1946

NEW ZEALAND

STATE FOREST SERVICE

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1946

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.

Wellington, 22nd July, 1946.

SIR,—

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, 1946.

As during the war years, much of the report is presented in précis form, with comparative statistics for corresponding dates or periods for the previous year shown in parentheses.

I have, &c.,

ALEX. R. ENTRICAN,

Director of Forestry.

The Hon. the Commissioner of State Forests.

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REPORT

CHAPTER I.—FOREST POLICY

1. *General Administration.*—The transition of the Dominion from a war to a peace economy has intensified rather than simplified the general administrative problems of the State Forest Service. Under the impact of six years of war on timber production, forestry has suffered severely, and must continue to do so until the present demand for timber is overcome and adequate forestry staff and labour have been secured. All that it has been possible to do has been to concentrate with the meagre staff available upon fire-prevention, forward planning, and training, which will allow arrears of essential silvicultural and general maintenance work to be overtaken as rapidly and as efficiently as practicable when labour requirements are eventually met.

A continuation of man-power difficulties and of timber control for a period of at least two years, which now appears inevitable, will call for mutual forbearance on the part of all concerned. Both Forest Service staff and the employers and employees in the timber industry are suffering from war weariness, the result of working long hours, often under extremely arduous conditions; the public is understandingly tired of controls, which, however necessary they may be or how well administered, invariably appear vexatious; and returned servicemen long separated from their families—civilians too—are clamouring for dwelling facilities.

The bald fact of the matter is that the accumulated arrears of repairs, maintenance, and new construction over six years of war are of such a magnitude that not only timber, but also all other building-materials, could probably be absorbed for several years to come at twice the pre-war rate of consumption. The same applies in many other lands, even more so in war-devasted countries, so that overseas supplies of timber and other building-material must likewise continue in short supply. It must be obvious that there is no short-term solution to the problem, hence the necessity for patience and forbearance. The Department can only hold the scales of justice in the allocation of available supplies to various zones and industries by a factual assessment of the many complicated claims which the Office of the Timber Controller is requested to handle, and at the same time explore, develop, and persevere with every conceivable means of increasing production and relieving the timber shortage. It is advisable in principle that timber control should be transferred from a war emergency to a peacetime basis, and recommendations to this effect will be presented to the Government during the current year.

2. *Staff Reorganization, Recruitment, and Training.*—During the 1929–35 depression the Forest Service, like many other governmental and private organizations, allowed recruitment to lapse, and current staffing difficulties spring from this fact. In retrospect, it appears difficult to justify the fact that over a long period of years the Department did not recruit a single field officer. With the ever-increasing expansion of forest activities and with the changing character of much of the work it has been necessary not only to reorganize the whole administrative structure of the Department, but also to develop a twenty-year staffing objective, together with a training scheme covering virtually every category of trained personnel, in order that the future expenditure of public moneys amounting to many millions of pounds may be reasonably safeguarded. This training scheme, which is based on a recruitment policy first brought into operation in 1939, was inaugurated two years ago with the establishment of the Rotorua Forest Training Centre, and it has since been further developed by the setting-up during the year under review of a Vocational Training School at Tapanui. Training courses for all

categories of officers have already commenced, and only the inauguration of a full two-year post-graduate course for officers holding B.Sc. or equivalent degrees is required for the completion of the scheme, a fuller description of which is attached as Appendix XII to this report. The ultimate objective in connection with the post-graduate course is recognition by the University of New Zealand, to which suitable representations will be made during the current year.

The recruitment and training of the rank and file of the Forest Service has hitherto proceeded on a more or less fortuitous basis. For many years it has been customary to regard forestry largely as a means of absorbing seasonal workers and unemployed labour, with the result that most employees have been single and untrained workers. To this fact is attributed much of the poor planting technique reviewed elsewhere in this report. Correction of this state of affairs is therefore imperative, and in order to attract and retain an adequate complement of permanent trained employees a construction programme for the provision both of accommodation for married men and of single men's hostels, &c., complete with community amenities has been made a prominent feature of post war-planning. Eventually it is hoped to inaugurate a number of reception centres at which all rank and file will receive elementary training in safety measures and in fire-fighting, &c., before being assigned to the various forestry projects throughout the Dominion. Dependence upon untrained and inexperienced workmen must be reduced to an absolute minimum, whether in the case of casual or seasonal workers. Only by this means can a high degree of efficiency by obtained in forestry work.

3. *Indigenous Forest Resources.*—As foreshadowed in last year's report, an officer with specialized experience in large-scale forest survey work has returned to New Zealand after six months' duty in the United States of America, where the most recent developments in the theory and practice of forest surveys were studied. This officer is now charged with the prosecution of a national forest survey for New Zealand, and the organization necessary to its accomplishment has been developed. In spite of inevitable difficulties caused by shortages of staff, transport, and equipment, a start has been made on this project, and all the preliminary investigations which are essential to the formulation of a satisfactory field procedure have been finalized. The survey proper commenced in the Rotorua Conservancy in January of this year, and considerable progress has been made in the provision of a volume estimate for one of the most important reserves of timber left in the North Island, the western belt of the large continuous Urewera Forest.

The national forest survey has as its main objectives—

(*a*) An estimate of the volume of available merchantable timber in the remaining non-protection indigenous forests in New Zealand, the estimate to be by major regions, and within each region by species and by diameter classes.

(*b*) A revision of existing national forest inventory estimates in order to obtain more accurate figures for individual forests and minor land subdivisions.

(*c*) The preparation of vegetation maps for all classes of forested land, based on broad vegetation and volume-per-acre classes.

(*d*) Other objectives include a survey of the extent and degree of natural reproduction of forest, a survey of the extent and nature of deer and other animal damage occurring in all classes of forest, the superimposing of land-ownership boundaries on the vegetation maps, and a survey of all types of non-commercial and protection forests.

The data accumulated should go a long way towards providing a scientific basis for the orderly management of all classes of forested land. The survey, though primarily volumetric, is thus also botanical and ecological in nature, and for this reason a high degree of training is required in the staff who carry it out. The methods used depend largely on vertical air photographs, the interpretation of which enable accurate acreages to be obtained without detailed ground surveying. The rate of progress is thus directly dependent on the availability of photographs, and it is unfortunate, therefore, that the

present quite considerable aerial cover of New Zealand is largely confined to non-forest areas, necessitating the placing of large orders for further photography. In spite of excellent co-operation from the authorities concerned, however, the supply of photographs is slow to come forward. The main contributory causes are priority work for other Government Departments, unsuitable flying weather, and recently in the North Island haze from the Ruapehu eruptions and smoke from the Taupo fires. The ground-sampling phase of the forest survey has been designed on a statistical basis, and every effort has been made to control the sampling errors which will unavoidably arise. Definite standards of accuracy have been set, and it is believed that by use of the two tools of aerial photography and statistical method they will be obtained with less field work and at a smaller cost than has been envisaged in the past.

The project is a monumental one representing the first large-scale attack upon the scientific management of the indigenous forest resources and constituting the most comprehensive national forest survey yet undertaken in any country of the English-speaking world.

4. *Indigenous Forest Management.*—The continuing emphasis both upon timber-production and exotic foresty has led to a general uneasiness that the future role of the indigenous forest is insufficiently appreciated by the Forest Service. Rather the reverse. Ever since its inception the Forest Service has realized that grave dangers are attached to a policy of either complete or heavy dependence upon exotic species for the long-term provision—as measured by centuries—of the country's future timber-supplies. The first large-scale investigative project undertaken by the Department was a national forestry reconnaissance. When this was completed in 1924, it had been established beyond all doubt that the remaining indigenous resources were so limited and the growth of all commercial species was so slow, requiring rotations ranging between one hundred and fifty and four hundred years, that the only means of managing the indigenous forests to meet future timber requirements was to conserve the remaining supplies by establishing supplementary exotic forest resources of rapidly growing species. At that time, of the 300-odd million board feet of timber being produced annually, only about eight million, or little more than 2 per cent., consisted of exotic softwood, principally insignis pine, and it was obvious that unless a very much greater production of this timber could be secured within a relatively short period, then it would be only a matter of twenty or thirty years before New Zealand would be faced with the necessity of making relatively large importations of foreign timbers, and any hope of dependence upon domestic supplies would be deferred for many centuries.

The wisdom of developing extensive exotic forests has been amply justified by subsequent events. Exotic softwood production has now increased to 100 million board feet per annum, equivalent to 28 per cent. of the total annual cut of 350 million board feet, the total production for the intervening period being almost 800 million board feet, representing five times the pre-1925 level of production. It is estimated that although within three years the total annual demand for timber will have risen to over 400 million board feet, 30 per cent. above the pre-1925 level, the consumption of indigenous timber will have decreased to only 80 per cent. of the pre-1925 figures. The net effect of this development is that the life of the Dominion's remaining indigenous resources has already been increased by 60 per cent. and will eventually be trebled. As a result of this policy of conservation, the Forest Service has a much more favourable opportunity of bringing the indigenous forests under management, and the national forest survey, already reviewed, will ensure the orderly planning of indigenous forest management.

5. *Indigenous Silviculture.*—Concurrently with the establishment and exploitation of extensive exotic forests, investigations have been made into the silviculture of the principal commercial indigenous species. Long-continued observations allow it to be stated with confidence that choice of silvicultural systems for kauri and beech will not present much difficulty, but the opposite is still the case with rimu, the most common indigenous timber tree. Its much longer maturing period, its habit of bearing pollen and seed on different trees, and generally the novel problem it presents—unassisted by any

literature or records of work done on similar species elsewhere—all intensify the difficulty that has to be solved by the New Zealand forester. It is hoped, however, as a result of fundamental research now in progress, combined with the practical management of demonstration forests to be commenced shortly, that success will ultimately be achieved.

6. *Exotic Forest Management and Resources.*—Technical staff has been concentrated, as far as practicable, upon the assessment of growing stock, using the method of strip sample plots. This investigation provides the fundamental basis of working plans for the exotic forests, indicating as it does the degree of thinning required, the best year for felling, and the volume of timber becoming available for utilization. The investigation indicates that considerable areas are under-stocked, chiefly owing to tree malformation caused by frost and fungus injury, combined with wide planting espacement. A thinning policy in such forest compartments would leave too small a stocking of final crop trees of good form, and indications are that a policy of clear felling and re-establishing at closer spacing will be the best one for the ultimate benefit of many stands.

7. *Exotic Silviculture.*—Although thinning treatment, heavily in arrear in most of the forest compartments, can be delayed up to a point, a stage is reached when further delay is liable to involve serious trouble which cannot easily be remedied. Sound silviculture is wrapped up in sound protection against fire, insect, and fungus damage, and unthinned forest stands inevitably deteriorate sooner or later into a condition in which, owing to tree suppression, mortality, and decay, felling amounts in effect to a salvage operation, as distinct from harvesting a normal heavy crop of high-quality timber. It is against this eventuality that labour is so desperately needed for essential silvicultural improvement works in many of the exotic stands. The strong contrast between insignis pine planted at 6 ft. by 6 ft. and that planted at 8 ft. by 8 ft. has been further confirmed during the year. Excepting on the best of soils, often more suited to agriculture than to forestry uses, 6 ft. by 6 ft. planting gives much better results in respect of both volume per acre and timber quality. As one forest officer aptly put it, insignis pine planted at 6 ft. by 6 ft. seems, in middle-aged to mature stands, like a different species from that planted at 8 ft. by 8 ft.

Natural regeneration of clear-felled areas of insignis pine near Rotorua now shows greater promise of reliability, but success in the past has doubtless sprung in large measure from the reserve of good seed stored on the parent trees in durable cones of up to ten years of age and older. With definite indications, however, that such cones opened during the abnormally hot, dry summer of 1946 and shed much of their seed, it is obvious that this may lead to abandonment of the natural regeneration policy for a few years and reversion to a policy of planting.

8. *Land Acquisition.*—Land areas under consideration for acquisition were inspected by inter-departmental committees representative of the Departments of Lands and Survey, Agriculture, and Scientific and Industrial Research (Soils Division), and the Forest Service. This procedure has assured the implementation of the policy of avoiding dedication to forestry of land suitable for farming and which, from the broad view of national land utilization, should not be withdrawn from agricultural uses.

9. *Water and Soil Conservation and Forest-fire Prevention.*—Widespread recognition by all land-controlling and land-using authorities that control of burning and grazing operations constitutes the only practicable administrative measure for limiting run-off and preventing accelerated erosion is the culmination of twenty-five years of pioneering work by the Forest Service. Under the combined efforts of the Lands and Survey Department, the Soil Conservation and Rivers Control Council, and the Forest Service, all of which are working in close co-operation, it should be possible to implement these measures so essential for the correction of the errors of the past century of trying to grow one blade of grass where two trees grew before. A much-expanded programme of fire-prevention publicity is in course of preparation for the forthcoming fire season. Numerous references are made throughout the main body of this report to the Taupo fires of last summer, which have served as never before to demonstrate that although in general

New Zealand with its high and normally well-distributed rainfall throughout the year does not suffer from the same recurring fire risk as is so characteristic of Australia and elsewhere, nevertheless plans must be made against an occasional high and widespread risk. To this end the major authorities concerned—the Soil Conservation and Rivers Control Council, the Forest Service, and the fire-brigade authorities—have been making exhaustive inquiries, as a result of which it is anticipated that a conference of all interests concerned will be called at an early date to consider the implementation of far-reaching proposals for dealing with the whole problem on a national basis, the essence of these proposals being the declaration of fire emergency areas and the provision of reserve fire-fighting equipment for use in such areas.

10. *Forest Utilization.*—The most serious crisis in timber use in the history of New Zealand arose during the past year. Under pressure of the acute shortage of timber, the pendulum has swung from a virtual prohibition against the use of exotic softwoods in general and insignis pine in particular to a permitted use without adequate safeguards.

It can be said that for the first one hundred years of New Zealand's development, timber use as based upon such durable species as kauri, totara, and matai was characterized by virtually limitless abuse. When rimu became the predominant timber in the country's economy this feature still continued, and even now there is gross carelessness in the handling of indigenous timber required for average building operations, as at some stage or other the timber is needlessly exposed to the elements at the sawmill or in the yard or on the building-site, and even in partially erected structures. But whilst the indigenous timbers do not seriously deteriorate under such conditions, the exact reverse occurs in the case of the exotic softwoods, particularly insignis pine produced from immature stands and containing little, if any, heartwood. If this freshly sawn timber is either block-stacked or carelessly exposed to the elements it will not only warp and twist more than the indigenous timbers, but, what is worse, become affected with sapstain, which will act as a focal point for decay. Previous annual reports have stressed this, together with the necessity for kiln drying and, in the case of sub-flooring timbers, also treating with suitable wood-preservatives. Unfortunately, now that only very limited supplies of indigenous timber are available, the necessity for these precautions is being lost sight of. If this tendency is to continue, it will jeopardize the national forestry objective of transferring the emphasis on timber-production from the indigenous to the exotic forests.

The danger is a very real one, and all housing authorities, local bodies, and other interested parties are urged to see that the strictest safeguards are taken against the development of careless practice in the handling and use of insignis pine for building purposes. It would be nothing less than a tragedy if in a few years' time, due to negligence now, a significant number of structures were to suffer a high rate of deterioration. Numerous references will be found in the body of this report with respect to the various precautions which are advocated in the use of insignis pine for building purposes.

11. *Forest Finances.*—Considering the limited trained staff available, excellent progress has been made with the reorganization of departmental accounts and finances. Sufficient preparatory work has been completed to ensure the introduction of a modern budgetary control system into all conservancies during the next two years, and it is anticipated that mechanization of wage accounts will be initiated in the Rotorua Conservancy towards the end of the current financial period. After prolonged negotiations the State Forests Account has been credited with the cost of timber control over the four-year period ended 31st March, 1945. The outstanding defect in the existing departmental financial system is that all expenditure must be made out of the State Forests Account, which is virtually a loan account. There are some items of expenditure which should more properly be met out of the Consolidated Fund, and as with the inevitable expansion of general forestry functions, as distinct from State Forest activities, these expenditures must increase, appropriate recommendations are being formulated for consideration by the Government.

12. *Rehabilitation and Post-war Planning.*—While long-term planning is the essence of forest management, it is no less important that within the wider period there should be intensive short-term planning supplementary to the main scheme. Without such planning expenditure will often be incurred that does not achieve the results which are desired, or which may even bring about results that are undesirable against the background of the long-term objective.

The first instance of this occurred in the initial establishment of the supplementary exotic forestry resources first provided for in 1925 when, due to the general buoyancy of the Dominion's revenues and the availability of labour, annual planting operations were increased to a peak figure of 60,000 acres instead of being limited to a maximum of 24,000 acres or even less. The undesirable results included—

(*a*) The concentration of too much planting in one area remote from many timber-consuming centres;
(*b*) Too much planting of insignis pine due to the relative abundance of seed-supplies of this species compared with others;
(*c*) The planting of various species on unsuitable sites; and
(*d*) Poor nursery and planting practices, including 8 ft. by 8 ft. espacement, and poor planting technique due to the employment of too many inexperienced and seasonal workers.

The second instance occurred during the depression, when, in common with other public works, forestry was invoked as a means of alleviating unemployment. On this occasion the defect of relying largely upon insignis pine was remedied by the extensive use of other species and although large annual plantings were again undertaken, this does not constitute a defect, as the use of the slower-growing species permits of more elasticity in management. While planting continued to be over-centralized in one area, the gravest fault of this period appears in retrospect to lie in the failure to concentrate available labour on the silvicultural improvement of the exotic areas already established.

Taking into account the original cost and accumulated interest charges, it is not improbable that by the time the various areas affected have been reconverted to better stands of other species a wastage of as much as £2,000,000 may be involved. It is against the repetition of such errors that the whole of the Forest Service long-term planning and more especially the short-term planning of the post-war period have been directed, and it is pertinent to observe that this applies also to the intensive staff-training proposals, as it was the shortage of highly trained personnel over the two periods reviewed that was fundamentally responsible for the defects referred to.

It will be observed that the one factor common to both periods was the ample supply of labour. It is therefore fundamental that any planning for the future should take cognizance of this factor, for then, if unemployment did occur, large numbers of men could be efficiently and not wastefully employed. This is the only safe policy that can be followed with respect to the planning of any public works. It is no less fundamental to such planning that priorities for various projects should be established. Moreover, as events have demonstrated during the past year, much less labour is now likely to become available during the post-war period than was at first expected, which means, of course, that only the most essential works can be undertaken, and it is not improbable that failure to appreciate the fact, combined with the magnitude of the expenditure involved in planning against the worst eventuality—that is, surplus labour—is responsible for some uneasiness regarding the short-term—five or ten year—planning of all public works.

Naturally, the intensity of planning for individual projects varies with their priority, but nevertheless a definite assurance can be given that all projects have been sufficiently planned to avoid every major mistake that has been made under the pressure of expediency over the last twenty-five years. Among other things, planting is being widely extended throughout the whole Dominion, annual plantings of each species on each project

are being kept strictly within limits, better nursery practices and closer planting espacements have been adopted, and labour will be concentrated on silvicultural improvements in place of extensive planting.

CHAPTER II.—ADMINISTRATION

13. *Permanent and Temporary Staff.*—Permanent, 309 (254); temporary, 201 (171); total, 510 (425).

The above totals include men still with the Forces, returned servicemen on extended leave (12), and others doing full-time study at the universities (13). Although present staff numbers show an increase of 24 per cent. compared with the number engaged as at 1st April, 1945, the Forest Service must still recruit on a major scale in view of expanding activities and the rehabilitation programme. Efforts have been made to increase present staff in the more senior positions, for it is apparent that recruitment to the lower ranks alone will not be sufficient to carry out present and future works. Temporary staffing difficulties also arise over the need to allocate existing personnel to training duties, but this is inevitable if the present staff shortages are to be overcome.

To cope with the ever-increasing volume of staffing problems a formal staff committee was set up and has operated with much success. A co-ordination committee co-operating with regional staffs has supervised the merit marking of officers for promotion.

The replacement of officers who have been retained after their normal retiring dates is now necessary, but this position is alleviated by the willingness of these officers to remain and assist during the immediate post-war period.

14. *Military Service.*—Army, 15 (48); R.N.Z.A.F., 5 (31); Navy, 2 (14); and Territorial, nil (4); making a total of 22 (97).

Staff now remaining with the Forces are almost wholly specialists retained on particular duties and men of an age class retained in the interim Army or in the "J" Force. The Armed Services have been most co-operative in releasing from overseas service forest officers required either for special investigational work overseas or for developmental work in New Zealand. Three officers so released returned to New Zealand after an extensive tour of duty in Canada and the United States of America. One officer specialized on forest-fire prevention and control, one on forest pathology, and one on silviculture.

15. *Casual Staff.*—Average for year, 1,108 (992). The number employed at the 31st March, 1946, was 1,299, an increase of 310 over the number employed twelve months ago. Although many industries were released from man-power control prior to the 31st March, 1946, employees of the Forest Service remained still subject thereto, but even that protection was insufficient to provide an adequate fire-fighting force at all forests, a fact that was very evident during the exceptional fire-hazard period from January to March.

16. *Honorary Staff.*—Honorary forest rangers, 245 (217). New appointments numbering 34 were made, and there were 6 resignations or appointments expired due to effluxion of time or removal of the appointee from district.

17. *Health of Staff.*—Real progress has been made during the year in securing additional timber-measuring staff to replace the older officers who have been retained unduly on these arduous duties, and, while suitable transfers will be arranged during the current year, further field staff will be required before it is possible to suspend cruising activities during the worst winter months. Office accommodation is not keeping pace with staff expansion, causing loss of efficiency as well as poorer general health. Obviously the Forest Service is affected by the strain now being placed on the national building resources, but all possible means to secure even temporary improvements are being taken.

18. *Safety of Employees.*—Total accidents, 259 (149), made up as follows: cuts, 67 (25); strains, 59 (38); fractures, 10 (8); crushes and bruises, 76 (23); septic wounds, 13 (16); eye injuries, 12 (7); miscellaneous, 20 (18).

It is necessary to report, with regret, 2 fatal accidents. On 9th November, 1945, a tractor-driver was killed through being pinned underneath a bulldozer which had overturned on a bank. On 11th February, 1946, a bushman, hauling logs from a steep slope, was crushed by a log, receiving injuries from which he died. In both accidents there was no suggestion of negligence by the Forest Service, and verdicts of "accidental death" were returned at the inquests.

Safety instruction will be incorporated in all future training work. Following the passing of the Bush Workers Act, 1945, it is anticipated that an active safety campaign will be developed in co-operation with the industry and the Department of Labour.

19. *Compensation to Employees.*—The Service carries its own accident-insurance risk, and the total compensation payment, total wages, &c., are as follows:—

Year.	Total Payments.	Total Wages.	Per Centum (Approximately).
	£	£	£ s. d.
1944–45	5,774	292,483	1 19 5
1945–46	5,548	349,863	1 11 9

As the estimated premium payable for a comprehensive commercial accident policy for the year would have been £15,275, a saving of £9,727 has been effected.

It is satisfactory to note that the amount of compensation paid during the year has decreased in spite of the increased number of accidents, the reason being that minor injuries formed a large proportion of the total.

20. *Recruitment.*—The recruitment and training of officers has finally been organized as a separate section of the Forest Service and staffed by three highly qualified officers working to a twenty-year staffing-plan objective. The high proportion of young ex-servicemen appointed during the year has been a feature of the field-staff recruitment. Ten out of the 17 appointees are ex-servicemen, and of these 2 are studying for B.Sc. degrees under rehabilitation bursaries. Junior field recruits total 85, of whom 50 have served in the Forces.

To meet an acute shortage of timber-measures in indigenous forests, 24 temporary staff appointments, including 18 ex-servicemen, have been made. Prior to their appointment these men were given a period of employment as chainmen and a two-month competitive course in timber-measuring.

21. *Training.*—Junior field recruits are continuing to receive training as two groups:—

(*a*) Professional trainees (32), who have the opportunity of graduating in approved science subjects as a preliminary to a two-year intensive post-graduate course in professional forestry subjects at the Rotorua Forest Training Centre, which it is hoped will commence in April, 1947, and receive University recognition.

(*b*) Field trainees (53), who are given rotational field experience culminating in competitive courses at the Forest Service Training Centre.

Of the professional trainees, 3 have completed their B.Sc. degree and 13 have, as ex-servicemen, been granted rehabilitation bursaries in New Zealand. In addition, 2 ex-servicemen officers of the Service have been granted rehabilitation bursaries in the United Kingdom and are studying for a forestry degree at Edinburgh and Aberdeen Universities respectively.

With a view to taking up forestry as a career and professional appointments in this Service, 5 ex-servicemen are studying forestry at Universities in the United Kingdom. An additional 7 ex-servicemen have been granted rehabilitation bursaries in New Zealand with the object of graduating B.Sc. as a preliminary to post-graduate forestry training.

At the Rotorua Training Centre, where only temporary quarters are at present available, five courses were conducted during the year—viz., two for timber-measurers, one for log-scalers, and two (refresher) for senior field officers and for senior clerical officers respectively (see Appendix XI). The instructors were seconded from the permanent staff of the Service. A more ambitious programme, including short courses for both field and professional trainees, is already planned for this year. An important development during the year was the acquisition of a well-appointed hostel at Tapanui, where a vocational training school for the South Island has now been established. At this centre 38 ex-servicemen have already been instructed in leading hands' duties, and a continuous series of six-weekly courses will be carried on throughout this year. A vocational school is also being provided at the Rotorua Training Centre, where similar classes will commence during the winter. At the saw-doctors' school at Waipa State Mill 2 ex-servicemen received instruction during the year.

22. *Examinations.*—Two trainees completed their M.Sc. degree during the year, and 60 men attending courses at the Rotorua Training Centre and the Tapanui Vocational School were successful in passing the various examinations (see Appendix XI).

23. *Allocation of Duties.*—Some progress has been made with the setting-up of separate divisions for each distinct activity of the Forest Service. Acceptance of the proposals submitted to the Government will involve a major staff reorganization. Key personnel will be drawn from existing staff, but it is obvious that additional officers of senior grades must be recruited from other Departments and perhaps from outside the Public Service.

As yet no appreciable difference has been made in the administration of timber-control activities in so far as the allocation of staff is concerned. The post-war demand for timber is so acute that senior officers at Head Office and in the conservancies are still required to spend considerable time on such matters, and it is a cause for congratulation that these duties have been lightened by the retention of some officers after their normal retiring-age.

24. *Field and Office Inspections.*—The continued demand for increased timber-production has resulted in most field inspectional work being directed towards that objective, special inspections having been made of reserve areas of indigenous forest and of those exotic stands from which saw-logs can be secured either by thinning or by clear-felling. Both field and office inspections generally have been restricted through the necessity of senior officers carrying out formal training and reorganizational duties.

25. *Conservancy Organization.*—As indicated in paragraph 23, progress has been made in the reorganization of the Forest Service into divisions, making it necessary to defer temporarily the setting-up of minor territorial charges within the conservancies. Here, again, key staff is not immediately available and progress can only be made through the acceleration of training activities.

26. *Inter-departmental Co-operation.*—The constantly increasing scope and complexity of rehabilitation and post-war activities and problems have necessitated more intimate co-operation than ever before with many departments, principally the offices of the Commissioner of Works, of the Building and Shipping Controllers, and of the Railways Department. Special tribute must be accorded the three Armed Services, the Public Works, Post and Telegraph, Police, and Internal Affairs Departments, the Inspector of Fire Brigades, and the Auckland, Wanganui, Palmerston North, and Wellington Fire Brigades for their co-operation and assistance in fighting the Taupo forest fires, without which much more extensive losses would have been sustained.

CHAPTER III.—CONSTITUTION OF STATE FORESTS

27. *Changes in Area.*—During the year 42,367 acres were set apart as permanent and provisional State forest and 766 acres were withdrawn from reservation—a net increase of 41,601 acres. The area under State forest reservation now totals 9,189,763 acres, representing 13·84 per cent. of the total land area of the Dominion.

Of this area, 6,237,667 acres, being 67·87 per cent. of the total State forest area, are permanently reserved (see Appendix I).

28. *Changes in Status.*—Only a small area was affected under this heading, consisting mainly of 423 acres withdrawn from reservation for settlement purposes in the Taranaki district and 332 acres for scenic purposes in the Hawke's Bay district.

CHAPTER IV.—FOREST MANAGEMENT

29. *Surveys.*—In the demarcation of sawmill areas, boundary surveys were carried out on 172 areas, totalling 17,877 acres, and timber-reconnaissance surveys were completed over 8 areas, containing 21,194 acres. Topographical surveys of exotic forests covered 382 acres and forest-type surveys 172 acres.

The use of aerial photographs has been considerably extended, especially in connection with the national forest survey, resulting in an appreciable increase in the orders for photographs placed with the contractor for this work. With the termination of the war it has been possible to complete the photography of some of the long-outstanding contracts, but owing to the limited season for the satisfactory photographing of forested areas, and also to other factors, the progress made has not been as great as could be desired. During the year 9 mosaic copies and 1,690 prints were added to the library, and 30 mosaic copies were supplied to the conservancy offices for their use. The Forest Service library of aerial photographs now contains 42 mosaics covering 1,400 square miles.

30. *Mapping.*—The continued shortage of experienced survey draughtsmen has prevented much being done towards overtaking the accumulation of work or in the preparation of new record maps. Work for the year was therefore mainly confined to the recording of operations and the preparation of plans and maps for current work. Two stock maps were redrawn, and 1 communications and 11 operational maps were prepared. Thirteen forest atlas sheets were renewed, 30 new plans were recorded, and additions were made to 29 stock and operational maps. Eight maps of the Rotorua-Taupo area were prepared for use by the aerial fire patrol.

31. *Forest Management Staff.*—Two professional officers returned from military service with forestry companies overseas and were posted to special duties, one to take charge of the national forest survey and the other to forest pathology. An M.Sc. graduate in pure science also returned from service with a forestry company, and, with experience of the survey of the woodland resources of Great Britain, was appointed to the professional staff and posted to duty with the national forest survey. Duties connected with timber control, post-war timber requirements, rehabilitation, recruitment, and training once more absorbed a large part of the time of the professional officers; but, despite this, good progress was made with growing-stock assessments, and volume and yield tables were compiled for unthinned insignis pine in the Rotorua district.

32. *Forest Working Plans.*—The five year period of the working plan for the kauri-working circle expired on 31st March, 1946. Of a prescribed allowable felling of 680,000 cubic feet of standing dead kauri, only 180,000 cubic feet were actually cut, the corresponding figures relating to living kauri being 1,220,000 cubic feet and 1,020,000 cubic feet respectively. The allowable cut for normal, peacetime uses amounted to 520,000 cubic feet, and this volume was actually taken, though largely used in connection with the war. The additional allowable cut for war-timber requirements was 700,000 cubic feet, and of this 500,000 cubic feet was actually removed.

In the years 1942–43 and 1943–44, both crucial years in the Pacific war theatre, it became imperative that overcutting of kauri be sanctioned for war requirements, and in those two years the planned cut was exceeded by 225,000 cubic feet. The quantity of living kauri extracted in 1945–46 dropped to the low figure of under 50,000 cubic feet, while that of dead or dry kauri rose to nearly 70,000 cubic feet.

The working-plan revision is now under way, and during the next decade it should be possible, by reducing the allowable log production from the State forests, to offset to some extent the 500,000 cubic feet which was cut for abnormal war requirements, thus restoring the kauri "forest capital" to its sound pre-war position. Working plans for Herekino, Omahuta, and Puketi Kauri Forests are in course of preparation.

On the State exotic forests, the field work of assessment surveys was completed over 38,300 acres as against 12,600 acres in the previous year. The forests surveyed are: Puhipuhi, 300 acres; Maramarua, 4,300 acres; Kaingaroa, 23,700 acres; Golden Downs, 900 acres; Balmoral, 4,000 acres; Dusky, 4,500 acres; and Conical Hill, 600 acres. In all, 150 forest compartments were assessed. The strip-plot method was used in all cases, but on Maramarua Forest the area was also surveyed by the line-plot method for the purpose of comparing the accuracy of the two methods. Maramarua Forest was resubdivided into smaller compartments of a mean area of approximately 250 acres. Following the resubdivision of Eyrewell Forest in the previous year, the compartment register is being rewritten and is almost completed.

In the Southland Conservancy, silvicultural treatment and management of silver-beech stands on Longwood Forest were commenced after ten years' work on an experimental basis.

CHAPTER V.—SILVICULTURE

33. *General.*—As in the previous year, silvicultural treatments accorded to the State forests were limited mainly to small areas which could be covered by maintenance and caretaker personnel. Additional workers who became available were employed on silvicultural work as far as possible. The areas treated by way of pruning and thinning rose slightly, to 1½ per cent. of the total planted area. New planting fell from 1,748 acres to 553 acres. Statistics appear in Appendix II.

34. *Natural Regeneration.*—On kauri compartments under working plan, very heavy mortality in kauri seedlings was caused by the exceptionally dry summer and autumn. It has been reported that the same phenomenon led to an unusually prolific seed-fall in insignis pine in Rotorua Conservancy and elsewhere (see paragraph 51). Natural regeneration of insignis pine is generally secured in clear-felled compartments without any firing measures, and to a very large extent such regeneration must spring from seed shed by old cones, which on standing trees commonly remain closed and retain viable seed for up to ten years and more. Loss of such a reservoir of seed might prevent adequate restocking by natural regeneration of compartments to be felled in the next few years, and the problem is therefore being investigated.

35. *Interplanting Indigenous Forests.*—Worked podocarp forest to the extent of 110 acres was interplanted, 30 acres with kahikatea and 80 acres with Douglas fir. The kahikatea plants were raised from seed in a nursery and the Douglas fir were advance-growth wildlings from an exotic forest.

36. *Afforestation.*—New planting on open land amounted to 443 acres, 452 acres were blanked up, and 137 acres were replanted.

Tree seeds collected totalled 1,463 lb., which includes 4 lb. of indigenous tree seeds.

37. *Nursery Operations.*—From 1,682 lb. of tree seed sown, 8,503,000 seedlings were obtained. Trees lifted for planting totalled 1,203,000, and 1,601,000 trees were lined out. At the close of the year there were 11,985,000 trees in the nurseries. These figures are low. Had it not been for the climatic vicissitudes detailed in paragraph 51, the nursery stocks would have stood at 20,000,000 trees.

One new departure in local nursery practice is worthy of record. The removal of larch and of Douglas fir thinnings from certain older compartments in Whakarewarewa State Forest, where the original stand was a larch - Douglas fir mixture, resulted in a dense advanced growth of Douglas fir seedlings in recent years. As these wildlings could have no place in or under the pure stand of Douglas fir, which will be left for

another forty years to mature into the final crop, 430,000 of them were lifted and lined out as seedlings in an adjacent "flying nursery." They have thriven well and an excellent small crop of 1/1 trees has been secured at the cost of a single year's cultivation. The procedure is being repeated this year, even to the extent of transferring such stock to other conservancies in lieu of the seed-supplies, which were wholly lacking for that species this year.

38. *Tending of Indigenous Forests.*—On Great Barrier State Forest, 150 acres of young kauri were released from overtopping growth of manuka, &c., and on other kauri forests this operation was performed by patrolmen as opportunity offered.

After marking, 25 acres of red-beech pole forest were thinned and mine props extracted. Thinning, girdling, and underscrubbing were commenced in a silver-beech forest, involving extraction of mine props and saw-logs.

Exotic interplantings in worked podocarp forests were released on 282 acres.

39. *Tending of Exotic Forests.*—Release cuttings covered 925 acres, low pruning 5,340 acres, and high pruning 458 acres; and 574 acres were thinned and 234 acres clear-felled. In addition partial fellings, with extraction of forest produce, were carried out on 742 acres which had suffered wind and snow damage.

40. *Silvicultural Investigations.*—Small trial plantings were instituted on one area acquired for formation of an exotic forest, and were continued on two other areas.

Trial plantings of insignis pine at rectangular spacings of 12 ft. by 6 ft., 10 ft. by 5 ft., and 8 ft. by 4 ft. were continued.

Small areas heavily thinned on a trial basis the previous year on Eyrewell Forest did not stand up to the heavy gale of July, 1945, and in the future thinning will have to be carried out gradually in several stages.

41. *Experimental Plots and Statistical.*—Plots established on Whakarewarewa Forest for studying natural regeneration of insignis pine after clear-felling were recounted, and this has again shown that ample stocking is obtained except on odd small areas, which are filled up by means of planting. Germination is not yet complete on the plots felled in 1945, and the same applies to a less extent to plots felled in 1944:—

Year clear-felled.	Number of Plots.	Number of Trees per Acre.		
		Mean.	Maximum.	Minimum.
1942	10	3,590	11,250	920
1943	7	2,190	4,470	970
1944	14	2,680	12,660	240
1945	14	796	2,660	Nil

Mortality from the bast beetle, *Hylastes ater*, and the honey fungus are relatively negligible.

Quinquennial reinvestigation was made of a series of plots in silver-beech stands on Longwood Forest, Southland Conservancy, and a further thinning carried out.

Further data on mortality in an eighteen-year-old unthinned insignis-pine plot on Maramarua Forest were obtained from a recount made early in April, 1946. The mean annual mortality in all crown classes over four years was twenty-six per acre, but in the fifth year was only fourteen. This indicates that possibly the period of heavy mortality, due to competition, has passed, though one or two further annual investigations will be necessary to obtain confirmation of this possibility.

42. *Forest Botany.*—The collection and summarizing of data relating to current phenological projects for the main exotic and indigenous forest tree species have continued during the year as part of a long-term investigation. Tests carried out on seed stored under different conditions confirm that the storage methods practised are quite suitable for most exotic species studied and also for some indigenous species. It is not possible

at this stage of the investigation to give any conclusive figures, as the seed is to be stored for ten years with annual or biennial testing as results indicate; but preliminary examination suggests that, while indigenous species lose a certain amount of viability even when stored for short periods, cool storage is more satisfactory for these species than storage at room temperatures. This is borne out by the fact that kauri seed stored at room temperatures (33–78° F.) had completely lost its germinative capacity in two years, while that kept in cool storage at 35–40° F. for the same period still had a germinative capacity of 64 per cent. of the original test. In the case of exotic conifers, seed kept in cool storage had a higher germinative capacity than that stored at room temperatures, though insignis pine apparently shows no appreciable difference in power of germination whether stored at room temperatures or in cool storage.

Reports on seed crops of both indigenous and exotic species indicate that with few exceptions the 1945–46 season has been a poor one (see also paragraph 51).

CHAPTER VI.—FOREST PROTECTION

43. *Fire Damage.*—A period of unprecedented fire hazard during December, 1945, and January, February, and March, 1946, coupled with severe drought conditions, culminated in extensive fire outbreaks in the Hawke's Bay, Rotorua-Taupo, and North Auckland districts. Fires reported from Forest Service lookouts were 606, a number considerably lower than in previous years, as under a new system of reporting fires only outbreaks occurring within ten miles of a State forest boundary are now recorded.

The number of recorded fires occurring in State forests during the fire season totalled 62, involving an area of 16,330 acres of all classes of forest, both indigenous and exotic. From the 8,000 acres of indigenous forests swept by fire, virtually the whole of the scorched merchantable timber, totalling 28,000,000 board feet—on 390 acres at Mangapeehi and 580 acres at Oruanui—will be salvaged over the next two or three years without significant loss. Exotic forests burned totalled only 161 acres, this being at Tairua, Coromandel. The balance was made up of protection and worked-over forest and tussock and scrub lands. Due to the high efficiency of the departmental fire-fighting organization, not one acre of exotic forest was lost in the Taupo conflagration, though the fires actually reached the Kaingaroa State Forest boundary before being brought under control. Similarly, in the Te Whaiti district the Forest Service logging operations were entirely free of fire damage, while many adjacent cut-over areas on Maori and privately owned land were badly swept by fire.

Recorded fires outside of State forests numbered 311, 200 of which were "spot" fires on the North Island Main Trunk Railway caused by locomotives. Although little damage was done by these locomotive fires owing to their being extinguished promptly, they constitute a grave menace, and a considerable amount of time is spent by Forest Service patrolmen and others in keeping check of train movements. The total area involved in these 311 fires was 574,000 acres, made up of 32,676 acres of privately owned exotic forests (mainly in the Rotorua-Taupo district), 10,929 acres of indigenous forest with a loss of 525,000 board feet of merchantable timber, and 530,500 acres of mainly scrub, fern, and tussock.

Hopes of salvaging the scorched exotic timber have been slight from the outset. The main blocks swept by fire were some of the youngest and poorest, capable of yielding only relatively small-diameter and therefore costly saw-logs, and situated at considerable distances from both mill and rail facilities. Another factor militating against salvage operations is the shortage of bushmen, combined with the practical difficulties of providing special accommodation and the very real problem of persuading men to transfer to an uncongenial and dirty type of logging. It is an inescapable conclusion that only by a sacrifice of overall timber production can salvage be undertaken—and uneconomically at that—by transferring bushmen already more productively engaged elsewhere. This appears to be confirmed by the fact that the

largest loser by fire already operates several sawmills, but is not carrying out any large-scale salvage work. Nevertheless, as an exploratory effort, the Forest Service made an offer to those companies not possessing mills that it would investigate the possibility of organizing a second shift at its Waipa Mill if they could deliver their logs to Waipa at ruling prices, but nothing practicable came out of the offer.

During the year fire destroyed 12 (2) sawmills or box-factories, as follows :—

Sawmills—

Ellis and Burnand, Ltd., Mangapeehi (Auckland Conservancy).
Morningside Timber Co., Ltd., Omahuta (Auckland Conservancy).
Pohokura Timber Co., Ltd., Pohokura (Rotorua Conservancy).
C. P. and P. D. Smith and Co., Ltd., Taumarunui (Wellington Conservancy).
J. J. Orbell, Hastings (Wellington Conservancy).
Dominion Timber Co., Ltd., Owhango (Wellington Conservancy).
Ogilvie and Co., Ltd., Marsden (Westland Conservancy).
N.Z. Refrigerating Co., Ltd., Islington (Canterbury Conservancy).
Carroll and Co., Gore (Southland Conservancy).

Box-factories—

K.D.V. Boxes, Ltd., Morningside (Auckland Conservancy).
T. W. Wall, Ltd., Owhango (Wellington Conservancy).
Saunders Kiln Dried Timber Co., Ltd., Lower Hutt (Wellington Conservancy).

There are no satisfactory figures of the total amount of sawn-timber stocks destroyed in these fires, but with few exceptions losses were not large.

44. *Fire Detection and Control.*—During the February fires in the Taupo district humidity observations and fuel moisture sticks proved their infallibility as fire-risk indicators. Insufficient attention, however, was accorded the readings, and to prevent this happening in future an officer has been specially assigned to developing a fire-hazard meter which will enable all members of the staff better to assess current fire conditions and to take prompt and appropriate measures to avert a similar emergency. There appears to be little doubt that legislative power must be secured under which, when the fire hazard becomes unduly high, forest officers or the local authorities may declare a fire emergency, during the period of which no person shall be permitted to light any fires whatever out in the open.

An analysis of records taken in the Rotorua district shows that relative humidities at 9 a.m. were below 45 per cent. on fourteen days during December, January, and February at Rotoehu, on seven days at Whakarewarewa Nursery, on three days at Wairapukao, and on one or two days at each of four other stations. Maximum hazard was between 1 p.m. and 4 p.m. Relative humidity readings taken at those times were below 45 per cent. on forty-four days at Wairapukao, on thirty-two days at Kaingaroa, and on fifteen or more days at other stations (records for Rotoehu and Whakarewarewa Nursery are available only for 9 a.m.), the readings indicating that stations at lower altitudes in the hazard areas do not show the same overnight rise in relative humidity as stations at higher altitudes. During this period the rainfall was far below average, temperatures were above average, and there were relative humidities below 20 per cent. on several occasions, and the cumulative drying effect of these factors on the taller vegetation, the ground cover, the soil, and the peat brought about conditions of extreme hazard in February. At Kaingaroa Station readings at standard times of observation disclosed sixty-three occasions on which the arbitrary danger point was reached, as compared with four, fifteen, and twelve occasions respectively during the three preceding fire seasons.

One additional station for recording fire-hazard conditions has been set up at Granville, on the west coast.

The assistance received from the Weather Office in correlating recorded conditions at Forest Service stations with their own daily records from widely dispersed stations, in issuing broadcast warnings and special forecasts, and in the urgent establishment of mobile reporting stations linked by radio in remote areas during a period of exceptional hazard has been invaluable.

The erection of two more important lookout stations at Opango and Reporoa, on Kaingaroa State Forest, has further improved the facilities for locating fires by the resection of bearings and by direct observation. These buildings are of the standard type developed for the purpose, complete with modern detection and communication equipment. At Eyrewell State Forest the old lookout tower, which had become overtopped by the trees, has been replaced with a new 100 ft. tower giving an extensive view of the forest and surrounding country. It has already proved of great value in the early detection of fires.

The aerial fire patrol provided by the Air Department proved of inestimable value during the Taupo fire emergency in the Rotorua Conservancy, and also in the Auckland and Wellington Conservancies, to which it was extended at short notice. As a result of air observation many fires were quelled in the incipient stage, and only by the aid of this patrol and observation service was it possible to use fire-fighters and equipment to maximum effect and avoid much more serious losses than were sustained. The normal practice at Rotorua was to keep one aircraft standing by at the Rotorua Airfield, but an increase to two was made when the situation became dangerous. A total of 141 patrol flights were made from Rotorua, 90 of these taking place after the 9th February. Supplementary reconnaissance and patrol flights were also made by the Beechcraft aeroplane operated by New Zealand Aerial Mapping Services, Ltd., these flights extending over the Urewera country, Tauranga, Coromandel, and as far west as Mangapeehi. A forest officer was carried as observer in nearly all cases, information being radioed to headquarters or direct to fire-fighting parties. Two mishaps occurred in landing at Taupo, but no injury was received by the crews, and substitute aircraft were made available without delay. Full use was made of the landing-strip formed at Kaingaroa. A hangar erected at Rotorua by the Forest Service for the Air Department was completed in time to permit the efficient functioning of the patrol service. From the Ohakea Airfield 7 flights were made over forest areas in the King-country and Wairarapa, providing information that could not have been obtained in any other manner. Radio contact was established with Army wireless trucks as required. The ready co-operation of the Air Department and Air Force personnel in providing these services is gratefully acknowledged.

The seventeen "Desert Mule" forest fire-engines referred to in last year's report are now completed and stationed at suitable forest locations. The successful performance of these machines during the Taupo fires has justified the development of this type of equipment, but the experience gained has necessitated certain improvements being incorporated in both existing and new machines now being built. In addition to the fire-engines, twenty-eight "Desert Mule" 800-gallon water-tankers are under construction. These machines comprise a specially designed sectional tank, with pump and suction hose capable of filling the tank from all forms of water-supply, and all parts are standardized with those of the fire-engines. The tankers have been designed to maintain a continuous supply of water to the fire-engines and can, like the fire-engines, traverse rough country. If so required, they are able to pump directly on to a fire. Nine "Desert Mule" chassis have also been acquired for development as hose-layers. E.P.S. fire-pump units have been fitted to four of them, together with the necessary hose lockers, and sufficient pumping units to equip the remainder are being obtained.

Communications at the Taupo fires functioned almost perfectly. Radio contact between land stations and land and air patrols was maintained at an effective level throughout the emergency, but valuable experience was gained and certain operating and equipment weaknesses were disclosed. As a result, new types of equipment are now being developed to give wider coverage and to allow of complete North Island control

of fire emergencies. It was a reassuring sight to air observers to see trucks converging on to the scene of the fires within a few minutes of the locations being radioed to Kaingaroa and other fire headquarters.

45. *Fire Districts.*—Fire districts to a total of 71 have now been constituted, containing an aggregate area of 4,834,618 acres. During the year three new fire districts were set up—viz., Rotoehu Fire District, 38,700 acres, in the Bay of Plenty district, for the protection of State forest (closed season, 1st October to 15th April); Granville Fire District, 32,000 acres, in the Westland district, for the protection of State forest (closed season, 1st August to 30th April); and Whakatane Fire District, 161,000 acres, in the Bay of Plenty district, for the protection of an exotic forest owned by a company (closed season, 1st October to 15th April).

The coverage afforded by the Kaingaroa Fire District (573,000 acres) was found, during the period of extreme fire hazard experienced in the Taupo district in February, to be inadequate for the protection of all the area in danger, and in the absence of power to declare a "fire emergency district," in which the lighting of fires outside for any purpose whatsoever would be prohibited, there was no alternative but to extend the fire district in question in order to cope with the situation. The extension was effected in the usual way by simultaneously revoking the original notice constituting the Kaingaroa Fire District and declaring a new fire district to be known as the Kaingaroa-Rotorua Fire District, covering 1,340,000 acres (closed season, 1st October to 15th April).

Fire districts are constituted under section 27 of the Forests Act, 1921–22, as amended by section 5, Forest Amendment Act, 1925, which states, *inter alia*, that "the Minister may, by notice in the *Gazette*, on the recommendation of the Director and the Land Board of the district, declare any area to be a fire district." In the case of an emergency, however, the procedure involves too long a delay and envisages a pre-determined plan rather than immediate declaration when a crisis occurs. In the February crisis immediate action was fortunately possible owing to the Land Board being then assembled for its usual monthly meeting, and, with the co-operation of the Under-Secretary for Lands, arrangements were made for the Board urgently to give its recommendation and thus facilitate immediate gazetting of the requisite notices. The coverage now afforded by fire districts in the region extends roughly from Lake Taupo on the south to the Bay of Plenty in the north and from the Waikato River on the west to the Rangitaiki River on the east.

An aerial survey of the Taupo district when the emergency was at its height revealed numerous fires burning over a very wide area, leaving no doubt that total prohibition of lighting fires outside for any purpose whatsoever is imperative under such conditions. As mentioned in the preceding paragraph, it now appears imperative that legislative authority should be given to declare a "fire emergency district" in times of high fire hazard. Many requests have been received from local interests to have the fire-district laws enacted for the protection of forested areas extended to other rural areas, and this matter is being examined, together with the general question of fire prevention and control. The whole position is at present the subject of discussion among interested State Departments, with a view to establishing a Dominion-wide fire-fighting and fire-control service, and it is hoped that legislation necessary to set up such a service will shortly be submitted to the Government for consideration.

The fact that no losses were suffered on the huge Kaingaroa State Forest during the critical period of the Taupo conflagration, although fires actually reached the boundary of the forest, is evidence of the smooth and efficient functioning of the departmental fire-fighting organization for the purpose for which it was originally designed, the protection of State forest. The widely expanded duties it was required to perform by way of organizing the general fire-fighting throughout the district menaced by fire were discharged with great merit by the responsible personnel, and, whilst it was undoubtedly effective in preventing a very much worse disaster, there appears to be a real need for some formally organized fire-fighting establishment which can be promptly brought into action in any such emergency, and the proposed legislation now being prepared will make provision accordingly.

46. *Forest (Fire-prevention) Regulations 1940 (Serial Number 1940/246), as amended (Serial Number 1943/31).*—No amendment to these regulations was made or found necessary during the year.

One of the principal means of keeping the provisions of the regulations under the notice of operators and workers in State forests and in fire districts is their distribution in poster form for display in sawmills, where they can be conveniently read by workers and visitors. Early in the fire season arrangements were also made for a leaflet to be placed in each worker's pay envelope directing attention to his responsibilities under the regulations. Many posters were renewed during the year.

The early confusion concerning the obligations imposed by the regulations has now almost entirely disappeared, and the majority of operators are ready and willing to co-operate with forest officers in enforcing their observance.

During the period of high fire hazard in February and March the prohibition (*Gazette*, 1944, page 89) of the use of gas producers on the Dargaville–Opononi Road through Waipoua Forest in North Auckland and on the Rotorua–Waikaremoana Road through Waiotapu and Kaingaroa Forests was undoubtedly of the greatest value in preventing the small roadside fires which inevitably follow the use of gas-producers.

For the first time since the regulations came into force it was necessary to exercise the authority conferred by Regulation 7, which provides that, when weather conditions arise which in the opinion of the Director of Forestry present an extreme fire hazard whereby life and property may be endangered by spreading forest fires, the Director may issue or cause to be issued either by radio or otherwise an order suspending, for the period and in the localities designated in such order, any logging, sawmilling, or other operations specified in such order. An order under this regulation was issued on the 19th February, 1946, and was advertised in local newspapers and broadcast by radio on that day and the following day, suspending the lighting of fires and the use of any steam log-hauler or other steam-engine whatsoever associated with forest logging operations in the locality comprising Tauranga, Matamata, Rotorua, Whakatane, and Taupo Counties. The restriction created by the order was removed from individual operations as the fire danger passed. This particular experience demonstrated that even sawmillers and honorary forest rangers in charge of fire districts are in need of education as to their responsibilities under forest-fire-protection legislation. As an instance, an aerial patrol after the issue of the order actually found a sawmill operating a slab fire within a few hundred yards of one of the largest exotic forests in the area, and fire-fighters and patrolmen constantly passing it by.

47. *Animal Damage.*—Damage is still being done by deer, pigs, goats, horses, hares, and opossums in exotic and indigenous forests in spite of the large number of animals destroyed. Pigs are injuring tree roots at Kaingaroa, with a marked dietary preference for Corsican-pine roots, and the usual minor damage is being caused by wild horses browsing on young shoots. Hares are becoming a nuisance in the newly regenerated areas at Whakarewarewa by eating off young leaders. Both deer and goats are reported to be destroying undergrowth in the indigenous forests in the high country on the west coast. Opossums are now rated as the most serious of exotic forest pests by Southland forest officers.

48. *Animals destroyed.*—The numbers of animals reported killed in State forests during the year are: rabbits and hares, 30,500 (17,500); deer, all species, 923 (1,680); pigs, 1,367 (3,400); goats, 266 (187); opossums, 15,528 (3,226); other animals, including cats, weasels, stoats, 1,658.

49. *Insect Damage.*—No serious outbreaks of insect pests have been reported during the past year. The usual seasonal occurrences of *Navomorpha*, *Hylastes*, *Sirex*, *Pachycotes*, and *Platypus* spp. have been observed in all conservancies. *Eucolaspis* caused slight damage to insignis pine and spreading-leaved pine in Whakarewarewa Forest in November–December by defoliating young stock.

Shipments of hardwood timber have been inspected at ports of discharge by officers of the State Forest Service and the State Advances Corporation. In only one instance has any termite-infested or other insect-infested timber imported from Australia been

reported since the Commonwealth Government, at the request of the New Zealand Government, amended the Customs (Prohibited Exports) Regulations by the introduction of Statutory Rules 1942, No. 479, which came into force on the 1st December, 1942. This was the case in which a shipment arriving at Auckland was reported to contain infested material, but only four sleepers required treatment, and investigations in Australia disclosed that the vessel had been loaded under particularly difficult conditions, recurrence of which will be guarded against, as far as practicable, by the New South Wales Forestry Commission.

50. *Damage by Fungi.*—No serious outbreaks of fungal disease have been reported in indigenous or exotic State forests during the year. Investigations on the pathology of the chief forest species, including rot of silver-beech, kauri, and the exotic pines in the field, and larch rot and tawa stain during seasoning, have been continued. Constant observation is maintained by forest officers and periodic inspection by the forest pathologist has been made. Fungal attack has caused minor losses in nursery stock at Waipoua and Waitangi and in regeneration and young trees on sites subject to unfavourable conditions. Marked susceptibility to sapstain has been noted in logging operations in progress in areas of wind-thrown insignis pine in Canterbury Conservancy. A great deal of information has been obtained, supplemented by many herbarium specimens illustrative of pathological conditions in seedlings, trees, slash, and timber during seasoning and service, fructification of many species, and typical cultures.

51. *Damage from Natural Causes.*—The departmental reports of the first decade of the century appear to indicate a constant struggle with climatic conditions adverse to forestry work. Yet, for the past twenty years at least, although the climate has shown its vagaries from time to time, widespread ill effects have been but little known in forestry, and there was a tendency to suspect that reports of thirty or more years ago had drawn too gloomy a picture. The year just past, however, has disproved this and has pointed to the necessity for maintenance of old and tried ameliorative and precautionary measures that have fallen into abeyance to some extent in modern practice.

The winter of 1945 was marked by excessive severity, particularly in Canterbury. Heavy rains, followed within twenty-four hours by a gale of extreme severity, saw swathes cut through several North Canterbury forests so suddenly that it was at first feared that lives had been lost. Workmen in Balmoral State Forest in particular had to run for the forest edge amid falling trees, leaving tools and equipment. The estimate is that 4,000 acres of pine forest were laid low in this gale alone, damage being both from windthrow and from windbreak.

Within a few days this was followed in the same district by a severe snowstorm, and then by over a week of unusually severe frosts.

Hanmer Forest recorded temperatures below zero on three successive mornings. Fortunately, there are at the moment no areas of this forest in the regeneration phase and consequently no widespread frost damage occurred in State forest. But many miles of insignis pine farm windbreaks and forest-edge trees were completely browned and defoliated. The red- and mountain-beech forests of the same latitude lying between Hanmer and Reefton showed much snowbreak and much deformation and bending of natural young pole stands under the snow load, which in this case froze on the canopy to form a " glaze," such as is known to New Zealand foresters more from reading of other countries than from local experience.

The episode illustrated clearly the occasional climatic hazards to which the indigenous forest is subject. These hazards leave an impress on the forest physiognomy which is very hard to interpret during the decades which may be free of such extreme conditions. During this period the telephone service was completely disrupted throughout Canterbury, chiefly because of the load of frozen " glaze " on the wires, but in no small measure also because of fallen and broken trees, which smashed lines that had been located too near to windbreaks and forests. It was of interest to the forester to note that lines on iron, steel, and concrete poles appeared to suffer as much as, if not more than, those on wooden poles.

Soon after this disastrous period in Canterbury, torrential rainstorms interfered with forestry work farther south. The township of Milton, where a new forest nursery was being broken in, experienced 5 in. of rain in twenty-four hours, a record which seriously interrupted the job of tile and mole draining and ploughing which was in progress at the time, and delayed in consequence all of the other numerous preliminary details of work involved in large-scale nursery formation.

The spring that followed was, throughout the South Island in particular, cold and wet. Seed-sowing was of necessity delayed in the heavy clay soil at Milton, and seed-germination was irregular and took place too long after sowing. Weeds of arable land, however, germinated apace, and the new nursery faced a weeding problem such as the Forest Service had not encountered for years. Exactly the same sequence of events occurred at Tapanui, where a portion of the old Tapanui Nursery was reopened. Farther north, at Ashley Forest in Canterbury, the unseasonable spring and early summer weather culminated in a hailstorm which struck the nursery on the anniversary of the hailstorm of December, 1944, recorded in last year's report. A large crop of line-sown pine had partially germinated and was in the seed-leaf stage with the seed testas still adhering to the seedlings. Naturally, this crop was completely ruined. Still farther north, at Golden Downs, a heavy rainstorm caused sudden flood in the Motueka River and an overflow from an old river channel through the nursery. Losses in this case were also very considerable.

The summer, thus delayed, proved when it did arrive to be one of almost unparalleled dryness, particularly in many parts of the North Island. Temperatures were not excessively high, but there were very long periods when no rain fell and when the humidity was continuously low. Nursery stock suffered severely from drought both at Waipoua and Rotoehu, and a period of forest-fire hazard of great intensity developed in early February, especially in the Taupo, Bay of Plenty, Coromandel, and North Auckland districts. Settlers' and accidental fires which would normally have been of small moment were fanned to conflagration dimensions by a violent gale, estimated at 70 m.p.h., which traversed South Auckland province throughout the whole of a night in early February, when relative humidity had been low for over a week. The results were the Coromandel and the Taupo fires, described elsewhere in this report. During the same period the Wairarapa and Nelson districts experienced fire outbreaks of considerable size, and one Wairarapa State forest of 3,000 acres was ruined for over two-thirds of its area by a settler's fire which started at least two miles away from the forest edge.

The climatic perversity of the season was immediately demonstrated by a deluge over the most hotly burned area a week after the fire itself. This was at Taupo, where a particularly fierce ground and crown fire had consumed an area of 30,000 acres of exotic forest in the thicket stage. The intensity of the fire was such that all ground debris was consumed and most of the limbs were burned from the pine poles. The soil was the finest and lightest of pumice. On this newly bared soil some 3 in. of rain fell in the one day, with great resultant scour of the light soil.

The long dry period of February and March, besides creating the fire hazard, caused many deaths in exotic conifers from sheer drought. As usual, these occurred more among shelter and ornamental planting on farm lands unsuited for forests than in State forests. Such losses were very noticeable in the vicinity of Taupo Township and on the drier shingle plains of Hawke's Bay, where already decimated stands of insignis pine in many cases received the *coup de grace*. More moisture-loving species, such as Douglas fir, redwood, and cypresses of all species, were lost in many ornamental belts planted within the last twenty years.

All of these cases must be regarded as Nature's inevitable retribution for planting species out of their safe and correct habitats.

Not in quite the same category was the much more unusual phenomenon of wilting and frequent death of advance growth and natural seedlings of indigenous species in untouched native forest. The forest floor was in places so dry that wilt and death of the floor population of seedlings and saplings was very evident. In one large scenic

reserve near Rotorua, young pukatea saplings up to 6 ft. in height were losing all leaves; and the fallen tree trunks, which always carry a population of timber-tree seedlings, were bone dry, so that on one of them alone an observer counted six rimu seedlings from 1 in. to 6 in. in height all recently dead from drought. Even more striking are Auckland reports which speak of mature taraire as dying, especially on exposed rocky faces, and Hawke's Bay reports which record rimu and black beech as dying within forest stands. These are not to be interpreted as disasters which any amount of forestry foresight could have prevented, but rather as an instance of the extreme conditions that every forest stand has to encounter at intervals during its long life and which leave their imprint on the physiognomy and even on the composition of the forest for ever afterwards. Just as the snowbreak recorded earlier in this paragraph will have a permanent effect on the beech-forest stands between Hanmer and Reefton, so the drought will have its long-term effects on the forests of the north. It is only by thus recording the lean years as they occur that the forests of the fat years can be understood.

What was probably the most extraordinary and unsuspected phenomenon of all came to light when fire-fighting activity and anxiety had died down and the Service had returned to its normal late-autumn activity of seed-collection. Insignis pine normally carries several seasons' crops of cones unopened—indeed, it was described by the botanists and foresters of a generation ago as a species which in Nature opened its cones only under stress of fire or decay. There has never hitherto been any reasons in New Zealand to dispute this opinion, and it has always been possible to collect good seed from unopened cones at any season of the year. The seed-collectors of late March, 1946, however, found in the Rotorua district that all cones of the species had opened and shed their seed, and investigation showed that the same had occurred in eastern Hawke's Bay. To a limited extent the experience was repeated in parts of Nelson and in the stands of Canterbury Plains that had been windthrown in the preceding winter.

The episode had its economic effect, as the Service had accepted various overseas orders for nearly a ton of seed, and collecting, extraction, and packing operations had to be moved at very short notice from Rotorua to the South Island. The point, however, is of far greater general scientific interest than this mere temporary embarrassment indicates. It has already been pointed out that the season, though dry, was not one of extremely high temperatures. The difference from normal was in the prolonged spell of drought and of low relative humidities. It would appear, therefore, that for insignis pine at least, and probably for many other conifers, it is these factors rather than mere temperature which are critical for cone dehiscence.

52. *Forest Offences.*—The number of convictions for offences against the Forests Act, 1921–22, and the Forest (Fire-prevention) Regulations 1940 secured during the year were 39 (46), and the total fines, costs, and damages amounted to £886 (£622). Particulars of these offences appear in Appendix IX.

Included in the convictions are three cases of operating an engine not provided with efficient means of preventing the escape of dangerous sparks, &c., twenty-two of unlawfully entering or hunting in a State forest, and seven of unlawfully cutting and removing forest produce from a State forest. In the seven last-mentioned cases the fines, costs, and damages amounted to £535. Other important convictions secured were two of failure to report or to fight a fire in a State forest or leaving a fire before it was suppressed, and one of failure to comply when a request was made by a Forest Officer for assistance in extinguishing a fire. Offences of this nature are very difficult to detect or enforce, and a serious view is taken of them, as prompt attention to fires in their incipient stages will often prevent extensive and sometimes incalculable damage.

Besides these convictions, the Service was also successful in securing a verdict in its favour in a case concerning a number of posts that had been seized and branded under section 53 of the Forests Act on suspicion of having been unlawfully taken from a State forest.

CHAPTER VII.—FOREST ENGINEERING

53. *General.*—Existing roads, bridges, and buildings, and engineering services in general, have been maintained at a reasonable standard. Although equipment is now more readily available, shortage of suitable labour is still a difficulty.

54. *Roads and Bridges.*—Developmental work in both exotic and indigenous forest has continued, necessitating the construction of many new roads and bridges. Work under this heading includes: new roads formed, 37 miles 65 chains; roads maintained, 865 miles; new tracks formed, 10 miles, 58 chains; new culverts, 71; culverts repaired, 23; new bridges, 7; and bridges repaired, 34. In addition, drainage work and road construction in Berwick State Forest are being undertaken by the Public Works Department. Airstrips for the use of light aircraft of the aerial patrol have been constructed, one at Kaingaroa Forest and one at Rotoehu Forest.

55. *Construction Equipment.*—Second-hand plant has been acquired from the Armed Forces and from United States surplus equipment as it has become available and has been put into service after reconditioning. While the selection is limited and the life of such plant must necessarily be short, the needs of the Service are being met for the time being. The additional plant has also made possible a higher standard of maintenance of all units.

56. *Buildings.*—The problem of accommodation both for married and for single employees remains acute. It has been possible to relieve it in some instances by grouping several huts for married quarters, and by the utilization of defence huts for camp accommodation for single men. In Southland a number of houses and other buildings originally erected for the Linen Flax Section of the Department of Industries and Commerce have been taken over by the Forest Service. Included in these is the hostel of thirty-eight rooms at Tapanui, which is now the South Island Vocational Training School. The requirements of the main departmental training centre at Rotorua have been met temporarily by the conversion of old buildings at the former Whakarewarewa Forest headquarters.

Apart from camp construction, which includes dining-rooms, kitchens, and ablution rooms, the building work included: 2 fire lookout cabins completed and 1 nearing completion; 1 100 ft. fire-lookout tower; 1 school; 1 pumphouse; 1 tractor-shed; 1 aircarft hangar (for Air Department); 5 major house alterations and renovations; and 3 house removals. In addition, contracts have been let by the Housing Division of the Public Works Department for 36 houses in various State forests.

57. *Water-supply and Drainage.*—New wells have been drilled at Balmoral and Kaingaroa to augment existing water-supplies, and additional permanent storage has been provided in Conical Hill and Dusky Forests by building five small dams. A limited amount of storage has been completed at Kaingaroa Forest by the erection of concrete tanks at three strategic locations, and additional tanks will be provided as supplies of cement become available. On account of the dry summer, it was found necessary to cart considerable quantities of water at Rotoehu to houses not connected to the main supply, but these houses, which are now widely separated, will eventually be moved to form one compact settlement.

58. *Utilization Plant.*—The production capacity of the Waipa Sawmill was increased during the year by the installation of another high-speed log-frame, making a total of four frames now in operation. Only a relatively small building extension was required for this purpose. The circular rig, which since December has concentrated on cutting scantling for building purposes, was also improved to enable it to cut larger logs, and heavier mechanism was installed to deal with the larger quantities of waste produced. With the increased log throughput it proved impossible to burn all waste under the boilers, and in consequence some had to be dumped. At the same time, steam demands for kiln and power requirements could not be fully met, but additional boilers purchased for this purpose will, when installed, overcome this difficulty. They will also obviate the need for forcing the existing boilers to their full capacity, which this year has

resulted in heavy maintenance of boiler and flue-draught fans. A fifth dry kiln, 66 ft. in length, was completed and put into service during the year, as well as a 200 kW. steam-driven alternator, the purchase of which was referred to in last year's report. Covered storage for dry timber was increased by an extension to No. 2 dry-storage shed.

Other plant improvements and additions included—a log-turning winch for the circular-sawmill, designed and built in the fitting-shop; an additional crosscut saw in the box-factory; a conveyor to eliminate handling and reduce congestion in the box-mill; an improved grinding-room for the box-factory; explosion doors in the boiler flue; extension of the sprinkler system to reduce fire risk; and power-factor correction of the electricity supply.

Power consumption increased 7·3 per cent. over that for 1944–45, principally on account of the operation of the fourth frame and of higher production in the box-mill, and it was again necessary to purchase power from the Department of Tourist and Health Resorts. As an offset against this it was possible to sell back to that Department power generated after the mill had closed down to the extent of half that purchased. All items of plant have been maintained in good condition, although a shortage of replacement parts from overseas for some items of mechanical plant caused anxiety until supplies were received.

59. *Transportation.*—To meet the extra demands of timber production and to replace unserviceable machines, 52 motor-vehicles were purchased from the War Assets Realization Board and added to the Forest Service fleet. Eleven of these vehicles went to the Auckland Conservancy, 24 to Rotorua, 6 to Wellington, 3 to Nelson, 5 to Canterbury, and 3 to Southland. One new tractor was purchased for exotic forest logging in the Rotorua Conservancy. Of four lease-lend machines hired from the War Assets Realization Board, three have been allocated to the Auckland Conservancy—two for logging in indigenous forests and one for general forest maintenance—and the fourth to the Wellington Conservancy for forest maintenance and road formation.

60. *Communications.*—Fourteen miles of new telephone-line were erected during the year and 2 miles renewed, and the usual maintenance was carried out to keep the systems in good condition. The aggregate length of all lines is 461 miles, of which 166 miles are of metallic circuit. A total of 254 instruments is now installed. Twelve portable telephones of a type used by the United States Army were obtained and distributed among the conservancies, and 2 radio stations, similar to those at Rotorua, were installed during the year in the Southland Conservancy to provide emergency communication between the district headquarters at Tapanui and the ranger station at Beaumont.

The value of the radio telephone as a means of rapid communication was effectively demonstrated during the February fire emergency, the Forest Service equipment in the Rotorua Conservancy giving efficient and satisfactory performance. The system, which in 1940 was installed in this conservancy on a restricted basis due to war conditions, has since been extended and at present comprises the following units: a control station at Kaingaroa Forest headquarters using a 100-watt transmitter, together with a 50-watt emergency unit; a station at the Conservator's office, Rotorua, 25 watts; and four at other forest headquarters and sub-headquarters, four in major lookout stations, and five spare sets suitably located for field use, all these last-mentioned being of 15 watts output. In addition, two lightweight portables and a number of portable receivers are located at Kaingaroa Forest. All these stations, together with those in the aircraft of the regular aerial fire patrol, operate on the frequency of 2,760 kc./s., but the control station can also use 4,750 kc./s. for communication with other military aircraft and 333 kc./s. for civil aircraft. The 15-watt sets can also be operated on 4,750 kc./s. The receivers of all units, where desirable, are fitted with an automatic tuning device for 2,760 kc./s., ensuring immediate and correct tuning of incoming signals on this frequency, and the frequencies of all the transmitters are crystal-controlled. The system is tested daily in the fire season and weekly at other times. Patrol aircraft are in constant communication with the control station from the time of leaving the airfield at Rotorua

until their return, and can also communicate direct with the 15-watt sets used either as fixed or portable stations. At the Kaingaroa Airstrip a permanent aerial has been erected for a transportable radio used to facilitate aircraft landings.

When it became necessary to establish a fire-control headquarters at Taupo and a fire headquarters at Atiamuri, the radio sections of these headquarters were equipped largely and staffed wholly by the Navy and later by the Army, as the Forest Service operators and most of their equipment were already fully employed and could not be released for other work. The radio equipment at Taupo was used as three fixed stations and two (later three) mobile stations, and that at Atiamuri as one fixed and one mobile station. Full use was made of the radio for the rapid passing of messages between ground stations and between air and ground, the observers in many instances giving direct instructions to fire-fighting parties. The field telephone was used only to a limited extent and portable telephones were used where lines were available. Extensive use was naturally made of the line telephone, temporary lines being run from the Taupo Telephone Exchange to the fire-control headquarters. Difficulty was experienced in obtaining and maintaining contact with Wellington and other places due to unavoidable delays, noisy conditions, and interruptions, and also to breaks in the lines on account of burned poles, the importance of these defects being magnified by the urgency of the situation. As a precaution in the event of telephone and power-line failure, the Post and Telegraph Department's emergency wireless telegraph station at Rotorua was available for communication with Kaingaroa, but was not used. The excellent co-operation and valuable assistance rendered by the Post and Telegraph Department, the Navy, the Army, and the Air Force in providing and maintaining communication facilities are gratefully acknowledged.

In the King-country, also, radio was used for reporting fires to Ranger stations at Te Kuiti and Ohakune, this work being carried out by Army personnel with wireless trucks stationed at Te Kuiti, Pureora, Ohakune, National Park, and Tokaanu. Meteorological tenders of the Air Force located at Mangapeehi and Moerangi furnished weather reports to (*a*) Army trucks at Te Kuiti and Ohakune, where they were handed to Forest Officers; and (*b*) to Ohakea, whence they were forwarded to the Forest Service at Wellington and Auckland via the Air Department, Wellington, and Whenuapai respectively, and also to the Forest Service, Palmerston North.

From experience gained during the emergency period the following developments in the communications system are envisaged: (*a*) a radio link between Head Office, Wellington, and the offices at Rotorua, Auckland, and Christchurch; (*b*) provision of powerful mobile radio stations in suitable locations; (*c*) installation of radio in additional forest areas; (*d*) provision of suitable lightweight portable radios for steep terrain; and (*e*) provision of equipment for laying field telephone cable.

61. *Community Planning.*—The assistance of officers of the Housing Division has been made available for planning community centres with suitable amenities at Kaingaroa, Golden Downs, Ngaumu, and Gwavas State Forests. Some progress has been made with those mentioned in last year's report. Schemes are also under consideration for Balmoral, Hanmer, Karioi, Waipoua, and Tairua Forests. The provision of the best possible living conditions is considered essential for the recruitment and retention of competent staff.

CHAPTER VIII.—EXTRACTION AND COMMERCIAL DEVELOPMENT

62. *State Forest Block Sales and Permits.*—Timber appraisals carried out during the year totalled 173 (168), the quantity of timber measured being 146,867,000 board feet (155,129,900). Of the appraisals made, 143 (118) were in State forests, the balance, which covered 40,312,000 board feet (42,757,700), being for other Departments and private owners. In addition, 8 (12) reconnaissances were carried out for the approximate estimation of timber quantities, disclosing timber containing about 217,415,000 board feet (112,291,000) on a total area of 21,194 acres (16,598). As a test of the accuracy of the timber-cruisers' work, 8 (2) check cruises were carried out from Head Office and 19 (13) from Conservators' offices.

The quantity of indigenous timber sold from State forests aggregated 75,529,000 board feet (104,018,000), of which the details of individual species in board feet are as follows: rimu and miro, 53,043,000 (85,356,000); kahikatea, 7,074,000 (3,396,000); matai, 4,189,000 (2,819,000); totara, 2,967,000 (1,138,000); tawa ,1,925,000 (2,050,000); beech, 5,608,000 (7,874,000); and others, 723,000 (1,385,000). The total value was £104,239 (£141,467).

Indigenous timber produced from State forests by holders of licenses and permits totalled 100,443,000 board feet (107,735,000), including that from validated Wardens' areas. Minor forest produce removed under permit comprised the following: poles, 2,258 (2,161); strainers, 13,992 (16,826); posts and stakes, 313,618 (306,632); stays, 6,491 (6,302); sleepers, 2,406 (21,429); house and pole blocks, 1,295 (8,591); mining timber, pieces, 34,972 (50,644); battens, 501,600 (373,105); and firewood, cords, 352 (791).

The quantities of exotic forest produce cut under permit were as follows: battens, 2,100 (2,000); mining timber, pieces, 42,600 (45,000); and firewood, cords, 259 (226).

63. *State Forest Log Sales.*—Logging operations conducted by the Forest Service in indigenous State forests in the Auckland and Rotorua Conservancies resulted in the production of 1,588,000 cubic feet (1,501,521) of logs valued at £66,193 (£57,008). Included in this quantity are 27,900 cubic feet cut from trees felled as a fire-prevention measure at Oruanui. Minor forest produce extracted at the same time comprised the following: posts, 8,312 (268); strainers, 173 (194); battens, 60,000 (18,000); stays, 29 (11); and firewood, cords, 40 (131).

In exotic State forests, logging operations produced a total of 2,503,000 cubic feet (2,273,319), mainly for the Waipa Sawmill. From a private forest 23,500 cubic feet, representing timber purchased some years ago and not now required, were also removed and sold. The following minor produce from exotic State forests was also extracted: poles, 620 (1,132); posts, 2,933 (23,523); rails, 2,883 (1,180); mining timber, pieces, 117,656 (126,000); round timber for creosoting, cubic feet, 7,815 (187,600); and firewood, cords, 6,340 (7,869).

64. *Indigenous Timber Disposal.*—Although additional field staff was secured during the year, great difficulty was experienced in keeping cruising work ahead of sawmillers' requirements. It is not generally appreciated that for various reasons the Forest Service requires a much larger forest ranger staff than was necessary before the war. Many officers are unable to devote the same time as formerly to the measuring of timber owing to the additional timber-control duties now required of them. On account, too, of the cutting-out of bush supplies accessable to many long-established sawmills and of the urgency for setting up additional new units, it has been necessary to open up new State forests and Maori-owned forests, which has involved more field work than if only the further cruising of old areas was required. This position is accentuated by the growing dependence of the sawmilling industry on State and Maori forests and the declining importance of private areas. The immediate objective is to keep two years ahead of sawmillers' requirements.

During the year 119 sawmills, equivalent to 27 per cent. of the total registered sawmills or 38 per cent. of the registered sawmills principally engaged in cutting indigenous timbers, secured their supplies from State forests. The quantity of sawn indigenous timber produced from State forests amounted to 100,444,000 board feet and represented 27 per cent. of the reported total annual cut of all timbers and 41 per cent. of the indigenous timbers.

An economic survey carried out during the year by the North Island sawmilling industry clearly established the fact that at ruling price levels a substantial portion of the industry was in an unhealthy trading position. The Government accordingly approved of a general increase in the level of North Island indigenous timber prices which it is hoped will not only arrest the decline in production in many mills, but will encourage additional capital for the expansion of production by new mills operating on forest areas not previously within economic reach. It is nevertheless clear that,

as far as existing sawmills are concerned, little overall increase in production can be expected without a substantial accession of man-power, and also that, now that the war has terminated, operators with limited bush resources will be reluctant to liquidate them at an accelerated rate during a period of high taxation.

The return on capital invested very obviously determines the extent to which additional money will be encouraged into the timber business, and it is believed that the price improvement will go a long way towards achieving the objective of increased production. This is confirmed by many recent inquiries for information upon possible ventures in which capital could be invested. Not unexpectedly, a number emanated from timber-merchants and builders, who have been forced to consider entering the field of timber production to protect a heavy investment already incurred in retailing or building and the safety of which is threatened by current deliveries being inadequate to maintain their plants in economic operation. It is now apparent that the buyers' market which characterized the timber trade between the two World Wars has disappeared so far as the indigenous-timber industry is concerned. The strong sellers' market which exists at present will undoubtedly attract merchants and builders into the field of sawmilling to a greater extent than previously, and the additional production so achieved should assist materially in overcoming the timber shortage.

The trend for new mills to be erected in or adjacent to existing centres of population rather than in the forest continues. To the extent that it is restricted largely to rural centres not far from the forest, this development has much to commend it. Long road haulage of saw-logs, however, is uneconomic, and in forest areas remote from the railway it is Forest Service policy to locate new mills so that they will be served by a common centre for accommodation and thus enable living and social amenities of a much higher standard than would otherwise be possible to be provided. The expansion of sawmilling in urban centres, on the other hand, is strongly deprecated as violating the highest conception of town-planning. What is of more specific and immediate importance is that rail facilities have become and promise to remain so restricted that any further development of urban sawmilling, requiring as it does twice as much rail transport as rural sawmilling, will tend more and more to restrict overall production.

65. *Rotorua Exotic Forest Log Production.*—To assure the Waipa Sawmill of an adequate log-supply, a forty-eight-hour week was continued in the Whakarewarewa State Forest, and a start was made with the logging of the older insignis-pine stands in the Waiotapu Forest and the north-western section of the Kaingaroa Forest. Logs delivered to the mill from the Whakarewarewa Forest amounted to 2,005,262 cubic feet, of which 1,454,394 cubic feet were insingis pine. From Waiotapu 205,393 cubic feet of logs, including 184,783 cubic feet on insignis pine, and from Kaingaroa 44,079 cubic feet of insignis pine, were delivered. From the Whakarewarewa and Waiotapu Forests 244,214 cubic feet of logs unsuitable for sawing were sold as mine props or delivered to the creosoting plant for production of treated fencing-posts.

The wage-incentive plan introduced two years ago was continued in the Whakarewarewa Forest, three clear-felling and seven thinning gangs participating. A total of £1,804 14s. 5d. in bonuses was distributed, representing an average increase in wages of 7 per cent.

66. *Waipa Milling Operations.*—The Waipa Mill worked overtime continuously throughout the year, the main log-frame plant operating on 258 days and the circular rig on 256 days. A fourth log-frame has been installed and commenced cutting in mid-November. It was primarily responsible for the 10·6 per cent. increase secured in sawn-timber production. The total cut of 13,757,000 board feet (12,410,000) was a record for the plant, which now produces over a quarter of the exotic timber milled in the North Island. The logs received for sawing comprised insignis pine, 75 per cent. (78 per cent.); Corsican pine, 17 per cent. (10 per cent.); ponderosa pine, 5 per cent. (8 per cent.); and other species, 3 per cent (4 per cent.).

The circular rig, which saws the larger insignis-pine logs, concentrated from November onwards in cutting scantling for the building industry. The effect of this change is reflected in the range of widths produced. Whereas during the previous

year only 26 per cent. was below 6 in. in width, the production in this size-class rose to 47 per cent. Concurrently, the quantity sawn in widths exceeding 9 in. fell from 33 per cent. to 20 per cent. The log-frame sawmill, which was operated to cut a maximum of wide timber for the box-factory, produced 46 per cent. up to 6 in. wide and 16 per cent. above 9 in. in width.

In addition to the increased needs of the box-factory being met, 4,968,000 board feet (3,049,000) of timber was sold to manufacturers, principally in the Auckland Province. Sales thus increased by 63 per cent. and comprised green timber, 3,851,000 board feet (2,703,000); kiln-dried timber, 982,000 board feet (311,000); and air-dried timber, 135,000 board feet (35,000). Over half of the kiln-dried timber sold—537,000 board feet (63,000)—was shipped to Australia, and assisted in filling the quota of softwoods which it was necessary to guarantee to the Commonwealth in order to assure New Zealand of its essential requirements in hardwoods.

Timber stocks on hand at the 31st March, 1946, totalled 2,804,000 board feet, a reduction of 9 per cent. on the record stocks of 3,076,000 board feet held at the corresponding date last year. The supply of railway trucks was somewhat erratic and week-end loading was resorted to on occasions to relieve yard congestion. During the spring and summer months, when railway-truck supply proved most difficult, conditions were ideal for sapstain attack, and to minimize loss it was necessary during the worst periods to arrange with the New Zealand Railways for a truck-supply priority for green insignis pine over the more resistant indigenous species.

Timber filleted for kiln-drying totalled 7,355,000 board feet (5,444,000) and for air-drying 2,486,000 board feet (3,366,000). The balance of 3,916,000 board feet produced was sold or used in a green condition. The kilns dried 7,827,000 board feet (5,683,000), of which 7,077,000 board feet (5,196,000) consisted of green timber and 750,000 board feet (487,000) partially air-seasoned stock. The increase in the quantity of timber dried is attributable chiefly to the operation of the fifth kiln, which was brought into use during June, 1945. Based on the assumption that the plant is capable of drying for 335 days of twenty-four hours, the kiln-operating factor for the year was 91 per cent. The quantity of timber dried per kiln hour amounted to 267 board feet (238).

A new dual dry-bulb recorder-controller was installed in November and has operated satisfactorily. There were no major breakdowns during the year, but several bearings failed and had to be replaced. A pressure-spray painting outfit proved very useful for repainting the kiln metalwork. Improvement in the drying of pith-grade timber was achieved by the adoption of much lower dry-bulb temperatures and a slightly lower humidity. The kiln-drying of scantling sizes is also being achieved successfully with a negligible amount of de-grade. Kiln-drying costs amounted to 3s. 6d. per 100 board feet, compared with 3s. 1d. last year. The increased cost is due to the drying of a larger proportion of 2 in. stock and the use of slower drying schedules to improve the quality of the finished product.

The profit earned by the sawmill and dry kilns amounted to £21,576, compared with £20,090 last year.

67. *Waipa Box-factory and Planing-mill.*—The box-factory operated on an average forty-eight-hour week throughout the year. Soon after the war ended heavy cancellations of orders for foodstuff and munition cases were experienced, but these were offset by increased orders for cheese-crates and fruit-cases. Concurrently, the shortage of indigenous timber led the building and furniture industries to compete with boxmakers for supplies of insignis pine, as a result of which most North Island boxmakers were unable to maintain sufficient stocks to meet the demand of primary and secondary industries. Fortunately, the Waipa plant, which possesses the largest kiln installation in the North Island box industry, was able to make available its full capacity of 700,000 board feet monthly of kiln-dried timber, and at short notice averted grave shortages by supplying cases unprocurable elsewhere. Fruit-cases were delivered as far afield as Nelson to assist in meeting an abnormal local demand during the January–April period.

The box-factory's output of case shooks used a gross total of 8,691,000 board feet of timber (7,645,000) and created a new Waipa record in box production. Periodical difficulties were again experienced in securing rail trucks for distribution, but none of the factory's customers were at any stage left without boxes, although some had only a few days' supply on hand during the months of peak demand. On these occasions the accumulated stocks at the plant became so great that the large shook-storage sheds were filled to capacity. Sales of dressed timber during the year amounted to 459,000 board feet (383,000).

Profits from the box-factory operations amounted to £19,142, as compared with £20,596 for the previous year. The decrease in profit was due to the change-over to peacetime production, for which a higher standard of finish is necessary.

68. *Departmental Wood-preserving Activities.*—The total quantity of produce treated by the three creosoting plants was maintained at a figure equal to last year's. At Waipa there was a substantial increase in the number of poles treated and a proportionate reduction in the number of posts. At Hanmer Springs, mainly poles were treated, while the Conical Hill plant continued to treat fencing-material for departmental use. At both Waipa and Hanmer Springs seasoning yards, stocks have fallen to a very low level owing to shortage of labour to cut produce in advance for seasoning prior to creosoting, and a serious reduction in the output of creosoted material will result next year.

69. *Exotic Forest Exploitation.*—Experience since the cessation of the war has clearly demonstrated that the timber available from the exotic forests of the Dominion is destined to have an immediate and much wider field of utilization than was envisaged even a year ago. Based on pre-war standards and conceptions of timber use, the current product of the exotic forests can only be described as knotty stock, which is the best that can be sawn from shelter-belts and farm wood-lots or from the unthinned stands now being logged. Nevertheless, realization that the wood-using industries of New Zealand must rely for evermore on a strictly limited supply of indigenous timbers has forced consumers to adapt the available exotic softwoods to many of their requirements.

As explained in other sections of this report, some grades now obtainable in insignis pine can successfully replace rimu for house-construction, furniture, and other purposes, provided appropriate care and attention are paid to their production, grading, seasoning, and use. Although it is possible to-day on a strong sellers' market to sell timber produced by out-of-date equipment, this position will not continue indefinitely: better conversion and marketing technique will be required in order to maintain sales as the demand is overtaken. Exotic-timber production by the State Forest Service has established standards of sawing, seasoning, and grading hitherto unknown in New Zealand, and the general adoption of these methods is essential to achieve the most efficient production of sawn exotic timber and the expansion of both domestic and export markets.

The investigation into logging and milling practices in North America and Europe, referred to in last year's report, has been concluded, and an exhaustive report will be ready for publication at an early date. In the meantime certain information of immediate interest to the sawmilling industry has been handed to the Dominion Federated Sawmillers' Association and has been published in three sections in the October, 1945, December, 1945, and May, 1946, issues of the *New Zealand National Review*.

CHAPTER IX.—TIMBER TRADE

70. *Production of Sawn Timber.*—Under the Sawmill Registration Regulations 1942, 445 (452) sawmills were registered for the year ended 31st March, 1946. A list of those registered as at 31st August, 1945, was published in the *Gazette*, 1945, at page 1274. During the year 63 new sawmills were registered, of which 40 commenced cutting and produced a total of 14,038,000 board feet of timber. On the other hand, there were 21 units, with an aggregate output of 4,024,000 board feet during the previous year, which, for such reasons as exhaustion of bush supplies or destruction by fire, did not cut any timber this year.

According to the sawmill registration returns, the total production of sawn timber for the year ended 31st March, 1946, was 344,000,000 board feet (341,000,000). It is a tribute to both employers and employees that, despite the difficulties, the year's output was slightly above the 1944–45 figure, and 8½ per cent., or 27,000,000 board feet, above the quantity of timber sawn in 1938–39, the last year when reasonably normal conditions prevailed.

Detailed statistics prepared by the Government Statistician for the year ended 31st March, 1945, are included as Appendix VII of this report. It should be understood that there is an unavoidable time lag between the close of the year and the collection and compilation of these statistics, so that even under the most favourable of circumstances the detailed statistical summary always relates to the year preceding that covered by this report. Sawmill-registration forms do not contain the detailed information later available to the Government Statistician, but they do furnish figures of vital interest—viz., the quantity of timber, by species, sawn during the year immediately past. Experience has shown that there is complete agreement between these figures and those compiled later in greater detail by the Government Statistician; but, as the latter are the only authoritative statistics covering the sawmilling industry, the production figures compiled by the Forest Service are subject to confirmation by the Government Statistician.

71. *Species cut.*—Marked changes continue to occur both in the relative quantities of the species cut and in the geographical incidence of production. The most conspicuous change is the phenomenal increase, both relative and actual, in the output of insignis pine, which has risen by 55,000,000 board feet from 42,000,000 board feet in 1938–39 to 97,000,000 board feet in 1945–46. The incidence of production, in fact, is moving from the indigenous to the exotic forests, for over the same period the output of indigenous species declined by 28,000,000 board feet. In 1938–39 insignis pine accounted for only 13 per cent. of the total cut, while in 1945–46 the proportion had risen to 28 per cent.

Rimu is still the predominant timber species, but production at 174,000,000 board feet for the year was 15,000,000 board feet less than the cut in 1938–39. The progressive decline in the production of kahikatea, which commenced prior to 1939, continued throughout the war years, the cut in 1945-46 being, as for the previous year, only 17,000,000 board feet, or one-half of the 1938–39 figure. Totara remained constant, but matai was 3,000,000 board feet less than in 1938–39, and kauri fell to an all-time low production of 1,779,000 board feet, or less than 30 per cent. of the cut in 1938–39. Tawa was the only indigenous species in which any appreciable increase in production was secured, for, whereas during 1938–39 only a little over 100,000 board feet were sawn, in 1945–46 the output was over 5,000,000 board feet.

72. *Man-power.*—The cessation of hostilities, and the subsequent release of men from the Armed Forces, has resulted in a considerable influx of men to the timber industry during the past year. Nevertheless, there has been a loss in skilled personnel, who have been drawn to occupations which, temporarily at least, appear more attractive: their positions will be difficult to fill satisfactorily in the meantime, as during the war years few junior recruits were available for training. There have been other personnel losses as well, but mainly in men who have been carrying on during the crisis though well past normal retiring-age. As a result of all these factors, the number of men employed in the industry is by no means adequate to enable production to be increased in accordance with the continued heavy demand. It is estimated that an increase of approximately 1,500 to 2,000 men will be necessary before the required production budget can be attained. To make the work more attractive, constant attention is being given to improving the living and working conditions at sawmills and logging operations. It is hoped that progress in this direction will steadily encourage skilled workers to return to their pre-war employment, and will also encourage young men to find their vocation in the timber industry.

Considering the man-power shortages, particularly in skilled bushmen, production over the war years was maintained at what must be regarded as a very satisfactory figure; every year of the war, in fact, showed a substantial increase over the output of 1938–39. Additional reference to man-power will be found in paragraph 102.

73. *Equipment for Timber and Allied Industries.*—Many difficulties in obtaining equipment and supplies for the industry again occurred during the year, but the supply of transport, tractors, and machinery generally was sufficient to maintain production, although sawmillers and boxmakers were hard pressed at times to keep their plant in working condition. Shortage of transport, moreover, affected the delivery of logs and sawn timber.

Heavy tractors were allocated through the Mechanical Plant Advisory Committee, and further machines should become available as a result of Government purchase of surplus war equipment in the Pacific. The service given in the past by the Timber Controller's office in locating machinery has been continued in close co-operation with other Departments and organizations, particularly the Transport Department and the War Assets Realization Board.

74. *Domestic Markets.*—Throughout the year the State Forest Service was called upon repeatedly by various sections of the wood-consuming industries for assistance in bridging the gap between timber demand and supply. This gap is not immediately apparent from a study of the production, import, and export statistics. Considering sawn timber only, and excluding such items as sleepers and poles which are included in the import statistics, the net inflow of timber to the domestic market in 1945–46 was the same as the annual inflow immediately before the war—viz., 350,000,000 board feet. Imports admittedly were much below the pre-war figure, but the loss of imported timber was fully counterbalanced by the increase in production and a much lower rate of export. Accordingly little, if any, fault can be found with the net inflow of timber during the year, particularly when it is remembered that half the year had elapsed before hostilities terminated.

The fact that in spite of a satisfactory inflow there was still insufficient timber for the country's internal requirements is explained by a number of factors. Firstly, the overall demand is expanding rapidly to overtake the arrears due to the war. Secondly, the initial shortage thereby created is greatly accentuated by the exhaustion of pre-war stocks during the defence-construction programme. Among other factors may be instanced the progressive decline in rimu production, which means that the building and furniture industries can no longer secure the quota of indigenous timber they were accustomed to before the war; the reduced output of other indigenous species; and the reduction of pre-war stocks of kauri, as the result of wartime demand, to negligible proportions, so that, as production cannot be increased, consumers who have relied on this species in the past now have no alternative but to turn to other timbers for at least a portion of their requirements.

The customary joinery timbers also are in short supply. The total quantity available even in 1939 was below demand, but the position was not generally so patent then as it is to-day, as users were still working on stocks accumulated during depression years and timbers suitable for joinery were readily procurable from overseas. Now, however, existing stocks are negligible, and only limited supplies of overseas timbers are procurable. Joinery-manufacturers must therefore accept the fact that totara, matai, and redwood are no longer available in sufficient quantities for their needs, and that henceforth they must use for many purposes timbers previously considered less suitable.

Despite the difficulties of the supply position, the Dominion in 1945–46 built as many houses as in the year of peak activity immediately before the war, but this was achieved at the expense of other wood-using industries, and to some extent by reducing already subnormal stocks to an irreducible minimum and at the expense of the 1946 housing programme. In the larger North Island towns the result of the 1945 house-building programme is already evident in the number of house frames which can be seen, but for which flooring or weather-boarding is unavailable.

At the conclusion of hostilities, large orders for foodstuff and munition cases were either cancelled or drastically reduced. This permitted a relaxation in the wartime prohibition imposed on insignis pine for purposes other than boxmaking, and led to many wood-using industries exploring the use of this species as a substitute for rimu. With

its precision-sawn timber and unrivalled kiln-drying facilities, the Forest Service has been able to pioneer the use of insignis pine with extraordinary success, and in the short time since the war ended the timber has been employed by many industries to an extent that would not have been deemed possible even a year ago.

In the building industry the timber has already been proved suitable for joists, scantling, and roof framing, though special care is necessary in grading and drying. Compliance with the grading rules issued by the New Zealand Standards Institute is essential. As regards drying, the Forest Service is unequivocally opposed to the use of air-seasoned insignis pine for house-construction. The supplies available consist almost entirely of sapwood, which is particularly susceptible to sapstain attack, even when good air-seasoning practices are adopted. Whilst sapstain in itself is not detrimental, timber so attacked holds moisture to a far greater extent than stock free from stain and becomes a focal point for infection by decay-producing organisms. In the interests of the building industry and of the future reputation of the timber, the State Forest Service urges that local bodies should insist upon kiln-drying when approving the use of insignis pine for house-building, and in support of this view the Waipa Mill sells green insignis pine only to such customers as will undertake to kiln-dry the timber before using or selling it for housing construction. A start has been made with the derivation of grading rules for insignis-pine flooring and weatherboarding. Although the average class of log now being converted into sawn timber will yield only a small percentage of weatherboarding, large quantities of an acceptable grade of flooring should become available.

During the war, insignis pine, when available, was used for furniture-manufacture and also for some joinery. Since the conclusion of hostilities the North Island demand for these purposes has exceeded the supply, and many possible uses must remain unexplored until production is further expanded. The most common use of insignis pine in this respect has been as core wood overlaid with veneer or plywood of other timbers, and this development must be encouraged in order to conserve rimu-supplies for flooring and weatherboarding. To assist the furniture and allied industries, therefore, the Government is approving the importation both of fancy veneers and of logs and flitches for local veneer production. For the manufacture of the cheaper grades of furniture, rimu will continue in short supply, but there are already clear indications that as insignis-pine production increases this species will be acceptable without veneer or plywood covering for this class of work. The Forest Service, for example, is already supplying clear shorts to manufacturers for use in tallboys, &c., and an increased usage in this field can be expected.

75. *Timber Imports.*—The imports of timber into New Zealand are shown in detail for the past three years in Appendix IV. During these years the quantities imported remained practically constant, varying between 15,000,000 board feet and 17,000,000 board feet. These quantities bear no relation whatever to demand in New Zealand, but represent the maximum quantities which it has been possible to buy overseas or for which shipping could be secured. As explained previously, during the immediate pre-war years New Zealand consistently imported 40,000,000 board feet of timber annually, and, as the then established policy virtually confined imports to species and quantities considered essential to the Dominion's economy, it can be well appreciated that the wood-users affected are now often in difficult straits. Actually, were supplies freely obtainable, the importation of timbers which could be classed in the essential category would be much greater than pre-war.

Australia, in common with other countries which normally are not self-supporting in timber, is feeling keenly the effect of the world-wide timber shortage. This has led to the Commonwealth's adopting a policy under which it will agree to supply hardwoods to New Zealand only if assured of softwoods in return. Although this policy hits the Dominion hard at the present time, when local demand for softwoods is so much in excess of production, it must be realized that New Zealand has no alternative, in that local production of substitute indigenous hardwoods would involve an even greater reduction in softwood output. The limited supply of hardwoods still available under the conditions described is vitally essential to New Zealand's welfare and economy.

During the later years of the war the New Zealand Supply Missions established at Ottawa and at Washington, D.C., negotiated the supply of essential requirements of North American softwoods. On their advice that it would be difficult to procure supplies in 1946, due to demand in both Canada and the United States of America being in excess of potential production, arrangements were made for a representative of the trade and the Deputy Timber Controller to visit North America. Although this delegation found the advices cabled by the New Zealand Supply Missions all too true, export permits were eventually obtained from the Government of the United States for a satisfactory supply of redwood, and an undertaking was secured from the British Columbia exporters for the supply of substantial quantities of Douglas fir. Unfortunately, however, due to a strike in the mills, no redwood has been produced since 14th January, 1946, and at the time of writing this strike was still in progress. As shipments cannot commence until after the strike ends, New Zealand, for a period at least, is going to face a difficult position in the production of external joinery, as redwood stocks are rapidly nearing exhaustion and totara supplies are inadequate to meet the demand. Some slight relief has been secured by the revocation of the notice relating to the cutting of totara into railway sleepers as a result of an improvement in the supply of Australian hardwoods. Due to a lack of shipping, the delivery of Douglas fir did not commence until May, 1946, when 2,000,000 board feet was shipped. On the 15th May another strike commenced, this time in British Columbia sawmills, and future shipments may be seriously prejudiced.

Not unexpectedly, the fact that demand for Canadian production exceeds supply has resulted in a substantial rise in the price of Douglas fir. Although domestic prices in Canada are strictly controlled, export prices are free, and for some years at least it appears likely that demand will result in prices being maintained at a high level. Shipping freights, which are far above pre-war level, also appear unlikely to fall substantially within any short period. In the United States of America both export and domestic prices are controlled, with the result that redwood to-day, although much dearer than pre-war, is considerably cheaper than western red cedar. This position can be expected to continue as long as the United States Government exercises control over export timber prices, but some increase in price appears inevitable on the termination of the redwood-sawmill strike.

76. *Timber Exports.*—For the third year in succession, exports were limited by the shortage of trans-Tasman shipping to slightly over 4,000,000 board feet. A comparison of Appendices IV and V will show that total exports amounted to only 25 per cent. of imports. Although New Zealand has actually gained by imports threefold the timber lost by this modest quantity of exports, there has been much public criticism of the Government's policy of permitting export at a time when there is a serious timber shortage within the Dominion itself. The brief explanation given under paragraph 75 will help to dispel any suspicion that much-needed timber-supplies are being unnecessarily allowed to leave the country. New Zealand is committed to provide Australia with approximately 12,000,000 board feet of softwoods this coming year, but shipping is the bottleneck, and unless more tonnage is made available it will be impossible to deliver the full quota.

During the year 1947–48 and thereafter it is anticipated that New Zealand's timber production will have increased to such an extent, and that the shipping position will have so improved, that export on a much more liberal scale will be possible. The planning of forward production is based on an export trade of 35,000,000 board feet by 1948–49. Therefore, quite apart from express Commonwealth stipulations as to reciprocal trade, it is in New Zealand's own interests to discount the present to some extent in order to maintain her export market for further development when her maturing exotic forests yield a substantial surplus above domestic needs.

CHAPTER X.—UTILIZATION TECHNOLOGY

77. *General.*—Attention that was directed primarily to wartime needs during the earlier part of the year has since been diverted to the almost equally pressing need for timber and timber products for essential post-war purposes, both within and without New Zealand. Old-established timber-using industries are now so largely dependent upon local timbers that, with a more diversified demand on account of new secondary industries, utilization problems have become much more difficult and complex.

78. *Grading of Timber.*—During the year draft grading rules for insignis-pine framing timber drawn up by the Forest Service were submitted to the Timber Sectional Committee of the Standards Institute. The adoption of several standard grades, to be known as "No. 1 Dimension," "No. 2 Dimension," and "Shop" respectively, was agreed to only after members had satisfied themselves by inspections of State houses under erection and by grading studies at Christchurch and Frankton Junction that the rules were practicable and met the requirements of house-building. The dimension grades, which are intended primarily for full-length use, require that two-thirds of the cross-section at any part of the length of any piece admissible in No. 1 shall be free from defects, and that pieces admissible in No. 2 shall have half the cross-section free from defects. "Shop" timber, on the other hand, is not for full-length use; it is a "cuttings" grade. Each piece graded "Shop" is required to yeild at least one 8 ft. cutting of No. 2 Dimension or better for studs, and the remainder is intended for shorter cutting; but the Forest Service is not satisfied with this particular grade and proposes to investigate its modification.

Preliminary studies are now in progress to establish grades for flooring, weatherboarding, and matchlining obtainable from good-quality insignis pine and other planted coniferous woods. Interest has also been shown in the possible use of these woods for interior and exterior joinery; a British Standard Specification for the grading of joinery timber describes grades and timbers which may possibly be paralleled in New Zealand. Dip treatment of manufactured joinery parts in approved preservatives would secure ready penetration of the end-grain surfaces, which are vulnerable to rot. This is standard practice in United States of America.

Pending the completion of national hardwood grading rules, a tentative system of grading for tawa has been supported to facilitate marketing of the timber, of which increasing quantities are being produced.

The Forest Service was again required to adjudicate between suppliers and users of white-pine in respect to both grading and sapstain caused by transport delays.

79. *Specifications for Finished Products.*—Draft specifications for the sizes and profiles of weatherboarding, flooring, and matchlining and of joinery and mouldings have now been circulated to the trade for final comment prior to their issue by the Standards Institute.

As a result of complaints, especially by furniture-makers, regarding quality of plywood, frequent inspections have been made in the users' factories to determine the extent to which plywood conforming to the Standard Specifications fails to give satisfaction. Several instances of non-conformity to specification were referred back to the manufacturers, but the main complaints were levelled rather at faults not covered by the specification. A meeting of the Standards Institute Committee was called to revise the specification, and amendments were made to the provisions governing core gaps, checks on backs, and tests for adhesion of plies. The occurrence of hair checks on face veneers was discussed, and, while a proposed amendment covering this blemish was rejected, the trouble is a very real one and is receiving further study.

Other Standards Institute Committee work included revision of the "Timber Ladders" specification, provision of clauses governing the permissible timbers and their blemishes and defects in "Handles for Garden Implements," and revision of the "Household Furniture" specification in regard to timber sizes, acceptable species, and methods of construction. It must again be emphasized that furniture-manufacturers would be well advised to consider alternative methods of construction, employing plywood and veneers in conjunction with insignis-pine timber in place of solid timber.

80. *Structural Utilization.*—The following observations upon the use of insignis-pine framing-timber are recorded for public information:—

(*a*) In several instances the problem of non-availability of long lengths, principally 18 ft. and 16 ft. of No. 1 Dimension, for ceiling joists and rafters has been solved by the use of No. 2 Dimension with double the normal number of 8 in. by 2 in., 6 in. by 2 in., or 4 in. by 3 in. runners, &c., to strengthen the complete assembly.

(*b*) The erection of green-timber framing is to be strongly deprecated as likely to result in sag and decay. It is essential that all framing-timber should be dried to approximately 20 per cent. moisture before use, and the Forest Service opposes the current belief that timber dried to only 40 per cent. moisture can safely be used.

(*c*) Kiln-drying of framing-timber gives the most satisfactory results.

In a number of houses in the Hamilton area, insignis pine has been used extensively during the last thirty years. The ages of the houses inspected ranged from seventeen years to over thirty years. In addition to weatherboarding, flooring, interior woodwork, and wall and roof framing, insignis pine was used in two instances as floor joists (6 in. by 1½ in. in one house). The very satisfactory service being given by this timber should help to dispel doubts as to its suitability. Instances of the successful use of insignis pine in the South Island are also numerous.

Locally grown Douglas fir, too, has been used during the year for wall framing in a number of Christchurch houses.

81. *Mill Studies.*—Several mill studies were made to ascertain the production from logs of a number of species. Two totara studies, one in a Rotorua district mill and the other near National Park, concerned primarily sleeper production and the incidental timber sizes obtainable from the residue of the logs. Another short investigation covering the sawing of small matai logs revealed a low percentage of heart grades.

The most comprehensive study continued over a period of three weeks on all classes and species of logs produced from State Forest No. 96, near Mangapeehi. A total of 559 logs, comprising 169 rimu, 268 matai, 66 totara, and 56 kahikatea, and containing 30,654 cubic feet., were sawn. The product was graded and analysis made to show grade percentages by log classes for each species. Conversion factors and other valuable information on bark thickness and log scaling and classing were also obtained as a result of this study.

82. *Utilization of Minor Timbers.* The extensive use of timbers previously rated as minor is indicated by the rising production figures reported elsewhere. Indigenous hardwoods are chiefly affected, but attention is focused also upon numerous locally grown European and Australian hardwoods, and upon Douglas fir, macrocarpa, and other exotic softwoods. The industries and timber-uses most affected are:—

(*a*) *Furniture:* Tawa, taraire, and rewarewa retain their importance as good-quality figured woods, but preservative treatment of all three woods is essential if they are to give satisfactory service.

(*b*) *Ship and Boat Building:* The scarcity of kauri has brought numerous inquiries for tanekaha and yellow-heart white pine. Irregular supplies of the durable red and hard beech, with their good bending and good wearing qualities, have forced users to seek locally grown elm, and to give consideration to preservative treatment of woods of poorer natural durability *e.g.*, mangeao and tanekaha. For canoes of Canadian pattern the Forest Service has recommended silver beech for ribs, red and hard beech for strakes, &c., and spruce, kohekohe, or white pine for paddles.

Investigations were made into the premature rotting of kauri planking in a small ship after a very short period of service, two other older vessels being similarly affected. These instances emphasize that types of construction such as the "three-skin" method which expose timber to extreme decay hazards should be avoided, since the middle skin (diagonal sheathing) is particularly subject to rotting when condensation water from an adjacent hold or fresh water from other sources penetrates to it. The sea-water permeates a short distance into the outer planking and rot extending from the affected

skin is not likely to be visible from the outside, nor is the ventilated surface of the inside sheathing likely to show signs of rot until it is far advanced. Kauri is conceded to be relatively durable when used intelligently, but both the mature resinous heart and the less-resinous material normally preferred for long-length planking will decay in positions where conditions are unfavourable. If non-durable timbers are to be used in ship and boat building, or if durable timbers are to be subjected to hazards as indicated, serious thought should be given to treating the timber with wood-preservatives at the time of building.

(*c*) *Sporting Requisites :* Tennis and babminton racquets made in New Zealand have in the past been manufactured from Canadian ash or Australian leatherwood. The Forest Service assisted one firm in replacing those timbers with silver beech and mangeao, the latter being specially noted for its toughness and good bending properties. Rewarewa and tawa may also play a useful part in combination with other woods, but their bending properties are scarcely comparable. Supplies of willow have also been located for racquet parts and possibly for cricket-bats. Pukatea has been shown to be satisfactory in place of willow in racquet-manufacture. Locally grown ash, which on good sites produces an excellent timber, is curtailed in its use for sporting equipment by virtue of the limited supplies available. For vaulting-poles, experiments are being carried out with test lots of locally grown bamboo.

(*d*) *Handles :* Fulfilment of an UNRRA order for shovel handles has required large quantities of tawa. This involved investigations of a small percentage of the timber that gave a brashy fracture, the formulation of kiln-drying schedules, and the supervision of drying. Recommendations were made also for treatment of the tawa handles to avoid trouble due to attack by powder-post beetles. In studying brashiness, use is being made of toughness-testing equipment. Brashiness, in one or two instances, appeared to be related to the greyish discoloration that is difficult to avoid in air-drying of tawa. The kiln-drying schedule developed for this timber commences at lower temperatures than are normally employed, and, while mould growth is liable to occur in the early stages of drying, a short steaming treatment effectively kills the mould without detriment to the timber.

Additional uses of minor woods receiving attention included : tawa for caskets, transformer construction, motor-body work, and flooring ; willow for artificial limbs ; larch for rustic furniture ; and beech for bobbins and spools in textile mills.

83. *Timber Mechanics.*—The variation with height in the tree of the strength properties of insignis pine grown in Whakarewarewa Forest has been fully analysed for one of the trees for which average results were reported in last year's annual report. As indicative of the variability typical of this timber it may be mentioned that, whereas the general average for modulus of elasticity for the tree (green timber) was 925,000 lb. per square inch, the maximum and minimum for individual pieces tested were 1,714,000 lb. and 489,000 lb. per square inch respectively.

Tests on green material from three loblolly-pine trees have been completed. From one of them measuring 18 in. D.B.H., all 4 ft. bolts from ground-level to 48 ft. were used. The results compare poorly with those of similar tests on insignis pine, but are not yet available for publication.

Useful data on the toughness of numerous timbers are being assembled from tests on the Denison toughness machine. Toughness in wood is dependent upon the relationship of tensile strength to compressive strength, and where toughness is essential as, for instance in aircraft members, it is necessary that each piece of timber should be critically examined. Density is a good guide to strength properties, but may be misleading if incipient decay or minute compression failures are present in the piece. The purpose of the current experiments is to establish by tests on a wide range of material minimum and average toughness values for local species. They will serve as a useful supplement to standard strength-test data already established. The toughness values (relative to density) of red beech, locally grown elm, and mangeao are higher than those of any other species tested to date. Softwoods in general are poorer in this quality, larch giving the best values so far.

84. *Box-testing.*—No tests of any consequence were carried out during the year with containers for export of produce. To meet a deficiency in wooden bacon-cases, plywood cases were designed and gave very satisfactory tests in the drum-tumbler machine. Revised nailing schedules for soap-boxes were prepared, and specifications were drafted to cover the nine principal local-trade fruit-cases whose retention was considered necessary by the Fruit Case Committee. Local shortages in timber-supplies make it necessary to eliminate cases that have little re-use value and to substitute where practicable cases that are suitable for a number of products. Technical assistance was continued with moisture-content testing and inspectional work to ensure that specification requirements were met for munitions and other supply containers for the Armed Services.

85. *Wood Technology.*—Fundamental studies of the physical properties of the wood of exotic-forest trees have been concerned primarily with loblolly pine and ponderosa pine from Whakarewarewa Forest and insignis pine from Kaingaroa Forest and Golden Downs Forest :—

(*a*) Loblolly pine cross-sections from three trees from which bolts for standard-strength tests were also cut showed specific gravity variation ranging, for instance, in dominant trees from 0·361 at butt level to 0·300 at 4-in.-top-diameter level. Analysis by zones from bark to pith shows a small decrease in specific gravity until a more resinous heartwood zone is reached in the butt log. There were no marked differences in longitudinal shrinkage from the pith to bark, nor is this shrinkage excessive.

(*b*) Ponderosa pine cross-sections from one tree showed little variation in specific gravity with height in the tree, but rather high values for longitudinal shrinkage, and further study is imperative.

(*c*) Insignis pine butt sections and 4 in. to 5 in. top sections from three trees (Kaingaroa Compt. V.8) averaged 0·411 specific gravity (based on weight oven-dry and volume green) in the 11-in.-diameter butt sections and 0·331 in the top sections.

(*d*) Detailed analysis of the physical properties of twenty-eight insignis-pine trees from Golden Downs have been completed. Variation of properties with height in tree and from bark to pith is covered by specific gravity (green and air-dry bases), ring width, and latewood determinations. In line with the consistent decrease in specific gravity from butt to top are the volumetric shrinkage, linear shrinkage (radial, tangential, and longitudinal), and latewood percentage. Ring width and green moisture content increase from butt to top.

Miscellaneous tests included specific gravities of several exotic hardwoods, such as : black locust, 0·646 ; ash, 0·571 ; and elm, 0·486. Numerous moisture-content tests were made for wood-using industries.

Thirty-two Solomon Islands woods were tested for specific gravity (weight oven-dry, volume green) and shrinkage. Relating these woods to well-known New Zealand woods on the basis of this basic specific-gravity determination, it is noted that nearly half of them are medium-density woods in the rimu-tawa range, eight woods being lighter than kahikatea and seven heavier than tawa. In the last-mentioned group of woods several had the desirable property of slight shrinkage (relative to their density).

Microscopic examination of woods was primarily concerned with identification of lesser-known woods for new industrial applications, but was also related to botanical and soil investigations. Studies of failures in service included a brashy fracture of a hemlock ladder style, serious failure of wooden parts of ailerons in fighter aircraft (from which subsequently the rot fungus was cultured), and the decay of kauri in three-skin ship construction (see paragraph 82). Routine identification of over fifty specimens was carried out. Additional material has been received from the Pacific islands and microscopic examinations are proceeding. Considerable interest in the Pacific woods and their properties is being shown by industries requiring decorative woods and veneers.

86. *The Drying of Timber.*—A specification prepared by the Forest Service for the practice of kiln drying was fully discussed by a Standards Institute Committee and has now been submitted for final comment by the trade before final adoption. Width of side flues has been related to stack width. Stacks up to 7 ft. 6 in. width require a side flue width of 18 in., and wider stacks require a width of 27 in. The Forest Service recommendation is that stacks should not exceed 7 ft. in width. The inclusion in architects' specifications of the requirement that timber be supplied "kiln dried" in accordance with this specification is a necessary corollary if it is to achieve its object.

Further experience was gained on the drying of rewarewa for furniture and of tawa for furniture and handles (see paragraph 82). Schedules similar to those recommended for heart rimu are fairly satisfactory for both these timbers for furniture. One of three loads of tawa dried at the Waipa Mill was, however, dried by the "stress reversal" method. Higher temperatures and a constant high humidity are maintained until strips cut from boards in the load indicate that the reversal of stresses stage has been reached. Without further increasing the dry-bulb temperature, the humidity is then dropped by 40 per cent. It is essential that the change be made at the correct time, and the method cannot yet be recommended for general use.

In the drying of insignis pine containing pith, the most satisfactory schedule developed at Waipa uses lower dry-bulb temperatures and lower relative humidities than for timber free from pith. A final conditioning treatment has been shown to be necessary for pine timbers as well as for the common building timbers. The pre-seasoning in the air of timber intended for kiln drying is recognized as beneficial for such timbers as North Island rimu (especially hill-grown), and is necessary for other timbers such as silver beech. Such seasoning, however, tends to be uneven when applied to kiln stacks with boards stacked edge to edge. It is good practice to withdraw boards from the centre of the stack (slotted fillets facilitate removal) just before kiln drying commences and to cut the mositure-content samples from these. Assistance has been given to a number of kiln operators with schedules, testing of controller bulbs, air-velocity measurements, and other problems of operation. Inspections of seven new units were made during the year.

87. *Wood Preservation.*—Standard Specification No. E202, "Code of Practice for the Preservative Pre-treatment of Timber by Cold Dipping Process," was issued during the year by the New Zealand Standards Institute. This specification described the method of treatment and provides for three alternative preservatives which may be used—viz., pentachlorphenol, copper naphthenate, and zinc naphthenate.

Test specimens exposed in 1943 to marine borer attack in Auckland Harbour were again recently examined. Creosoted exotic species remained immune to attack, except in a few instances in which creosote penetration was shallow. Untreated control specimens of the same species are all badly attacked or nearly destroyed. Of the indigenous species (untreated), totara still exhibits marked resistance, being only very slightly attacked. There is fairly widespread attack in taraire, though only moderate destruction has occurred. Tawa, miro, and kauri, on the other hand, are very badly attacked and partly destroyed. Round bolts of tawa, taraire, and miro with bark intact, both summer and winter cut, were exposed in 1944, and where the bark has remained intact no attack has occurred. Retention of bark appears to be best in taraire, being more intact and tighter than for either tawa or miro. So far there appears to be no significance in the season of cutting.

Observations were completed of an investigation commenced two years ago at Waipa to ascertain whether the treatment of round larch posts would be more successful if the bark were left on them for periods of one month, two months, and three months after cutting and they were then stacked for final seasoning rather than if the posts were barked immediately after cutting, as is at present customary. Observations were made on posts cut at monthly intervals throughout a year. It was found that retention of bark for the periods mentioned had no significant influence on the absorption or penetration of creosote. It was also found, as was to be expected, that no significant drying occurred until the bark was removed; that there was no difference in the rate of seasoning between posts barked immediately after cutting and posts on which the bark had been

retained for up to three months after cutting; and that the rate of seasoning down to the fibre saturation point varied only slightly with the month of cutting. Rate of seasoning below the fibre saturation point was, of course, dependent on the season of the year, and climatic conditions generally. Over a whole year very few posts reached an average moisture content below 20 per cent., the general average varying between 20 per cent. and 25 per cent.

88. *Painting of Wood.*—A number of basic principles affecting painting of wood are not generally understood, and this is one of the factors responsible for early failures of paint coats so abundantly evident to-day. (The others, involving paint formulation and method of application, will not be discussed here.) Insistence upon the following procedure is advocated:—

(*a*) Drying of weatherboarding to at least 16 per cent. moisture content and thereafter ensuring that it be kept dry until the priming coat is applied.

(*b*) Skilled brush application of a good priming coat to both face and back and edges of the dry weatherboarding. The water-repellent properties of a coat applied to all surfaces will retard water absorption and the cupping likely to result from an unprimed back where the weatherboarding is exposed to wetting.

(*c*) As the water-repellent properties of a single priming coat are not sufficient to withstand prolonged exposure prior to application of undercoat and finishing coat, the period lapsing between priming and the undercoat application should be limited, preferably to two weeks or less. (It is obvious that the mositure content of the wood will be an unknown factor when the undercoat is applied if the priming coat has been long exposed to weathering. In addition to the possibility of peeling of the coat due to high moisture content, the undercoat is in effect asked to fulfil a function for which by composition it is unsuited.)

Inspections of panels on the Wallaceville paint-test fence erected by the Forest Service show that useful results will be available during the next twelve months on the different priming treatments applied to insignus-pine weatherboarding. Analysis of the present condition shows that white lead and combined white lead and red lead primers of standard type with standard undercoat and finishing coat are standing up very well. Incidently, it is noted that the exposed lower edge of the face of bevel-backed weatherboarding should be chamfered, especially where varnish-base primers are to be employed. The sharp edge of boards in the test panels is a starting point for failure by flaking of the paint film.

The kiln-drying of insignis pine is recommended, as there is apparently less trouble with subsequent bleeding of resins. Further progress in the United States of America with sealers for knots in timber similar to insignis pine may result in the shellac knotting being replaced by a more effective sealer. The shellac type, however, applied over the primer, is still recommended for local use.

Small-scale tests were made to determine whether pre-treatment of rimu and heart rimu, by dipping in recommended pentachlorphenol concentrations, in kerosene, and dieselate, was detrimental to subsequent painting. Absorption by weight by both rimu and heart rimu was substantially greater in dieselate dips than in kerosene. Paint coats were applied satisfactorily to kerosene-dipped boards after three and a half days' drying, but even after seven days' drying of dieselate-dipped boards some blotchiness was apparent in the finishing coat.

The Inter-departmental Paint Committee and its district committees have been active during the year. Arrangements for the erection of additional paint-test fences at Auckland and Christchurch should give a balanced picture of paint behaviour as affected by climate.

89. *Plywood Manufacture.*—Woods from the Solomon Islands, and to a less degree from Samoa and Fiji, have been the subject of a special investigation. Interest is attached to those decorative woods which are present in substantial quantities and are a potential source of supply for high-class veneers. The supply of five logs from Guadalcanal to a

New Zealand firm for slicing has shown that three of the five species which are fairly abundant produce attractive veneers, and the possibilities of securing a continuity of log supply is being urgently investigated.

Other investigational work has been centred primarily on the completion of grading specifications for peeler logs of rimu, matai, and miro. Their introduction would have the desirable effect of eliminating logs whose conversion by sawing would give a substantially better yield of finished product than could be obtained by rotary peeling. The extent to which the pith of the tree is located away from the diametric centre is obviously very significant. Four inches off centre for logs under 6 ft. in girth and 5 in. for larger logs is recommended as a permissible maximum. Spiral grain is a serious defect likely to give poor conversion and to cause warping in the finished plywood. Nine inches in 6 ft. 6in. should be the permissible maximum. Emphasis upon limitation of size and type of shake is a most important feature, as this defect causes excessive wastage in veneer.

Percentage conversion of green timber to green usable veneer was shown to be 60 per cent. for "select" quality logs (average of five species), as compared with 47 per cent. for lower-quality peeler logs. An additional 19 per cent. loss occurs in subsequent factory operations due mainly to shrinkage and trimming to finished panels. Wastage due to inaccurate tearing of the veneer as it comes off the lathe and at the wet clippers is largely unavoidable. A significant reduction of waste can come only by improved technique at these points, by improved quality of logs accurately crosscut, and by salvage of small sizes at the lathe.

During the year increased quantities of insignis-pine veneer were used to good advantage in thick composite plywood of five and seven plies, of which two inside plies were pine. As regular supplies of this timber become available in peeler-log sizes, this type of plywood is certain to be an important product. A few forest-grown logs from Waiotapu Forest yielded exceptionally good veneer. Peeled even in plies over a quarter of an inch thick the product comes off cleanly and smoothly. Drying and warping problems are insignificant in comparison with logs of indigenous species.

Among the problems with which manufacturers are faced are the elimination of hair checking in face veneers of plywood used in furniture and bus bodies (closer control of finished moisture content is apparently necessary), and the production of built-up products at a price comparable with solid timber for use in casket and furniture manufacture and the manufacture of special types of stereo blocks. The increasing use of built-up construction—*e.g.*, solid or hollow core with veneer or plywood surfaces—to replace solid wood for furniture is an encouraging trend. Apart from its use for bus-body and similar construction, resin-bonded plywood has found one of its logical applications as shuttering for smooth concrete curves. Developmental work on compressed, resin-bonded assemblies employing veneers of local woods is progressing.

90. *Pulp and Paper Production.*—In order to demonstrate the manufacture of newsprint, kraft paper, liner board, &c., from New Zealand woods, arrangements were made with Australian Paper Manufacturers, Ltd., whose co-operation is gratefully acknowledged, to carry out an exhaustive series of laboratory tests prior to the manufacture on a full mill scale of quantities of bleached, semi-bleached, and unbleached sulphate pulp. The co-operation of Australian Newsprint Mills Pty., Ltd., is also assured for the demonstration of the manufacture of groundwood and newsprint, incorporating the semi-bleached sulphate pulp and groundwood in the newsprint furnish. Associated Pulp and Paper Mills, Ltd., is likewise expected to assist in the manufacture of fine papers from bleached pulp, and Australian Paper Manufacturers, Ltd., will complete the manufacture of kraft paper, including some that will be used for the manufacture of multiwall paper bags. At 31st March the laboratory work was still in progress, but it is hoped to complete the whole of the demonstration at an early date, after which it should be possible to finalize arrangements for establishing the industry in New Zealand on a sound basis.

91. *Charcoal Production.*—No charcoal burning was undertaken during the year. A total stock of 8 tons remains, sales for the year being 22 tons.

CHAPTER XI.—MISCELLANEOUS

92. *Legislation.*—No amendments to the Forests Act, 1921–22, were made during the year, nor were there any amendments to the regulations under the Act.

Section 2 of the Reserves and other Lands Disposal Act, 1945, cancels the reservation as an endowment for primary education of an area containing 173 acres and 36 perches, being Sections 34 and 35, Block VIII, Otepopo Survey District, Otago Land District (C.T. 180/103), and sets the land apart as a permanent State forest under and subject to the provisions of the Forests Act. This land is included in Herbert State Forest, a new afforestation project.

The Bush Workers Act, 1945, makes provision for the safety and protection of bush workers.

93. *Finance.*—Appendix VI of this report summarizes the receipts into and payments out of the State Forests Account during the year ended 31st March, 1946, together with those of the three previous years. The complete departmental accounts are set out in parliamentary paper B–1 [Pt. IV].

Reference to Appendix VI will show that, compared with the previous year, payments for 1945–46 increased by approximately £123,000 and receipts by more than £127,000.

The increased expenditure was necessary to finance essential preparatory work required in the establishment and maintenance of new projects and the restarting of work on established forest projects which had to be held over during the war years.

The increase in revenue from £460,800 for 1944–45 to £588,324 for 1945–46 is accounted for largely in the returns from utilization projects. This increase cannot, however, be taken as a measure of the increase in output, as it arises to a substantial extent from the liquidation of slow-moving accounts, the sales concerned having now been diverted to other channels. The only other increase that calls for comment is in the final item in the Appendix—viz., "Miscellaneous credits." This item is so much larger because of the crediting to the account of £42,000 in adjustment of timber-control expenses which had previously been charged against the State Forests Account, as referred to in last year's report.

94. *Subventions to Local Bodies, &c.*—The extent to which subventions of forest revenue to the Consolidated Fund and local bodies have necessitated the raising of additional loan-moneys over the past three years in order to provide the necessary finance for forest activities is shown in the following table :—

Year.	Consolidated Fund (under Section 39 of Forests Act, 1921–22).	Local Authorities (under Section 17 of Finance Act, 1924).	Local Authorities (under Sections 6 and 7 of Forests Amendment Act, 1926).	Total.
	£	£	£	£
1943–44	17,455	12,928	7,596	37,979
1944–45	16,196	12,799	6,057	35,052
1945–46	14,235	17,114	6,230	37,579
Totals	47,886	42,841	19,883	110,610
Percentage of indigenous forest receipts	11·00	9·84	4·56	25·40

The relationship which the above subventions of revenue bear to the amounts of loans raised is as follows :—

——	1943–44.	1944–45.	1945–46.
	£	£	£
Total loans raised	110,000	110,000	300,000
Subventions—			
Amounts	37,979	35,052	37,579
Percentage of loans	34·53	31·87	12·53

95. *Recreation in State Forests.*—The increased activities of tramping clubs and kindred bodies as members returned from military service were reflected in a greater number of visitors to State forests for general recreational purposes during the year.

Piano Flat Camping-ground, Southland, was placed in charge of a caretaker during the Christmas–New Year holidays, when campers occupied the ground. Hanmer Forest again attracted visitors, eighty-five permits to inspect the forest being issued during the year.

Deer-stalkers comprised the greater number of visitors to indigenous State forests due to the continued high prices for deer-skins, and reports indicate successful and remunerative visits by many stalkers. Owing to the fire hazard, no sporting activities are permitted in exotic State forests.

All applications for permits to use rifles with a bore less than ·303 in. were refused, in accordance with the long-standing policy of bird-life protection.

Owing to the high fire hazard which prevailed during February and March and the numerous outbreaks of fire, all permits to enter State forests in the Wellington Conservancy were cancelled by radio announcement and newspaper advertisement. Persons desiring to enter State forests were required to make further application to the Conservator of Forests, Palmerston North, and fresh permits were granted as soon as the fire danger passed. In other conservancies affected by similar conditions permits were also withheld during the danger period. It is regretted that this action had to be taken, but it was necessary to cope with the critical situation brought about by the numerous outbreaks of fire in various parts of the Dominion at a time when available staff were already fully occupied.

96. *Forest Privileges.*—(*a*) *Grazing Privileges:* Grazing licenses and leases now number 185. Five new licenses were granted, 3 surrendered, and 1 transferred.

(*b*) *Mining Privileges:* Applications for mining privileges under the Mining Act, 1926, totalled 33. Three applications were made for coal-mining rights under the Coal-mines Act, 1925. Although these applications are not granted under the Forests Act, 1921–22, the applicants are subject to the same obligations as holders of State forest privileges with respect to the protection of State forests, consequently their attention is directed particularly to the provisions of the Forest (Fire-prevention) Regulations 1940 and amendments.

97. *Library.*—During the year 528 books and pamphlets were added to the Head Office library, bringing the total number of publications to 9,579. Quarterly catalogue supplements have, as usual, been circulated to conservancies.

98. *Rehabilitation.*—Areas acquired during the year for planting of new exotic forests or treatment of existing unworked or partially felled indigenous forest aggregated 22,700 acres. The total area suitable for forest management of this nature and acquired since 1940 is 73,100 acres. At the end of the year 32,400 acres were under negotiation for purchase. As mentioned in last year's report, 77,000 acres are available for exotic planting on State forests proclaimed prior to 1940, and more than 200,000 acres require silvicultural treatment, such as pruning and thinning.

Planning for development and expansion during the five-year post-war reconstruction period has now been completed with respect to 53 managed State forests and 4 purely utilization projects. The plan provides for productive employment of 4,700 personnel (including salaried staff) by the fifth year, or a mean number over the whole period of 4,000. The total includes 1,250 wages-men and 450 salaried officers at present employed. Expenditure over the five years is estimated at £11,100,000, which includes £4,300,000 for existing works, an increase of £6,800,000. Receipts for the five years are estimated at £4,500,000, including £2,500,000 from present operations.

Although additional forests have been included in the revised plan, the totals of both financial and personnel requirements are similar to those mentioned in last year's report. This is mainly because the commencement of certain projects has been delayed owing to labour not becoming available as freely as was anticipated.

Employees at the beginning of the year under review totalled 900, and by the end of the year, six months after VJ Day, their number had increased to only 1,230. A further 2,000 men can be employed from September, 1946, until March, 1948, but present indications are that this additional number will not be fully recruited. Apart from employment, accommodation is in itself a difficult problem because of the scarcity of tradesmen and materials. Postponement of the construction of permanent accommodation with modern amenities seems inevitable, but every effort is being made to install comfortable temporary living-quarters consisting of refitted and improved Army huts, including some of the sectional steel types. Other works in hand in preparation for the rehabilitation programme are layout surveys and the development of four new tree nurseries.

A list of forests in which expansion is planned, and their location is given in Appendix X.

99. *Export Butter-box and Cheese-crate Pools.*—The deliveries of timber for butter-box manufacture to North Island boxmakers licensed under the Export Butter-box and Cheese-crate Pool Regulations 1941 amounted to 8,704,000 board feet (10,475,000). Shipments from the South Island totalled 5,249,000 board feet (5,381,000), comprising 2,544,000 board feet of white-pine and 2,705,000 board feet of rimu. The balance, of which only 354,000 board feet were rimu, was secured from North Island sawmills. Shortages of coastal shipping again made it difficult to move timber from the west coast ports to the North Island. Details of the boxes supplied during the past year are as follows:—

Standard wooden boxes (approximately 60 per cent. white pine and 40 per cent. rimu)	1,366,000
"Saranac" type (fibre-board mats and wooden ends) ..	814,000
Corrugated kraft fibre-board cartons	1,336,000
Solid fibre-board cartons made from imported blanks ..	1,002,000
Solid fibre-board cartons made from New-Zealand-manufactured blanks	495,000
	5,013,000

Total manufacture during the previous year was 4,077,000.

At 31st March, 1946, stocks of boxes held by dairy companies totalled 934,000 (400,000).

Two serious fires occurred during the year. The first, in July, 1945, destroyed the box-factory of K.D.V. Boxes, Ltd., at Auckland, one of the largest manufacturers of butter-boxes in the country. The other destroyed the factory of T. W. Wall, Ltd., at Owhango in February, 1946. Fortunately there were two factors that mitigated the otherwise serious effects of these fires. The former and more disastrous fire occurred at the slackest period of the dairy season, and while the latter occurred more in the flush of the year, the demand for boxes had already greatly diminished as a result of the drought conditions in dairying districts.

At the time of preparing this report the total output of butter to date for the current season shows a decrease of 16 per cent. compared with the same period of the preceding year, and while a fall of these dimensions, coinciding with a world food crisis, is to be greatly regretted, there is no doubt that an output equal to that of the previous season would have involved grave problems regarding box-supplies. The forward supply for next season, moreover, is far from reassuring. With the approaching exhaustion of the accessible white-pine supplies, New Zealand has come to depend in a large measure on the fibre-board container for its butter-box requirements. Substantial orders were placed for Canadian supplies, but advice in recent months leaves little hope that more than a small proportion of this material will be received. There appears to be no alternative other than to use a larger proportion of wooden boxes, even though this must necessarily mean a continued and expanded use of the rimu box, which is held in general disfavour by the dairy industry.

Box-factory capacity during the coming year will be considerably reduced. The K.D.V. factory at Auckland is being rebuilt, but it will probably be late in the new season before manufacture recommences. The Owhango factory is not being rebuilt, while, in addition, a long-established box-factory in the Main Trunk region is expected to close down shortly as a result of depletion of white-pine supplies. The remaining box-factories will be fully capable of supplying boxes to the maximum extent of the timber available. In view of the potential shortage of fibre boxes, however, and the very limited supplies of butter-box timber in the North Island, it is vitally important that more shipping be provided for moving west-coast timber and boxes to the North Island.

CHAPTER XII.—TIMBER CONTROL

100. *Timber Production Advisory Committee.*—The Timber Production Advisory Committee, under the chairmanship of the Commissioner of State Forests, held three meetings during 1945–46. Towards the end of the year the membership of the Committee was enlarged by the addition of one representative each from the West Coast Sawmillers' Association and from the Nelson, Westland, and Marlborough Timber Industry Employees' Industrial Union of Workers.

The most important aspect of the Committee's work was an investigation of the standard of accommodation available at bush sawmills, as a result of which recommendations embodying a definite scheme for a large-scale improvement were submitted to the Government. A man-power survey has shown that the timber industry must recruit an additional 2,000 men in order to reach the post-war production objective. The principal obstacle deterring men from offering for bush work is the very inferior standard of accommodation for married workers available at many mills. The Committee was unanimously of the opinion that accommodation is the key to increased production. Important reforms are proposed, the aim of which will be to provide a standard of housing and general amenities at bush mills which will compare reasonably with urban living conditions. The implementation of this scheme, which was initiated by the Forest Service, will be the most progressive move in the history of sawmilling in New Zealand.

101. *Declaration of Timber Industry as Essential.*—During the year the following undertakings were added to the Declaration of Essential Undertakings No. 99 (*Gazette*, 1943, page 433), issued pursuant to the Industrial Man-power Emergency Regulations 1944 (Serial number 1944/8), and applying to the maintenance and protection of exotic forests owned by local bodies and afforestation companies :—

(i) All afforestation operations being carried out by the State Forest Service. Dated 24th August, 1945, and published in *Gazette*, 1945, page 1108.

(ii) One afforestation company. Dated 31st January, 1946, and published in *Gazette*, 1946, page 84.

Revocations of declarations of essential undertakings in pursuance of Regulation 11 of the Industrial Man-power Emergency Regulations 1944 are as follows :—

(*a*) Revocation of Declaration of Essential Undertaking No. 22, as published in *Gazette* No. 81 (22nd January, 1942) : affects the undertakings in respect only of the manufacture of wooden boxes or of wooden containers or of parts of wooden boxes or wooden containers. Dated 30th November, 1945, and published in *Gazette*, 1945, page 1520.

(*b*) Revocation of Declaration of Essential Undertakings No. 71, as published in *Gazette* No. 49 (14th May, 1942), together with amendments : affects the undertakings in respect only of their timber-yards, joinery-factories, and planing-mills. Dated 31st January, 1946, and published in *Gazette*, 1946, page 84.

(*c*) Revocation of Declaration of Essential Undertaking No. 105, as published in *Gazette* No. 78 (20th August, 1942), together with amendments : affects maintenance and operation of a railway-line and salvage operations on portion of railway-line being dismantled. Dated 31st January, 1946, and published in *Gazette*, 1946, page 84.

(*d*) Revocation of Declaration of Essential Undertaking No. 106, as published in *Gazette* No. 78 (20th August, 1942), together with amendments: affects undertakings relating to wood products. Dated 31st January, 1946, and published in *Gazette*, 1946, page 84.

(*e*) Revocation of Declaration of Essential Undertaking No. 78, as published in *Gazette* No. 60 (18th June, 1942), together with amendments: this revocation was contained in Declaration of Essential Undertaking No. 151 (dated 20th July, 1944, and published in *Gazette*, 1944, page 925), which declared the Public Service to be an essential undertaking.

(*f*) Revocation of Declaration of Essential Undertaking No. 151 (in (*e*) above). Dated 24th August, 1945, and published in *Gazette*, 1945, page 1108.

The essentiality of afforestation operations of the State Forest Service was preserved under the amendment to the Declaration of Essential Undertakings No. 99, noted above, but all controls of man-power were subsequently revoked as from the 29th June, 1946.

102. *Industrial Man-power.*—Due to the returning of servicemen, gains in man-power exceeded the losses in most districts. Unfortunately, however, the losses have been largely of highly skilled men with long service in the industry, whereas the gains comprise a large percentage of servicemen who are inexperienced and will have to be trained before production is proportionate to their numerical strength. Shortage of skilled men, particularly bushmen, is partly responsible for the timber shortage, and the output of timber cannot be adequate until there is an ample supply of skilled as well as unskilled labour.

The Regional Timber Industry Man-power Advisory Committees continued with the allocation of man-power to the best advantage among sawmills. They also brought to the notice of authorities concerned any causes of discontentment among mill employees with working or living conditions so that, wherever possible, these matters might be remedied.

Many requests were made for the withdrawal of the declaration of essentiality on the sawmilling industry and the removal of man-power restrictions, but the unceasing demand for timber for much-needed housing and other vital work and the general shortage of man-power were factors that necessitated continued control. As stated in paragraph 101, however, all man-power controls have been subsequently revoked. Notices issued previously to numerous sawmillers and employees to observe a forty-eight-hour week pursuant to the Industrial Man-power Emergency Regulations 1944 continued in force during the year, but they were modified to allow the working of alternate weeks of forty and forty-eight hours where continuous operation of a forty-eight-hour week was impracticable, and during the winter months Regional Timber Controllers found it necessary in some cases to agree to the working of shorter hours, although every effort was made to maintain some extended working-hours in the bush in order that mills could be operated continuously for at least forty hours a week.

The following notices suspended the operation of the forty-eight-hour-week requirement during holidays and permitted workers to take holidays to which they were entitled under the Annual Holidays Act, 1944:—

(*a*) The Sawmilling Industry (Easter Holidays) Notice 1945 (*Gazette*, 1945, page 293) required every sawmilling undertaking and every employee to continue working until the usual closing time on Wednesday, 28th March, 1945, and to resume not later than the usual commencing time on Wednesday, 4th April, 1945.

(*b*) The King's Birthday, 4th June, 1945, and Labour Day, 22nd October, 1945, were observed as statutory holidays by the sawmilling industry.

(*c*) The Sawmilling Industry (Christmas Holidays) Notice 1945 (*Gazette*, 1945, page 1497) required every sawmilling undertaking and every employee to continue working until the usual closing time on Wednesday, 19th December, 1945, and to resume not later than the usual commencing time on Thursday, 10th January, 1946.

Provision was made in these notices for relaxation or variation to meet individual requirements by consent of the Timber Controller.

The working of extended hours by sawmills directed under Regulation 20 of the Industrial Man-power Emergency Regulations has been subsidized from the War Expenses Account since the coming into force of the Timber Industry Labour Legislation Modification Order 1941 to the extent of 80 per cent. of the extra wages cost over and above ordinary rates—*i.e.*, 80 per cent. of half-time. On 7th February, 1945, when the revocation of the Order became effective, the subsidy was increased to cover 80 per cent. of the extra cost for overtime at time-and-a-half rates worked during the week and on Saturday mornings, and 100 per cent. of the extra cost of overtime at double rates worked on Saturday afternoons. The Forest Service checks all claims from the industry for the subsidy and during the year has passed for payment amounts totalling £120,129 (£76,024). It is estimated that the additional production achieved as the result of this subsidy is 32,000,000 board feet (27,000,000).

103. *Petrol and Tire Conservation and Vehicle and Tractor Supplies.*—In the use of petrol and tires by various sections of the industry the Forest Service has continued to act in an advisory and policing capacity to the Commissioner of Transport and the Oil Fuel Controller. It has also served the industry usefully in arranging for the supply of parts and new plant and for the hiring of tractors and other essential equipment.

104. *Essential Supplies.*—The removal of controls over saws, wire ropes, corrugated fasteners, hoop steel, &c., has resulted in the placing of large orders for these items, and with the easing of the supply position overseas some of these orders have already been met, but owing to the current shortage of other items appropriate recommendations have been made for increased importations.

105. *Timber Purchases for Defence Works.*—There were no activities under this heading, as the Forest Service ceased the purchase of timber for defence purposes towards the end of 1943. Subsidiary functions in the nature of liaison and advisory services, which were reported as continuing in last year's annual report, came to an end with the conclusion of hostilities. There still remains, however, the need to reconcile the timber-quantity schedules compiled from purchase records in the Timber Controller's office with those prepared from the contractors' records, and although considerable progress has been made with this task, detailed analysis of figures supplied for later composite contracts which were in part abandoned towards the end of the war will yet require some time.

106. *Timber Control Notices.*—The Timber Emergency Regulations 1939 were amended by the Timber Emergency Regulations 1939, Amendment No. 2 (Serial number 1945/100), which transferred Ministerial control from the Minister of Supply and Munitions to the Commissioner of State Forests.

The following Timber Control Notices were issued pursuant to the Supply Control Emergency Regulations 1939 and the Timber Emergency Regulations 1939:—

(*a*) Timber Control Notice No. 51 (*Gazette*, 1942, page 2825) required that insignis-pine timber should not be cut, sold, or used except for the manufacture of wooden containers without the precedent consent of the Timber Controller.

In order to keep an effective check on the sales of insignis-pine timber, a notice in the form of a circular letter dated 23rd April, 1945, was sent to all insignis-pine sawmillers requiring them to submit each month a return setting out particulars of all insignis pine sold during the preceding month.

Following the cancellation of American orders for foodstuffs, there was a considerable reduction in the use of insignis pine for boxmaking, and it was possible from September, 1945, to ease the provisions of this Notice. At that juncture, however, as stocks held by boxmakers were generally low, and in view of the unknown demand for timber consequent upon orders placed by the British Ministry of Food and by UNRRA, it was not possible to remove the restrictions.

The Notice has since been revoked by a Notice dated the 13th May, 1946, and published in *Gazette*, 1946, at page 686.

(*b*) *Revocation of Timber Control Notices:* In addition to the revocation of Timber Control Notice No. 51, the Notice above, dated the 13th May, also revoked the following Notices:—

Export of Kauri and Insignis Pine Notice, published in *Gazette*, 1940, at page 1724.

Timber Control Notice No. 33 (Binding Wire), published in *Gazette*, 1941, at page 3959.

Timber Control Notice No. 44 (Wire Ropes), published in *Gazette*, 1942, at page 1121.

Timber Control Notice No. 52 (Timber Materials), published in *Gazette*, 1942, at page 2844.

The revocation of these Notices was effective from 17th May, 1946.

(*c*) *Delegation of Powers of Timber Controller:* By notice dated 7th August, 1945, issued pursuant to Regulation 4 of the Supply Control Emergency Regulations 1939, the Timber Controller delegated to Bertrand Walsh, of Hamilton, secretary of the North Island Sawmillers' Distributing Association, powers to act for the Timber Controller as directed in the regulation and control of the supply of certain specified sawn timbers for export to Australia.

(*d*) The provisions of the Railway Sleepers Production Notice 1945, No. 2, dated 26th March, 1945, issued to certain specified North Island sawmillers requiring them during April, 1945, to saw at least 20 per cent. of their totara production into railway-track sleepers and to consign them as required to the New Zealand Railways, were repeated for May by Notice No. 3, and then by Notice No. 4 were continued until revoked. However, it was found that sufficient quantities of redwood could not be purchased for joinery, and as the New Zealand Railways were able to obtain additional quantities of Australian hardwoods to meet replacement needs, which were supplemented by beech and silver-pine production, Notice No. 4 was revoked in February, 1946.

(*e*) *Declaration of Timber Stocks:* During May, 1945, a notice was issued requiring every proprietor or owner of any sawmill, planing-mill, sash-and-door factory, box-factory, or other timber-products factory to furnish a statement giving the total quantity of sawn timber held on 31st May, 1945. This information was necessary in order to obtain a clear perspective of the timber-stock position in view of the rapidly expanding building programme.

107. *Removal and Erection of Sawmills Notice 1941 (Serial Number 1941/236).*—In 57 cases consent was given for the removal and erection of sawmills under the provisions of the Notice, 47 being for the erection of new mills and 10 for the removal of existing sawmills to new sites. In view of the continued man-power shortage in established sawmilling units, all applicants for consent under the Notice were required to give assurance that their operating staff could be obtained without the necessity of engaging men already employed in the sawmilling industry.

Three consents were issued for the erection of sawmills for the cutting of insignis pine from forests owned by afforestation companies. Since the forests are comparatively young, immature stands, the consents were conditional upon the installation of sawmills containing suitable equipment for the economic conversion of small timber. So far as equipment can be secured, it is required that such mills shall include Pacific breakdown bench, breast bench, and deal frame, the use of which should reduce waste to a minimum figure. In view of the extremely high fire risk in exotic forests, millers are also required to take approved precautions against fire and to provide adequate fire-fighting equipment.

108. *Sale and Purchase of Forests.*—Regulation 3 (1) of the Timber Emergency Regulations 1939 (Serial number 1939/148) provides that, except with the precedent consent of the Timber Controller, no person shall sell or purchase or contract for the sale or purchase of any forest, or grant or accept or contract to grant or accept a

lease or demise of any forest, or grant or accept or contract to grant or accept any right or license to fell standing timber. Under this regulation 424 (520) consents were granted during the year. The transactions fall into three groups :—

(*a*) *Privately Owned Forests :* Consents for the sale and purchase of privately owned forests chiefly affect insignis-pine trees from small farm wood-lots or shelter-belts. Of the consents given during the year, 360, or more than 80 per cent., were in respect of exotic trees in this group.

(*b*) *Maori-owned Forests :* Three notices affecting forests in Rotorua and Wellington Conservancies were issued pursuant to Regulation 3 of the Timber Emergency Regulations 1939, as amended by Regulation 2 of Amendment No. 1 (Serial number 1943/106), which authorizes the Timber Controller to require Maori owners of forest to sell their interests to such proprietors as he may nominate. A notice requiring such a sale is given to the Maori Land Board on behalf of the owners. In all cases as many owners as possible are consulted and, wherever practicable, their prior consent obtained. In effect, the procedure under the regulations simply provides the machinery for sales to be dealt with expeditiously, and in some cases the Maori owners have asked for the sales to be dealt with in this way. Under the regulations the owners are given twenty-one days in which to lodge objections to a sale. In only one case was an objection received, and it was made under a misapprehension. In two cases, one following a direction notice issued before 31st March, 1945, and one following a direction notice issued this year, it was necessary to issue authorizations enabling the sawmillers to proceed with logging pending the usual appraisal and issue of a license. In such cases the sawmillers are required to make substantial deposits and pay monthly for the timber cut. Three licenses for the sale of forest were granted following direction notices issued during the preceding year and one following a notice issued this year, and three licenses were confirmed by the Native Land Court. The normal procedure under the Native Land Act, 1931, is a lengthy process, and the shortened procedure of the Timber Emergency Regulations has proved to be extremely valuable in making available supplies of logs to meet emergency needs. All sales of Maori-owned forest require the consent of the Commissioner of State Forests in terms of section 35 (2) of the Forests Act, 1921–22, and in all cases a cruise and valuation of the timber in the forest is prepared by the Forest Service before consent is given. The same procedure is followed in sales under the Timber Emergency Regulations, and as such sales are subject to confirmation of the Native Land Court the owners are assured of receiving full value for the timber sold and their interests generally are protected by the supervision of cutting by the Forest Service.

(*c*) *Exotic Forests (Commercial).*—No consents for the sale and purchase of forests established for commercial timber production by afforestation companies were granted during the year. In accordance with the conditions of consents granted during the preceding year, two forest working plans, each covering the sales of 500 acres and prepared by a qualified forester, were received and approved, and one working plan, covering an area of 2,104 acres, is under consideration. In all cases of the sale for milling of commercial forests consents are subject to the condition requiring the owner to submit a forest working plan, which is a detailed written scheme, including map or maps, of the operations to be undertaken for the silvicultural management and progressive reforestation of the area as it is cut over, and also for fire prevention and control. Where a forest is situated in a fire district, close co-operation is required with the forest officer in charge.

A case occurred during the year in which, in order to prevent an important sawmill being closed down as the result of the refusal of a landowner to renew an easement over his property, it became necessary to exercise the compulsory powers of the Timber Emergency Regulations 1939, as amended, and to authorize the sawmiller to continue using the access. The conditions were similar to those attaching to the expired easement and the sawmiller completed his operations without further difficulties.

109. *The Timber Position.*—Although the war was still in progress when the year under review commenced, it had receded so far from New Zealand's shores that little demand was made on the Dominion for timber for large-scale defence works, military

hospitals, or similar uses. The building industry therefore was able to concentrate its efforts on meeting the civilian demand for houses and other buildings, and as a result of the high priority accorded dwelling construction about 9,000 houses were erected during the year.

The system of end-use control described in last year's annual report was originally premised on the regulation of building permits in accordance with the timber-supply. Had this policy been followed there is no reason to doubt that the End-use Committees would have succeeded in organizing timber distribution in an orderly fashion and, in particular, permit-holders would have received their timber-supplies in chronological order of the date on which their permits were issued and without undue delay. However, once the issue of permits had far outstripped timber-supplies, a tendency developed for permit-holders to adopt extraordinary measures to secure their needs. In some cases builders, rather than wait their turn for supplies, went to much expense in organizing log-supplies and had them sawn in mills which, due to a shortage of logs, were not working full time. Although this policy often resulted in the timber costing the builder more than if he had waited and obtained his supplies from his normal retail merchant, it did lead to increased timber production, which otherwise would not have been secured.

It is now certain that timber demand and supply are going to remain out of equilibrium for the next two years at least. Due to the heavy housing programme undertaken last year, timber stocks, which were badly subnormal when the year commenced, have now reached an irreducible level. To meet the changed conditions, steps are being taken to tighten up the control of sawmill production and so ensure that builders will no longer be able to induce country sawmillers to supply them with timber in priority to holders of earlier-dated permits. End-use control is also being strengthened by vesting end-use officers with legal powers to enforce the distribution of timber-supplies under their control according to priorities established, and where priorities do not exist, then according to the date of issue of building permits. In addition, the use of indigenous building timber for commercial buildings and other purposes is being limited so as to assure the maximum possible rate of house-building.

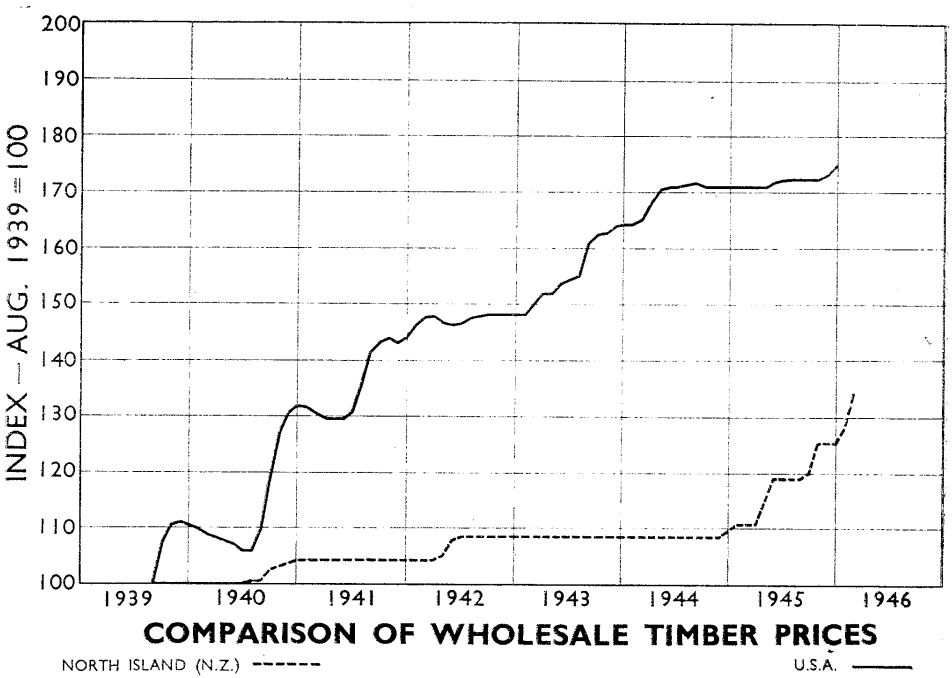
Periodically throughout the year, and particularly during the months of February and March, timber distribution to consuming zones was rendered extremely difficult by a shortage of railway trucks. Owing to the tire position, it was not possible to relieve the position by using road transport, as was done in the previous year.

Inasmuch as the South Island wood-using industries enjoyed relatively a better timber-supply than the North Island, it was not necessary to institute there the intensive zoning and end-use control that operated in the North Island. Nevertheless, the West Coast Sawmillers' Association, which produces 70 per cent. of the rimu in the South Island and has an area of distribution extending from Nelson to Dunedin, introduced a system of zoning to ensure an equitable apportionment of the timber produced.

The North Island received less timber from Westland than during any year since war commenced, mainly owing to coal being afforded a clear priority of shipping-space available for loading at Greymouth. For six months no tonnage has been available for shipping timber to Auckland, and only one vessel a month has loaded timber for Wellington. Concurrently, no shipping could be secured for loading at Greymouth for Australian ports, with the result that the North Island had to assume responsibility for the supply of most of the timber despatched to Australia under the reciprocal agreement for supply of hardwoods. The timber position in the North Island is therefore more serious than in the South and the urgent need for more shipping to move timber to northern ports is again emphasized.

110. *Timber Prices.*—After a lengthy period of relatively stable timber prices, three separate rises were approved by the Price Tribunal during the year. In two instances the increases arose out of alterations to the Timber Workers' award which increased the cost of timber production. To compensate sawmillers for these increases, the selling prices of indigenous timbers were advanced by a total gross or list average of 3s. per 100 board feet in the North Island and in Southland, and by 2s. 2d. on the west coast of the South Island. The third rise was granted after an exhaustive survey had revealed

convincing evidence that some sections of the sawmilling industry were in an unhealthy economic position, which was threatening not only to restrict expansion of production but also to impair current cutting. In the North Island, sawmillers working the indigenous forests were granted a gross or list average increase of 3s. 3d. per 100 board feet, thus giving a total gross increase of 6s. 3d. per 100 board feet, though, after allowing for sales tax and the customary discounts, the net increase is only 4s. 9d. per 100 board feet. Appropriate increases for South Island sawmillers were still under consideration when the year ended. As 30 per cent. of the total North Island cut was insignis pine, which was subject to a much smaller increase, the net weighted price increase for all species was only 3s. 11d. per 100 board feet in the North Island and 3s. 2d. for the Dominion as a whole.



The accompanying graph compares the movement of North Island wholesale timber prices with the movement of the corresponding prices in United States of America. Two important facts are clearly illustrated: in the first place, from 1939 to the end of 1944 North Island prices rose less than 10 per cent. (and the 1939 prices on which this percentage is based were lower than the general price-level then ruling, owing to the effect of price control from 1936 onwards); secondly, even with the latest increases timber prices have scarcely risen to half the extent of the increases recorded in United States of America. While as far as New Zealand is concerned the graph illustrates the North Island position only, it can be accepted as an index representing with substantial accuracy the movement of timber prices for the Dominion as a whole. The trend of prices in Canada has been similar to that in United States of America. These facts fully support the claim that timber prices in this country have not risen excessively, and further show that the increase has been considerably less than in two other countries whose timber-supply problems are closely related to our own.

111. *Timber Production.*—While there is cause for satisfaction that, despite the difficulties under which the industry has been operating since 1939, timber production for the year was maintained at well above pre-war cutting, it has now become necessary

to realize that such production has been secured only at the expense of certain sacrifices, and that in order to sustain and augment the present rate of production a radical change-over from wartime conditions, and the establishment of new units, will be required within the industry.

Among the factors that are tending to retard production are—

(*a*) Shortage of both skilled and unskilled labour in bush and mill.

(*b*) Shortage of essential supplies and inadequate maintenance.

(*c*) Lack of suitable accommodation for workers.

(*d*) Cutting out of convenient bush resources and transference of mills to less accessible areas.

(*e*) Shortage of rail trucks where logs are transported by rail to the mill.

The majority of sawmills are still operating considerably below normal capacity, because of shortages of man-power. These deficiencies can only be remedied by the adoption of an ambitious training scheme, which has already been submitted to the Timber Production Advisory Committee, and as under-staffed units are brought up to full complement a substantial increase in production will be secured.

The erection of new sawmills and the maintenance of existing plant have been severely handicapped by the difficulty of securing equipment and supplies from overseas during the last six years. The effect of inadequate maintenance became increasingly apparent last year, when some mills were compelled to shut down temporarily in order to effect essential repairs. It is likely to be some time before the lag in this respect has been overtaken.

The necessity of providing adequate and suitable accommodation at or near the bush and the mills has been referred to earlier in this report. Vigorous efforts have been pressed throughout the year to have a scheme introduced under which this objective might be speedily realized, and it is anticipated with some confidence that finality will soon be reached and operation commenced during the current year.

After the drain of the war years on bush supplies, a number of established mills will soon exhaust immediately convenient resources, and if production is to be maintained it becomes critically urgent that new areas be demarcated and made available for the re-location of old and the establishment of new mills. It is for this reason that so much emphasis is now being placed on the expansion of timber-cruising staff for the reconnaissance and appraisal of some important reserves of timber throughout the Dominion. The transference of mills to new areas, which are usually if not always less-accessible areas, entails a period during which these units are not in production, but every effort is made to hasten such transfers.

The erection of new sawmills will assist in improving production. The labour for these mills is largely recruited from outside the industry, particularly when mills are set up in or adjacent to established centres of population. It is therefore all the more essential, if labour is to be attracted away from the neighbourhood of urban amenities, that schemes for improving the accommodation at or near the mills be expedited. It might almost be said that timber production is tied up with this exigency, as it is clear that for several years to come a large portion of the labour required to man the logging and milling operations of the Dominion must be attracted from the general labour pool.

APPENDIX I

Areas of State Forest as at 31st March, 1946

Conservancy.	Permanent State Forest.		Provisional State Forest.		Totals.	Percentages of Land Area under State Forest Reservation
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	
Auckland	416,347	89,789	135,031	14,006	655,173	7·62
Rotorua	694,805	286,760	152,666	63,108	1,197,339	15·16
Wellington	1,059,967	41,135	33,698	3,808	1,138,608	9·41
Nelson	1,071,442	216,076	785,803	526,001	2,599,322	37·09
Westland	916,924	354,030	363,241	227,315	1,861,510	48·18
Canterbury	486,658	3,647	..	..	490,305	4·93
Southland	543,853	56,234	633,679	13,740	1,247,506	7·35
	5,189,996	1,047,671	2,104,118	847,978	9,189,763	13·84
	6,237,667		2,952,096			

APPENDIX II

Summary of Planting and Silvicultural Operations in State Forests as at 31st March, 1946

Project.	Year of Commencement.	Gross Area of Forest.	Total Net Area planted.	New Area planted, 1945.	Area treated, 1945–46.			
					Low-pruned.	High-pruned.	Thinned.	Clear-felled.
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Mangonui ..	1944	8,927	3	..	..	..	..	..
Waipoua ..	1925	12,600	3,980	76	207	1	..	..
Puhipuhi ..	1904	1,565	1,209	..	..	..	..	..
Glenbervie ..	1945	4,931	7	7	..	..	..	..
Riverhead ..	1926	11,965	10,593	..	256	..	..	..
Tairua	1930	48,510	13,452	10	85	110	..	..
Kauaeranga ..	1940	4,000	609	61	..	..	..	..
Maramarua ..	1928	14,087	12,311	..	682	20	..	..
Rotoehu ..	1937	35,168	5,156	34	159	..	..	..
Whakarewarewa ..	1898	10,065	7,399	70	1	5	166	210
Waiotapu ..	1901	7,974	6,925	34	..	..	95	12
Kaingaroa ..	1913	344,397	259,423	..	2,267	..	..	8
Tongariro ..	1937	4,500	2,300	..	..	..	..	..
Erua	1930	6,648	4,390	..	120	..	..	..
Karioi	1927	25,869	17,195	..	201	13	..	..
Gwavas ..	1944	8,645	9	2	..	..	..	..
Ngaumu ..	1942	5,243	15	2	..	..	..	..
Golden Downs ..	1927	38,856	23,078	172	12	..	..	..
Rimu	1922	5,839	3,090	..	..	..	..	..
Hanmer ..	1901	10,571	7,684	..	171	..	5	..
Balmoral ..	1916	24,141	21,268	..	102	..	92	..
Eyrewell ..	1928	19,266	17,383	..	304	12	6	..
Ashley	1939	5,099	1,722	..	..	..	..	..
Naseby ..	1900	4,032	3,095	..	21	23	22	..
Herbert ..	*	3,197	..	..	..	..	..	..
Berwick ..	*	5,165	..	..	..	..	..	..
Allanton ..	*	1,676	..	..	..	..	..	..
Dusky	1898	6,866	4,430	..	330	123	58	4
Conical Hill ..	1903	4,534	4,164	..	46	52	89	..
Blue Mountains ..	1925	10,058	8,889	..	174	82	37	..
Pebbly Hills ..	1930	5,330	4,349	..	136	7	..	..
Minor areas ..	1875–1939	12,488	3,366	85	66	10	4	..
		712,212	447,494	553†	5,340	458	574	234

* New projects. † Includes 110 acres interplanted in indigenous forest.

APPENDIX III

Creosoted Forest Produce

	Year ended 31st March, 1945.				Year ended 31st March, 1946.			
	Posts and Strainers.	Poles.	Other Produce.	Total Quantity of Produce.	Posts and Strainers.	Poles.	Other Produce.	Total Quantity of Produce.
	Number.	Number.	Cu. ft.	Cu. ft.	Number.	Number.	Cu. ft.	Cu. ft.
Produce creosoted ..	103,371	5,602	4,556	124,697	54,678	11,971	7,146	124,870
Sales	100,227	4,986	724	126,886	45,635	6,678	5,944	87,498
Creosoted produce used by State Forest Service	7,114	2,168	2,138	18,299	3,523	1,004	1,979	9,307
Creosoted stocks at end of year	36,269	3,860	3,090	65,773	41,435	7,497	7,819	92,304
Untreated stocks at end of year	82,001	13,129	46	162,720	58,687	1,124	2,425	57,176
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Creosote used.. ..	90,080	30,023	5,755	125,858	41,137	63,449	9,634	114,229

APPENDIX IV

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, 1943–45. Value represents value in country of export, plus 10 per cent. expressed in terms of New Zealand currency. The figures for 1944 and 1945 are subject to confirmation when final figures are published by the Customs Department.)

Item.	1943.		1944.		1945.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Bd. ft.	£	Bd. ft.	£	Bd. ft.	£
Hardwoods—						
Sleepers	3,470,000	58,000	3,781,000	63,100	3,253,000	69,500
Australian hardwoods ..	6,304,000	150,000	6,368,000	151,200	6,451,000	176,400
Total	9,774,000	208,000	10,149,000	214,300	9,704,000	245,900
Softwoods—						
Douglas fir	3,539,000	52,200	3,784,000	59,700	3,750,000	51,500
Redwood	1,364,000	41,300	1,205,000	35,200	2,552,000	75,100
Total	4,903,000	93,500	4,989,000	94,900	6,302,000	126,600
Other	37,000	2,700	40,000	3,000	778,000	22,900
Grand total ..	14,714,000	304,200	15,178,000	312,200	16,784,000	395,400
Shingles	..	20	..	59	..	..
	Tons.		Tons.		Tons.	
Tanning-bark	224	1,952	56	768	186	2,856
Wood-pulp	2,707	61,281	11,439	246,672	9,300	231,149

APPENDIX V

Export of Sawn Timbers and other Forest Produce

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1943–45.)

Item.	1943.		1944.		1945.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Bd. ft.	£	Bd. ft.	£	Bd. ft.	£
White pine	137,000	1,670	206,000	2,420	38,000	530
Rimu	2,261,000	25,500	2,416,000	28,290	690,000	10,220
Beech	719,000	11,650	988,000	15,340	927,000	16,230
Matai	78,000	940	28,000	570	75,000	1,070
Kauri	18,000	820	9,000	420	19,000	870
Insignis pine—						
Sawn	428,000	4,940	39,000	570	575,000	8,920
Case timber	731,000	14,740	505,000	10,840	1,249,000*	32,990
Other New Zealand	20,000	680	52,000	1,070	560,000	14,900
Foreign	148,000	11,670				
Total	4,540,000	72,610	4,243,000	59,520	4,133,000	85,730
	Tons.		Tons.		Tons.	
Kauri-gum	590	44,528	1,132	74,426	1,195	94,287

* Includes a small percentage of beech.

APPENDIX VI

Payments and Receipts for the Year ended 31st March, 1946

Item.	1942–43.	1943–44.	1944–45.	1945–46.
Payments				
Allocation of revenue—	£	£	£	£
Consolidated Fund (portion of revenue from national-endowment forests)	16,721	17,455	16,196	14,235
Working Railways Account (section 24 (1), Finance Act, 1936)	898	549	..	..
Local bodies	14,767	12,928	12,799	17,114
General management charges—				
Salaries	79,793	89,332	110,317	137,984
General expenses	34,370	41,254	56,019	102,275
Land purchase	25,307	11,687	38,957	30,098
Forestry projects under direct management—				
Exotic	220,598	248,705	346,743	377,910
Indigenous	22,945	30,521	41,912	58,808
Utilization: Sawmill, creosote, plant, &c.	100,720	104,826	125,931	133,677
Totals	516,119	557,257	748,874	872,101
Receipts				
Indigenous forest receipts—				
Timber sales	134,396	114,533	121,603	135,913
Timber royalties and trespass	9,467	8,588	9,250	13,451
Leases, grazing	1,492	1,402	1,611	2,865
Sawmill sites, industrial, &c.	239	247	308	672
Miscellaneous	8,017	6,895	9,124	8,960
Log sales from managed forests	30,596	73,317	54,716	67,053
Exotic forests: Poles, posts, firewood, &c.	54,234	51,952	45,938	38,643
Utilization projects—				
Sawn timber	40,607	16,180	22,529	63,451
Creosoted products	23,637	15,964	45,918	17,305
Box shooks	79,109	136,600	129,126	182,187
Miscellaneous	4,767	2,663	9,875	9,532
Miscellaneous credits	13,371	16,942	10,802	48,292
Totals	399,932	445,303	460,800	588,324
Receipts from national-endowment indigenous forests (included in above)	48,289	46,654	47,426	47,157

APPENDIX VII

Sawmilling and Sash and Door Manufacturing, 1944–45

Provincial District.	Number of Mills or Establishments.	Character of Organization.						Persons engaged in connection with													
								Felling, Hauling, &c.						Production of Sawn Timber from Logs.							
		Individual.	Partnership.	Registered Company.		Co-operative and Miscellaneous.	Government.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.	Wage-earners.	Contract.	Total.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.		Wage-earners.	Contract.	Total.	
				Public.	Private.			M.	M.	M.	M.	M.	M.	M.	M.	M.	F.	M.	M.	M.	F.
Auckland ..	143	27	24	27	62	1	2	13	41	2	657	86	799	42	92	61	30	1,178	67	1,440	30
Hawke's Bay ..	22	3	3	4	12	..	..	1	2	..	63	12	78	3	7	5	..	108	..	123	..
Taranaki ..	26	5	..	7	13	1	..	1	3	..	205	24	233	2	13	10	6	238	..	263	6
Wellington ..	62	11	2	5	44	..	..	6	15	1	272	7	301	7	28	17	5	340	..	392	5
Marlborough ..	9	3	2	..	4	..	..	3	1	1	7	9	21	3	2	2	2	19	..	26	2
Nelson	58	11	13	3	31	..	..	11	9	1	249	3	273	20	18	3	1	230	2	273	1
Westland ..	31	1	3	1	26	..	..	2	11	3	307	21	344	3	22	12	3	330	3	370	3
Canterbury ..	39	12	7	2	18	..	..	6	1	..	44	12	63	16	8	2	4	125	..	151	4
Otago—																					
Otago portion ..	23	4	2	4	12	1	..	2	6	..	55	2	65	6	7	2	3	91	..	106	3
Southland portion	34	3	4	..	27	..	..	5	10	3	175	..	193	6	15	9	3	234	..	264	3
Totals, 1944–45	447	80	60	53	249	3	2	50	99	11	2,034	176	2,370	108	212	123	57	2,893	72	3,408	57
„ 1943–44	453	81	72	51	244	3	2	66	103	9	1,947	174	2,299	97	235	119	60	2,999	93	3,543	60
„ 1942–43	422	70	61	52	234	3	2	39	92	12	1,889	181	2,213	73	215	111	47	2,936	97	3,432	47

Provincial District.	Persons engaged in connection with															Salaries and Wages paid to Persons engaged in connection with						
	Resawing, Dressing, &c.									Total.												
	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.		Wage-earners.		Contract.	Total.		Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.		Wage-earners.		Contract.	Total.			Felling, Hauling, &c.	Production of Sawn Timber from Logs.		Resawing, Dressing, &c.		Total.	
	M.	M.	M.	F.	M.	F.	M.	M.	F.	M.	M.	M.	F.	M.	F.	M.	M.		F.	M.	M.	F.	M.	F.	M.	F.
																				£	£	£	£	£	£	£
Auckland ..	2	54	37	32	679	26	..	772	58	57	187	100	62	2,514	26	153	3,011		88	298,378	483,213	4,589	265,921	10,170	1,047,512	14,759
Hawke's Bay ..	3	2	3	2	59	..	..	67	2	7	11	8	2	230	..	12	268		2	30,558	47,167	..	19,659	242	97,384	242
Taranaki ..	1	8	4	6	93	..	..	106	6	4	24	14	12	536	..	24	602		12	88,881	94,769	698	36,539	855	220,189	1,553
Wellington ..	1	23	14	14	252	4	..	290	18	14	66	32	19	864	4	7	983		23	114,764	137,393	921	89,731	2,819	341,888	3,740
Marlborough ..	..	3	..	1	20	..	..	23	1	6	6	3	3	46	..	9	70		3	6,529	8,486	250	7,455	100	22,470	350
Nelson ..	1	8	4	3	94	5	1	108	8	32	35	8	4	573	5	6	654		9	97,481	95,940	223	31,461	835	224,882	1,058
Westland ..	..	1	..	1	8	1	..	9	2	5	34	15	4	645	1	24	723		5	125,901	132,966	463	3,243	186	262,110	649
Canterbury ..	3	17	14	10	202	2	..	236	12	25	26	16	14	371	2	12	450		16	21,678	53,273	446	74,205	2,205	149,156	2,651
Otago—																										
Otago portion ..	..	11	10	6	123	2	..	144	8	8	24	12	9	269	2	2	315		11	24,015	37,171	302	42,791	1,151	103,977	1,453
Southland portion	1	4	2	2	52	..	..	59	2	12	29	14	5	461	..	..	516		5	70,377	86,079	354	17,994	200	174,450	554
Totals, 1944–45	12	131	88	77	1,582	40	1	1,814	117	170	442	222	134	6,509	40	249	7,592		174	878,562	1,176,457	8,246	588,999	18,763	2,644,018	27,009
„ 1943–44	15	123	89	81	1,566	25	5	1,798	106	178	461	217	141	6,512	25	272	7,640		166	826,268	1,177,697	8,112	575,988	17,475	2,579,953	25,587
„ 1942–43	14	120	93	72	1,556	27	..	1,783	99	126	427	216	119	6,381	27	278	7,428		146	755,320	1,127,150	6,993	543,667	15,212	2,426,137	22,205

APPENDIX VII—*continued*

SAWMILLING AND SASH AND DOOR MANUFACTURING, 1944–45—*continued*

Provincial District.	Expenses of Operation, other than Salaries and Wages and Cost of Materials.																						Cost of Materials used or operated upon.			
	Production of Logs at Mill.							Production of Sawn Timber from Logs.							Resawing, Dressing, and Manufacturing from Sawn Timber.										
	Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Stumpage.	Logs purchased.	Rough-sawn Timber purchased and other Materials.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Auckland ..	989	36,234	13,133	39,037	84,789	71,345	245,527	3,315	16,278	24,371	34,772	81,776	52,477	212,989	5,438	11,443	14,203	17,993	37,412	32,642	119,131	169,571	244,141	1,006,567	1,420,279
Hawke's Bay ..	5	2,441	1,238	1,426	3,811	770	9,691	66	905	2,805	2,006	5,025	1,594	12,401	168	793	1,129	902	2,031	1,133	6,156	15,812	6,930	68,529	91,271
Taranaki ..	45	6,401	4,202	14,726	18,217	354	43,945	1,150	2,191	4,312	5,226	10,941	3,567	27,387	349	1,379	1,603	1,751	2,020	704	7,806	27,130	27,191	71,918	126,239
Wellington ..	313	8,262	4,827	8,787	25,995	7,436	55,620	926	3,964	7,826	8,530	23,736	11,230	56,212	1,288	4,001	4,971	5,771	7,779	7,495	31,305	55,911	22,265	350,440	428,616
Marlborough ..	..	946	208	778	669	221	2,822	12	1,197	609	721	813	646	3,998	..	522	367	526	403	802	2,620	4,081	3,808	16,873	24,762
Nelson ..	121	7,544	4,407	8,457	21,100	5,255	46,884	931	3,863	4,730	5,754	13,799	5,042	34,119	692	1,265	830	1,264	1,185	1,425	6,661	29,106	2,487	87,593	119,186
Westland ..	809	8,407	5,500	6,042	16,334	7,539	44,631	1,076	5,296	7,068	5,965	15,191	7,643	42,239	117	140	167	138	83	61	706	38,566	3,013	13,698	55,277
Canterbury ..	..	7,311	1,127	1,526	2,575	1,928	14,467	629	4,838	3,007	1,894	5,786	4,763	20,917	1,066	3,635	4,706	3,668	7,438	4,526	25,039	14,125	47,989	217,056	279,170
Otago—																									
Otago portion ..	56	1,840	1,232	1,141	6,205	1,162	11,636	232	607	2,213	1,329	5,530	2,423	12,334	1,960	2,680	2,422	2,805	4,444	4,865	19,176	9,265	5,195	121,126	135,586
Southland portion	211	6,215	3,219	3,490	12,146	2,615	27,896	555	1,498	3,759	4,072	9,331	3,207	22,422	165	1,079	1,314	1,089	1,751	895	6,293	21,271	3,481	67,578	92,330
Totals, 1944–45	2,549	85,601	39,093	85,410	191,841	98,625	503,119	8,892	40,637	60,700	70,269	171,928	92,592	445,018	11,243	26,937	31,712	35,907	64,546	54,548	224,893	384,838	366,500	2,021,378	2,772,716
,, 1943–44	2,946	72,566	39,858	81,703	183,583	91,886	472,542	9,908	39,187	61,444	65,644	153,585	109,692	439,460	12,054	26,294	32,994	33,864	58,611	55,556	219,373	368,006	403,964	2,010,628	2,782,598
,, 1942–43	3,208	48,500	36,409	75,717	158,739	84,704	407,277	9,215	36,372	57,211	61,447	136,129	121,252	421,626	11,082	23,157	30,151	28,616	48,735	58,529	200,270	346,334	347,885	1,952,407	2,646,626

Provincial District.	Total Costs of Operation (including Salaries and Wages).				Products.														Total Value of all Products.
	Felling, Hauling, and Delivering Logs at Mill.	Production of Sawn Timber from Logs.	Resawing, Dressing, and Manufacturing from Sawn Timber.	Total.	Log Sawmill Products.				Resawing and Planing-mill Products.								
					Rough-sawn Timber.		*Other Products.	Total.	Planed Flooring, Skirting, Moulding, &c.		Sashes and Doors.	Joinery.	Butter-boxes.	Cheese-crates.	Fruit-cases.	Other Products.	Total.	
					Quantity.	Value.			Quantity.	Value.								
	£	£	£	£	Ft. B.M.	£	£	£	Ft. B.M.	£	£	£	£	£	£	£	£	£
Auckland	777,028	881,523	1,401,646	3,060,197	133,709,156	1,599,978	122,296	1,722,274	26,175,302	665,172	102,652	179,357	124,535	46,149	42,517	339,956	1,500,338	3,222,612
Hawke's Bay	57,558	65,001	94,586	217,145	12,533,743	137,203	1,698	138,901	1,854,144	41,929	2,050	3,950	..	5,708	33,134	13,695	100,466	239,367
Taranaki	165,623	144,378	117,118	427,119	29,253,736	325,769	5,766	331,535	2,777,511	50,862	16,012	19,294	..	17,101	..	9,966	113,235	444,770
Wellington	226,295	216,791	474,295	917,381	36,597,958	426,819	22,287	449,106	11,779,976	296,547	17,723	36,044	19,964	40,892	831	81,050	493,051	942,157
Marlborough	13,432	16,542	27,048	57,022	2,379,695	27,483	1,632	29,115	62,701	1,992	13,201	..	..	..	4,557	9,599	29,349	58,464
Nelson	175,481	130,759	126,550	432,790	30,339,036	306,633	2,941	309,574	481,296	9,189	134	10,647	4,488	2,338	81,647	28,356	136,799	446,373
Westland	211,445	176,334	17,833	405,612	46,238,241	438,232	1,898	440,130	1,116,196	14,792	..	..	2,364	..	..	131	17,287	457,417
Canterbury	50,270	122,625	318,505	491,400	16,501,131	181,356	4,589	185,945	6,427,988	154,710	4,817	39,713	2,865	9,619	23,385	103,257	338,366	524,311
Otago—																		
Otago portion ..	44,916	55,002	184,244	284,162	10,401,811	106,349	176	106,525	3,905,635	109,105	18,018	18,184	..	8,705	17,266	29,034	200,312	306,837
Southland portion ..	119,544	112,336	92,065	323,945	22,178,592	251,377	220	251,597	1,686,287	31,207	..	..	278	16,994	3,035	48,075	99,589	351,186
Totals, 1944–45 ..	1,841,592	1,921,291	2,853,890	6,616,773	340,133,099	3,801,199	163,503	3,964,702	56,267,036	1,375,505	174,607	307,189	†154,494	†147,506	†206,372	663,119	3,028,792	6,993,494
,, 1943–44 ..	1,709,299	1,987,040	2,823,174	6,519,513	350,747,629	3,810,085	155,857	3,965,942	57,973,145	1,293,909	161,184	271,392	217,138	125,404	171,825	728,908	2,969,760	6,935,702
,, 1942–43 ..	1,545,644	1,867,853	2,710,644	6,124,141	341,514,716	3,607,505	88,419	3,695,924	64,297,010	1,405,145	197,396	239,642	188,804	89,728	166,651	627,055	2,914,421	6,610,345

* Includes peeler logs, pulpwood slabs, laths, posts, waste products, &c. † Butter-boxes made numbered 1,666,079; cheese-crates, 974,490; fruit-cases, 3,948,527.

APPENDIX VII—*continued*

SAWMILLING AND SASH AND DOOR MANUFACTURING, 1944–45—*continued*

Provincial District.	Motive Power used for																				Approximate Value.									
	Hauling and Delivering.								Production of Sawn Timber from Logs.								Resawing, Dressing, and Manufacturing from Sawn Timber.								Sawmill.					Planing and Resawing Mill.				Total Value.
	Kind of Engine.								Kind of Engine.								Kind of Engine.																
	Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Land and Buildings.	Tram-ways and Tram Plant.	Logging and Hauling Equip-ment.	Other Machinery	Total.	Land and Buildings.	Tram-ways.	Other Machinery	Total.	
																									£	£	£	£	£	£	£	£	£	£
Auckland ..	70	..	144	53	2	1	270	10,018	85	..	32	29	192	3	341	10,054	12	..	7	2	596	..	617	6,872	250,838	123,717	225,736	349,573	949,864	237,728	..	218,079	455,807	1,405,671
Hawke's Bay	8	..	14	8	..	..	30	731	9	..	2	..	18	..	29	857	3	..	1	..	52	..	56	557	6,293	3,028	9,672	14,369	33,362	11,427	850	10,944	23,221	56,583
Taranaki ..	20	..	17	9	1	..	47	1,784	28	..	9	..	27	..	64	2,029	2	..	1	..	111	..	114	874	43,152	59,902	22,286	29,968	155,308	16,033	..	16,779	32,862	188,170
Wellington ..	35	..	46	28	..	1	110	3,068	24	..	13	11	43	..	91	2,248	11	..	3	1	205	..	220	2,656	33,526	27,963	56,769	64,742	183,000	55,945	61	59,612	115,618	298,618
Marlborough	1	..	8	2	..	..	11	304	3	..	5	2	..	..	10	286	..	..	..	..	24	..	24	130	3,881	100	3,483	7,817	15,281	5,100	20	4,450	9,570	24,851
Nelson ..	42	..	68	11	2	1	124	3,768	31	..	6	7	55	2	101	3,052	3	..	1	..	57	1	62	545	36,885	34,787	55,449	61,136	188,257	14,759	..	9,893	24,652	212,909
Westland ..	56	..	43	3	5	..	107	2,403	28	1	3	7	22	..	61	2,343	2	..	..	..	4	..	6	76	43,352	58,517	30,664	38,294	170,827	1,160	..	1,133	2,293	173,120
Canterbury	5	..	22	1	..	..	28	588	5	..	7	2	62	..	76	1,535	3	..	..	..	220	..	223	1,931	17,905	961	10,956	14,461	44,283	47,100	..	28,977	76,077	120,360
Otago—																																		
Otago portion	11	..	9	3	1	..	24	472	13	..	..	1	10	..	24	481	3	..	..	..	94	..	97	1,158	9,199	5,438	5,439	9,832	29,908	31,982	..	23,272	55,254	85,162
Southland portion	35	..	21	1	..	..	57	890	31	..	..	..	3	..	34	693	3	..	..	..	41	..	44	555	20,533	18,869	11,719	23,043	74,164	6,770	635	12,958	20,363	94,527
Totals—																																		
1944–45	283	..	392	119	11	3	808	24,026	257	1	77	59	432	5	831	23,578	42	..	13	3	1404	1	1463	15,354	465,564	333,282	432,173	613,235	1,844,254	428,054	1,566	386,097	815,717	2,659,971
1943–44	296	2	308	101	19	3	729	21,091	262	4	86	52	423	3	830	22,390	47	..	13	2	1255	2	1319	14,572	410,698	348,472	377,395	517,076	1,653,641	372,321	968	315,663	688,952	2,342,593
1942–43	287	2	281	100	27	1	698	21,077	253	3	53	52	315	3	679	19,770	44	..	12	52	1137	2	1247	13,950	382,847	379,056	347,542	485,493	1,594,938	364,209	993	288,779	653,981	2,248,919

Provincial District.	Number of Log-sawmills.	Approximate Sawn Output of various Kinds of Timber at Log-sawmills during the Year 1944–45.											Average Mill Output.	Maximum Daily Capacity of Mills (8 Hours).	Area Cut.
		Kauri.	Rimu.	Kahikatea.	Matai.	Totara.	Beech.	Tawa.	Miro.	Insignis Pine.	Other and Unspecified.	Total.			
		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	2,877,669	65,152,982	5,867,366	7,126,943	6,358,009	455,618	4,047,502	457,937	38,673,179	2,691,951	133,709,156	1,193,832	789,454	12,540
Hawke's Bay	16	..	6,302,150	682,712	1,146,196	24,459	17,423	3,177	2,186	3,068,027	1,287,413	12,533,743	783,359	76,500	408
Taranaki	22	..	14,698,090	2,751,027	4,007,800	2,667,658	14,592	78,961	124,141	4,842,008	99,459	29,253,736	1,329,715	131,250	3,119
Wellington	44	..	17,301,488	1,463,683	6,427,709	2,071,678	233,133	5,868	229,577	8,510,981	353,841	36,597,958	831,772	224,700	3,857
Marlborough	9	..	473,630	58,501	45,331	16,820	66,547	..	714	1,624,047	94,105	2,379,695	264,411	16,600	40
Nelson	56	..	19,599,840	1,304,616	269,353	4,316	1,973,883	..	5,140	7,108,915	72,973	30,339,036	541,769	263,628	2,757
Westland	30	..	40,777,493	5,323,813	117,642	18,523	298	..	..	..	472	46,238,241	1,541,275	253,300	3,958
Canterbury	23	..	1,845	..	..	..	..	..	..	16,186,119	313,167	16,501,131	717,440	90,600	71
Otago—															
Otago portion	15	..	6,136,507	..	10,850	4,600	1,150,000	..	..	2,994,260	105,594	10,401,811	693,454	58,370	670
Southland portion ..	30	..	11,487,344	538,355	28,817	86,551	7,162,676	..	29,816	2,735,903	109,130	22,178,592	739,286	133,200	2,078
Totals, 1944–45 ..	357	2,877,669	181,931,369	17,990,073	19,180,641	11,252,614	11,074,170	4,135,508	849,511*	85,713,439	5,128,105†	340,133,099	952,754	2,037,602	29,498
,, 1943–44 ..	361	4,308,495	190,316,027	20,930,928	18,372,976	11,161,056	12,333,193	2,801,404	1,270,943	83,229,174	6,023,433	350,747,629	971,600	1,969,110	28,707
,, 1942–43 ..	330	2,645,516	198,985,914	24,357,456	19,338,392	11,983,752	10,928,375	1,304,173	1,375,177	67,067,054	3,528,907	341,514,716	1,034,893	1,876,682	28,655

* Some miro is included with rimu. † Details for 1944–45 include eucalypts, 1,576,101 ft. b.m.; poplar, 1,213,931 ft. b.m.; taraire, 588,871 ft. b.m.; rata, 341,872 ft. b.m.; pukatea, 262,962 ft. b.m.; tanekaha, 206,241ft. b.m.; macrocarpa, 196,211 ft. b.m.; rewarewa, 128,102 ft. b.m.; cedar, 121,488 ft. b.m.; kamahi, 121,003 ft. b.m.; mangeao, 113,529 ft. b.m.; hinau, 92,979 ft. b.m.; puriri, 46,889 ft. b.m.; yellow pine, 29,562 ft. b.m.; other and unspecified, 88,364 ft. b.m.

APPENDIX VIII

SAWMILLS REGISTERED UNDER THE SAWMILL REGISTRATION REGULATIONS 1942

Conservancy.	Number of Sawmills registered as at 31st March, 1946.	Sawmills cutting mainly Indigenous Timber.	Sawmills cutting mainly Exotic Timber.
Auckland	106	73	33
Rotorua	56	45	11
Wellington	77	50	27
Nelson	64	51	13
Westland	50	50	..
Canterbury	40	3	37
Southland	52	38	14
Totals	445	310	135

APPENDIX IX

FOREST OFFENCES, 1945–46

Offence.	Law under which Proceedings were taken.	Number of Convictions.	Fines.	Costs and Damages.
			£	£ s. d.
Operating an engine which is not provided with efficient means of preventing the escape of dangerous sparks, &c.	Regulation 6, Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	3	7	16 13 8
Failure to report or to fight a fire caused by sawmilling operations or leaving a fire before it is suppressed	Regulation 8, Forest (Fire-prevention) Regulations 1940	2	2	5 1 6
Lighting a fire in State forest unlawfully	Section 44 (1) (*a*), Forests Act, 1921–22	1	..	6 2 0
Lighting a fire in a fire district contrary to the provisions of the Act	Section 44 (1) (*c*), Forests Act, 1921–22	3	12	1 14 0
Entering a State forest without a permit	Regulation 12, Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	14	21	29 5 5
Hunting in a State forest unlawfully	Section 47, Forests Act, 1921–22	8	11	6 18 6
Unlawfully cutting and removing forest produce from a State forest	Section 43, Forests Act, 1921–22	7	226	535 2 6
Failure to comply when a requisition is made for assistance in extinguishing a fire	Section 45 (3), Forests Act, 1921–22	1	2	4 1 0
Totals	..	39	281	604 18 7

APPENDIX X

Locations of Rehabilitation Projects

North Island.		South Island.	
Name of Project.	Locality.	Name of Project.	Locality.
Mangonui ..	North Auckland.	Golden Downs ..	Nelson.
Herekino ..	,,	Moutere Hills ..	,,
Warawara ..	,,	Tawhai ..	West Coast.
Waitangi ..	,,	Hukawai ..	,,
Omahuta ..	,,	Granville ..	,,
Puketi	,,	Rimu	,,
Russell	,,	Lake Ianthe ..	,,
Waipoua ..	,,	Hanmer ..	North Canterbury.
Puhipuhi ..	,,	Balmoral ..	,,
Glenbervie ..	,,	Eyrewell ..	,,
Great Barrier ..	Auckland.	Ashley ..	,,
Riverhead ..	,,	Herbert ..	North Otago.
Maramarua ..	North Waikato.	Naseby ..	Central Otago.
Whangapoua ..	Coromandel Peninsula.	Allanton ..	Otago.
Tairua	,,	Berwick ..	,,
Kauaeranga ..	Thames.	Akatore ..	,,
Katikati.. ..	Bay of Plenty.	Milton Nursery ..	,,
Rotoehu.. ..	,,	Conical Hill ..	Tapanui-Otago.
Pureora	Main Trunk-Taumarunui.	Dusky ..	,,
Whakarewarewa ..	Rotorua.	Crookston ..	,,
Waiotapu ..	,,	Blue Mountains	,,
Kaingaroa ..	Rotorua-Taupo.	Tapanui ..	,,
Whirinaki ..	Te Whaiti-Urewera.	Pebbly Hills ..	Hedgehope, Southland.
Tongariro ..	Main Trunk-National Park.	Longwood ..	Southland.
Rangataua ..	Main Trunk-Ohakune.		
Karioi	,,		
(Unnamed) ..	Gisborne.		
Gwavas	Hawke's Bay.		
Ngaumu ..	Wairarapa.		

APPENDIX XI

Training and Recruitment 1945–46

Course.			Number attended.	Examination Results.			Number of New Appointments made.	
Name.	Serial No.	Period.		Number passed.	Number failed.	Number on Staff who passed.	Ex-servicemen.	Others.
Timber-measurers	1	2 months	10*	5	4	1	3	1
Timber-measurers	2	2 months	10	8	2	..	5	3
Senior officers† ..	3	3 weeks	17	..	..	..	..	..
Log-scalers ..	4	2 weeks	12	4	8	4	..	..
Timber-measurers	5	2 months	11	5	6	..	3	2
Timber-measurers	6	2 months	12	9	3	2	7	..
Clerical officers† ..	7	3 weeks	15	..	..	..	..	..
Leading hands ..	1	6 weeks	19	14	5	..	13	1
Leading hands ..	2	6 weeks	20	15	5	..	15	..
Totals (for nine courses) ..			126	60	33	7	46	7

* One man did not sit examination. † Refresher courses.

APPENDIX XII

Forestry Education and Training in New Zealand

1. *History.*—In all large-scale undertakings the maintenance of and improvement in efficiency are wholly dependent upon the basic education and operational training of personnel. Forestry is no exception, and the State Forest Service, by far the largest employer of forest specialists in the Dominion, is deeply concerned in forestry education. For over a decade, since the University of New Zealand Schools of Forestry were discontinued, there has been practically no recruitment of graduate foresters or, indeed, of even partially trained foresters, thus creating a wide gap in the age classes of those engaged in this calling. Following the general recovery from the economic chaos of the early and middle "thirties," the Forest Service in 1939 initiated corrective domestic action, and, in accordance with its national obligations, finally evolved a scheme under which a regular quota of qualified foresters could be made available annually to forestry employers, both State and private.

2. *Annual Demand for Qualified Foresters.*—Without taking into account the present acute shortage of highly qualified forest officers, it must be recognized that the maximum annual demand in New Zealand for graduate foresters will not, on a long-term basis, exceed ten, and probably will be only eight. The Forest Service itself plans to absorb six annually, and anticipates that not more than four, perhaps only two will be required by local bodies and private forestry enterprise. The Forest Service will, in addition require annually an average of at least six trained forest officers without graduate qualifications, and other employers may take one or two.

3. *Standard of Forest Education.*—For many years the Forest Service has given careful attention to the question of how best to deal with new recruits. In 1939, as a result of experience with graduates and others who have been trained both overseas and in the Dominion, it was decided that a higher standard of forest education must be set for both professional and other forest officers. As forestry in New Zealand becomes more intensive and forest managment units increase in number (and decrease in size), with emphasis shifting from timber sales to silviculture and sustained yield, the greater becomes the need not only for higher qualifications in professional officers, but also for more technical forestry knowledge among the forest-ranger class of officer.

4. *Post-graduate Preferable to Undergraduate Forest Education.*—For forest officers of professional rank it was decided that post-graduate training was preferable to the inclusion of forestry subjects in an undergraduate course, and that a degree in basic science subjects to B.Sc. standard should be a necessary prerequisite to such training. The only subjects made compulsory for the forestry student are botany (to Stage II, Section B), mathematics (Stage I), and zoology (Stage I). In addition to his degree subjects, the student is encouraged to study English, economics, and statistical method. The contention that a deeper knowledge is required of basic science subjects than it is possible to acquire during a four-year undergraduate course is in accord with world-wide tendencies in forestry education. Such a course of preparation not only ensures a better grounding in the subjects upon which forestry is built, but also provides a better opportunity for selecting the most suitable candidates for the profession. It has the further advantages that it enables the successful student to study his technical subjects to a higher standard; that some students to whom forestry as a calling may prove unsuitable will find their B.Sc. degree more useful in other professions that a B.For. degree; and that in various other ways it reduces the number of potentially unsuitable entrants. It was also decided that forest rangers should serve an apprenticeship as trainees in order to qualify for their basic education, the standard of which is, of course, not so high.

5. *Education to enable Closer Liaison between Officer Divisions**—Forestry education is needed in New Zealand not only for professional forest officers and for forest rangers, but also for all other officers, including officers engaged in ancillary professions and clerical duties, for it is a fundamental necessity in technical organizations to ensure that all officers have an understanding of the workings of the Department and also of the relationship among the various officer Divisions. Following the appointment of a number of University-trained foresters to the Professional Division in 1939, it became necessary over the war period to transfer some of these men periodically to general duties. As officers of the Professional Division are subject to a series of salary increments less interrupted by barriers than are those of officers of other Divisions, there has been a tendency for misunderstandings and even jealousies to arise as a result of University-trained men being introduced into the organization and, without a suitable background or adequate practical experience, given seniority over or charge of men of good practical experience who, through adverse economic circumstances, have been unable to acquire systematized technical knowledge on as full a scale as their more fortunate colleagues. This undesirable tendency is a very real threat to the esprit de corps of any organization, and is seldom appreciated by those unversed in public administration and without experience in the workings of a technical Department of State.

6. *Democratic Opportunity for Promotion.*—It is a fundamental precept of staff organization that maximum efficiency can be attained only by making administrative positions open to officers of the Clerical as well as of the General and Professional Divisions. For such a system to operate successfully in the Forest Service it is essential that all members of the staff have a basic forestry education. Forest foremen and leading hands need it to fit them for appointment to officer grades of the General Division. Likewise officers of ancillary professions and of the Clerical Division require it for advancement to administrative positions. General and Professional Division officers need, in addition, short courses in departmental administration to furnish them with a working knowledge of staff and accounting, stores, and other aspects of office practice.

7. *Association of all Staff Members during Training.*—It is considered desirable that all members of the staff should be closely associated during the whole period of their forestry education and training. It has therefore been arranged that recruits for the professional ranks shall take their prerequisite B.Sc. degree on a part-time basis, thus allowing contacts with office staff during the University year, as well as field contacts during vacations. This plan has operated with success not only in improving the esprit de corps of the staff, but also in eliminating at an early stage quite a few of those who are unsuited temperamentally or otherwise for forestry work. A further development recently inaugurated requires that all recruits for professional ranking not possessing an appropriate rural or forest background should spend one year in the field before taking up their University studies. Carrying the policy of staff association to its logical conclusion the education of all ranks must be centralized, as far as practicable, within one institution, where the concurrent operation of post-graduate courses for Professional Division officers, of diploma courses for forest rangers, of vocational instruction for other staff categories, and of administrative courses for promising senior officers will both maintain contacts and improve the loyalty of the whole organization. In addition, the contacts made and the mutual understandings established between departmental officers and others attending the courses and living together will be maintained and be of general benefit not only to the Forest Service in the years to come, but to the profession as a whole.

8. *Inadequacy of University Staff.*—Reference has already been made to the higher standard of training required in the Service to meet future developments in forestry. To achieve the optimum results, adequate teaching staff is essential. In an undergraduate School of Forestry the number of qualified instructors is, by reason of finance, in direct proportion to the number of students. When the two Schools of Forestry were operating

* As referred to here, these are Divisions of officers as set up by the Public Service Commissioner for all Departments of the New Zealand Public Service (exclusive of the New Zealand Railways and the Post and Telegraph Departments).

in New Zealand, the number of full-time forestry lecturers in each of them rarely exceeded one. Taking into consideration the wide range of specialized subjects taught (and with due regard to the tutorial assistance provided by non-forestry faculties), there is little doubt that even two full-time forestry lecturers, however highly qualified, could scarcely be regarded as adequate to fulfil all requirements, even to old standards.

9. *Adequacy of Forestry Instructional Staff.*—In accordance both with prevailing opinion abroad and with its own experience, the Forest Service was forced to the conclusion that at least six highly trained and experienced forest officers were required to adequately staff a forest training establishment at the higher standard and with the increased scope of forest education already outlined. Grateful recognition is accorded the University of New Zealand for the valuable services it has already rendered to forestry education, but it was hardly reasonable to expect any educational authority to make such a marked increase in the number of qualified forestry lecturers as was desired, let alone provide that wide range of courses (in addition to graduate training) considered by the Forest Service to be an essential and integral part of a forestry training establishment.

10. *Integration of Educational and Investigational Activities.*—The problem was to evolve an alternative to the traditional undergraduate School of Forestry, with emphasis upon—

(*a*) A higher standard of professional forestry training than previously provided in New Zealand; and

(*b*) Adequate facilities and sufficient staff to provide a wide range of vocational forestry courses, simultaneously with post-graduate work.

The principal difficulty was that of assigning sufficient highly qualified and experienced specialists to this work, but a solution based on Swedish forestry experience and on Massey Agricultural College procedure was finally achieved in a decision to integrate the forest investigative activities of the Service with its educational and training work.

11. *Search for Suitable Environment.*—The original judgment expressed by Sir David Hutchins in 1920, was that the order of merit for a University School of Forestry was Auckland, Wellington, Dunedin, and Christchurch, but after a wide investigation into the possibilities of establishing combined educational and investigative activities in the vicinity of one of the four principal centres and their University colleges, it was decided that none possessed the forest environment so essential to both activities. Auckland, it is true, has some kauri stands in reserves in the neighbourhood of the Waitakere Ranges, but the closest exotic forests, at Riverhead and Maramarua, although of fair size, include only a narrow range of species, mostly on poor sites. Wellington has virtually no exotic stands of significance and no suitable sites for future establishment, but in contrast has substantial areas of rimu and beech forests in adjacent reserves, and also has the advantage of being the Forest Service headquarters. Dunedin has only small areas of indigenous forest, but fairly large exotic stands established by local authorities. Christchurch is virtually without any indigenous forest, and while it has within easy reach a wide selection of exotic species on a fairly extensive scale, most of the sites, being river gravel in a low-rainfall zone, are not natural forest sites, as the two disastrous windthrows of 1945, involving the ruination of a significant proportion of the Province's stands, fully demonstrated. The search for a suitable location was therefore extended over the whole Dominion, and it became ever increasingly clear with the progress of the investigation that Rotorua was overwhelmingly the most favourable, if not unique judged even by world standards.

12. *Rotorua, an Ideal Location.*—As in the case of the siting of the Massey Agricultural College near Palmerston North, considerable importance was attached to environmental influence, and in this respect Rotorua is eminently suitable as the location of a national forest training establishment. Not only does it possess an ideal site in what is predominantly a forest setting surrounded by a very wide variety of exotics of all ages and classes (forming the nucleus of an arboretum of great instructional value), but it is in close proximity to extensive indigenous forests as well as the most extensive exotic forests in the Dominion, and provides unrivalled facilities for practical instruction in all

branches of forestry, including the most modern utilization developments in the Southern Hemisphere. Set in the fifty-year-old Whakarewarewa State Forest, of 8,000 acres—one of the earliest of the experimental exotic forests in New Zealand—the location is believed to be unrivalled anywhere in the Empire and it should inspire an extraordinarily high standard of educational training and investigative work.

13. *Rotorua Forest Training Centre and Forest Experiment Station.*—By virtue of its environmental advantages, Rotorua is even more suitable for an investigative headquarters, and it was therefore decided to link with the Rotorua Training Centre a Forest Experiment Station, staffed by highly qualified specialist officers who would not only carry out forest investigational work, but also act in the capacity of part-time lecturers at the Training Centre. Only in this way is it possible to provide that minimum number of of qualified instructors referred to previously as being an essential requirement of an adequately staffed School of Forestry. It is pertinent to remark here that the associating of educational and investigative work and the dual functioning of specialist officers has been successfully developed in Sweden not so much for the economizing of staff, as for keeping the instructional staff thoroughly conversant with the latest forest technique and practices.

14. *Operation of Scheme, 1939–45.*—With the advent of the war it became necessary to defer the full establishment of the Rotorua Forest Training Centre and Forest Experiment Station, but both recruitment of young trainees and the original scheme of field training and of prerequisite degree work were commenced with a view to having sufficient entrants available for the first post-graduate course planned for 1948. The Training Centre was actually set under way as a tuitional school in 1944 for the purpose of providing vocational training for junior members of the Forest Service staff and for returned servicemen, and the success already achieved in the various courses for administrative field officers, timber-measurers, log-scalers, clerical staff, and leading hands has fully justified the confidence reposed in the scheme. Not only was the quality of instruction good, but the spirit of loyalty and of discipline inculcated into those who attended the courses has already shown healthy results throughout the Service.

15. *Tapanui Forest Vocational School.*—Following the termination of hostilities in 1945, an elaboration of the original scheme was necessary owing to the commencement of extensive rehabilitation projects much earlier than had been anticipated, and a purely vocational centre of instruction for supervising staff such as leading hands and forest foremen was established at Tapanui, Otago, to supplement the Rotorua work and to deal with South Island personnel. The two centres are planned to deal with a total of 200 men before 31st March, 1948, a number that is essential for the minimum staffing of rehabilitation and normal departmental operations with minor supervising personnel.

16. *Courses of Instruction at Rotorua Forest Training Centre.*—With the unexpected termination of hostilities one year earlier than anticipated, it is desirable that the Rotorua Training Centre should be brought into full operation in 1947 instead of 1948. It is planned to provide the following courses of instruction :—

(*a*) Two-year post-graduate courses for officers aiming at professional rank who have completed a B.Sc. degree in approved subjects and have had sufficient preliminary field experience in forest work.

(*b*) One-year diploma courses for non-professional students desiring to qualify for forest ranger status or equivalent, such students, as in (*a*), being required to have gained sufficient preliminary field experience in forest work.

(*c*) Short courses of instruction on the various ancillary and specialized branches of forestry, mainly of an elementary nature, for the purpose of raising the general standard of forest education among junior staff, thereby improving efficiency and providing opportunities for more rapid advancement.

(*d*) Refresher courses of a more advanced nature, as in (*c*), for more senior forest officers.

(*e*) Administrative courses for departmental officers of the Clerical, General, and Professional Divisions aiming for promotion to administrative positions.

17. *Staff Requirements and Qualifications.*—The staff of the Training Centre will consist of at least six lecturers (including the Principal), and will provide instruction in all essential subjects, tentatively grouped as follows :—

(1) Administration, Policy, Law, and Economics.
(2) Forest Botany, Silviculture.
(3) Utilization, Forest Products.
(4) Surveying, Engineering.
(5) Forest Management, Mensuration.
(6) Forest Protection.

The Principal and at least one lecturer will be full-time staff attached to the Training Centre. The remaining lecturers will be on the staff of the Forest Experiment Station. All lecturers, including the Principal, will have degree qualifications in forestry or cognate subjects and appropriate experience of high order, with the possible exception of the lecturer in surveying, who may be a registered surveyor with forestry experience.

18. *Buildings and Equipment for Training Centre and Experiment Station.*—An educational and investigational enterprise of such magnitude and value is worthy of dignified and appropriately equipped buildings. The main separate units will consist of—

(*a*) The school, with adequate provision for lecture-rooms, laboratories, museum-assembly hall, and administration offices.
(*b*) The hostel, to accommodate 30 to 40 students, with a cubicle for each student and a joint study for every two students.
(*c*) The experiment station, with accommodation for investigational officers, laboratories, and forest-product-testing equipment.
(*d*) Residences for married members of the staff.

19. *Training for a Career in Forestry.*—It is reasonable to assume that the State Forest Service will continue to be the employer of the great majority of students seeking a career in forestry. Thus, as a result of its recruitment and training policy inaugurated immediately prior to the war, the Forest Service is committed to the completion of the training of 103 young men (many until recently in the Armed Forces) appointed to the staff on probation as technical trainees, 3 of whom have completed their B.Sc. and 14 others of whom are at present studying for their degree in anticipation of post-graduate training. Further recruitment will be at the rate of 20 trainees a year, as this is the minimum that will give the final net annual accession of 12 after allowing for non-effectives due to transfers, losses, failures, and other causes. As previously indicated, students outside the Forest Service will be granted equal facilities at the Training Centre, but their courses will have to be paid for at prescribed rates.

20. *Independent Board of Management.*—The cardinal function of the Training Centre is to teach forestry subjects, but instruction in departmental practices will also be given as a subordinate though nevertheless essential function. For this reason, in the case of both the post-graduate and the diploma courses (see clauses (*a*) and (*b*) of paragraph 16), only forestry tuition is planned, and in order to effect this objective it is proposed that their administration shall be entirely removed from departmental control by setting up a board of management to be under the control of and solely responsible to the Senate of the University of New Zealand. It has been tentatively suggested that the Board might consist of—

(*a*) Representative nominated by the New Zealand University Senate (Chairman *ex officio*) ;
(*b*) Representative nominated by the Auckland University Council as the nearest constituent University college ;
(*c*) The Principal of the Training Centre ;
(*d*) Representative of the New Zealand Institute of Foresters (not to be a member of the Forest Service) ; and
(*e*) Representative of the Director of Forestry.

21. *Function of Board of Management.*—The principal duties of the Board of Management will be :—

(*a*) To select candidates ;

(*b*) To supervise the curriculum ;

(*c*) To conduct examinations and make recommendations to the University of New Zealand for the establishment and awarding of such degrees, diplomas, and scholarships as are justified by the standard of tuition provided ; and

(*d*) To approve appointments to the teaching staff.

22. *Function of the State Forest Service.*—Only in the case of those courses involving departmental practice (see clauses (*c*), (*d*), and (*e*) of paragraph 16) will the Forest Service control tuition, curriculum, and examinations. It is proposed that the Service shall finance the entire project, except that students other than departmental staff will be required to pay prescribed fees.

23. *Scheme so Unique may attract Overseas Students.*—The scheme as outlined is believed to be the only practicable means of achieving that high standard in both forest education and departmental training which is regarded as essential to the effective prosecution of the national forestry effort. So unique are the advantages of the scheme that it is anticipated with confidence that students will ultimately be attracted from other countries to study forestry in the Dominion.

24. *Parallel for Scheme in Massey Agricultural College.*—It is believed that the great success attending the Massey Agricultural College is a happy augury for the Rotorua scheme, which parallels the combined teaching and investigative activities of New Zealand's outstanding agricultural institution at Palmerston North.

GLOSSARY

1. Indigenous

(*a*) *Softwoods :—*
Kahikatea or white pine (*Podocarpus dacrydioides*).
Kauri (*Agathis australis*).
Matai (*Podocarpus spicatus*).
Miro (*Podocarpus ferrugineus*).
Rimu (*Dacrydium cupressinum*).
Silver pine (*Dacrydium colensoi*).
Tanekaha (*Phyllocladus trichomanoides*).
Totara (*Podocarpus totara*).

(*b*) *Hardwoods :—*
Beech (*Nothofagus* spp.).
Black beech (*Nothofagus solanderi*).
Hard beech (*Nothofagus truncata*).
Kohekohe (*Dysoxylum spectabile*).
Mangeao (*Litsea calicaris*).
Manuka (*Leptospermum* spp.).
Mountain beech (*Nothofagus cliffortioides*).
Pukatea (*Laurelia novae-zealandiae*).
Red beech (*Nothofagus fusca*).
Rewarewa (*Knightia excelsa*).
Silver beech (*Nothofagus menziesii*).
Taraire (*Beilschmiedia taraire*).
Tawa (*Beilschmiedia tawa*).

(*c*) *Other :*
Honey fungus (*Armillaria mellea*).

2. Exotic

(*a*) *Softwoods :—*
Californian redwood (*Sequoia sempervirens*).
Corsican pine (*Pinus laricio*).
Cypresses (*Cupressus* spp.).
Douglas fir (*Pseudotsuga taxifolia*).
Hemlock (*Tsuga heterophylla*).
Insignis pine (*Pinus radiata*).
Larch (*Larix decidua*).
Loblolly pine (*Pinus taeda*).
Macrocarpa or Monterey cypress (*Cupressus macrocarpa*).
Ponderosa pine (*Pinus ponderosa*).
Spreading-leaved pine (*Pinus patula*).
Spruce (*Picea excelsa*).
Western red cedar (*Thuya plicata*).

(*b*) *Hardwoods :—*
Australian hardwoods, principally *Eucalyptus* spp.
Australian leatherwood (*Eucryphia billardieri*).
Black locust (*Robinia pseudacacia*).
Canadian ash (*Fraxinus americana*).
Elm (*Ulmus* spp.).
Willow (*Salix* spp.).

(*c*) *Others :—*
Bamboo (*Bambusa* spp.).

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