1949

NEW ZEALAND

STATE FOREST SERVICE

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31st MARCH, 1949

Presented to Both Houses of the General Assembly Pursuant to Section 64 of the Forests Act, 1921–22

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

SIR,— Wellington, 12th August, 1949.

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, 1949.

I have, &c.,

ALEX. R. ENTRICAN,
Director of Forestry.

The Hon. the Commissioner of State Forests.

CONTENTS

REPORT

CHAPTER I—SUMMARY AND REVIEW

The salient features of the year's operations are summarized and reviewed hereunder :—

(1) *Forest Resources.*—Additional areas to the extent of 71,235 acres were placed under reservation as State forest, and 1,792 acres were withdrawn from reservation. The total area under reservation at the 31st March, 1949, was 9,355,000 acres.

(2) *Afforestation.*—The new area planted, 4,563 acres, was the largest since the year 1939–40. In addition, 1,334 acres were blanked and 832 acres replanted.

(3) *Forest Mensuration.*—Timber appraised during the year was the largest quantity in any one year since the inception of the Forest Service ; the quantity was 187,000,000 board feet.

(4) *Working Plans.*—Preparation of working plans was accelerated by the adoption of an abbreviated type. At the close of the year 20 plans were in course of preparation.

(5) *Timber Sales.*—Total sales of standing timber amounted to 151,000,000 board feet, valued at £264,000. In addition, saw logs and peeler logs to the extent of 6,789,000 cubic feet, valued at £288,900 and equivalent to another 45,000,000 board feet, were sold to the departmental sawmills and to private sawmillers.

(6) *National Forest Survey.*—The forest survey covered 470,000 acres during the year, bringing the total area covered as at the 31st March to 1,695,000 acres. A broad provisional estimate of the total merchantable resources of podocarp timber on lands of all tenures is 5,000,000,000 board feet of standing timber.

(7) *Departmental Logging.*—Logging operations were expanded considerably during the year, and a total of 7,603,000 cubic feet of logs of all kinds was extracted, exotic species accounting for 64 per cent.

(8) *Departmental Sawmilling.*—A total output of sawn timber was almost 23,000,000 board feet, of which 13,139,000 board feet was sold, and the balance used for boxmaking and departmental building purposes. Exports amounted to 3,329,000 board feet.

(9) *Timber-production.*—Production of sawn timber for the whole of New Zealand reached an all-time record of 480,000,000 board feet, of which 168,000,000 board feet were exotic species.

(10) *Sawmills.*—Sawmills registered at 31st March, 1949, numbered 692.

(11) *Overseas Trade.*—Exports of sawn timber at 23,000,000 board feet were the highest since 1936, and total timber imports at 45,000,000 board feet the highest since 1930.

(12) *Forest Fires.*—There were 32 fires in State forests during the year, but this number was the lowest for a number of years, and the damage was negligible. Three sawmills were destroyed by fire, and one was damaged.

(13) *Employment.*—The total number of employees on State forests at the 31st March, 1949, was 1,936. Unfortunately, forest employment is characterized by a high rate of turn-over, for though 2,876 commenced work during the year, 2,670 terminated their employment, giving a net increase for the year of only 206.

CHAPTER II—FOREST POLICY

National Pulp and Paper Project

(1) The decision in principle taken by the Government to proceed with the establishment of an integrated sawmill and pulp and paper mill at Murupara, on the Rangitaiki River, in the Rotorua Forest Conservancy, is a fitting climax to a quarter of a century of imaginative planning, sustained research, and faith and perseverance by the Forest Service in the development of the first sawmill and pulp and paper plant of economic size—as judged by world standards—to be established in the Dominion. It will be to New Zealand what Broken Hill is to Australia. As it is likely to be the most important implementation of policy planning for the next fifty years, it is appropriate to review the various developments leading up to the Government's decision.

(2) In 1925 a prominent technician in the world wood-pulp and paper industry in the person of Mr. William Adamson visited New Zealand, inspected the Forest Service stands of insignis pine and other softwoods established in the early years of the century, and studied the woods yielded by these various species. As Technical Director of Walmsleys Ltd., of Bury, England, the largest paper-machinery manufacturers in the Empire, Mr. Adamson had been associated with the designing and building of some of the most famous pulp and paper plants in the world, including the enormous Cornerbrook operation of Bowaters Ltd. in Newfoundland. He had also been responsible for the supply of paper machines to many other important mills not only in Great Britain and North America, but in Finland, Russia, Japan, and many other countries, including Australia and New Zealand.

(3) After a careful and searching examination of the transport problems in the Rotorua Forest Conservancy, including the Bay of Plenty district, and of the forest, water, power, and fuel potentialities of the region and surrounding districts, he recommended—

(*a*) That the pulp and paper making properties of the exotic softwoods be determined, more especially for newsprint because of the relatively large quantities consumed and imported, but also for kraft and other products;

(*b*) That in the event of promising results being secured, the Forest Service plans for exotic-forest establishment should be appropriately expanded on the premise that there will be an ever-increasing demand for newsprint and other papers;

(*c*) That owing to the extremely high capital investment involved in pulp and paper enterprises a greater variety of species should be planted, and the enormous proportion of insignis pine then being planted materially reduced so that in the event of its decimation by insect or fungal epidemic, supplies of substitute species would be readily available to protect the future of any pulp and paper plants which might be established; and

(*d*) That no pulp and paper plant should be established until a unit of economic size *as judged by world standards* could be justified both by continuity of wood-supplies and adequacy of demand. He stressed that the installation of smaller plants on any grounds whatsoever—whether of temporary national self-sufficiency or allegedly as a means of cautiously developing the industry—could only make it quite impossible to ever develop such plants on any economic basis. He considered that the basic technical principles of all pulping processes were so well established that the problem of building profitable operations was dependent solely on economic and not technical factors.

(4) Mr. Adamson's recommendations were adopted and successively implemented. By 1928 it had been proved, through extensive tests both on an experimental scale at the famous Madison Forest Products Laboratory and on a commercial scale at the mills of the Consolidated Pulp and Paper Co. at Wisconsin Rapids, Wisconsin, that insignis pine and other exotic softwoods could be used for newsprint, kraft, and other papers. Kaingaroa State Forest was extended to provide an ample supply of pulp-wood as well as of saw logs, &c., and ever-increasing proportions of species other than insignis pine were used for this purpose. The Forest Service policy was in strong contrast to that of the forest-bond-promoting companies, which concentrated largely on the planting of insignis pine, many of them avowedly for pulp and paper production alone. For a quarter of a century the Forest Service has followed the Scandinavian policy that an economic pulp and paper industry is only practicable as a supplementary activity to the utilization of saw logs, which probably for all time will remain the most important and basic product of the forest. That principle is sounder to-day than it was twenty-five years ago. It will become more so in the future.

(5) Mr. Adamson acted as the Forest Service consultant until his death in 1945, when he was succeeded by his colleague Mr. J. Temperley, also as Technical Director of Walmsleys Ltd. For almost fourteen years until 1939, Mr. Adamson had consistently recommended against any attempt to establish the pulp and paper industry in New Zealand, on the grounds that it was premature and uneconomic. Actually as early as 1928 some consideration was given to the possible establishment of the newsprint industry in New Zealand based on the production of a mixed softwood-hardwood sheet similar to that now being manufactured at the Australian Newsprint Mills, Ltd., at Boyer, Tasmania. Insignis pine was to have been used as the long-fibred chemical pulp to give the necessary tear and tensile strength, but the body of the sheet was to have been manufactured from tawa wood similar to the Australian eucalypt wood now being used at Boyer. Immediately newsprint prices broke in 1928, however, Mr. Adamson strongly recommended that the idea be abandoned. It was not until 1939 that he felt that the conditions which he had laid down in 1925 justified an early commencement with a newsprint project. As a result of his visit to New Zealand in that year, he was satisfied that there was a sustained yield of sufficient wood and a large enough consumption of newsprint to warrant the establishment of an economically sized mill.

(6) Concurrently, the Forest Service, pursuing its conception of saw log importance in the national forest economy, had been studying sawing practices both in New Zealand and abroad. It had been forced to the conclusion that none of the local sawing practices, established as they had been on the conversion of large-diameter logs, was either economical or suitable for the conversion of small-diameter exotic softwood logs, and that only by the adaptation of Swedish log gang saws was there any hope of solution to this problem. As no industrial interests in the Dominion either agreed with these conclusions or were willing to put them to test, the Forest Service was forced into sawmilling on an unprecedented scale, "unprecedented" in terms of size because the full benefit attached to the use of Swedish-type log gang sawing equipment could not be realized except on a mass-production scale. The ten years interim experience with this equipment not only has completely vindicated the Department's conclusions and fulfilled its fondest hopes, but has contributed a major improvement to the original plans developed by Mr. Adamson for the Dominion's first newsprint project. Meantime, the Waipa Sawmill is the unchallenged leader of the sawmill industry in the Southern Hemisphere, with its products freely acknowledged to be the Rolls Royce of the exotic softwood trade, whether in New Zealand or on the Australian export market.

(7) Though the intervention of the Second World War effectively prevented the immediate establishment of the projected newsprint mill, the delay proved to be a blessing in disguise. Nevertheless, the project was kept under constant review even during the war period, and the departmental consultant revisited New Zealand on several

occasions and reviewed his proposals from time to time. After Mr. Adamson's untimely death in 1945, Mr. Temperley visited New Zealand in the following year, and re-examined the original proposals in view of the Department's interim experience in the operation of the Waipa Sawmill. This resulted in a complete recasting of the Forest Service proposals whereby, instead of having widely separated pulp and paper mills and several medium-sized sawmills each of them with separate woodyards, steam and power plants, &c., all were centralized on the edge of the Kaingaroa State Forest. The economics which this huge plant made possible both in operating and in capital costs—through integration of raw-material supplies and by sharing of common woodyard, steam and power, and other engineering facilities—were such that the Dominion was assured of a manufacturing unit which could eventually compete on the Australian and similar markets at world parity. Both in diversity of species and in high efficiency of fire protection, the Kaingaroa State Forest was the only one in the Dominion which had sufficient security of raw-material supply to justify such a huge project.

(8) The magnitude of the project had, indeed, now attained such proportions that Messrs. Walmsleys Ltd. felt that, although its Technical Directors had endeavoured to act quite objectively as the Department's consultants, the firm was essentially a manufacturer of pulp and paper machinery and must therefore be suspect of a vested interest in the projected plant. For this reason, it recommended that the Department should secure an independent opinion and estimates on the Kaingaroa proposals. This suggestion was followed by the Government, which engaged the Rust Engineering Co., of Pittsburgh, Pennsylvania, to act as consulting engineers and economic planners in reporting upon the pulp and paper section of the plant, and Mr. W. H. Rambo, Industrial Engineer, of Portland, Oregon, to act in a similar capacity in reporting upon the sawmill section of the plant. The Rust Engineering Co. had not only planned, but also designed and constructed, numerous pine pulp and paper mills in the southern States of the United States of America using timbers very similar to the exotic softwoods to be used in the New Zealand plant. Mr. W. H. Rambo, likewise, has supervised the design and construction of important sawmills on the west coast of North America.

(9) The initial reports received from both the Rust Engineering Co. and Mr. W. H. Rambo indicated that the Forest Service proposals were soundly based in conception and in fact, so far as raw materials and operating-conditions were concerned. The Government and Treasury, however, felt that the physical magnitude of the project and the amount of money involved, both in the integrated sawmill and pulp and paper plant and in the allied public works, including harbour facilities, railways, hydro-electric extensions, and housing accommodation, made it imperative that the Ministerial head of the Department—the Hon. the Commissioner of State Forests—should make searching inquiries in North America before the Government finally confirmed the decision which it had made in principle to proceed with the project as based upon the Rust and Rambo reports.

(10) It was at this time that the Food and Agriculture Organization of the United Nations announced its intention of holding a World Wood Pulp Conference at Montreal between 26th April and 4th May. An invitation for New Zealand to be represented at this Conference was eventually received. As the principal purpose of the Conference was to ascertain the adequacy or otherwise of world wood-pulp capacity to meet current and immediate future demands, which was one of the most important questions upon which the decision of the Government to proceed with the scheme had hinged, it was decided that New Zealand should send a suitable delegation, led by the Hon. the Commissioner of State Forests, to the Conference. It is anticipated that a separate report will be published on the work of the delegation to the World Wood Pulp Conference at Montreal, but meantime it is possible to report that the Conference concluded that further expansion of the world wood-pulp-producing capacity is justified.

(11) It is pertinent to remark at this juncture that only by adoption of the completely integrated sawmill and pulp and paper plant as a whole can exploitation of the enormous Kaingaroa State Forest, representing an expenditure of several million pounds, be justified. Anything less, either by way of a smaller integrated unit or of a sawmill alone, cannot be regarded as having any hope of economic success. This is an unequivocal statement stemming from basic economic facts. It must be realized that as a saw log development alone, the Kaingaroa State Forest could not very well be poorer, largely due to the trees having been planted too widely apart, and left without any silviculture treatment in the interim. The only way in which any significantly large saw-log production can be organized from Kaingaroa State Forest is by having an integrated pulp and paper plant which will absorb both the small-diameter and the rough knotty logs which cannot be converted into sawn timber at a profit. Neither would it be economic to extract only the larger straight logs, owing to the much higher cost of logging involved. Admittedly, the project has called for a courageous decision, but, on the other hand, it is doubtful if any project in the world has been submitted to a more intensive and searching examination, both technically and economically, as a basis for authorization.

Demand for Forest Products

(1) The Dominion is witnessing the early stages of what it is hoped will be a Commonwealth immigration movement of some magnitude, and it is important to examine the probable trend of timber production and to prepare to meet the high level in demand that may prevail for the next twenty years or more. There is little doubt that any significant flow of immigration will greatly increase the demand for all forest products. Large immigration movements always involve a considerable extension of building and other capital construction; and timber is certain to remain one of the principal building-materials. Immigration is reflected also in a greater demand for consumer goods and general services; and wood is required in various forms and to a significant extent. Past immigration movements show that *per capita* timber-consumption rises with an increasing intensity of immigration, and falls as the rate of immigration slackens off. This, of course, is not to imply that immigration is the sole or even principal determinant of the rate of timber usage. By no means; but the fact that there is an obvious tendency for the unit demand for wood products to rise as the immigration wave gathers momentum indicates that New Zealand is likely to be confronted with a significant increase in the demand for sawn timber and other forest products. Forest policy must be concerned with the problem of satisfying such demand; and the Service intends to investigate in detail the incidence of production over the next twenty years, the effect of mills cutting out, and what specific action, if any, is required to ensure the ability of the timber industry to meet a high level of demand. That there must be radical changes is obvious.

(2) The general position is vastly different from that which existed during the course of the immigration movements of the second half of last century and the early years of the present century. There was then no problem of timber-supply, for timber was so plentiful as to appear more of a hindrance than an asset. To-day the country faces a prospective demand for timber and wood products far in excess of any previous level of consumption, but with very limited resources remaining of the original indigenous forest, though supplemented, it is true, by a fairly extensive area of exotic forests. The really significant point, however, it that the expansion in timber-consumption will synchronize with a difficult transition period in the timber industry, for, despite the rising demand, production from the indigenous forests must soon be curtailed; in fact, drastically curtailed. Sawmills will be cutting out at an increasing rate, and fewer of them will be able to secure further areas of indigenous timber. Nor can such units move automatically or easily to the exotic forests, for their sawmilling equipment and technique are not suited to the relatively small type of log characteristic of the latter forests.

(3) The necessity for a planned reduction in output from the indigenous forests has been foreshadowed in earlier issues of this report, but its implementation has, of necessity, been deferred pending the wider development of more mature exotic forests. The fact that it is deferred, however, does not mean that it is any the less certain. During the year ended 31st March, 1949, the total output of indigenous species was just over 300,000,000 board feet; and at that figure the indigenous forests supplied almost 70 per cent. of all sawn timber consumed within New Zealand. Whether or not the annual cut will have to be reduced to the low level of 50,000,000 board feet by 1965 as predicted by the first Director of Forestry in his annual report for the year ended 31st March, 1925, cannot be determined until the national survey of forest resources is completed in about five years' time. Whatever the reduction, it will be large; and it is being emphasized at this juncture so that sawmillers and wood-users will understand that the *status quo* in timber-production cannot continue; no amount of wishful thinking can alter the figures of the national forest balance-sheet. The sawmilling industry is most keenly affected, and the implications of the policy of rationing indigenous timber need to be appreciated, for mills will, in increasing numbers, cut out, and find they have no option but to close down and cease business or switch their operations to the exotic forests. As far as indigenous timber is concerned, the remaining State forest areas must be rationed; and, unfortunately, the fact can neither be circumvented nor rendered palatable.

(4) The decline in the available supply of indigenous timber will not only have a revolutionary effect on the sawmilling industry, but it will also have a major effect on the wood-consumer. In general, the New Zealand wood-using public has been extremely fortunate in having at its disposal large quantities of softwoods which are of wide utility, able to stand abuse, easy to season, and largely free of defects. The history of timber use in this country shows that in the days when kauri and totara were available in large quantities timbers such as rimu and matai were relegated to minor uses. As kauri and totara supplies dwindled, rimu and matai were substituted for purposes for which kauri and totara had previously been considered essential. We have now reached the stage when rimu and matai are becoming increasingly scarce; and exotic species will have to be substituted in many cases where rimu and matai have been considered essential. Wood-users need to appreciate the realities of the position and make their plans accordingly.

(5) Speaking generally, the future of the sawmilling industry lies more and more in the exotic forests; and, apart from a certain measure of instability and dislocation during the transition period, the future promises far greater stability and continuity of operation to both employer and employee than either have enjoyed in the past. A high level of timber demand seems to be assured for many years, particularly if the immigration movement continues and develops, in which event it is anticipated that within approximately fifteen years the total demand for sawn timber alone will be as high as 600,000,000 board feet annually. In addition, the export trade is expected within a few years to eclipse even the high figures immediately preceding World War I, when sawn exports almost reached 100,000,000 board feet. Production from the exotic forests, therefore, has to be geared in the near future to a total potential demand which will be approximately double the entire annual output between the wars. The exotic forests have the productive capacity, but, as stressed before in these pages, they are not amenable to development by the methods commonly applied to the indigenous forest. The Forest Service has consistently drawn attention to the need for different and improved sawing, handling, and merchandising techniques when dealing with the exotic timbers; and it is believed that the industry generally has been impressed with the achievements of the Forest Service Waipa Mill in this respect. The fact that the exotic forests must be systematically developed to yield approximately 500,000,000 board feet of sawn timber annually for domestic consumption and up to 150,000,000 board feet for export within about fifteen

years—and that they will support permanent industrial installations and communities—is indicative of both their importance and the scope they offer for industrial planning on a permanent basis.

Export Markets

(1) Timber and other forest products will figure prominently in the export trade of the near future. Geographically and otherwise the logical market is Australia, which has always been a large importer of softwoods and pulp products; and forest products promise to be the only important item which can be used effectively to redress the adverse balance in the trans-Tasman trade. The decision of the Government to proceed with the establishment of a sawmill of large capacity integrated with a pulp and paper mill (and of various forestry companies to produce both pulp and sawn timber for export) will provide an excellent opportunity for New Zealand not only to improve its overseas trade position, but also to make an important contribution towards Commonwealth security in the South Pacific.

(2) In the case of sawn timber, it is of the utmost importance that New Zealand should pay the strictest attention to the question of developing a very much superior standard of merchandising to that which has characterized its export trade in the past. The principle suppliers in the international timber market, especially those in Baltic countries, have established a reputation for well-graded, accurately-sawn, square-docked, branded, and packaged timber of really good quality; and if New Zealand is to develop and retain overseas timber markets it must be prepared to adopt comparable standards of merchandising. At the time of going to press, an official delegation is visiting Scandinavian countries on the occasion of the World Forestry Congress at Helsinki: and this question of production and preparation of sawn timber for export is regarded as so important that arrangements have been made for the members to study the methods employed by some of the leading timber exporters of Finland, Norway, and Sweden. The delegation is composed of a member of the Forest Service, and one representative from both the Sawmillers' Federation and Timber Workers' Union; and the experience of this delegation should be extremely valuable in developing very much better standards of export in New Zealand.

Indigenous Silviculture

(1) Recent ecological investigations, particularly the classification of extensive forest areas undertaken by the national forest survey, suggest that much of our indigenous forest is in an unstable condition. Present distribution and composition appear to reflect a warmer and more humid period in the past than do present climatic conditions. In particular, the bulk of the podocarp forest displays symptoms of over-maturity and stagnation with the virtual absence of young growth. With the harvesting of these over-mature stands, conditions are such as to inhibit re-establishment of the same type of forest, the second crop usually consisting of hardwoods of little value. The podocarp forests seem vigorous only on certain lowland sites, most of which have a high farming value debarring them from permanent forestry. Only on Stewart Island and where it occurs in mixture with red and silver beech does rimu show any appreciable regeneration capacity in unmanaged stands. This instability inherent in most podocarp forests, coupled with the intractability of most species to normal silvicultural measures, prohibits any reliance being placed on them for a large permanent yield of softwoods. Although present indications are that they will be capable of management only on a few limited sites, sustained research may ultimately extend these sites on a significant scale; elsewhere the residual hardwoods may yield a worth-while crop, or where these consist of inferior species the introduction of shade-bearing exotics may be necessary.

(2) The beech forests present fewer difficulties, having much more favourable silvicultural characteristics than any of the podocarps. The major problem is again to

determine in which forests the various species of beech exist by virtue of present climate and in which they are unstable survivors of the past, for it is only in the former that the desired species are aggressive and capable of sustained yield management.

(3) The silvicultural possibilities of kauri within its rather restricted natural range have been amply demonstrated, and there is no doubt that it can be successfully managed in perpetuity. All State-owned kauri forests have already been placed under working plans, and the policy of consolidation of existing areas and acquisition of potentially productive forest remnants is being continued.

Professional Forestry Training

(1) During the year the New Zealand University Senate approved the establishment of a School of Forestry at Auckland University College. This proposal is based, in the main, on the advice of Professor S. M. Wadham of Melbourne to provide a four-year undergraduate course leading to a degree in forestry. It has been suggested that part of the course should be taken in a forest environment away from the University college, probably at Rotorua. To the extent that the University has met the desire of the Forest Service for a still higher standard of forestry education by also providing for a Masters degree, the Department is very appreciative; but failure to provide for the whole of the professional work being located in a forest and not a University environment negatives the value of any local forest training, however high it may otherwise be.

(2) The Forest Service has found no reason to alter its opinion that a four-year undergraduate course is inadequate to equip a professional forester with a satisfactory background of scientific training as well as sufficient instruction in forestry. The view that a professional forestry school should be organized on a graduate basis with a suitable scientific degree as a prerequisite has become more widely accepted in the English-speaking world. After spending some weeks in New Zealand, Dr. H. H. Chapman, Emeritus Professor of Yale University and a leading figure in American forestry education, was emphatic on this point. In sharp contrast to the New Zealand University proposals, he advocates a four-year course in basic sciences in place of the three preferred by the Forest Service and only two recommended by Professor Wadham. It is also noteworthy that the recent international Forestry and Timber Utilization Conference for Asia and the Pacific favoured graduate forestry training following a science degree.

(3) If agreement to the establishment of a graduate school at Rotorua cannot be obtained, it may be preferable to follow a policy of training selected science graduates overseas rather than adopt the University's present proposal for an undergraduate school—a proposal which fails to provide the standard of forestry education advocated by this Service. Already it has become necessary to send junior professional officers overseas—one to Oxford and three to Canberra—and more must be sent before a local school could be organized.

(4) There are considerable advantages in overseas training: students gain a more liberal education and establish professional contacts which are of inestimable benefit in their subsequent careers; advantage can be taken of particular courses and forest conditions available in the best forestry schools in the English-speaking world and possibly in Europe, and the Forest Service will benefit from the diversity of experience and training. But one cannot ignore the disadvantages. Some excellent students may, for family or other reasons, be unable to go abroad; it will be more difficult for the private student or the staff of local body or company forestry organizations to obtain professional training, while in times of financial stringency overseas bursaries are probably more prone to retrenchment than an established school.

Forest Employment

(1) One of the most disturbing features of forest operations is the difficulty of securing the required personnel; other avenues of employment are attracting the best workers, and the type of man most likely to develop into a skilled and efficient forest employee is not available to the Forest Service. During the critical man-power shortage of the immediate post-war years it was logical that employment difficulties should be accepted with little question, but the problem can no longer be dismissed so lightly. It is obvious that there are fundamental reasons why forestry continues to be at a disadvantage in the labour market. The Forest Service places a good deal of reliance on its departmental staff-training schemes as the solution to its general staffing problems, and these training schemes are proving their value and giving very good results. So far, however, it has not been possible to widen the training scheme to include working personnel, but even if this could be arranged immediately, the setting-up of a training scheme would not in itself give the required results. The reasons underlying the exceptionally high turnover in forest employment reported in Chapter VIII obviously go deeper than this and therefore call for some inquiry.

(2) One of the contributing causes is the fact that, so far as the exotic forests are concerned, forest work has suffered from a widespread impression that it is seasonal and temporary rather than continuous and permanent; hence its failure to appeal to the man interested in a career with steady and permanent employment is not surprising. This is a misconception which needs to be corrected, inasmuch as it is only planting that is seasonal, and the planting boom is past. Management and utilization activities, on the other hand, offer year-round work of a permanent and varied character; consequently it is no longer the casual worker who is sought, but rather men who will take up forest work because they are convinced it offers them stable employment of a nature which inherently appeals to them. In other words, forestry now presents an opportunity for the skilled craftsman.

(3) Another contributing factor undoubtedly has been a general impression that forest employment means living conditions of a primitive kind as measured against urban standards. That undoubtedly was true up to the end of the depression of the early "thirties," but conditions have been greatly improved, and the day of the tent has gone forever. For single men either cabin or hostel accommodation with central facilities for meals is provided. The Standard Forest Service cabin with modern built-in furniture has been universally acclaimed as the best of its kind in either Australia or New Zealand. Married accommodation is limited, it is true, but an active housing programme is in operation, and houses are being built to the standard of State rental houses. Greater emphasis must be placed on the provision of married accommodation, however, for it is the home which is the foundation of any stable community. This is well recognized by the permanent forest industries in Scandinavia, some of which, in addition to donating land for the building-site, make considerable monetary grants to their employees to enable them to have their own homes. Linked with any improvement in general living conditions there must also be an improvement in the amenities available; sport and recreation, amusements, facilities for shopping, educational and medical services, &c., are all necessary to overcome that inherent lack which prompts people to shun forest employment for work nearer town. These things have not been overlooked: the standard of amenities has been considerably improved in recent years, and is still being improved as the development of permanent forest communities proceeds.

(4) Finally there is the question of comparative rates of pay. Other avenues of employment can and do offer better wages, and this places forestry at a disadvantage in the labour market. It is essential, therefore, that the wage level be improved if an efficient and stable forest personnel is to be built up; conversely, a high wage level is justified only if it results in the acquisition and retention of skilled craftsmen.

(5) It is believed that an approach along the following lines offers the best possibilities of a real solution: the development of the spirit of tradition in employment; emphasis on the continuity and permanence of forest work and its demand for skill; a significant improvement in the rates of remuneration; and living conditions and amenities comparable with urban standards, with particular emphasis on houses for married personnel. If tradition in employment is the basis on which to build a stable staff of skilled craftsmen, the starting-point is where youths with an inclination towards outdoor work leave school and look for a likely opening. It is hoped, therefore, to reserve some hostels on the forests for youth labour with the objective not only of attracting boys straight from school and giving them an opportunity to develop an enthusiasm for the forest life and forest work, but also of providing technical training in suitable subjects.

(6) Negotiations will be opened with youth organizations to determine the best way of initiating such a scheme and developing it. Short-term forest camps during school vacations also might be a means of developing in school-boys and Boy Scouts that appreciation of outdoor life in general and forest life in particular which must form the real basis of a stable forest personnel. Existing recruiting methods have been well tried and found wanting: radical changes seem to be required if forest operations are ever to be fully and efficiently staffed, and the suggestions put forward here merit a serious trial.

Legislation

Amendments enacted since the passing of the Forests Act, 1921–22, are now contained in some twelve different statutes. There is an urgent need for consolidation of the forest law in order to reduce its complexity and to rearrange its provisions in a more simplified form for administrative interpretation. A Bill along these lines has been drafted, and while it does not contain any major additional provisions, the opportunity has been taken to remedy defects revealed during past administration and to provide for extended activities of the Service.

CHAPTER III—MANAGEMENT DIVISION

Inspector in Charge: Mr. F. W. Foster

Forest Resources

(1) *Land.*—Two categories of State forest are recognized: provisional State forest, which may be withdrawn from reservation by Proclamation for settlement or other specific purposes: and permanent State forest, representing land which cannot be alienated save with the consent of both Houses of Parliament. Figures for the past year are as follows:

	Acres.
Area placed under reservation	71,235
Withdrawn from reservation	1,792
Provisional State forest permanently reserved	33,486
Total area under State forest as at 31st March, 1949 ..	9,355,130
Other areas administered as State forest as at 31st March, 1949	27,057

The areas withdrawn from reservation consisted of—

1,231 acres for settlement.
232 acres for scenic reserves.
244 acres for water development purposes.
31 acres for roads.

Detailed figures for the past year according to conservancies are given in Appendix I, which also shows the year-to-year changes for the country as a whole for the period 1920–48.

(2) *Timber.*—Growing stock assessments of indigenous and exotic forests have not yet been completed, but in some conservancies they are sufficiently far advanced to enable an estimate to be given. The following figures will be subject to correction when the work is completed :—

Conservancy.	Indigenous Forests.	Exotic Forests.
	Cubic Feet.	Cubic Feet.
Nelson	Not yet assessed	25,000,000
Canterbury	Not yet assessed	80,000,000
Southland	180,000,000	Not yet assessed

The Southland estimate, made by the national forest survey (see Chapter V), is further subdivided into—

	Cubic ft.
Hardwoods (beech, &c.)	123,000,000
Softwoods (rimu, &c.)	57,000,000
	180,000,000

The above estimates include forests on lands of all tenures, not only State forests. A broad provisional estimate of the total resources of indigenous podocarp species has been submitted by the national forest survey; this estimate, which is based on incomplete data, indicates that the remaining supply of podocarp species on lands of all tenures is probably in the vicinity of 5,000,000,000 board feet of standing timber.

Silviculture

(1) *General.*—Despite continued labour and accommodation shortages, considerable progress is reported. The aggregate acreages dealt with under planting, release cutting, high pruning, and thinning showed a 50-per-cent. increase over those of 1947–48 and a 300-per-cent. increase over the areas covered in 1946–47. The low-pruning acreage has remained steady over the past three years. Immigrant labour has again accounted in the main for the increased scale of silvicultural operations. In view of the necessity for commercial costing of utilization operations, including felling and extraction, roading, and incidental work, and of the importance of maintaining fire-preventive measures at the highest possible standard, it is perhaps natural that such works should claim the major portion of the most efficient labour. Such has been the tendency during recent years, leading to the inevitable, though regrettable, result that the forest stands which are being protected from fire and exploited on the best standards available are, owing to force of circumstances, being neglected silviculturally. As mentioned in the previous report, large areas are now too old to respond to silvicultural treatment (mainly pruning and thinning); while stands that would still respond have to remain untended due solely to the lack of sufficient labour (and accommodation) to deal with the very large areas requiring treatment. So large are the areas involved that even were adequate labour available, it would be necessary in many cases to leave convertible thinning logs on the forest floor to rot. In this connection, thinning by mechanical felling is being investigated with a view to economizing man-power.

(2) *Natural Regeneration.*—Natural regeneration of worked compartments of *P. radiata* in Rotorua and Canterbury Conservancies is progressing satisfactorily, with the prospect of complete restocking in many cases. During the year 231 acres were classed as fully stocked with exotic trees by natural regeneration, bringing the total area so stocked to 1,058 acres (836 acres in Whakarewarewa and 222 acres in Kaingaroa Forest).

In all cases the natural regeneration has followed on clear-felling, and no shelterwood systems involving the removal of the mature overwood in stages have so far been commenced on any appreciable scale. Problems of correct treatment have arisen, and investigation is proceeding.

Advance growth is reported from both exotic and indigenous forests throughout the country, and where of value silvicultural tending is applied, such as release cuttings of volunteer kauri, supplemented by plantings to increase the stocking; and pruning and thinning of *P. muricata* (blue variety) at Hanmer. Regeneration of red beech in Nelson Conservancy has been achieved following the removal of the ferns and shrubs comprising the ground cover.

(3) *Interplanting.*—An area of 344 acres was interplanted, as compared with 10 acres in 1947–48 and 5 acres in 1946–47. An investigation of earlier work in this direction is in train, and the results will form the basis of a policy directive. At Waipoua, kauri was interplanted on 20 acres (included in the above area) of *P. tæda* and *P. echinata* which has been pruned and thinned. This was done pursuant to a practice explained in last year's report of using young pine stands as "nurses" for kauri seedlings.

(4) *Afforestation.*—The areas planted, blanked, and replanted during the past three years are given below, and the planted area is shown in greater detail in Appendix II:—

Year.	Planted.	Blanked.	Replanted.
	Acres	Acres.	Acres.
1946–47	834	685	925
1947–48	2,819	956	883
1948–49	4,563	1,334	832

In addition, 705 lb. of *P. radiata* seed were direct sown in Kaingaroa Forest on an area of 873 acres.

(5) *Seed.*—Seed collected, both exotic and indigenous species, for the same period was:—

	lb.
1946–47	3,284
1947–48	3,120
1948–49	2,591

During 1948–49, 265 lb. of seed were sold. Import and export of tree seeds carrying insect infestation or disease are now prohibited by statute, and it is proposed to take steps for applying similar safeguards respecting locally-collected seed for local use. Furthermore, the desirability of introducing, if possible, some system of certification of seed is under consideration, with the object of ensuring that seed is of the best strain and of a high standard of quality; and to this end selected seed plantations are to be built up. Thermostatically-controlled seed-storage chambers were installed during the year on two State forests in the North Island and one in the South Island.

(6) *Nursery Operations.*—Seed sown in nurseries amounted to 1,934 lb., which germinated to yield 10,080,000 seedlings. A total of 6,760,000 trees were lifted for planting; and nursery stocks at the end of the year were 22,170,000.

A high standard of nursery technique is being maintained and stocks are severely culled to ensure that only trees of the highest quality are planted out. Where necessary, whole surplus beds are thrown out. As a result of these precautions the actual yield of trees per 1 lb. of seed is often considerably lower than the original germination rate per 1 lb. During the year a request received from a Catchment Board to take over cull trees for planting was refused.

(7) *Tending of Indigenous Forests.*—Release cuttings for liberation of kauri advance growth were carried out over 95 acres in Auckland Conservancy. Thinnings, with harvesting, have been carried out in beech stands in Nelson, Westland, Canterbury, and Southland Conservancies, the species represented being red, hard, black, and silver beech.

(8) *Tending of Exotic Forests.*—Areas dealt with in the course of normal tending operations are shown below for the past three years; but more detail is given for the current year in Appendix II, which also gives statistics for earlier years. The area clear-felled (shown in this section for convenience) includes 172 acres of salvage of wind-thrown trees.

Year.	Release Cutting.	Low Pruning.	High Pruning.	Thinning.	Clear-felling.
	Acres.	Acres.	Acres.	Acres.	Acres.
1946–47	677	6,556	932	1,055	601
1947–48	1,389	6,743	1,983	1,245	481
1948–49	2,722	6,728	2,247	2,094	651

Forest Protection

(1) *Animal Damage: General.*—Opossums, rabbits, and deer remain the most serious forest pests. Other animals such as pigs, goats, and wild cattle are also causing damage, but this is satisfactorily limited by existing control measures. The recorded numbers of vermin destroyed in State forests for the past three years are as follows:—

Year.	Rabbits and Hares.	Opossums.	Deer (All Species).	Pigs.	Goats.	Others.
1946–47	34,532	4,329	1,534	1,538	238	..
1947–48	139,507	6,042	2,956	3,225	294	145
1948–49	99,411	69,968	2,785	3,419	510	6,614*

* Includes 4,937 rats.

(2) *Opossums.*—Opossums have aroused concern following reports of a considerable increase in their population and range, and the damage done, in both Islands. Exotic forests have been affected most, the young shoots of several species being chewed and nibbled off. In indigenous forest a preference for young shoots of rata has been reported by parties of the national forest survey. Attempts to control opossums by poisoning to supplement contemporary trapping methods are being made in Nelson and Southland Conservancies. The large increase in the number of opossums killed (preceding paragraph) comes mainly from the inclusion this year of skins taken by trappers in State forests in the Wellington Conservancy.

(3) *Rabbits.*—Rabbits remain a serious problem at Gwavas Forest, where they were responsible for losses up to 60 per cent. in the 1948 planting. It is anticipated that, despite netting of plantation areas and continued rabbiting, they will be a major establishment problem on Esk Forest, in Hawkes Bay. Rabbits are still very numerous in Southland Conservancy, especially on marginal lands adjoining Naseby, Berwick, Herbert, Pebbly Hills, and the Longwood Forests. An intensive programme of trapping and poisoning on all affected forests is being pursued with good results.

The Rabbit Destruction Council, which has now been operating for a full year, has already achieved a measure of uniformity in methods of administration and attack upon this pest. Though lands of the Crown are outside the jurisdiction of the Council, excepting with the consent of the Minister concerned, the Council is assured of the co-operation of the Forest Service.

(4) *Deer.*— Deer show a slight increase in indigenous forest, but continual shooting is keeping their numbers in check. In some of the high country in Southland, however, their incidence is serious enough to endanger the well-being of certain areas of protection forest.

(5) *Insect Damage.—General:* With the exception of that caused by the steel-blue sawfly (*Sirex noctilio*), insect damage has been slight, as in the past, and most local attacks reported have been of limited extent and brief duration.

A leaf moth (*Epichorista persecta*) caused defoliation of kauri seedlings in a nursery at Waipoua. Arsenic spraying was effective. The bronze beetle (*Eucolaspis brunneus*) attacked young Douglas fir underplants in a larch stand in Rotorua Conservancy, causing a general set-back to the trees and some mortality. The cicada, *Melampsalta cingulata*, has been very numerous and damage to leaders of Douglas fir and *Cupressus macrocarpa* may be expected. A parasitic fungus, *Isaria* sp., appears to afford some measure of control by destroying large numbers of nymphs.

The Douglas-fir seed chalcid fly (*Megastigmus spermatrophus*), previously confined to Otago, has been found abundantly in Rotorua Conservancy. Transfer of Douglas-fir seed from the South Island to the North has been banned within the Forest Service for over fifteen years, and the reason for the insect establishing itself in the Rotorua forests is not known. The forest pathologist reports that examination of seed in other localities has failed to reveal additional centres of infestation.

(6) *Steel-blue Sawfly:* Appearances of *Sirex noctilio* have been reported from most conservancies, brief periods of high incidence being experienced in Nelson, Rotorua, and Auckland. The most serious spectacular outbreak occurred in Rotorua district, where an investigation made in the spring revealed that many trees had been killed by a fungus associated with the insect, young to middle-aged stands of insignis pine in both State and private forests being mainly affected. The forest pathologist reports (Chapter V) that the epidemic probably arose from climatic factors which were favourable to the insect.

Climatic conditions this year have been mild, no extremes being experienced. In the Rotorua Conservancy high temperatures at the end of October encouraged the emergency of many insects, but no high temperatures were recorded between 1st November and 9th December, and there was considerable rainfall. These conditions are of extreme importance in regulating the insect population, and also the susceptibility of trees to attack and their capacity for recovery if attacked. Compared with last year there have been few days ideal for *Sirex* oviposition, and it may be expected that damage from this cause will be reduced.

(7) *Damage by Fungi.—General:* No serious outbreak of fungal disease was reported and State forests suffered little damage during the year. The honey fungus (*Armillaria mellea*) was observed in Whakarewarewa Forest, where some naturally regenerated insignis pine suffered attack. In Wellington Conservancy this fungus continues to cause mortality amongst the more susceptible species used for interplanting indigenous forest. Sample plots in *Cupressus lawsoniana* at Taurewa show mortality rates at 8 per cent. to 9 per cent. in four and a half years.

In the area of *Pinus radiata* near Lake Taupo burnt in 1946, some damage to the dense regeneration which has appeared was caused by *Diplodia* following frost injury, and by *Armillaria mellea* spreading from dead trees. Timber being salvaged in Pureora State Forest from the area burnt in 1946 showed damage to the sapwood by ten species of fungus, in addition to sap-stain. *Stereum hirsutum*, *Coriolus cinnabarinus*, *Meruleus* sp., and *Stereum* spp. caused most of the damage. An uncommon heart-rot of kauri found at Waipoua, and a fungus causing wilt on seven-year-old *P. laricio* at Golden Downs Forests, have been submitted for examination.

(8) *Manuka Blight:* The "manuka blight," which has aroused interest in North and South Canterbury recently, is particularly abundant near Ashley Forest. Its effect on exotic forest trees has so far not been found to be in any way detrimental. This

"blight," caused by a combination of insect and fungus, is welcomed by a great number of settlers as a means of eradicating young manuka invading pasture lands. The indigenous manuka, however, is of such great value, both as a nurse for forest seedlings and as an excellent vegetative cover for preventing soil erosion, that the State Forest Service has constantly deprecated suggestions that the "blight" should be assisted towards spreading over the whole Dominion. Eradication of the manuka would lead to soil erosion on a disastrous scale.

(9) *Climatic Damage.*—The weather during the year was unmarked by extremes, the winter being mild in most areas; consequently, damage to State forests from climatic and other natural causes has not been severe. Winds of dangerous violence have not occurred, though local damage has been reported from Waitangi, where *P. pinaster*, *P. caribea*, and *P. taeda* growing on exposed ridges suffered breakage of leaders and lateral branches. On Kaingaroa Forest a 5-acre plot of Douglas fir suffered wind damage when a *P. radiata* windbreak was removed, and further wind-throw seems likely. Slight wind damage to pines (*P. caribea*, *P. taeda*, and *P. patula*) occurred in Rotoehu, where some trees were wind-blown. Similar damage has been reported from Hanmer and Balmoral Forests, Canterbury.

January frosts in Southland affected areas of recently-planted ash and poplar in Berwick and Beaumont Forests, the species being sited in valley bottoms. Similar damage occurred to two-year-old spruce in Milton Nursery. At Taurewa, November and December frosts nipped the new growth of 1948 planting *P. laricio*, which species has suffered similarly in this area in the past.

An isolated report of snowbreak and a little flood erosion have been reported from Southland and Westland respectively. Erosion on a small scale in protection forests in Southland has been reported, and it is noteworthy that the primary agents are browsing pests such as deer and goats. Reduction in their numbers will see the disappearance of beaten tracks and bared ground, and subsequently a return to normal forest conditions.

Fire damage, &c., is dealt with in Chapter VIII under "Fire Control and Communications."

(10) *Forest Offences.*—There were 38 convictions for offences against the forest laws. Fines imposed amounted to £73 10s., and costs and damages totalled £1,968 13s. 8d. Particulars of these offences are given in Appendix IX.

The heaviest fine this year, £15, was imposed for operating an engine not fitted with an efficient spark-arrester, and in this case the sum of £36 10s. 6d. was recovered as fire-suppression costs. There were 8 convictions for the unlawful cutting and removal of forest produce, two involving large amounts of produce valued at £1,428 19s. 1d. and £296 19s. 6d. respectively.

Forest Mensuration

The following table shows the number of areas and the quantity of standing timber appraised by conservancy staffs for sale during the past three years:—

Year.	State Forests.		Maori Forests.		Other Forests.		Total. Board Feet.
	Number.	Board Feet.	Number.	Board Feet.	Number.	Board Feet.	
1946–47 ..	129	116,697,000	22	43,567,000	19	7,756,000	168,020,000
1947–48 ..	160	121,532,000	24	54,239,000	14	6,295,000	182,066,000
1948–49 ..	181	118,755,000	26	56,939,000	33	11,067,000	186,761,000

The quantity appraised during 1948–49 was the greatest in any single year since the inception of the Forest Service. The sampling method of appraisal was used in the mensuration of the following quantities :—

	Bd. ft.
1946–47	11,407,000
1947–48	26,512,000
1948–49	11,113,000

The reduction in this year was due to the greater number of areas for which the sampling method was not suitable.

For the approximate estimation of timber stands for possible future timber sales, eight reconnaissances were made covering 4,090 acres, disclosing estimated stands of 34,500,000 board feet. To check the appraisal work of field staff, the Check Appraisal Officer carried out eighteen checks, while Conservators' staffs made sixteen checks.

Forest Working Plans

To ensure continuity in the execution of a deliberately determined policy or object of management, a written working plan containing a carefully specified set of physical prescriptions is prepared for each forest and supported by at least one map. In forest management, continuity is essential in view of the long-term nature of forestry, and the written working plan is necessary in view of unavoidable changes in forest staff during the life of a tree stand.

In New Zealand the preparation of a working plan for each State forest is required by statute ; plans are approved by the Minister, and may be altered only by the Minister on the recommendation of the Director of Forestry. The number of State forests is 627, though this number is capable of reduction by amalgamation of adjacent, and in some instances contiguous, State forests. At the present time 54 State forests are under management pursuant to statutory working plans.

In the past, working plans were prepared on a full-dress scale, including a fairly elaborate description of the forest as to both history and existing conditions, and a fully developed statement of objects of management and of prescriptions designed to achieve those objects. Following the strong recommendations of the Fifth British Empire Forestry Conference, it was decided to accelerate the completion of working plans by preparing skeleton or abbreviated working plans for the numerous State forests which are managed on a broad extensive basis—as distinguished from those forests which are managed on an intensive scale, and for which more elaborate working plans are necessary. Accordingly, standard headings were chosen under which only the bare essentials are to be recorded in each abbreviated working plan, and 20 such working plans are at present at various stages of completion. Of these, the majority are so designed as to implement the policy referred to in last year's report—namely, of deferring for some years the felling of indigenous forest stands or of confining such felling within planned limits.

In this connection it is desired to add that there are 56 " managed State forests " (localities are given in Appendices). These forests are not all under forest management in the narrower technical sense of management for sustained yield, accompanied by a proper arrangement of age-classes in each forest. They are rather staffed forests, or forests to be staffed with forest officers when adequate field staff becomes available. Of the 56 " managed forests," 43 are at present controlled by forest officers residing on the forests. For each " managed forest " a virtual skeleton working plan was written in the year 1946 as a basic report for Government ten-year plans, each basic report briefly summarizing the past history of the forest, existing conditions, the policy intention, and the works proposed. These requirements are being adhered to in so far as available labour and accommodation will permit, and are being incorporated, with the necessary amendments, into working plans as required by the Forests Act.

During the year, working plans for Whirinaki, Skyline, Pukepoto, Murupara, and Naseby Forests were compiled, and the first revision of the plan for Hanmer Forest is now ready for approval. In addition, work was commenced on the preparation of working plans for Pouakani, Pureora, Tararua, Mount Robertson, Herekino, Raepahu, Wharepuhunga, Okahukura, and Mangaokewa Forests (indigenous) and Gwavas and Pebbly Hills Forests (exotic).

Considerable progress was made in assessment of growing stock in exotic forests. Field-work covering roughly 500,000 acres in all was completed during the year, and office computation of this work is now in progress. Volume tables were again used extensively to calculate quantities, but for some areas data from sample-tree measurements were used.

Timber Sales

(1) *State Forest Block Sales and Permits.*—Details of indigenous timber sold during the year for removal from State forests, exclusive of log sales, are given below for the past three years :—

Species.	1948–49.	1947–48.	1946–47.
	Bd. ft.	Bd. ft.	Bd. ft.
Rimu and miro	112,056,000	86,514,000	84,615,000
Matai	11,374,000	10,820,000	6,910,000
Totara	5,483,000	4,780,000	5,154,000
Kahikatea	4,956,000	7,728,000	8,461,000
Tawa	5,509,000	5,650,000	2,088,000
Beech spp.	9,402,000	10,973,000	1,910,000
Others	2,101,000	1,271,000	803,000
Total quantity ..	150,881,000	127,736,000	109,941,000
Total value	£264,200	£194,900	£190,200

Method of sale was as follows :—	Bd. ft.
(1) By appraised quantities	127,714,000
(2) By log scaling	5,745,000
(3) By mill output	17,422,000

The last item was chiefly under Wardens' licences. In addition, exotic timber to the extent of 1,918,000 board feet valued at £6,300 was sold and removed from State forests during the year. The greater proportion of this represented sales of wind-thrown timber to a licensee operating in Balmoral State Forest, who finally abandoned operations in March, 1949. The failure of the licensee to fulfil commitments in this area has already resulted in the loss of a large area of the wind-thrown timber, but the Forest Service will salvage as much as possible of the timber which remains exploitable. Minor indigenous forest produce sold under permit was valued at £14,800, and exotic forest produce sold under permit was valued at £400.

(2) *Outturn from State Forests.*—The quantity of milling timber removed under log sale agreement, licence, and permit from State forests totalled 180,198,000 board feet.

The following minor forest produce was removed under permit:

	1948–49.		1947–48.		1946–47.	
	Indigenous.	Exotic.	Indigenous.	Exotic.	Indigenous.	Exotic.
	Number.	Number.	Number.	Number.	Number.	Number.
Poles	10,300	..	9,600	..	5,000	..
Strainers	23,300	..	21,000	..	17,600	..
Posts and stakes	565,700	..	430,600	..	357,600	16,000
Stays	13,700	..	8,100	..	7,300	..
Sleepers	14,100	..	20,000	..	17,000	8,400
House blocks and pole blocks	17,700	..	14,300	..	5,900	..
Battens	1,164,800	..	1,136,100	9,300	982,800	..
Bridge stringers	40	..	10	..	170	..
Survey pegs	500	..	..	..	..	..
Firewood (cords)	900	50	600	30	360	260
Mining timber (pieces)	55,000	9,700	61,400	12,700	54,600	3,700
Rails	240	..	..	..	..	..
Chopping-blocks	100	..	1,200	100	..	..
Tomato-stakes	1,400	..	38,600	..	..	..
Shingles	..	..	184,500	..	..	..

Indigenous and exotic timber extracted by the Forest Service itself is dealt with in Chapter VI, Section (1).

Soil Conservation

At the present time when the Forest Service is embarking on extensive schemes for the production and utilization of timber from exotic forests, there is a tendency to overlook the less spectacular but equally important work which is being undertaken in connection with protection forests. The use of vegetation in stabilizing soil and regulating stream-flow has long been recognized; and the management of forests on the steeper hill country, primarily for protection purposes, is regarded as one of the major responsibilities of the Service. Out of a total of nearly 9,250,000 acres which comprise the forest estate, it is estimated that over 6,000,000 acres can be classed as essentially protection forest. Much of this land consists of mountain-tops and precipitous and inaccessible back country where extraction of timber is impossible; and the value of such forest lies in the protection which it affords to the highly productive farming-land below. In some instances, however, extraction of milling timber, where practicable, may be permitted on a restricted scale if there is no danger of accelerating erosion. The chief enemies of these forests are fire and browsing animals; and the judicious removal of mature trees, where this is possible, does not adversely affect the valuable properties which are associated with protection forests.

All timber-sale proposals on State and Maori-owned lands are subject to careful scrutiny from the viewpoint of possible erosion. Where erosion is likely to follow felling and extraction, the proposal is either refused or modified in the case of State forest areas, or made the subject of strong representations to the Maori Land Court or Maori Land Board respecting Maori-owned land.

The Forest and Rural Fires Act, 1947, which was sponsored by the Forest Service, provides adequate means for the prevention and control of fire on protection forest areas; but the position with regard to animal pests gives cause for grave concern. In Southland Conservancy, where ecological research is being carried out in the indigenous beech forests, evidence points to the ultimate disappearance of the forest unless deer can be brought effectively under control. This conclusion has Dominion-wide application and merits very careful attention. Damage by opossums and goats

is also serious, and reference must be made to the destruction of the forest along the boundaries of unfenced " bush-edge " reserves as a result of browsing by domestic sheep and cattle. The introduction of browsing animals into New Zealand has indeed had a profound effect on the vegetation; and the Forest Service is co-operating with the Departments of Internal Affairs and Scientific and Industrial Research in investigating the problems which these forest pests have created.

The policy of retiring to forestry land-use submarginal land which is unsuitable for agriculture has been steadily pursued, and the assistance given by the Department of Lands and Survey in negotiating the acquisition of land in this category has been particularly helpful. During the year seven areas totalling 46,000 acres were taken over, including one of 8,000 acres which was donated by the owners. These areas will be largely locked up, and regeneration encouraged by extermination of pests and exclusion of fire.

Throughout the year the Forest Service has taken an active part in the work of the Soil Conservation and Rivers Control Council and the twelve Catchment Boards now in operation. The Service is represented on the Council and on all the Catchment Boards by senior forest officers; and, in addition, a professional forester, seconded from the Service, is employed in an advisory and liaison capacity with the Council.

Owing to shortage of trained staff it has not yet been possible to implement fully the programme of work which the Service has envisaged in connection with soil conservation. There is, nevertheless, much progress to report. Problems of plant and animal ecology are being investigated; field surveys have been carried out to assist Catchment Boards in classifying land; farmers have received advice and help in selecting and planting trees for various counter-erosion purposes; the area of land acquired for protection forests has steadily risen; and it is hoped that a Forest Extension Service (see Chapter IV) will shortly be functioning.

Miscellaneous Forest Uses

(1) *Grazing.*—At the end of the year there were 216 grazing leases in operation, all but a very small number being on a year-to-year basis. A close watch is kept on the effects of grazing, and where it appears that the results may be detrimental, applications are refused.

(2) *Mining Privileges.*—One hundred and five applications for mining privileges and 5 for coal-mining rights were granted by the Mining Warden over State forest land. These are not granted under the Forests Act, 1921-22, but entail the same obligations regarding the protection of State forests as any of the other privileges.

(3) *Recreation.*—Whilst the Forest Service is entrusted with the control of the State forests for the general good of the Dominion, it would be both unreasonable and unwise to lock up the forests to all but departmental employees and rightholders who actually work in the forests. In addition to their functions of growing useful wood material and conserving water and soil, forests afford wide scope for healthful recreation and relaxation. The educative value to forest visitors is also highly important: they get to know the forests and its trees and birds, and are likely to develop a personal interest in the care of the forests and their protection from harm. Such a feeling of sharing ownership in the forests leads to a diminution in vandalism and in carelessness with fire which will be infinitely more stable and permanent than if left to " officialdom " to inculcate by means of warnings and prosecutions.

The development of this multiple use of State forests has received prominence in other countries both old and new, and must be actively and progressively pursued in New Zealand by opening up tracks, providing camping facilities at key points, and so on. State forests are being used increasingly for recreational purposes—mainly shooting, tramping, and climbing—but they can have a very much wider appeal than they do at present if their use for recreation is developed with initiative and imagination.

(4) *Other Privileges.*—Other privileges operative at the end of the year were: Sawmill-site leases, 15; tramway and road licences, 64; housing-site leases, 5; miscellaneous, 5.

(5) *Water Conservation.*—Protection of water catchments by maintaining and extending their vegetative cover—whether this consist of trees or of shrubby plants—is of essential importance for water as well as soil conservation. Forests therefore play a very valuable part in conserving water-supplies and in regulating their rate of flow in connection with hydro-electric, irrigation, and municipal water schemes. A number of State hydro-electric works draw their water-supplies from State forests, while numbers of small private schemes are in the same position. Several town water-supplies come from State forest land, the largest scheme being that of Wellington City—though many such supplies are from special public reserves vested in the control of the local bodies concerned. The Forest Service has therefore a responsibility to protect such water catchment areas from fire, soil erosion, and plant damage caused by forest pests.

(6) *Nassella Tussock Control Reserves.*—As explained in Chapter VIII under "Legal," the Legislature has determined that where a Nassella Tussock Board or County Council considers it desirable, the Minister of Lands may acquire any tussock-infested land as Crown land subject to the Small Farms Act, 1932–33 (now Land Act, 1948). Furthermore, with the concurrence of the Commissioner of State Forests the Minister of Lands may declare the land or part of it a nassella tussock control reserve. It would appear that this course will be adopted only respecting required land which is so heavily infested that agricultural methods of controlling the weed would be ineffective. Nassella tussock control reserves are to be administered by the Forest Service as if they were State forests.

The Forest Service has accepted no responsibility for the efficacy of tree-planting as a method of control, and it is not anticipated that trees will actually choke out the tussock in many cases. There is some evidence, however, that they will entrap a proportion of its high-flying seed-heads, and in this way prevent the spread of the seed down wind on to uninfested land. It will be obvious that trees with a rapid height development are required, and that the early planting of tactically-placed strips having regard to topography and prevailing wind direction is advantageous. Unfortunately for the theory that nassella tussock can be controlled or exterminated by tree-planting, the tussock reaches its maximum development in localities which are suited only to inferior tree growth.

The administration and intensive management of small scattered areas will constitute a departure from the long-established Forest Service policy of confining intensive forestry to reasonably large areas which are economically capable of carrying the burden of adequate fire protection and general overhead. Nassella tussock control by tree-planting, however, is a special-purpose forestry use of land, and the difficulties involved in the management of small isolated areas, though regrettable, will be unavoidable. At the close of the year the first area selected, 500 acres in extent, had been purchased by the Lands Department and arrangements were in train for the commencement of tree planting in the coming winter.

CHAPTER IV—PUBLIC AND PRIVATE FORESTRY

General

Functions of the Forest Service which fall under the heading of public and private forestry are—

(*a*) To encourage the extension of forests—both private and local body—on to land areas unsuitable for farm use; and

(*b*) To encourage the protection and management, on proper lines, of existing forests. Protection implies maintaining the forests in a thrifty and hygienic condition by preventing, as far as is humanly possible, all forms of disease or other damage, whether from fire, insects, fungi, or other causes.

The first function received some prominence in earlier years through the activities of a Forest Extension Officer stationed in each Island during the period 1921–29; while, as regards the second of these functions, a minimum standard of protection and management had been insisted upon by the Timber Controller, both during and subsequent to the war years, in respect of those private forests for which consent to utilization was given. During the year under review, however, the Timber Emergency Regulations were revoked, and, in consequence, the working plans which were approved by the Timber Controller will now continue in force solely at the discretion of the forest owners. In their own interests, however, the forest owners concerned would be well advised to adhere to the provisions of the simple working plans which they were required to prepare.

Work under this heading will be chiefly the dissemination of information and advice, but in approved cases assistance may be given by means of monetary advances or loans; in the latter case, however, legislation may be necessary. The provision of assistance and advice to certain forest owners, with possibly some measure of control, appears to be overdue. Now that the forests are reaching middle age or approaching maturity, it is evident that some are largely in derelict condition due either to understocking or to other forms of neglect; and sound forest protection and management practice should be applied to these potential assets before it is too late. Last year's report referred to a resolution of the Empire Forestry Conference of 1947 urging Empire Governments to take early steps to ensure that private or commercially owned forests and woodlands are managed in accordance with the principles of sound forestry. Unfortunately, at present only a few of the numerous private, local-body, and company forests in this Dominion are under expert forest management.

The problem is primarily not so much one of ensuring local timber-supplies, though that is a consideration of very great importance, but rather one of land-use; of encouraging forest use of odd corners on farms, of waste portions of local-body reserves, and of other lands unsuited to farm use. In this connection, a resolution of the 1947 Empire Forestry Conference stressing the urgent need for a clear-cut land planning policy, and the establishment of a supreme land-use authority, was dealt with in last year's report.

Forest Extension

(1) *Planting.*—Indications are that although many landholders express interest in the planting of waste areas, there are comparatively few instances where that expression of interest has been translated into action. Progress appears to be hindered by shortage of labour for planting; by fear of destruction of planted areas by fire; by anticipation of onerous taxation on forest produce; or by actual difficulty in procuring trees for planting. As a result, planting by individual farmers and others is virtually limited to the provision of only the most essential farm shelter, as distinct from both general shelter and woodlots for the production of local timber requirements and logical use of small waste areas.

(2) *Private Nurseries.*—In some, if not most, districts, demand for forest trees exceeds supply, for large-scale planting nurseries appear to raise forest trees of only half a dozen species, normally as a side-line and rarely in any considerable quantities. Few specialize in raising forest trees for sale, but some nurseries, in accordance with sound business practice, do raise large quantities of forest trees under firm forward order. It is confidently anticipated that forest extension work will further increase the demand for planting stock, highlighting the desirability of early consideration being given to the production of certified seed as a means of protecting tree-planters.

Farm Forestry

Numerous requests for advice, some forwarded through the Department of Agriculture, have been dealt with. Quite frequently the inquirer has asked for trees to be supplied from State nurseries; but the sale of such trees was discontinued in the year 1929 under an agreement between the Forest Service and the commercial nurserymen.

There is great scope and urgent need for the extension of tree-planting on farms, with a threefold objective: provision of shelter for stock and farm crops; protection of the soil against gully, slip, sheet, and wind erosion, and river-bank protection; and utilization of small waste areas of land for production of timber, and firewood for farm use. Admittedly, these three purposes overlap to some extent: where the object of planting is fairly clear cut, however, advice and, in some cases, other forms of assistance are available from the Department of Agriculture (farm shelter-belts); from the Soil Conservation Council and Catchment Boards (soil-conservation planting), or from the Forest Service (farm woodlots). Planting of coniferous trees where subsidized by the Soil Conservation Council and Catchment Boards is subject to the advice and guidance of local forest officers or the forestry liaison officer attached to the Soil Conservation Council.

Company Forestry

No new planting by afforestation companies is reported, their principal activity at the present time being either felling and extraction operations or forest maintenance. The term "afforestation companies" means companies which planted forests out of bond or share capital. Of those now exploiting their forests, many dispose of their stands to sawmillers under agreement, the sawmillers carrying out the felling and extraction. In a few instances, however, and including some of the most extensive forests, the companies themselves fell and extract their trees as raw material for their own utilization plants, whether sawmills or pulp-mills. Only one of the afforestation companies is undertaking any thinning; but, although this thinning has been done on unorthodox lines, it has nevertheless benefited the company by returning an early monetary yield and by enhancing the increment of the final crop trees.

There are also several company forests which have been established on a different basis. Here long-established sawmilling or paper-manufacturing companies have planted or are still planting softwood forests to furnish raw material for their main line of business. One such plantation was recently commenced on a tract of sand-dunes under a measure of subsidy from the Soil Conservation Council. The company in question planted a few acres during the year with trees raised in its own nursery; and a similar concern which in 1948 planted 800 acres is reported to have half a million trees in its nursery for planting out in the winter of 1949.

Local Bodies

According to available information, at least 153 County, City, and Borough Councils and Town Boards control reserves which are at least partly under forest, and, in addition, there are at least 20 local authorities of other designations and 55 semi-public bodies, committees, trusts, &c. Their areas range from a few acres to tens of thousands of acres.

At present only one body, the Wellington City and Suburban Water Supply Board, controlling 70,000 acres of State forest vested in the Wellington City Council and other lands, is required to submit forest working plans to the Minister; and this requirement has been faithfully adhered to since it was instituted by statute in the year 1927. A number of other local authorities in which Crown land has been vested for afforestation purposes are supposed to submit proper working plans to the Minister; but this practice where it was observed, has fallen into abeyance. Several of the local bodies employ professional foresters to undertake orthodox forest management of the communal forests concerned.

During the past year the planting of 320 acres of new exotic forest by local bodies was reported, while a considerable quantity of material was removed from older forests by sawmillers and firewood-cutters under sales agreements with a number of local bodies.

It is desired to emphasize, however, that in addition to large areas planted to exotic tree species a very considerable area of indigenous forest is controlled by local bodies for the conservation of municipal water-supplies. The aggregate acreage is not available, but the total indigenous forest area probably exceeds the total area of exotic forest.

Government Departments

At least 12 Departments other than the Forest Service control forest lands, and with these the Forest Service has always co-operated in giving advice on planting and thinning, the sale of mature timber, and in measuring stands for sale, &c. During the year, the Ministry of Works planted further areas of sand-dunes and portions of Soil Conservation Reserves; and the Lands and Survey Department and the Department of Maori Affairs undertook planting on land-development schemes for shelter purposes and woodlots. Utilization is now under way on exotic forests controlled by the Departments of Agriculture, Lands and Survey, and Mental Hospitals.

Maori-owned Forests

There is provision in the Forests Act, 1921–22, for the administration of Maori-owned forest lands, with the consent of the assembled owners, by the Commissioner as if they were State forests. However, no such lands have been declared "Maori forests" under this provision, though it is true that under the Act the consent of the Commissioner has been a prerequisite to any grant by the Maori Land Court or Maori Land Boards of rights to cut timber. However, Maori owners in their own interests would be well advised to consider the question of introducing some measure of proper forest management to their forests, whether by way of applying a well-planned timber-sales policy in the case of forest lands which, where cleared, will be suitable for farm settlement, by managing on a long-term basis forested lands that are suited only to forest use (either productive or upland protective forest), or by afforestation of suitable open lands of non-agricultural quality.

It is felt that Maori tribes are so organized as to justify from every viewpoint the management of permanent communal forests of the kind which has been so successfully administered for centuries past in various parts of the Old World. Large areas of Maori land would, under managed forest, bring to the owners a steady revenue, and they would provide permanent employment of a type for which the Maoris are eminently fitted. This will become possible, of course, only when the Maori forest owners realize the advantages of a long-term investment yielding steady returns, in contrast to a large, single, monetary return from timber-sales.

During the past year, advice has been given by the Forest Service on the silvicultural treatment of a Maori exotic forest established some years ago by the Department of Maori Affairs. Also on behalf of Maori owners twenty-six timber-sale areas were appraised by the Forest Service, involving a total quantity of 57,000,000 board feet of indigenous milling timber, the sale proposals being carefully scrutinized before the Minister was recommended to give his consent.

CHAPTER V.—DEVELOPMENT DIVISION: TRAINING AND RESEARCH

Inspector in Charge: Mr. T. C. Birch

Recruitment

(1) *Professional Staff.*—The Professional Division of the Service has been strengthened by the addition of 8 graduate foresters from overseas. This group consisted of the balance of the successful applicants for positions advertised in 1946, together with the final group of New Zealand ex-servicemen bursars who had completed their forestry training in Britain. Four science graduates of the University of New Zealand also joined the Service.

The total number of professional officers in the Forest Service now stands at 66, of whom 33 hold University degrees in forestry. The balance are science graduates preparing for higher forestry education, qualified engineers, or specialists in other fields.

(2) *Clerical Staff.*—The lack of clerical cadets offering during recent years has created a serious shortage in the junior ranks, and a concentrated effort was made during the year to recruit suitable young men from the rural areas. Recruitment from all sources resulted in the appointment of 26 cadets to the Service. Details of all staff appointments during the year are given in Chapter IX.

(3) *Field Staff.*—The usual recruitment of technical trainees was this year preceded by advertisement in rural newspapers and by radio. The number of applicants was not as great as usual; but their quality, as evidenced by higher educational qualifications, was better, and enabled the Selection Committee to raise the standard. Twenty-one applicants were finally accepted, a small percentage of these being ex-servicemen. It is expected that next year will bring very few applications from this group, so that the emphasis from now on will be on the recruitment of youths who have a good rural background plus satisfactory educational qualifications.

A special recruiting drive to engage workmen suitable for training as skilled forest workmen and leading hands was undertaken during the spring months, and training-camps were established in all conservancies. The response was disappointing, and the quality of the labour offering generally below the required standard. However, likely recruits still coming forward are selected for training, and if, after a period, they prove suitable for advancement, they will be nominated for courses at the training centre.

Labour recruitment for exotic forests in recent years clearly indicates that more married accommodation is necessary to attract the more stable and mature type of workman. There is no doubt that, were houses available, many excellent workers would gladly move their families to the country districts, where living-costs are lower.

Forestry Education

The Forest Service has persevered during the year in its endeavours to secure the establishment of a professional School of Forestry within New Zealand, and in doing so has not deviated from the firm conviction that such an institution is justified only if it provides the highest standard of professional training. Nevertheless, whatever be the outcome concerning a School of Forestry in New Zealand, the Forest Service cannot afford to neglect the training of suitable men for its future professional staff. Hence the continuation of facilities for selected technical trainees to attend the University and graduate B.Sc. as a preliminary to higher forestry education. During the year 1 graduate commenced the study of forestry at the Imperial Forestry Institute, Oxford, and 3 at the Australian Forestry School at Canberra. A further 11 trainees completed their B.Sc. course in New Zealand during the year.

The presence of Dr. H. H. Chapman (Emeritus Professor, Yale University, United States of America) in New Zealand during the year was a good opportunity for this Service to seek the views of a recognized world authority on forestry education. It was learnt that Dr. Chapman not only approves of the principle of a science degree prerequisite to a forestry course, but also suggests specifically that the University of New Zealand should provide a four-year basic science course, followed by a two-year Master's degree course in forestry—not in a University centre, but "at the most serviceable centre of forestry activity." This independent expression of opinion is of the utmost significance, in that it advocates an even higher standard of forestry education than that sought by the Forest Service since 1946. The Forest Service adheres to the conviction that Rotorua is the only logical centre for a national Forestry School not only because of the advantage of association with the Research Institute there, but also because of Rotorua's geographical position as the focal point of the Dominion's major forestry activities.

Departmental Training

(1) *Field Training.*—Some 52 technical trainees were receiving field training, advantage being taken of the wide range of conditions and operations on forests throughout the Dominion to give them varied rotational experience. The number of new recruits was offset by a similar number of senior trainees being promoted to forest rangers and by others commencing University study towards professional training.

Junior forest workmen also were given training in the branches to which they belong; and courses for junior labourers, leading hands, and timber measurers were held during the year at the Rotorua Training Centre.

(2) *Clerical Training.*—With the extension of activities within the Service, there has been a greater demand for clerical servicing not only on the main offices, but also at forest stations where no clerical assistance has been given previously. Recruitment alone is not the solution to the additional clerical work involved; training means increased efficiency, consequently more attention has been given to the training of existing staff. The need for more organized training was recognized during the year by the appointment of a Clerical Staff Training Officer; and full advantage is now being taken of the facilities at the Rotorua Training Centre for short courses of instruction. Staff lectures, conferences, and job rotation were continued.

(3) *Rotorua Training Centre.*—Twelve courses were held at the Rotorua Training Centre, compared with seven in the preceding year (see Appendix X); consequently it was sometimes necessary to conduct two courses simultaneously, taxing the limited space available. At the present rate of progress (approximately one a month) with short courses—technical, clerical, and vocational—the type of instruction to serve present needs should be sufficiently disseminated throughout the Service by 1950 to warrant some slowing down. Thereafter a long-term training policy, looking to the future rather than to immediate needs, can be developed.

The trend of instruction has been to cut lecture-room work to a minimum and incorporate an adequate amount of field-work for demonstration purposes, theory having proved satisfactory only when adequately combined with practice. The total personnel passing through the Training Centre during the year was 201, including those engaged on tool-maintenance courses. As courses have become more standardized, the number of instructing personnel has been reduced, and there have been fewer calls upon staff outside the Training Centre.

The quality of the technical trainee group has been well up to standard, mentally and physically. Twenty-two recruits passed through the trainee preliminary course. The course for senior trainees revealed that, although their standard was satisfactory, more field training is required if they are to cope with the problems confronting present-day field officers. An interesting departure this year was the secondment of 2 junior officers of the Fiji Forest Department for six months' training in the New Zealand Forest Service.

The Tapanui Forest Vocational School, which was established as a post-war measure to train ex-servicemen and leading hands, has fulfilled its purpose and was closed during the year. The number of men requiring this type of training is now small enough to be handled entirely by the Rotorua Training Centre. There were two courses at Tapanui during the year: one for junior labourers and one for leading hands.

Forest Research Institute

(1) *General.*—Satisfactory progress was made in the development of the Forest Research Institute (previously known as the Forest Experiment Station) during the year, and certain projects, particularly those connected with volume and yield tables, have already produced results of value. The preparation of a programme of both routine and special investigations for the next three years is now envisaged.

(2) *Staff.*—The staff of the Institute was increased by transfers and new recruitments; posts of Silviculturist, Assistant Mycologist, Soil Biologist, Biometrician, and Botanical Assistant were filled. Apart from its own programme of research work, the Institute has provided specialist staff for lecturing duties, as required, at the adjoining Training Centre.

The programme of work which can be efficiently undertaken by a research organization is, of course, directly limited by the numerical strength and research experience of its staff. As the Forest Research Institute is at present operating with only a nucleus staff (not more than 5 officers in a total of 16 have the experience to enable them to undertake major research), the response to an advertisement throughout the British Commonwealth for foresters experienced in research is keenly awaited.

(3) *Records and Library.*—A permanent record system for the collection of technical information is in course of preparation, the basis being the decimal system of classification for forest literature as used in the *Forestry Abstracts*. The Institute has been allotted the task of abstracting certain New Zealand publications for the Commonwealth Forestry Bureau. Preparation of a punched-card index system for records of sample trees has been commenced.

Additions to the library during the year amounted to about 1,700 books and pamphlets. Compilation of the index is now complete, and it is intended to issue a catalogue shortly, and supplements at quarterly intervals thereafter. A photographic library has been commenced.

(4) *Publications.*—Material for the first issue of *Forest Research Notes* was collected and edited. This series is intended to give relatively short accounts of completed projects, and interim results of more ambitious investigations. The following papers were read to the Seventh Pacific Science Congress by members of the Institute staff:—

"Shifting Cultivation and Its Effects in Burma," by F. Allsop.
"Recent Observations on the *Sirex noctilio* Population in *Pinus radiata* Forests in New Zealand," by G. B. Rawlings.
"Ecological Investigations in the Nothofagus Forests of New Zealand," by J. T. Holloway.

Silvicultural and Botanical Research

(1) *Herbarium.*—The herbarium at the Forest Research Institute was augmented during the year and now contains specimens of 120 indigenous and 240 exotic species. The dried specimens have been supplemented by a collection of fruit and flowers preserved in Hessler's solution.

(2) *Arboreta.*—The identification and labelling of trees in the exotic arboretum has been completed. The important additions during the year include *Pinus echinata*, *Pinus strobus*, *Ostrya virginana*, *Cupressus macrocarpa*, and the hybrid *Cupressus macrocarpa* x *Chamaecyparis lawsoniana*. Improvement of the indigenous arboretum was delayed by drainage work; but sixteen species were planted out. Seedling stock of both exotic and indigenous species has been raised for further plantings in the arboreta, and for amenity plantings elsewhere. A further 1,350 trees, including exotic species of *Agathis*, were planted in the Northern Arboretum at Waipoua Forest, and some failures of earlier years were replaced.

(3) *Tree Seed Studies.*—Collection of information on the occurrence of seed crops of exotic and indigenous forest trees was continued, also studies of germination periods and cotyledon and seedling characteristics. Routine viability tests of seed were carried out. Observations on growth of native and introduced trees were collected and correlated. Special attention was given to reports on the growth cycles of exotic conifers, and a summary of the information collected to date is being prepared for publication.

(4) *Tree Genetics.*—The initial steps have been taken in the study of tree types in *Pinus radiata*, Douglas fir, and Corsican pine; and a little experimental grafting of these species has been done so that progress in the technique of collecting cuttings and grafting will keep pace with investigation of types. If successful, the grafting method will give quicker results than cuttings in the creation of stands of good-type trees from which high-grade seed can be collected.

(5) *Vegetative Propagation.*—The experiments on vegetative propagation of *Pinus radiata* described in the last report as giving almost entirely negative results were repeated on a larger scale under more suitable conditions; this time with appreciable success. The principal planting was in June, 1948, using 400 cuttings of each of several types of shoot, 200 being heeled cuttings—*i.e.*, torn off the tree with a fragment of the parent stem—and 200 unheeled cuttings—*i.e.*, removed from the tree by a clean cut. Half of each were treated with a hormone preparation and half used untreated. These units of 100 cuttings were broken into sets of 25 and planted in random blocks in the nursery beds. Repetition is necessary before definite conclusions can be drawn, but interim results can be summarized as follows:—

(*a*) Survival percentage was about the same (60–70 per cent.) for all six types of cuttings used—viz., cut tops of one-year-old seedlings; first order laterals from two-year-old trees; first order laterals from five-year-old trees; second order laterals from five-year-old trees; and second order laterals from seven-year-old trees.

(*b*) There was no significant difference between results from heeled and unheeled cuttings.

(*c*) Vagaries in weather immediately after planting had a marked effect, but if the weather was favourable, August plantings were as successful as those in June.

(*d*) Owing to difficulties in the supply of hormone preparations this aspect of the investigation was not handled as systematically as could be desired, hence repetition is necessary.

(6) *Sample Plots.*—By courtesy of New Zealand Forest Products, Ltd., and Afforestation Proprietary, Ltd., permission was obtained to establish sample plots in the dense natural regeneration of *Pinus radiata* and *Pinus pinaster* which followed the extensive fires of 1946. A set of plots is also planned in a seven-year-old crop of similar origin. Methods of treatment, which of necessity must be exploratory, will be considered next year.

Permanent sample plots were established in natural regeneration of *Pinus radiata*, aged five to seven years, to study the effect of pruning and thinning at various seasons. There is evidence that if such operations take place between December and March when *Sirex noctilio* is plentiful the incidence of attack by this insect is so heavy that undue casualties occur among trees it is intended to retain.

(7) *Soil Deficiency.*—Abnormal mortality in young plantations of *Pinus radiata* in Rotoehu Forest, Rotorua Conservancy, gave cause for concern. In stands planted initially at 6 ft. by 6 ft. spacing, survivals per acre were:—

Age.	Living Trees.	Dying Trees.
4	842	12
6	740	..
8	490	100
11	283	124

Casualties at this rate being encountered only in Rotoehu Forest, the possibility of deficiencies in the soil were envisaged; and trials were begun to study the effect of applying boron, potassium, and other elements.

(8) *Thinning.*—Studies of the response to thinning of Douglas fir, *Pinus murrayana*, *Pinus laricio*, *Pinus patula*, *Pinus ponderosa*, *Pinus radiata*, *Pinus strobus*, and *Pinus taeda* were initiated in permanent sample plots. The plots in *Pinus radiata* will also be used to investigate the effect of thinning—and possibly underplanting—in podzolization of the soil under this species. The year's work in the establishment of permanent sample plots was largely centred in Rotorua Conservancy, where eleven new plots were laid out and measured, and most of them thinned. Four old plots were remeasured, and two of them thinned. One old Corsican-pine plot had to be abandoned owing to serious damage by wind. A set of new plots was established in Karioi Forest, Wellington Conservancy. Review of old plots in Southland and part of Canterbury Conservancies was begun, and tentative sites were selected for new plots.

(9) *Underplanting.*—The results of planting exotic conifers in indigenous forest after logging operations were studied. The field-work is nearing completion, and when complete an attempt will be made to assess the success of the policy.

(10) *Beech Regeneration.*—Regeneration experiments were continued in red and silver beech in virgin and logged parts of Rangataua Forest, Wellington Conservancy. For the past five years a negligible amount of seed has been produced in this forest, but there is evidence of a good crop in 1949.

Forest Management Research

(1) *Yield Tables.*—Based on data collected from temporary sample plots in the exotic forests of Rotorua Conservancy, empirical yield tables were prepared for unthinned stands of *Pinus radiata*, *Pinus laricio*, and *Pseudotsuga taxifolia*. Plots were also established in *Pinus ponderosa* and *Larix decidua* stands, but the results have not yet been analysed.

During the course of this investigation data were collected to study the development of heartwood in these species, the purpose being to determine the yield of timber suitable for the manufacture of groundwood pulp. This work is discussed further under "Forest Products Research." Studies of the relationship between the usable volumes of timber in malformed and normal trees were also carried out.

In the course of routine work on the establishment of permanent sample plots further data were collected for the preparation of normal yield tables for the principal exotic species. For convenience, the initial programme of permanent sample plots has been centred on Rotorua Conservancy. However, a manual of instructions has now been issued, and this will facilitate the extension of this type of work to other conservancies. The first new plots in Auckland and Wellington Conservancies have already been established.

(2) *Volume Tables.*—The year has seen great progress in the production and testing of volume tables. New tables have been prepared for Douglas fir and Corsican pine in Rotorua Conservancy, and for insignis pine in Southland Conservancy. A revised volume table for insignis pine in Rotorua Conservancy was also compiled. Progress was made in the preparation of volume tables for kauri, ponderosa pine, and European larch. Revision of the volume tables for rimu was begun.

(3) *Assessment.*—Assessment methods in exotic forests received attention. Experimental work has indicated the superiority of the line plot method over the strip plots used hitherto. However, the computations are possibly more complex than can be handled by the staff available, and it may be necessary to prescribe the intensity of sampling instead of basing it on statistical examinations of results of a preliminary

trial in each particular case. An attempt to prepare a scale of stocking classes for *Pinus radiata* from aerial photographs was only partially successful, the indications being that if site-quality were taken into account such a scale could be developed. These investigations will continue as time and staff permit.

Forest Pathology Research

(1) *Entomology.*—The local epidemic of *Sirex noctilio* which has been developing in Rotorua Conservancy over the last three years has continued. Investigation of dying *Pinus radiata* has shown that death is directly attributable to mass attack by *Sirex*, and that the killing is caused by the action of the associated fungus upon the rays and water-conducting elements of the wood. It is significant that an insect, normally regarded as purely secondary, should be capable of becoming of primary importance. The epidemic is probably associated with an unusual series of hot dry summers, coupled with the existence of ideal breeding-sites in the form of trees left after felling operations. It is probable that if more aggressive insects, such as bark beetles, were to be introduced, the trees would be killed before they became susceptible to *Sirex*, which would then revert to its position of secondary importance. The fact that *Sirex* has been able to develop to this extent is in itself an indication of an unhealthy condition within the stands, and of the heavy mortality which may be expected should a dangerous species be introduced.

Following the investigation of *Pinus radiata* in which the effects of climate, soil, aspect, insects, and fungi were studied, *Sirex noctilio* was selected as a specific subject for research. While it will be several years before proof of many of the more obscure points is obtained, it has become clear that *Sirex* is the vector for a fungus which is capable of killing *Pinus radiata* and other pines. The predisposing conditions for successful attack are now under investigation. The study was made with particular reference to *Pinus radiata* in the Rotorua Conservancy; but general information was collected regarding dates of emergence and oviposition throughout New Zealand for both *Sirex* and its parasite, *Rhyssa persuasoria*. Information was also obtained regarding *Sirex* attack on other species of pine. *Rhyssa* has been bred out from material collected in Whakarewarewa Forest and liberated in new localities.

Breeding experiments were initiated to study the life-history of *Nacomorpha lineatum*, which attacks branches of Douglas fir. The study was complicated by the presence of a second species, *N. sulcatum*, which apparently attacks branches killed by the first species. Routine work in entomology included the following:—

(*a*) Collection and identification of forest insects.
(*b*) Life-history studies, breeding under controlled and uncontrolled conditions.
(*c*) Compilation of data from returns submitted by outside observers.
(*d*) Advice to field staff, and identification of specimens sent in.

(2) *Mycology.*—Special attention was given to the identification, distribution, and importance of fungi-forming mycorrhizæ with forest trees, particularly with exotic species. Fungi attacking *Sirex*, *Rhyssa*, scale insects, and cicadas were studied, and the following routine projects were dealt with:—

(*a*) Collection, preservation, and identification of forest fungi.
(*b*) Maintenance of stock cultures of forest fungi.
(*c*) Toxicity tests for wood-preservatives.
(*d*) Advice to field staff, and identification of specimens sent in.

Other investigations included the causes of mortality in *Pinus radiata* regeneration following fire; the deterioration of timber in fire-damaged indigenous trees; *Cyttaria* disease, *Nothofagus menziesii*; *Platypus* attack in beech and tawa; *Lyctus* attack on tawa timber; *Charagia* damage to beech poles; insects and fungi in forest nurseries; heart-rot fungi and sapstain in sawn timber.

National Forest Survey

Forest survey work was continued at approximately the same rate as in the previous year. The total area now covered exceeds 1,600,000 acres, approximately 500,000 acres being covered during the year. Of this area, 75 per cent. represents merchantable forest. Further details are given in Appendix XI.

In the North Island, millable podocarp stands north-west of Lake Taupo and areas due south of Opotiki are the most important units untouched, and these will be accorded priority for future work. In the South Island, 50 per cent. of the milling timber areas south of Hokitika have been covered on the ground, but the areas north of Hokitika are still untouched. Western Nelson, particularly the region north of Westport, is likely to be difficult area, as it is largely unknown. South Westland and the outstanding milling timber areas of the North Island will be the programme for the summer, 1949–50. In Southland the podocarp forests west of the Waiau River have been completed as far as field-work is concerned; and other areas of beech forest, where information was required for working plans, have likewise been investigated. Coromandel has been completed in the field as far south as Thames. This unit is concerned less with milling stands than with the regeneration of the kauri forests once so abundant in that locality. Milling timber of any extent is practically non-existent on the Coromandel Peninsula. Computation of the stand per acre has been completed for all areas except Westland, and complete volumes have been compiled for an area of 88,000 acres.

Completion of final type maps has fallen far behind field-work owing to shortage of draughting staff, both in the Forest Service and the Aerial Mapping Branch of the Department of Lands and Survey. To date only five of these maps have been completed, and a further five are in the hands of the Aerial Mapping Branch. In the coming year there will be a considerable increase in the number of aerial photographs ready for plotting. However, with the demands made on draughting staff by exotic-forest activities, it is doubtful whether any great increase in the output of type maps will be possible. Until these maps are completed, no reliable timber estimates are possible.

The aerial photograph library was increased during the year by 2,305 to 8,934. It is important to build up adequate cover of the forested area so that photographs are available for use by the field staff of the project.

Forest Products Research

(1) *General.*—In anticipation of the transfer of research work to the Forest Research Institute at Rotorua, the necessary laboratory facilities have been planned and are now approaching completion; however, immediate cessation of all investigational work in Wellington is not practicable. In any case, it will be necessary to maintain liaison with other research bodies, Government Departments, and trade organizations in Wellington, also to continue the technical advisory service in that centre.

A short course on wood technology was again given by a Forest Service officer at the Wellington Technical College. It is of interest to note that a more ambitious course is now in progress at the Seddon Memorial Technical College.

Standards Institute Committees continue to occupy a considerable amount of officers' time. The more important matters under consideration during the year were grading of insignis pine, kiln drying practice, New South Wales hardwoods, wood preservation and glues.

(2) *Grading of Timber.*—The timber requirements of the building industry in New Zealand are in need of very critical analysis in the light of the changing situation as regards availability of both species and grades. In particular there must be a much greater economy in the use of the clear grades of indigenous timbers. In the immediate future the exotic species, particularly insignis pine, can make their greatest contribution in the form of framing grades. As regards finishing grades, it is inevitable that some

defects, such as intergrown knots, should be admitted; hence it would be at least logical to relax the specifications governing the use of indigenous timbers for similar finishing purposes. All rimu and matai suitable for machining into flooring and weatherboarding should be rigidly excluded from the building grades in order to offset as far as possible the deficiency in dressing grades. There is, of course, no suggestion that all Building A rimu is suitable for finishing lines, but a considerable proportion undoubtedly is; and suitable relaxation as regards defects admissible in the machined products will achieve the desired objective.

During the past year the grades of insignis pine intended for machining were published as Amendment No. 3 to the National Grading Rules (New Zealand Standard Specification 169). Specifications for the machined products will also be issued by the Standards Institute in the near future. In Amendment No. 3, two grades, "Finishing Grade" for machining into interior finish woodwork, and "Dressing Grade" for machining into flooring and weatherboarding up to and including 6 in. wide, and other dressing lines, were provided for. The percentage of sawn output which measures up to these grades is very small and consequently can make only a relatively small contribution to building needs.

A technical officer attending a conference in the United States visited a number of large sash, door, and millwork plants where the principal timber used is western yellow pine (*P. ponderosa*) in Shop and Factory grades. It has previously been pointed out that this timber has many basic properties similar to those of *P. radiata* grown in New Zealand. The Nos. 1, 2, and 3 Shop grades of *P. ponderosa* are required by definition to yield stated percentages of Door "cuttings," including the whole range of small sizes, but with particular emphasis upon a minimum yield of the 6 ft. 8 in. or longer door stiles and the wide bottom rails. It is not inferred that *P. radiata* as grown in New Zealand will yield grades directly comparable with these Shop grades from virgin growth *P. ponderosa*, but a similar approach to the formulation of "cuttings" grades for the more important factory uses in New Zealand is logical.

Current work on grading of insignis pine is concerned with the development of grades for export, factory grades, and structural grades. A comprehensive study of inter-nodal lengths—*i.e.*, distance between whorls of knots—in insignis pine logs has provided useful information as a basis for grading and the utilization of short lengths.

(3) *Timber Mechanics.*—One of the few important indigenous timbers which had not been included in the strength test series is mountain beech (*Nothofagus cliffortioides*). Recent botanical studies in western Southland, however, have shown this species to be of considerable potential significance and material for strength tests was obtained from five trees representative of the excellent type of mountain beech growing in that region. The tests of green material have not yet been completed, but preliminary results show that the density to strength relationship is very good. Tentative results for all the bolts from one tree show the following:—

Static Bending.	Mountain Beech.	Red Beech.	Silver Beech (Southland).
Modulus of rupture (pounds per square inch) ..	8,600	9,070	7,570
Modulus of elasticity (pounds per square inch) ..	1,300,000	1,720,000	1,280,000
Toughness (inch-pounds)	172	(Tests incomplete)	

In density the timber is intermediate between Southland silver beech and red beech. On the basis of toughness tests and figures for "work in bending to total load," the wood is very tough.

Air-dry material from C and D bolts of five *Pinus radiata* trees from Rotorua previously tested was tested after six years in dry storage. Slight changes to some strength properties have been recorded.

The most interesting results from toughness tests were obtained from a batch of white-manuka specimens which gave an average toughness value of 245 in.-lb. for air-dry material with a density of 59 lb. per cubic foot. This timber is not equal to hickory for the highest-duty handles but it appears to be superior to spotted gum and American and European ash in toughness.

A conference of representatives of British Commonwealth countries actively conducting strength tests was proposed at the 1947 Empire Forestry Conference for the purpose of standardizing testing procedure. This Conference was convened at Ottawa during September-October, 1948, and was attended by the Engineer in Forest Products. In addition to British delegates, there were representatives from the United States Forest Products Laboratory at Madison, Wisconsin, where the second half of the Conference was held. With the transfer of forest products research to Rotorua in the near future it will be necessary to purchase equipment for standard and structural A.S.T.M. tests for accelerated work on exotic species from the various districts in which these forests are approaching maturity. In the meantime the arrangement by which the Forest Service is able to use the testing machines at the technical college and Works Department in Wellington will be continued, the co-operation of these institutions being greatly appreciated.

(4) *Wood Technology.*—Routine microscopic identifications of 21 specimens were undertaken during the year. In addition, the microscopic investigation of New Zealand woods by major botanical family groups was commenced. Thirty proven samples were supplied for microscopic sectioning, and some 150 permanent microscopic slides were added to the reference collection.

An extensive survey of specific gravity and shrinkage variation in the New Zealand beeches has been initiated, over 40 specimens having been collected from forest areas ranging from Mamaku Plateau in the North to western Southland.

Interim conclusions are :—

(*a*) In general, North Island silver beech is of high density, as indicated originally by the Mamaku strength test trees.

(*b*) Silver-beech samples from parts of the Nelson Conservancy suggest that resources of the light-weight versatile timber may not be limited to Southland.

(*c*) Red beech, represented by the greatest range of material, shows a tendency to decrease in density from North to South. North Taranaki samples (with basic specific gravity 0·64) were exceeded only by one fast-grown sample from near Wellington, while the minimum values, 0·45, were recorded from Westland (the latter being the same as the average figure for Southland silver beech.)

(*d*) Samples from two other species (hard and black beech) gave general confirmation to the figures established from the strength-test material.

(*e*) Samples from small mountain-beech trees from montane forests gave specific-gravity figures lower than those established for the low-altitude large trees of western Southland.

(*f*) Additional strength-test data should be established for red beech from important South Island forests.

A comprehensive study of the density of non-heart rimu was made, using samples of weatherboarding, flooring, and matchlining. There is no appreciable difference in the mean densities for North Island, Westland, and Southland material, but the North Island samples showed the greatest variation. It must be noted, however, that the South Island material came from two reasonably homogeneous localities, while the North Island material was from rather widely dispersed areas. The mean density at 17½ per cent. moisture content was 33·9 lb. per cubic foot.

As an integral part of the current study of mountain-beech timber from western Southland, tests are being made of shrinkage and specific gravity on material from the five strength-test trees and an additional five trees to indicate variation with site. The basic specific gravity for C. and D. bolts of the five test trees is 0·514, this figure being in fairly close agreement with the average basic specific gravity of 0·498 obtained from butt and merchantable top sections of six trees. Very high shrinkages occurring in some test material were indicative of the refractory nature of heartwood, which tends to " collapse " in seasoning.

In conjunction with the study of resin content in trees from insignis-pine compartments in Kaingaroa forest, a study of the wood itself was also undertaken. Most of the material came from one compartment of twenty-three-year-old trees. The mean basic specific gravity for thirty-six trees from this compartment was 0·373 ; individual means for the several crown classes were : dominant, 0·367 ; co-dominant, 0·363 ; intermediate, 0·383 ; suppressed, 0·386.

It has been shown that the presence of low-density core wood in insignis pine is not necessarily indicative of high longitudinal shrinkage. This latter feature is noted especially in butt logs in dominant and co-dominant trees, whereas low-density corewood occurs at all heights in these crown classes, being disguised by infiltrates at the butt. The light corewood is found only in top logs in intermediate and suppressed trees.

Trees of *Pinus patula* were also studied in connection with resin-content work. The average basic specific gravity for four thirty-seven-year-old trees from Whakarewarewa was 0·386 (co-dominants, 0·402 ; suppressed, 0·370) ; material from three sixteen-year-old trees from Kaingaroa contained no heartwood and had a mean specific gravity of 0·336.

Studies of heartwood content of several species were made in conjunction with volume-table work at Rotorua. Douglas fir and insignis pine are notable for their early development of heartwood, while Corsican pine and ponderosa pine in forty-year-old stands carry a very small proportion of heartwood.

Interim results are reported from chemical posioning experiments designed to retain the easy barking characteristics of spring and early summer fellings by killing the trees during these seasons. Sodium arsenite as a flour paste was applied after ring-barking. European larch trees felled four months after treatment were barked more easily than the controls. Experience was less favourable with Corsican pine, as parts of many trees remained green, and the killed parts were affected by sapstain and insect attack. In another study concerned with living trees, the practicability of sapwood penetration with chemicals is being investigated with the object of rendering tawa sapwood immune from *Lyctus* attack during and after seasoning.

(5) *Drying of Timber.*—It has been necessary to emphasize to users and producers of insignis pine timber that extreme care must be used in seasoning this timber and in storage after drying. The need for anti-sapstain dipping has been recognized in the export trade ; and the Forest Service suggestion that local users should insist upon freedom from excessive sapstain in timbers for building has resulted in greater attention to this problem. A cyclostyled note, " Prevention of Sapstain," has been widely distributed, and it will be available shortly as a printed information leaflet. There is also a need for an information leaflet on all aspects of seasoning and after-care required with insignis pine for building purposes, and a suitable leaflet has already been completed for publication.

In the field of kiln drying, assistance has been given to kiln operators in the provision of schedules, in kiln testing, and in the training of operators. A small laboratory kiln to dry lengths up to 6 ft. has been completed, and initial tests are in progress at Waipa. This kiln will be used for the development of kiln schedules for the more troublesome indigenous and exotic timbers.

The accelerated drying of tawa blocks for subsequent turning into shoe-lasts was the subject of a small-scale study. Tawa logs were cut into last blank lengths, split " along the quarter " into sectors, and kiln-dried. Even using chemicals to minimize

checking during seasoning, it is obvious that kiln drying down to the final required moisture content of between 12 per cent. and 15 per cent. is not the best method. From experience gained in this study and information obtained overseas, it is preferable to kiln dry the sectors only to about 30 per cent. moisture content; they should then be rough-turned and stored for slow final seasoning in a conditioned room.

Numerous attempts have been made in the past to accelerate the drying of timber to a degree far in excess of that achieved by normal kiln drying, and two processes developed in the United States of America have potential value to New Zealand. The solvent-seasoning process developed by the Western Pine Association has not yet been brought into regular commercial operation, but the vapour-drying process developed by the Taylor-Colquitt Co. is already in regular operation as a method for pre-seasoning railway sleepers and large-dimension structural timbers before treatment with creosote or other preservatives, and that has been its most important application so far. A technical officer of the Forest Service who visited the Taylor-Colquitt plant last October has reported very favourably upon the process as applied to large-dimension stock, and has also indicated that its application to the drying of sawn timber is worthy of close investigation. However, it has not yet been proved to be commercially practicable.

Tentative equilibrium moisture-content figures for various indigenous and exotic timbers have now been developed for most parts of New Zealand. This was based on a study of equilibrium mositure contents in Wellington over a period of two years, with the assistance of the comprehensive range of meteorological data now available for New Zealand.

(6) *Wood Preservation.*—Service test lines of creosoted rimu poles which had been installed in co-operation with the Post and Telegraph Department were examined critically during the year. Whereas unpreserved controls had failed after two to four years' service, all preserved-poles with the exception of two were found to be perfectly sound after eighteen years' service. These poles were treated by the open-tank process, and because of the limited control over absorptions and penetrations it was thought at the time of treatment that a life in excess of twenty years would not be obtained by this method of treatment. The present condition of the preserved poles indicates that an average life in excess of thirty years may be anticipated; and a report covering the treatment details and service performance of these creosoted rimu poles has been prepared for publication.

The performance of creosoted larch poles under service conditions is being studied in co-operation with the Post and Telegraph Department in four test lines in the North Island and one in the South Island. For rural reticulation, creosoted larch (*Larix decidua*) poles are extensively used by the Post and Telegraph Department, and also by some Power Boards. Larch poles are known to check severely during seasoning prior to preservation, and the possibility of these checks progressing during the service life of the pole and extending beyond the depth of creosote penetration was a matter for concern. Poles that have been in service for ten years were examined, and the results of this inspection were gratifying, as no evidence of decay was apparent. It would appear, therefore, that no extensive exposure of untreated wood occurs after preservative treatment. Severely-checked poles that have been in service for ten years were removed from some lines so that they may be dissected to investigate the depth of checking in relation to the depth of creosote penetration. Creosoted larch cross-arms have been used by the Post and Telegraph Department, and the service performance of these units has also been placed under observation. In co-operation with the Railways Department, the testing of creosoted insignis pine sleepers has been undertaken.

Service testing of creosoted fence-posts in New Zealand dates back to 1922, when the first test lines were erected by the Forest Service. Additional lines were erected during the period 1922 to 1927. Pines, beeches, larch, and eucalypts were included in these tests, and were given various hot and cold bath butt and full-length treatments.

The average untreated life of these species varied from two to six years. Those posts which had received full-length treatments, resulting in satisfactory absorptions and penetrations, were found to be serviceable after an exposure period of twenty-six years. A detailed report on these tests has been prepared for publication, while the results of these tests have also been included in publications dealing with recommended practice for the preservation of fence-posts and farm timbers.

The experimental pressure impregnation plant 26 in. diameter by 8 ft. long was brought into operation at Rotorua during the year, and treatment schedules for the pressure impregnation of larch poles and posts were investigated. Pressure impregnation studies will be extended to cover all species of commercial significance, and will be of value in grouping the commercial timbers of New Zealand into permeability classes.

Testing of wood-preservatives against marine-borer infestation was continued with the co-operation of the Auckland Harbour Board, and these tests have now progressed to a stage where some conclusions may be drawn from the results of the six years' exposure. These tests will be extended, using the facilities now available for treating timber under pressure.

Unfavourable conditions for air-drying large-dimension pine stock are frequently encountered in New Zealand, and where such conditions do exist it is impossible to air-dry pine poles without appreciable degrade due to decay. Means of overcoming this problem are now under investigation; it is thought that a light preservative treatment prior to seasoning will prove to be effective.

The wood-preservation section dealt with many requests for assistance or technical advice from industry, the public, and from Government Departments. Information leaflets on methods of sapstain prevention and on the preparation and use of toxic chemicals in organic solvents for the preservation of timber were frequently in demand.

(7) *Painting of Timber.*—The general conclusions previously reached regarding the usefulness of white-lead paints for application to insignis pine have been modified to a very minor degree by further experience. Current tests suggest that a bodied oil vehicle may be preferable to raw oil in the white-lead priming coat. It is of interest to note that the Western Pine Association of United States of America recommends white-lead pigment in all coats applied to *Pinus ponderosa*. Tests are not yet far enough advanced to indicate the effectiveness of the Western Pine knot-sealer applied under the priming coat, but on the basis of overseas experience it is recommended in preference to shellac knotting. This sealer is now available from a local paint-manufacturer.

Inspections of houses in course of erection have again drawn attention to the undesirable practice of allowing the priming coat on weatherboards to weather for periods of six to twelve months before an undercoat is applied. Insignis pine will not withstand this abuse. When the priming coat no longer provides protection to the timber, the boards cup and also check very badly (due to restraint to their swelling when the moisture content rises, and the consequent "compression shrinkage"). The cupping opens up gaps at the laps, and the checks cannot be adequately covered by subsequent painting. Hence with insignis pine the need for correct painting practice is even more essential than with heart timber of the indigenous species. The additional protection afforded by back-priming the weatherboards, provided that they are at the correct moisture content (between 15 per cent. and 18 per cent.) when primed, is advocated as good practice. The undercoat and finishing coat should be applied not longer than four weeks after priming.

Useful information will be obtained from the paint fence tests sponsored by the Inter-departmental Paint Committee, on which Forest Service officers are serving. The major part of the testing work is undertaken by the Dominion Laboratory, and the technical data published in the *Paint Review* and in mimeographed bulletins is filling a long-felt want.

(8) *Wood Chemistry.*—The most important work in progress is the study of the resin content of the more important exotic *Pinus* species from the viewpoint of their pulping properties. Heartwood content is a significant factor in much of the *P. radiata*

twenty years old or more in the Kaingaroa Forest. Material selected from the several crown classes, and cut at the butt, 4 in. top, and intermediate heights, was divided into sapwood, heartwood, and intermediate zones for detailed examination. Ether-soluble content determinations were made by the Dominion Laboratory on several hundred samples; and the Laboratory is also making a more minute examination of larger quantities of resin extracted from a log of *P. radiata* to determine the chemical and physical properties of the resin constituents. Some conclusions drawn from the ether-soluble determinations are:—

(*a*) Resin content in suppressed trees is higher than in other crown classes—*e.g.*, in the bolts taken from material 6 in. diameter down to 4 in. diameter the content in suppressed trees is 1·4 per cent., as compared with 0·9 per cent. in dominants and co-dominants. This is largely accounted for by the heartwood contents:—

At 4 in. diameter: Suppressed, 8 per cent.; other classes, 0 per cent.
At 6 in. diameter: Suppressed, 13 per cent.; other classes, less than 1 per cent.
At 8 in. diameter: Suppressed, 10 per cent.; dominants, 1·6 per cent.

(*b*) Seasonal-variation figures for butt sections show highest resin contents in the spring, for 10 in. and 7 in. diameters highest in autumn to winter, for 6 in. and 4 in. diameters slightly higher in spring than in autumn.

(*c*) Mean annual resin content for all crown classes, 1·6 per cent., which is also the seasonal mean.

Exploratory tests of resin content using solvents other than ether are in progress on *P. radiata* samples. This Service has made a few ether-soluble determinations on *P. patula*, whose low resin content is of interest—0·6 per cent. in thirty-seven-year-old trees from Whakarewarewa, but 1·7 per cent. in sixteen-year-old Kaingaroa trees.

Tests of silica content in mountain beech confirm previously published data. The timber from western Southland has a silica-in-ash content varying from 12 per cent. to 80 per cent. At the top of the merchantable bole the content is higher than at the butt; sapwood also has a higher content than hardwood.

An investigation of the substances in the heartwood of a wide range of durable coniferous timbers, including the more important New Zealand species, is being made in Sweden at present. Other wood chemical investigations are being made in Switzerland (*Dacrydium* spp.) and in England (puriri wood) on New Zealand timbers.

(9) *Plywood and Related Products.*—Investigations by British Commonwealth countries on the range of problems covered by this heading will be better co-ordinated by the Corresponding Committee set up as the result of discussions at the 1947 Empire Forestry Conference.

In the absence of equipment for laboratory investigations of plywood and glues, the principal matters calling for comment are in the industrial field. During the past year the results of a study of conversion losses in plywood-manufacture undertaken by the Forest Service were published in the *Empire Forestry Review*. It was also worthy of mention that the very considerable merits of insignis pine for rotary peeling are beginning to be appreciated. It is being used to an increasing extent for cores and cross-banding of thick plywood with high-class faces and backs.

From observations made in the United States of America, the application of high frequency to the edge-gluing of the component pieces of sawn timber used for cores of wide assemblies (such as counter tops) has a great deal of merit.

A local firm was assisted in the drying of $\frac{1}{8}$ in. thick, rotary-cut insignis pine veneer, a standard type of timber-drying kiln being used, with crude trays for the veneer sheets. Green veneer was dried down to 11 per cent. moisture content in seven hours. The broad latewood zones in some sheets are apparently slower drying than the lighter-coloured wood.

CHAPTER VI—COMMERCIAL DIVISION

Inspector in Charge: Mr. W. C. Ward

Departmental Logging Operations

1. *Log-production.*—Departmental logging operations were conducted during the year in four conservancies and in fifteen forests, and the current year's production showed an increase of 31 per cent. over that of the previous year. Production statistics for the past three years are as follows:—

	Cu. ft.
1946–47	4,436,000
1947–48	5,818,000
1948–49	7,603,000

Of the 1948–49 production, 36 per cent. was from indigenous forests and 64 per cent. from exotic forests. Of the latter, 66 per cent. of the yield came from clear-felling, 28 per cent. from thinnings, and 6 per cent. from salvage operations. Major logging operations are reviewed hereunder, and figures for each forest are given in Appendix XIII:—

(*a*) *Auckland Conservancy: Pureora Forest.*—Efforts were concentrated largely on the salvage of fire-damaged trees, and a record production of 1,017,000 cubic feet resulted. This operation concluded during the year, and normal production of green sawlogs was resumed. Three sawmills situated near the forest are supplied under contract from this logging scheme, and a temporary supply for one year only is being made to one other sawmiller. In conformity with the policy of conservation of indigenous-timber supplies, deliveries to another sawmiller ceased during the year.

(*b*) *Rotorua Conservancy: Whakarewarewa Forest.*—Production for the year totalled 1,905,000 cubic feet, of which 1,638,000 cubic feet of sawlogs were delivered to the departmental sawmill at Waipa. The remainder was in the form of mine props, fencing-materials, and poles. Thinning operations supplied 44 per cent. of the logs produced from the Whakarewarewa Forest.

Kaingaroa Forest.—A record production of 2,267,000 cubic feet was attained in this forest during the year. In addition to providing all of the sawlogs for the Department's Kaingaroa Sawmill, operations in this forest provided 44 per cent. of the logs for the Waipa unit. Thinning operations supplied 13 per cent. of the total log output from Kaingaroa Forest.

Whirinaki Forest.—Of the total production of 1,445,000 cubic feet, 92 per cent. was sold as sawlogs and 8 per cent. as peeler logs. Sawlogs were delivered to three sawmills which have purchased log-supplies on a long-term basis, and to one sawmill on a temporary basis only. In accordance with the departmental policy of setting the standard for forest industries, the Service is supplying some of the finest peeler logs in the Dominion, and 119,000 cubic feet were sold during the year to plywood-factories.

(*c*) *Canterbury Conservancy.*—Small logging operations have been carried out in three forests in this conservancy. Balmoral and Eyrewell operations were confined to salvaging wind-thrown timber. At Hanmer Forest, thinning operations yielded fencing-material and poles. Sawlogs from the Balmoral and Eyrewell operations are sold to private sawmillers, while Hanmer produce is treated at the local departmental creosote plant.

(*d*) *Southland Conservancy.*—Logging operations on a small scale have been conducted in six exotic forests in the Southland Conservancy. These operations have supplied logs to six sawmills, including the departmental pilot sawmill at Conical Hill.

2. *Log Sales.*—Sawlogs and peeler logs comprised 89 per cent. of all logs produced by departmental logging schemes. The quantities and values of logs sold during the last three years were :—

——	Indigenous.	Exotic.	Total.	Value.
	Cu. ft.	Cu. ft.	Cu. ft.	£
1946–47	1,174,000	2,783,000	3,957,000	154,300
1947–48	1,721,000	3,284,000	5,005,000	203,600
1948–49	2,707,000	4,082,000	6,789,000	288,900

The increase in production of indigenous species resulted mainly from the first full year's operations in those areas in which new log sales were made in 1946. During the past year logs were sold to twenty-two sawmills, deliveries being as follows :—

——	Indigenous.	Exotic.	Total.	Percentage.	Number of Mills.
	Cu. ft.	Cu. ft.	Cu. ft.		
Private sawmills	2,705,000	289,000	2,994,000	44	19
State sawmills	..	3,795,000	3,795,000	56	3
Total	2,705,000	4,084,000	6,789,000	100	22

Departmental Sawmilling Operations

1. *Sawn Output.*—Sawn-timber production in departmental sawmills amounted to 22,831,000 board feet for the year. This represents approximately 5 per cent. of all timber produced in New Zealand during the year, and 14 per cent. of all exotic-timber production. For the first time more than half of the total output was sold in the form of sawn timber. The balance was used for boxmaking and for departmental building purposes. Statistics of the production and distribution of sawn timber during the past five years are given in Appendix XIV.

2. *Waipa Sawmill.*—This mill again averaged a forty-eight-hour week throughout the year, with the circular rig again working both a day and a night shift. During the year, 265 nine-hour days were worked, and production was again a record for this plant.

Sawn timber produced and profits earned by this mill each year since it commenced operating during 1940 are shown in the following schedule :—

Year Ended 31st March,	Log Frame Mill.	Circular Rig.	Total.	Profit.
	Bd. ft.	Bd. ft.	Bd. ft.	£
1941	4,064,000	..	4,064,000	8,500*
1942	6,346,000	..	6,346,000	9,000
1943	7,696,000	..	7,696,000	7,100
1944	8,272,000	872,000	9,144,000	13,700
1945	10,066,000	2,345,000	12,411,000	20,100
1946	11,379,000	2,379,000	13,758,000	21,400
1947	12,367,000	3,771,000	16,138,000	14,900
1948	12,649,000	4,132,000	16,781,000	22,800
1949	13,300,000	4,691,000	17,991,000	19,200

* Loss during first part-year of operation.

The reduced profit for 1949 is due to two causes : (*a*) the alteration of the exchange-rate in August, 1948, meant that some of our prices for the Australian market had to be reduced ; and (*b*) considerable lapses occurred between the time wage increases for

timber-workers were granted and the time when compensating increases were authorized in timber prices—*e.g.*, an increase on account of a wage rise in November, 1947, was not authorized until August, 1948, and a wage rise in January, 1949, had to be carried until March, 1949.

Logs sawn consisted of insignis pine, 66 per cent; larch, 23 per cent.; corsican pine, 10 per cent.; and other species, 1 per cent. The proportion of clear-felled insignis pine was lower than last year's figure; and this was reflected in a reduction in the average log size and a slight increase in the production of narrow widths. The yield for the year was :—

	Per Cent.
Up to 6 in. wide	60
Over 6 in. to 9 in. wide	32
Over 9 in. wide	8

Year Ended 31st March,	Sold or Used Green.		Filleted for Air Seasoning.		Filleted for Kiln Drying.	
	Bd. ft.	Per Cent.	Bd. ft.	Per Cent.	Bd. ft.	Per Cent.
1945	3,629,000	29	3,366,000	27	5,444,000	44
1946	3,917,000	28	2,486,000	18	7,355,000	54
1947	5,846,000	36	3,167,000	20	7,126,000	44
1948	4,534,000	27	2,670,000	16	9,577,000	57
1949	4,241,000	24	2,672,000	15	11,038,000	61

One new 66 ft. kiln was completed and brought into operation during the year, increasing the total kiln capacity to six 66 ft. and one 20 ft. chambers. Based on the assumption that the plant is capable of drying for 335 days of twenty-four hours, the kiln operating factor was 94 per cent. The quantity of timber dried per kiln hour was 255 board feet. Comparative kiln-drying figures for the past five years are given in the following schedule :—

Year Ended 31st March,	Green.	Part Air Seasoned.	Total.	Percentage of Production
	Bd. ft.	Bd. ft.	Bd. ft.	
1945	5,196,000	487,000	5,683,000	46
1946	7,077,000	750,000	7,827,000	57
1947	7,525,000	721,000	8,246,000	51
1948	8,611,000	1,162,000	9,773,000	58
1949	11,323,000	557,000	11,880,000	66

The kiln-drying costs of this unit are the lowest in New Zealand. The Waipa plant was established to turn out a superfine product, and proof of the quality of its output lies in the very keen demand which exists for kiln-dried timber on the Australian market. It is reported that this timber has established a standard in Australia against which timber from all other New Zealand sources is judged.

With the higher output from the sawmill and a reduction in the amount used by the box-factory, substantially larger quantities of sawn timber were available this year for sale. Demand for timber remained firm, and an improvement in the shipping position enabled the previous year's exports to Australia to be more than doubled, shipments

being made to New South Wales, Victoria, Queensland, and South Australia to secure the widest practicable distribution. Details of distribution and stocks held for the past five years are given in the following schedule :—

Year Ended 31st March,	Sawn-timber Sales.				Stocks.	
	New Zealand.		Australia.			
	Quantity.	Percentage of Production.	Quantity.	Percentage of Production.	Quantity.	Percentage of Production.
	Bd. ft.		Bd. ft.		Bd. ft.	
1945	2,986,000	24	63,000	1	3,076,000	25
1946	4,431,000	32	537,000	4	2,804,000	21
1947	6,903,000	43	911,000	6	3,000,000	19
1948	4,802,000	29	1,539,000	9	3,372,000	20
1949	5,977,000	33	3,329,000	19	3,780,000	21

During the year, experiments were conducted in the sorting of timber for length and wire-bundling into packets containing 600–1,000 board feet for ease of handling both on to rail trucks and into ships' slings. The trials were very successful, and all concerned have expressed the keenest interest in the wider adoption of this procedure. So far the acute shortage of wire has been the principal limiting factor, but with the gradual easing of the supply position it is expected that a large proportion of future shipments will be bundled.

As in the past few years, there was again a seasonal shortage of rail trucks during March and the use of road transport was necessary to relieve the congestion in the mill yards at Waipa and Kaingaroa. During the period March–May last year, 675,000 board feet were forwarded by road ; but this year the truck shortage is not likely to continue beyond the end of April, and by then approximately 550,000 board feet will have been forwarded by road.

3. *Kaingaroa Sawmill.*—This was the first full year of operation for this mill. Logs sawn were almost entirely insignis pine ; and the mill worked an average forty-eight-hour week, operating 264 nine-hour days for a total production of 4,421,000 board feet. Last year it cut 1,094,000 board feet during the four months it was in operation. Of this year's output, 4,095,000 board feet were sold or used green and 326,000 board feet were filleted for air seasoning. Sales during the year amounted to 3,835,000 board feet, of which all except 66,000 board feet was green timber. At the end of the year stocks on hand amounted to 419,000 board feet.

4. *Conical Hill Sawmill.*—Construction of this mill, the log supply for which will come from the group of small forests located near Tapanui, was commenced during the year. The sawmill will include two 30-in. gang frames, and a bandmill with auxiliary machines ; boiler and power house, dry kilns, and ancillary workshops will also be erected. This mill will come into operation during 1950 with an annual output of 6,500,000 board feet ; but it is planned to double this figure about thirteen years later in accordance with the potential forest yield by that date. A small pilot mill was erected during the past year, but it operated only intermittently to cut timber as required for the main building programme. A total of 458,000 board feet was cut, and, of this, 230,000 board feet was held in stock at the end of the year.

Waipa Box-factory and Planing-mill

The demand for box-shooks in the North Island showed a recession from last year's peak. Less than 4 per cent. of the year's manufacture was exported, but, with a further reduction in the domestic demand pending, a corresponding increase in exports to Australia will be sought during the coming year. Details of the annual production and profits earned since operations commenced in 1941 are shown in the following schedule :—

Year Ended 31st March,	Gross Timber Input.		Profits.
	For Shook Manufacture.	For Dressing Only.	
	Bd. ft.	Bd. ft.	£
1942	2,627,000	..	2,800
1943	4,380,000	..	8,200
1944	7,763,000	86,000	15,400
1945	7,645,000	383,000	20,600
1946	8,691,000	459,000	19,500
1947	7,468,000	862,000	8,300
1948	9,593,000	414,000	27,800
1949	7,957,000	636,000	19,600

Wood-preservation Plants

1. *Waipa.*—Owing to the lack of seasoned produce for treating, the plant operated at only 50 per cent. capacity for the first half of the year; but from then on stocks were sufficient to maintain the plant in full production. The additional treating-tanks installed will assist in meeting the keen demand for posts and poles. Practically all round produce treated was larch, and details are given in the following table :—

Year Ending 31st March,	Posts, &c.	Poles.	Miscellaneous.	Total Volume Creosoted.	Creosote Used.
	Number.	Number.	Cu. ft.	Cu. ft. (approx.)	Gallons.
1945	93,500	2,900	3,900	99,700	107,300
1946	34,400	9,700	5,700	93,100	89,000
1947	38,100	..	12,100	49,100	45,000
1948	23,100	600	8,600	35,600	34,800
1949	77,600	6,500	16,100	131,700	105,900

Relevant figures for sales and stocks on hand for the same five-year period are as follows :—

Year Ending 31st March,	Sales or Transfers.		Stocks on Hand at 31st March.			
	Posts, &c.	Poles.	Treated Posts.	Untreated Posts.	Treated Poles.	Untreated Poles.
	Number.	Number.	Number.	Number.	Number.	Number.
1945	101,100	2,700	23,100	69,200	1,300	9,700
1946	45,700	5,400	9,800	37,300	4,800	..
1947	43,800	6,600	6,300	58,700	5,800	200
1948	7,900	300	23,700	55,000	600	1,200
1949	99,500	6,100	3,000	127,000	1,000	9,200

The experimental pressure cylinder was brought into operation in July, and 145 charges were treated during the year. A commercial pressure treating plant is now being installed, and with the information obtained from the experimental plant it is hoped that full-scale production will be possible immediately the main plant is ready.

2. *Hanmer.*—This plant again operated well below capacity, the reason being insufficient labour to cut an adequate supply of round produce for seasoning. Production details are shown in the following schedule :—

Year Ending 31st March,	Posts, &c.	Poles.	Miscellaneous.	Total Volume Creosoted.	Creosote Used.
	Number.	Number.	Cu. ft.	Cu. ft. (Approx.)	Gallons.
1945	500	2,100	..	12,000	8,000
1946	2,000	2,000	100	14,600	11,500
1947	..	100	..	800	400
1948	700	1,100	1,300	12,400	6,000
1949	2,800	1,300	600	7,100	3,800

Relevant figures for sales and stocks on hand for the same five-year period are as follows :—

Year Ending 31st March,	Sales or Transfers.		Stocks on Hand at 31st March.			
	Posts, &c.	Poles.	Treated Posts.	Untreated Posts.	Treated Poles.	Untreated Poles.
	Number.	Number.	Number.	Number.	Number.	Number.
1945	1,000	3,000	6,900	2,000	2,200	2,100
1946	1,900	2,100	7,000	..	2,100	100
1947	2,000	800	4,900	..	1,400	700
1948	2,600	1,500	3,100	2,600	900	1,300
1949	4,500	900	1,500	16,900	1,300	1,900

3. *Conical Hill.*—Owing to the unsatisfactory condition of this plant, no new material was delivered for seasoning and subsequent treatment, operations being confined to treatment of seasoned stocks on hand. During sixty-seven days' operation the plant treated 2,100 posts, strainers, &c., 36 poles, and 34,600 board feet of timber, a total of 7,100 cubic feet of produce, with a consumption of 5,876 gallons of creosote. All produce treated is being used by the Forest Service ; and treated stocks at the end of the year consisted of 29,000 posts, strainers, &c., and 500 poles.

National Sawmill and Pulp and Paper Project

During April-May, 1948, two representatives of the Rust Engineering Co., of Pittsburg, Pennsylvania, which firm had been engaged by the Government to report upon the economic and engineering aspects of an integrated pulp and paper project at Murupara, visited New Zealand to critically examine the proposed plant sites, to gather data, and generally to familiarize themselves with local conditions. Owing to unforeseen delays, the Rust Engineering Co.'s report was not received until just after the end of the year.

For the design of the large sawmill to be intergrated with the pulp and paper mill the Government engaged the services of Mr. W. H. Rambo, Industrial Plant Engineer, of Portland, Oregon, who is widely regarded as the foremost sawmill consultant in North America at the present time. During the year, two senior officers of the

Commercial Division proceeded to Portland to advise Mr. Rambo of local requirements and conditions; they spent three months working with him on the sawmill design. Mr. Rambo's report was received in January.

The Ministry of Works furnished detailed reports on the harbour, railway, and housing developments which are essential to the project; and the Forest Service, in addition to preparing the working plan covering that portion of Kaingaroa Forest which will supply the raw material, reported on other aspects such as logging, roading, water-supply, &c.

CHAPTER VII—ENGINEERING DIVISION

Inspector in Charge: Mr. V. C. Rapson

Surveying and Mapping

1. *Surveys.*—Essential survey work in most conservancies is still delayed through shortage of trained staff, and the few additions to staff during the year have not relieved the situation to any appreciable extent. The following survey work was carried out during the year:—

	Acres.
(*a*) Exotic forests—	
Topographical surveys	1,727
Subdivision into compartments	4,500
Forest-type surveys	304
Preliminary triangulation survey at Rotoehu forest	20,000
(*b*) Indigenous forests—	
Boundary surveys: 180 timber appraisal areas ..	18,485
Reconnaissance surveys	5,864

In addition, topographical surveys for the purpose of village and housing sites were carried out at Omahuta, Tairua, Kaingaroa, Esk, and Hanmer Forests. Other work included:—

(*a*) Surveying 446 chains of new roads.
(*b*) Reconnaissance of 12 miles of road-line.
(*c*) Surveying 272 chains of forest boundary.

The value of aerial surveys for forest reconnaissance and assessment surveys, as well as for the national forest survey, is becoming more and more evident, and wherever aerial photographs are available they are being used to an increasing extent.

2. *Mapping.*—In connection with current operations, the following work was carried out: 225 plans were prepared; 5 stock maps, 3 topographical maps, and 1 indigenous forest record map were drawn; and 2 stock maps were redrawn. Thirty-one forest atlas sheets were renewed, and 273 new plans were recorded.

A considerable amount of work for the draughting staff was entailed in connection with the reconstitution of all fire districts under the Forest and Rural Fires Act, 1947. Five maps were prepared for fire lookout stations and fire-control purposes.

The work of compiling the forest-type maps in connection with the national forest survey which is being undertaken by the Aerial Mapping Branch of the Lands and Survey Department is proceeding slowly, and is at present far behind the field-work. To date, 5 type maps have been prepared, while the field-work has been completed for a further 5 maps.

The library of aerial photographs was enlarged by the addition of 26 mosaics and 3,170 prints, and now contains 13,030 prints and 82 mosaics. Fifty-four mosaic copies were obtained for the use of conservancy offices and district stations.

Civil Engineering

1. *Roads and Bridges.*—Construction of new forest roads and surfacing of existing roads during the year were as follows :—

Conservancy.	New Forest Roads.	Metalling or Other Surfacing.
	M. ch.	M. ch.
Auckland	9 20	2 60
Rotorua	19 76	18 58
Wellington	13 45	1 26
Nelson	9 71	..
Westland	3 47	..
Canterbury	2 2	..
Southland	11 16	15 16
Total	69 37	38 0

The above figures do not include work on streets in State forest villages. In most of these cases the work is only partially complete, being dependent on the construction by contract of kerbing and channelling, storm-water drains, sewers, and water-mains.

Forest roads totalling over 850 miles were maintained in reasonable condition, but lack of man-power and suitable equipment still prevent attainment of the desired standard. Six miles of access tracks were constructed, and maintenance work was carried out on a further 7½ miles. Six new road bridges and two pedestrian suspension bridges were constructed, and existing structures were maintained to as high a standard as possible with the limited man-power available.

2. *Water-supply and Drainage.*—The contractor has not yet completed the standpipe and reticulation for the Kaingaroa forest village; nevertheless, completion is expected at an early date. Reticulation has been completed at Waipa and Minginui Villages; while at Kotaki, Mamaku, Pureora, Karioi, Gwavas, Hanmer, Ashley, Eyrewell, and Golden Downs various improvements have been effected, chiefly by way of extra storage, improved supply, or the installation of booster pumps for emergency fire-fighting service.

Many of the forest villages are not yet large enough to justify an expensive water-supply system which would give immediate fire-fighting pressures; in such cases good storage and a pump for boosting the pressure are provided. Storage by means of concrete-stave tanks has been provided at Wairango (for forest fire protection) Waiotapu, Hanmer, Ashley, Karioi, and Gwavas. A number of small reservoirs have been created behind road fillings to provide supplies for fighting forest fires, while several domestic supplies have been provided or augmented with new bores.

Samples of water have been taken at regular intervals for analysis for the purposes of the pulp and paper scheme. A measuring weir to gauge the flow of a spring-fed possible source of supply for the pulp and paper mill was also constructed.

The provision of all reasonable amenities in forest communities is necessary in order to attract and retain the best type of employee, and one of the most important of these amenities is the installation of a water-borne sewage system. With the development of forest communities and improvements to water-supplies, sanitary drainage has been improved in villages and camps wherever possible.

Architectural

1. *Buildings.*—Very satisfactory progress has been made in three conservancies—Rotorua, Nelson, and Canterbury—with the provision of accommodation for both married and single employees, and also with the construction of essential workshops, garages, stores, &c. Difficulties are still persisting in the arrangement of contracts,

particularly in isolated localities, and in the supply of materials. The following schedule lists the buildings erected and in course of erection according to a broad classification, but does not include activities within the mill grounds at the various State sawmills, which are shown under another heading :—

Type of Building.	Completed During Year.	In Progress at 31st March.
Houses—		
Standard type	36	52
Sawmill workers' type	42	12
Temporary	5	1
Dormitory blocks	..	3
Single men's huts	216	21
Camp ablution block and/or sanitary block	7	5
Camp kitchen—dining-room	1	1
Recreation-rooms	5	..
Plant workshop	4	3
Plant garage	5	2
Power-house (for Diesel-driven generator)	1	..
Stable	1	..
Blacksmith's shop	3	1
Fire depot	3	1
Fire lookout	2	..
Office and/or store	19	..
House renovations	13	..
Buildings removed and re-erected	6	..
Buildings enlarged or altered	11	..
Miscellaneous small buildings	14	1
Sixteen-unit flat	..	1

Building operations connected with the Waipa Mill include the completion of the export dry store, erection of a Quonset hut as a store at the railway, erection of a new yard office, and the conversion of the former plant workshop for other purposes. At the Kaingaroa Mill, additions have been made to the sorting-table, and work has commenced on the permanent log-skids and log-sorting chain. Progress at Conical Hill Sawmill is very slow. A contract has been let for the construction of the main mill building, while a store, dry-loading shed, and log-sorting chain structure have been constructed, and the log pond partially built, by day-labour.

2. *Community Planning.*—The Forest Service is indebted to the Housing Division, Ministry of Works, for planning the layout of forest communities. Localities planned so far include Glenburvie, Tairua, Pureora, Kaingaroa, Minginui, Waipa, Kiorenui, Wairapukao, Karioi, Gwavas, Golden Downs, Hanmer, Balmoral, Ashley, Eyrewell, and Tapanui. Progress is slow, but in many instances streets and footpaths have been formed and kerbing and channelling commenced. Where development is sufficiently advanced, lawns have been sown and recreational facilities provided. No permanent community buildings have yet been commenced, on account of the necessity for concentrating on more essential buildings ; but steel huts have been erected in several of the localities to serve as community halls. The planting of ornamental shrubs will be undertaken during the coming year.

Mechanical Engineering and Transport

1. *Utilization Plants.*—At the Waipa Mill the boiler installation is now sufficient to enable the brickwork and boilers to be given more intensive maintenance than they received prior to 1947. A surface condenser was installed during the past year of sufficient capacity to deal with the exhausts from all engines, and the old condensers were discarded. An alteration was made to the arches of Nos. 2 and 3 boiler furnaces,

which, with an alteration to the design of the fuel chute, improved the flow of fuel to the furnaces. Other boiler furnaces will be treated similarly as opportunity permits.

One generator broke down and was out of action for several weeks, but even with this handicap 65 per cent of the power required was generated by the mill. At the same time steam to the kilns and creosote plant was maintained, except on a few occasions when fuel ran short. Steam heating was also installed in the main office, boxmill office, and girls' rest-room.

No. 7 kiln came into operation in May, after which No. 2 kiln was given a complete overhaul, including the fitting of new fans. In the box-factory a Johnsered bandsaw was installed, and the other machines were maintained. The supply and installation of additional machine tools, partly ex-German reparations, has increased the efficiency of the fitter's shop. The pilot pressure preservative treatment plant came into operation in July, and two open treating-tanks, 37 ft. and 18 ft. long respectively, were added to the commercial treating installation. Part of the area required for the new seasoning-yard has also been cleared.

Apart from minor outbreaks of fire in the boiler-room, there were two fires at the Waipa Mill, but both outbreaks were quickly brought under control by the mill fire brigade.

2. *Plant Workshops.*—In order to cope fully with the repair and maintenance of the mechanical equipment operated by this Service, plant workshops have been erected at Waipa (Rotorua), Karioi, and Golden Downs (Nelson). Further workshops are being built at Pureora, Ashley, and Tapanui. The bulk of the equipment, such as lathes, drilling-machines, millers, grinders, &c., have been obtained from German reparations.

Mechanics, fitters and turners, welders, and other essential personnel have been obtained for the completed shops, and no difficulty is anticipated in obtaining staff for those shops now completing.

3. *Transport.*—The demand for transport is most acute. Many of the vehicles in operation are long past the end of their economical life, and are costly to retain in commission. Expansion of Forest Service activities has developed a demand for new vehicles, which, under the present supply conditions, cannot be procured. In addition, vehicles at present carting logs and sawn timber will in some cases require replacement during the next twelve months.

Thirty-eight new vehicles were added to the fleet; three went to Auckland, fifteen to Rotorua, four to Wellington, three to Nelson, two to Westland, five to Canterbury, and six to Southland. Two ambulances were obtained through the War Assets Realization Board, one going to Pureora and the other to Golden Downs (Nelson).

4. *Logging and Earth-moving Equipment.*—One 12-yard carryall scraper was obtained from the Ministry of Works for use in the Rotorua Conservancy. Two new tractors were purchased during the year, and are now operating at Conical Hill in the production of logs and the maintenance of extraction routes.

Fire Control and Communications

1. *Forest and Rural Fires Act.*—The Forest and Rural Fires Act, 1947, came into force on the 18th November, 1947. All previous Acts authorizing the constitution of fire districts were repealed, but section 53 (2) of the Act provided that fire districts created under any of the repealed Acts were to continue in existence until the 18th November, 1948, or until a new fire district was constituted, whichever was the earlier.

It is likely that eventually 68 rural fire districts will be constituted under the Act; at the present time 62 fire districts containing a total of 4,244,010 acres have been constituted, and are shown in detail in Appendix XII. The remaining 6 rural fire

districts are in the initial process of being constituted. A summary follows showing the number of districts controlled by the various Fire Authorities and the forest areas which are protected :—

Fire Authority.	Number of Fire Districts.
Commissioner of State Forests	45 gazetted and 4 pending.
Rural Fire Committees	6 gazetted and 2 pending.
Local bodies	11 gazetted.
Fire districts protecting—	
State forests	39
Watershed reserves	6
Private forests administered by Rural Fire Committees	5
Private forests owned by or vested in local bodies	5
Development areas administered by other Government Departments	4
National parks and an endowment	3
Crown and Maori land administered by Rural Fire Committee	1

One also includes a national park.

Before an Order in Council constituting a fire district is issued, the Minister is required to advertise the proposals in a newspaper circulating in the locality and deposit a plan and notice setting out the proposals for public inspection ; any person affected is given one month in which to lodge an objection. Any objection received is considered by the Minister or by some person appointed by him, and if it is not well grounded the Order in Council is issued. Ten objections were lodged against the constitution of the various rural fire districts, but there is only one which has not been settled. This objection concerns the Waipori Rural Fire District, administered by the Dunedin City Council as the Fire Authority, but it is anticipated that satisfactory arrangements will be made and the district constituted before the next fire season.

Following the expiry on 18th November, 1948, of the period during which fire districts constituted under other Acts continued in force unless reconstituted under the Forest and Rural Fires Act, 1947, forest-fire prevention and control throughout the Dominion now comes under the provisions of the latter Act, except State Forests, which are not protected by rural fire districts. Such State forests, as hitherto, are administered under the Forests Act. Under the principal Act there was no provision for the administration of areas not controlled by County Councils, but this has been remedied by an amendment authorizing adjoining Fire Authorities or a Conservator of Forests to exercise control over such areas. Another defect revealed in the principal Act is the absence of power for a Fire Committee of a rural fire district to borrow money to meet expenses in the event of an emergency. This is a necessary provision and is favourably recommended for amending legislation. The Act will for the first time be in full force and effect during the 1949–50 fire season, and the rapid progress made in the reconstitution of fire districts ensures that practically all areas of high fire hazard will be covered by its provisions.

It is regretted, however, that mention must be made of the tardiness of certain commercial forest interests in making the necessary preliminary arrangements to have the provisions of the Act applied to the protection of their forests ; they rather appear to be depending on the consequential protection afforded by adjoining Fire Authorities. It is a basic principle of the Act that an owner is required to accept responsibility for the physical protection of his property. It is therefore imperative to have complete coverage and co-ordination in districts embracing a number of owners, and all owners must accept their share of the responsibility. Consequently, in certain instances it may be necessary to apply the provisions of the Act without further prolonged delay to ensure that the administrative machinery is in force during the next fire season.

In counties with a high fire hazard the provisions of the Act are being enthusiastically administered by the County Councils concerned; and with greater knowledge of the powers conferred by the Act the somewhat hesitant action apparent during the previous fire season was not evident during the 1948–49 fire season. Those counties with a lesser fire risk are also taking a greater part in the administration of the Act.

There has been some confusion in catchment districts owing to Catchment Boards being empowered to make by-laws prohibiting the lighting of fires. However, in all cases that have come under notice confusion and duplication have been avoided by co-operation between the Boards and Fire Authorities, provision for which is contained in the Act.

An important provision of the Act authorizes a Rural Fire Officer to prohibit certain operations during periods of fire danger within his district. In a time of emergency the issue of an order by radio will undoubtedly be necessary, and accordingly arrangements have been made with the National Broadcasting Service for the broadcasting of such orders.

To assist the National Broadcasting Service, a roll of Rural Fire Officers is being compiled and will be supplied to that Service for reference purposes. An order for broadcasting may be sent direct to the broadcasting station concerned or through the nearest Conservator of Forests or other forest officer. In any case, the latter officers will be consulted to establish the authenticity of an order, and whether it complies with the provisions of the Act, before it is broadcast. It is provided under the Act that Fire Authorities may act together in the exercise of their powers, and it is important before any order is issued that a Fire Authority should consult adjoining Fire Authorities, because it may be desirable for one order to cover several counties or parts of counties, particularly an order prohibiting the lighting of fires. This procedure was followed in some districts during the past fire season; and in some instances joint action has been agreed upon between counties and between counties and Catchment Boards.

There was a complete absence of serious fires during the last fire season, no doubt due to the activities of local Fire Authorities in hazardous districts; and as the organization for the prevention, detection, control, and supression of fires is strengthened it can be expected that serious fire damage will become history. Close supervision and keen administration are necessary to achieve the objective of the total elimination of dangerous fires throughout the Dominion, and at the same time to assist primary production; but experience during the comparatively short period that the Act has been in operation shows that it will prove an effective instrument when it is fully understood and implemented.

2. *Fire Damage.*—The total number of recorded fires in State forests during the year was 32, of which 24 occurred in indigenous forests and 8 in exotic forests. The area affected was 502 acres; but all except half an acre was tussock, fern, and cut-over land. One fire in an exotic forest unfortunately resulted in the destruction of a forest workers' hostel which was nearing completion.

There were 40 fires outside State forests, affecting an area of 2,024 acres. Of these, 4 fires in private plantations destroyed 552 acres of exotic forest. The remainder were in tussock, fern, and scrub country. Three sawmills were destroyed by fire, and one was damaged by fire following lightning. Details are as follows:—

Destroyed—
Townsend and Lithgow, Mangatapu.
Canterbury Sawmilling and Timber Co., Ltd., Pudding Hill.
Kopara Sawmilling Co., Ltd., Totara River.
Damaged: Aitken and Gillespie, Ltd., Christchurch.

Comparative fire statistics are as follows :—

Year.	Fires in State Forests.		Other Fires.*		Sawmills Destroyed.
	Number.	Area Affected.	Number.	Area Affected.	
		Acres.		Acres.	
1944–45	17	1,990	52	3,920	2
1945–46	62	16,330	311	574,000	9
1946–47	44	1,700	88	2,700	5
1947–48	48	4,200	127	24,800	6
1948–49	32	500	40	2,020	3

* Fires within ten miles of a State forest boundary.

3. *Fire Detection and Control.*—Weather conditions were exceptionally favourable in most districts during the fire season ; well-distributed rains kept the vegetation, which normally drys out towards mid-summer, green to some extent until the autumn freshening of growth. Canterbury was an exception to this, dry and very hot weather with low humidities setting in early in January and continuing with brief respites almost until the end of the fire season. In the central North Island districts there was a short spell of hazardous conditions late in December and again in February.

The number of fires in State forests was the lowest for a number of years ; only one fire occurred in exotic forests, and the damage from this was held to the loss of less than half an acre. This fire started in the centre of the forest while a high and dry wind was blowing, and had it not been for the quickness and efficiency of the fire organization in the forest, serious loss might have resulted.

The assistance given by the Weather Office in providing special forecasts, and the National Broadcasting Service in broadcasting warnings, has again been most helpful. Aerial fire patrols from the Rotorua Airfield were carried out as in previous years ; these patrols, apart from their direct purpose in observing and reporting on fires, are proving a valuable adjunct to our publicity measures in furthering the development of fire consciousness amongst the general public. The aircraft (Austers) now used for the work, with their greater range, better visibility, and comfort for crews, are giving an improved service. The willing assistance and co-operation of the Air Department and Air Force personnel are again gratefully acknowledged. Aerial patrols for other districts were unnecessary this season.

Fire-fighting equipment acquired during the year included 27 locally-built trailers to carry the power-driven pumps mentioned in last year's report, and the necessary accessories, which include 1,060 ft. of $1\frac{1}{2}$ in. hose in three pack-sacks. The trailers are fitted with a standard ball hitch suitable for towing by any vehicle in the Service. The convenience of these pumps for manual transport in rough country, and the ease with which the hose can be run out, make them extremely valuable units of fire-fighting equipment under suitable conditions.

A 100 ft. lookout tower with quarters for a married man was erected at the Eyrewell Forest. Six-bay depots for mechanized fire equipment were erected at the Ashley, Balmoral, Hanmer, and Eyrewell Forests ; and a lookout for the Tapanui group of forests has been practically completed.

4. *Communications.*—New telephone-lines erected comprised 7 miles of earth-working circuit and 9 miles of metallic circuit ; and 7 miles of earthing-working circuit were renewed. The total length of lines is now 536 miles, of which 213 miles are of metallic circuit. A total of 282 fixed instruments is installed ; and 14 portable telephones were purchased during the year, bringing the total to 84.

A radio-telephone installation was completed in the Canterbury Conservancy at Ashley, the control station for that conservancy, the equipment comprising a 45-watt dual-frequency transmitter and associated receiver. The total number of transmitters in use in fixed locations is now 27, as follows :—

Auckland Conservancy	8
Rotorua	16
Canterbury	1
Southland	2

Installations have also been made in a mobile fire-fighting headquarters vehicle, the fire control officer's light truck at Kaingaroa, and the Head Office inspection vehicle. In addition transportable equipment is available in Auckland and Rotorua for use in the field.

Extensions to existing installations are being carried out in the Auckland, Canterbury, and Southland Conservancies, and work is proceeding also in Wellington and Nelson Conservancies. Another mobile fire-fighting headquarters vehicle which has been delivered to Kaingaroa is being fitted with radio. Transportable equipment is being prepared for use where required.

For the forest fire hazard prediction service, data are sent from the control stations of the Auckland, Rotorua, and Canterbury Conservancies to the Post and Telegraph receiving-station at Makara, Wellington, by radio telephone, and thence by line telephone to Head Office. In this way information from remote areas is received for analysis within an hour of the readings being taken, and the extension of the system to other conservancies is in hand.

5. *Water-supplies.*—The continuing shortage of steel and cement has restricted progress in the provision of static water-supplies at strategic points for fire-fighting. A 5,000-gallon concrete tank with a catchment apron was constructed on Ashley Forest. On Golden Downs Forest the construction of rain-storing reservoirs is proving a simple matter. They are simply dozed out anywhere on the ridge tops where there is a sufficient catchment area, the hard compacted subsoil in the ridge tops of the Moutere hills being apparently impervious to water. Such reservoirs hold water during the hot dry summer characteristic of this district with little more than evaporation loss.

CHAPTER VIII—OPERATIONS DIVISION

Inspector in Charge: Mr. W. J. C. Kinloch

Organization and Staff

(1) *Organization.*—No major changes have been made in the Departmental organization during the year, the endeavour being to consolidate changes made in previous years and to develop suitable new officers for the key positions or as understudies to the key officers.

(2) *Staff.*—In common with other organizations, major difficulties are being experienced in securing suitable staff to maintain essential servicing. In any expanding Department this difficulty becomes of major concern, and within the Forest Service applies particularly to the Clerical Division. Trained clerical officers in all grades are simply not available, and the only effective remedy is more intensive training from within—*i.e.*, by short courses and by " on the job " instruction.

The permanent staff now totals 737 and temporary staff 20, making a total of 757, which is a net increase of 133 over last year's figure. New appointees totalled 212, but there were 79 resignations and transfers; new appointees include 17 technical trainees who have commenced practical and theoretical training as future forest officers. Fourteen officers are on leave without pay, of whom 9 are taking a full-time course of study at the University.

Comparative statistics of staff for the past five years are as follows, the figures relating to the 31st March in each case :—

Year.	Permanent Staff.	Temporary Staff.	Total.
1945	254	171	425
1946	309	201	510
1947	325	225	550
1948	600	59	659
1949	737	20	757

(3) *Honorary Staff.*—Under section 18 of the Statutes Amendment Act, 1947 (amendment to section 10 of the Forests Act, 1921–22), all existing appointments of honorary forest rangers lapsed on 31st March, 1948. At the date of expiry, existing appointments numbered 268

During the current year, 119 honorary forest rangers have been appointed under the amended section of the Act.

(4) *Forest Employment.*—A recruiting campaign during July resulted in an increase of over 200, and 110 immigrants from the United Kingdom were allocated to the Forest Service. Unfortunately, there are indications that approximately 60 per cent. of the immigrants electing to undertake forest employment in New Zealand will seek other avenues of employment before the expiry of their two years' term, but those who are content to remain with the Service are proving good employees.

While there has been an improvement in the standard of those seeking forest employment, the large turnover continues to be an unsatisfactory feature. Over the twelve months under review, 2,876 commenced work and 2,670 terminated their employment, giving a net increase of only 206 for the year. The main reasons for the large turnover are probably the higher wage-rates and the opportunities for earning overtime in other avenues of employment, coupled with the isolated nature of forest work. Good forest management requires a relatively stable labour force, and it is obvious that this failure to hold employees is a serious aspect of forest employment. There appears to be no easy solution to this problem, but a possible solution may be found in recruiting youths at school-leaving age and giving them an appreciation of the advantages of forestry as a career, but with emphasis also on the provision of a good standard of amenities and accommodation. The ultimate aim is to develop a stable forest staff against a background of tradition in employment.

Comparative employment statistics showing a doubling of the labour strength over the past five years are as follows :—

Year.	Number of Employees.	
	As at 31st March.	Average for Year.
1944–45	989	992
1945–46	1,299	1,108
1946–47	1,631	1,513
1947–48	1,730	1,675
1948–49	1,936	1,881

(5) *Health and Safety.*—Fully-equipped ambulances are now stationed at five of the major operations ; a registered nurse is employed full time at the Waipa State Mill ; and instruction in first aid is included in the syllabus for training courses for leading

hands. Further attention will be given to the provision of safety equipment, particularly in bush and logging operations. During the year there were 552 accidents, as shown below, but fortunately none were fatal.

Cuts	152	Septic wounds	71
Strains	129	Eye injuries	31
Fractures	18	Miscellaneous	49
Crushes and bruises	102		

Compensation paid to employees :—

Year.	Total Payments.	Total Wages.	Compensation per Centum of Wages (Approximately).
	£	£	£ s. d.
1944–45	5,774	292,483	1 19 5
1945–46	5,548	349,863	1 11 9
1946–47	8,708	497,615	1 15 0
1947–48	6,232	629,948	0 19 10
1948–49	11,988	742,647	1 12 5

Legal

(1) *Forest Legislation.*—The Forests Act, 1921–22, was amended during the year by the Forests Amendment Act, 1948, as follows :—

(*a*) As from 1st April, 1948, the State Forests Account established under the principal Act is abolished, and all moneys standing to the credit of that account are transferred to the Public Works Account. All moneys which would have been payable into the State Forests Account are now credited to such funds or accounts as the Minister of Finance may determine.

All expenditures under the Act are now paid out of moneys from time to time appropriated by Parliament for the purpose. In effect, all expenditure is now a charge on the Consolidated Fund, and not on a separate account as hitherto. In consequence, the amending Act repeals sections 36, 37, 39, and 40 of the Forests Act, 1921–22, and makes the necessary changes in all other statutes affected.

Existing payments of fifths and tenths of revenue to County Councils are maintained.

(*b*) Provision is made for the setting-apart of sanctuaries within State forests for the preservation of indigenous flora and fauna. The constitution of such a sanctuary does not remove the area affected from State forest, but requires the provisions of the Forests Act as to State forests to be applied in a manner which will maintain the purposes of the sanctuary.

(*c*) The Minister is authorized to acquire and to dispose of shares in companies.

(*d*) Powers are also given to deal with the importation and exportation of any tree, tree-seed, timber, or timber product to ensure freedom from disease or insect infestation. These powers are in substitution of section 20 of the Statutes Amendment Act, 1947, which authorized the making of regulations for this purpose.

Additional powers to make regulations are given to deal with machinery matters relating to imports and exports ; also for prescribing the uses, naming, manufacture, drying, treating, grading, handling, sale, supply, distribution, and disposal of timber and manufactured timber products, and for restricting or preventing the use, sale, or disposal of timbers which are in short supply or which require to be conserved. The latter powers replace certain of the powers of the Timber Emergency Regulations 1939 and amendments which were revoked by section 2 of the Supply Regulations Amendment Act, 1948. Power is given also for the constitution, appointment, or election of advisory committees.

(2) *Regulations.*—(*a*) The Timber Emergency Regulations 1939 (1939/148), Amendment No. 1 (1943/106) and Amendment No. 2 (1945/100), and certain provisions of the Supply Control Emergency Regulations 1939 (1939/131), were revoked by section 2 of the Supply Regulations Amendment Act, 1948. Consequent upon this revocation, the appointment of Timber Controller, all Timber Control Notices, and all powers delegated by the Timber Controller under those regulations to other persons lapsed on the 3rd December, 1948.

(*b*) The Timber Regulations 1948 (1948/211), issued under the powers of the Forests Amendment Act, 1948, provide that beech timbers may not be sold unless named as specified in the regulations; also that, except with the written consent of the Director, a Conservator, or other authorized officer, "first-class" (heart) or "medium" kauri timber may not be sold or otherwise disposed of, and no kahikatea or white-pine timber may be used or disposed of for any purpose other than the manufacture of tallow-casks or butter-boxes or use as ships' dunnage; also that tawa timber or manufactured tawa timber products may not be sold or otherwise disposed of except to a person named in an order approved by the Director or other person authorized by him in that behalf. Provision is also made for particulars of timber stocks to be furnished when required; also that rimu, miro, matai, and totara building timbers are to be classified and graded according to the National Grading Rules.

(*c*) The Timber Regulations 1948, Amendment No. 1 (1949/72), revoke the restrictions relating to the use, sale, or other disposal of kahikatea or white pine.

(*d*) The Timber Production Advisory Committee Regulations 1949 (1949/46) provide for the appointment of an advisory committee consisting of the Commissioner of State Forests as Chairman, the Director of Forestry as Deputy Chairman, three persons who are officers of the State Forest Service, Department of Labour and Employment, and Ministry of Works respectively, two persons to represent the Dominion Federated Sawmillers' Association (Incorporated) and the West Coast Sawmillers' Association respectively, two persons to represent the New Zealand Timber Workers' Industrial Union of Workers, one person to represent the Nelson, Westland, and Marlborough Timber Industry Employees' Industrial Union of Workers, and one person to represent the New Zealand Timber Merchants' Federation.

All appointments are made by the Minister (Commissioner of State Forests), and persons other than Government representatives are appointed for a term of one year, but are eligible for reappointment.

(3) *Fire Control Legislation.*—(*a*) The Forest and Rural Fires Act, 1947, was amended by the Forest and Rural Fires Amendment Act, 1948, principally as follows:—

Section 10 is extended to authorize a Fire Authority to act in an adjoining area where there is no County Council or other Fire Authority.

By an amendment to section 11 a Fire Authority is given discretionary power in the matter of Fire Officers residing in the rural fire district to which they are appointed.

An additional clause to section 18 of the principal Act provides that the powers under that section dealing with the prohibition of certain operations during periods of fire danger may be exercised by adjoining Fire Authorities or a Conservator of Forests in any area in which there is no County Council or other Fire Authority.

An addition to section 21 provides that the owner of any exotic forest is to provide two safe alternative routes whereby persons employed in the forest may escape in the event of fire; and a right of appeal to the Fires Appeal Tribunal from a notice given by a Fire Officer to make such access routes is also given.

An amendment to section 26 of the principal Act, which deals with the maintenance of apparatus by persons cutting timber, extends its provisions to provide for securing the safety of personnel from fire.

An amendment to section 35 widens the powers of Fire Authorities to recover costs of fire-fighting from the owner of property menaced by the fire or to apportion costs among the persons interested if a Fire Authority thinks fit. An owner may appeal against the charge to the Fires Appeal Tribunal.

(*b*) The Rural Fire Committee Regulations 1949 (1949/21), issued under the Forest and Rural Fires Act, 1947, provide generally the necessary machinery for the constitution of Rural Fire Committees and the regulating of their procedure. These regulations have general application to all Rural Fire Committees, and they avoid the necessity for repetition each time a Rural Fire Committee is appointed.

(4) *Other Legislation.*—(*a*) Section 5 of the Nassella Tussock Amendment Act, 1948, amends section 65 of the principal Act, and provides that where a Nassella Tussock Board or County Council is of the opinion that any land should be acquired by His Majesty the King for the purpose of controlling or eradicating nassella tussock thereon, the Board or the Council, as the case may be, may request the Minister of Lands to acquire such land.

The Minister of Lands, with the concurrence of the Commissioner of State Forests, may, by notice published in the *Gazette*, declare any land so acquired to be a nassella tussock control reserve. While any such notice remains in force, the land concerned is deemed to be a State forest within the meaning of the Forests Act, 1921–22, and is to be administered by the State Forest Service accordingly.

(*b*) Section 17 of the Reserves and Other Lands Disposal Act, 1948, cancels the reservation as education endowment land over 14 acres, being Section 3, Block III, Rankleburn Survey District, Otago Land District, and sets the land apart as permanent State forest.

Finance and Accounts

(1) *New Financial Basis.*—During the year under review, legislation was passed which effected a change in the method of financing Forest Service activities on the lines mentioned in the last annual report. The State Forests Account (a separate account within the Public Account) was abolished as from 1st April, 1948, by section 3 of the Forests Amendment Act, 1948, the Act providing that moneys should be received into and paid out of such funds or accounts as may be determined from time to time by the Minister of Finance. The accounts at present approved are the Consolidated Fund and the Public Works Account.

The Consolidated Fund is used for the general administrative activities of the Service and, as the fund is financed generally by administrative revenue (taxation, &c.), neither repayment of nor interest on the moneys expended is required. Expenditure from the Fund is appropriated by Parliament under vote: "Forest Administration." The Public Works Account is used in connection with forest development and management, and the development of utilization and administrative units, the Account being financed for this purpose partly by forest revenue and partly by loan-moneys. Appropriation of expenditure is under vote "Forest Development."

Vote "Forest Administration" shows, in addition to the net amount chargeable against the vote, the total payments by way of salaries and other payments to staff for the whole of the Service, and also certain other payments requiring specific appropriation, regardless of which vote finally bears the charges. That portion of the expenditure which finally comes to charge against Public Works Account is provided for by two deductions from vote "Forest Administration," one under "Salaries" and the other under "Other charges." Vote "Forest Administration" provides for the operating-expenses (as distinct from development or establishment expenses) of the departmental utilization units, and the revenue from these units is credited to Consolidated Fund. Vote "Forest Administration" also includes an item "Transfer to Public Works Account: contribution towards cost of forest development," which provides

funds in Public Works Account to meet the costs of those forest activities which do not justify the use of loan-moneys or of forest revenue, the latter being in the nature of "capital" receipts.

The ultimate aim is to distinguish between forest development and subsequent management, but to do this, many problems have still to be solved; and they will probably remain unsolved until the reorganization of the accounting system has been completed and in operation for several years. When this distinction is made, post-developmental management of forests will be financed from Consolidated Fund and only the development work will come under Public Works Account. However, until this can be done, the present framework will ensure that forest finance is on a sound footing, especially as our forest activities are still predominantly developmental. Apart from the question of finance, the estimates show the total cost of staffing and administering the Department, in spite of their being spread over two votes.

(2) *Departmental Accounts.*—Unfortunately, the expenditure for the year could not be recorded under the new system until legislative authority was provided towards end of the 1948 session of Parliament; and this late start, coupled with serious staff difficulties on the accounting side, made it impossible to have the accounts up to date by 31st March, and, in particular, prevented the passage of transfers between the two accounts before the end of the financial year. Appendix XV of this report summarizes the receipts and payments of the Service for the financial year and gives, for comparative purposes, the corresponding figures for each of the four preceding years. Reference to Appendix XV will show that, compared with the previous year, payments increased by approximately £520,000 and receipts increased by £135,000. The predominance of forest-development works mentioned above, and the substantial arrears of silvicultural work, account for the larger increase in expenditure, but, with the approaching maturity of many of our exotic forests, receipts should show a steady increase in future. However, it will be many years before development work is substantially completed and the gap between payments and receipts is materially reduced.

Appendix XVII shows in narrative form the revenue accounts and Balance-sheet for the utilization units for 1948–49, the figures for the previous year being shown for comparative purposes. As the Conical Hill Mill is still in course of establishment, no revenue accounts are shown, expenditure having been capitalized. The 1948–49 accounts are subject to audit, but no material variations are expected as a result of the audit. Provision was made in the estimates for the year for the payment of income-tax by the utilization units with the object of placing these units on a basis directly comparable with similar privately-owned concerns. However, conflicting legislative provisions made this impossible, but the same result has been achieved by the method adopted in drawing up the accounts for the Appendix herewith.

The complete accounts for the Forest Service are set out in parliamentary paper B–1 [Pt. IV]. It had been hoped to have the accounts for the 1948–49 financial year available for publication with this report, but, although substantial progress has been made in building up a practically new accounting staff and in overcoming the arrears of work, it has not been possible to achieve the desired result this year.

Stores

(1) *Stores Administration.*—The growth of the Service in recent years has demonstrated the need for a fully-organized Stores Section specializing in this work. Appointments have now been made to form the nucleus of a stores Section, the stores system has been improved, and a course of instruction for Stores clerks was held during the year to standardize the improved system.

(2) *Stores Supply.*—During the year there has been a steady improvement in the supply position as regards most of the items required by the Forest Service. More stores are readily available from merchants' stocks, and indent deliveries are becoming faster, but shortages still exist in numerous lines.

INFORMATION

(1) *Publications.*—There is a great need for the Forest Service to resume publishing as actively as before the war. Not the least valuable part of the Forestry Library consists of the research publications of other forestry bodies sent to it on the understanding that the publications of this Service would be sent in exchange, but, except for its annual report, the Forest Service has had little with which to meet its exchange obligations. Within New Zealand, public interest in long-term forest policies is considerable, and if the Forest Service does not go out to meet the public with information, it is liable to be involved in unfortunate controversies, which will be damaging to its good relations with the public. At the present time it is all too clear that, while the public is well informed about the Forest Service's part in the development of the timber industry and in the planting of the extensive exotic forests, it knows but little of the Service's research activities and operations directed towards the regeneration of the indigenous forests of New Zealand.

For these reasons a departmental Publication Committee was set up during 1948 and has since met regularly. Broadly speaking, two series of publications are projected: a research series publishing the results of original research, such as that carried out by the Forest Research Institute; and an information series which will meet the timber industries' need for a flow of up-to-date information on the utilization of timber, and the general public's need for some interpretation of long-term forest policies and reports on forestry operations. A number of bulletins are now being written, and two have been sent to printers—namely, "Accounting in the Timber Industry" and "Forestry in New Zealand." The reprinting of some bulletins which are out of print is under consideration, also publication of volume tables for the estimation of standing timber.

During the past year the writings of Forest Service officers have appeared in various journals, including the *New Zealand National Review*, the *British Empire Forestry Review*, and the *New Zealand Journal of Forestry*, which printed two notable papers read to the Pacific Science Congress: C. M. Smith's "Acclimatization versus Domestication of Forest Species," and J. T. Holloway's "Ecological Investigations in the Nothofagus Forests of New Zealand." Newspaper reporters have been encouraged to call on the Forest Service, and a significant outwards flow of information has been maintained.

(2) *Library.*—The Forestry Library in Wellington now holds nearly 2,000 books and some 5,000 bulletins and pamphlets, and it receives regularly more than 100 trade and technical periodicals. The Forest Research Institute in Rotorua also has a fairly large specialist library, and conservancy offices and forest stations hold small collections of standard works. The central library, of course, serves the whole Forest Service, not only the Wellington office. The task of recataloguing the whole book stock in accordance with modern library practice was completed during the year; and half the stock of pamphlets was recatalogued. Catalogue cards for all the books in the Library are held in the National Library Service Union catalogue, so that the books are available to all libraries which subscribe to the library interloan system.

(3) *Motion Pictures.*—"Timber Harvest," a documentary film on the sawmilling industry, was commissioned by the Forest Service in 1948 for screening at the Australia - New Zealand Timber and Forestry Conference in April. It aroused a great degree of interest in delegates to the conference, and it was later released for general exhibition by a national theatre circuit, being seen by several hundred thousand people. In a year of record timber production, "Timber Harvest" served as a timely tribute to the industry.

The place of films in forestry training was demonstrated during the year by an instructional film purchased from the United States Forest Service and a film commissioned by the New Zealand Forest Service to demonstrate the use of certain equipment in fighting forest fires. Apart from their use in staff-training, these films

were found useful to demonstrate advances in the technique of controlling forest fires to the annual conference of the United Fire Brigades' Association and other fire-control bodies.

(4) *Forest Fire Publicity.*—Publicity was again used as a weapon against forest fires in the 1948–49 fire season—October to March. It consisted chiefly of display advertising in rural and metropolitan newspapers, backed up with radio broadcast warnings at times of exceptional danger. Other publicity media such as posters and roadside warnings were also used. The Soil Conservation and Rivers Control Council was again associated with the Forest Service's anti-fire publicity, and the press co-operated by featuring news stories which quickened the public's interest in the campaign.

Such publicity is an economical anti-fire weapon. There is no direct way of measuring its effect on the occurrence of forest fires, but it goes to the root of the matter: forest fires are started by men, whether carelessly or deliberately, not by natural agents. The purpose of the annual fire-prevention campaign is to cultivate a general sense of responsibility in the use of fire in scrub and grass lands bordering forests as well as in forests themselves, and to make it second nature for smokers to stamp out cigarette-butts and pipe ash. It sets out, too, to make every member of the public realize his duty to put out or report any fire endangering a forest. In this it is complementary to the Forest and Rural Fires Act, which gives to all citizens specific duties for the suppression of fires.

CHAPTER IX—FOREST ECONOMICS AND TRADE

Timber-production

(1) *Sawn Output.*—There has been a spectacular increase in timber-production during each of the past two years. Last year's report placed the total sawn output at 429,000,000 board feet, but when the final scrutiny of all figures was completed after publication of the report a further 4,000,000 board feet was added, making the total for 1947–48 433,000,000 board feet. For the year ended 31st March, 1949, there was an increase of 41,000,000 board feet, and the total cut of all species was 474,000,000 board feet, details by districts and species being given in Appendix VII. These statistics are provisional pending the official collection and publication of sawmilling statistics by the Government Statistician, but they are based on declarations furnished by sawmillers under the Sawmill Registration Regulations and therefore can be accepted as authoritative.

Such an increase of 34 per cent. from 354,000,000 board feet in 1946–47 to 474,000,000 board feet in 1948–49 is remarkable. The most significant feature, however, is the shifting of the incidence of production; of the total increase of 41,000,000 board feet last year, 36,000,000 board feet relates to the North Island and 31,000,000 to the Rotorua Conservancy. The detailed figures in Appendix VII emphasize the dominant importance of the Rotorua region as a source of timber-supplies. With a total sawn output of 153,000,000 board feet, this region now accounts for about one-third of the national output, and it almost equals the entire output of the South Island.

Production in the North Island during the past year was 315,000,000 board feet, and in the South 159,000,000 board feet. Thus, having regard to population and the effective level of demand, production in the two Islands is probably now in a better state of balance then ever before. Shipments of sawn timber from the South Island to the North—so regular a feature of the pre-war years—can now be regarded as virtually a thing of the past.

Production of insignis pine at 153,000,000 board feet showed an increase of 17,000,000 board feet on the previous year; including other minor species, the total output of exotic timber was 161,000,000 board feet, which is equal to 34 per cent. of all timber sawn, and the highest figure, both relatively and absolutely, yet reached. It is worthy of mention, however, that the production of exotic species is virtually static in all conservancies except Rotorua, and Auckland, still dependent principally on farm woodlots and shelter-belts, shows a small decline. Production of larch at a little over 4,000,000 board feet assumes some significance for the first time.

Among the indigenous species there are both increases and decreases. Production of rimu and miro is up by 18,000,000 board feet on the previous year, matai is up by 4,000,000 board feet and totara, by 1,000,000 board feet. Beech, kauri, and white-pine show little change; and tawa shows a decline of 2,000,000 board feet. However, though total production of indigenous species was more than 20,000,000 board feet above the figure for 1947–48, it is likely that the peak has been reached; and a progressive decline in the output of indigenous timber is expected to commence next year.

(2) *Sawmills in Operation.*—There has been a rather remarkable increase in the last few years in the number of sawmills in operation, the number having risen by 50 per cent. during the past five years to a total of 692 as at the 31st March, 1949. Comparative statistics for the five-year period are as follows:—

Year Ended 31st March,	Mills Registered as at 31st March.
1945	452
1946	445
1947	527
1948	608
1949	692

The increase, incidentally, has been distributed almost uniformly between the North and South Islands, both showing an increase of just over 50 per cent. for the five years. This contrasts rather strangely with the relative increase in timber-production referred to in the preceding paragraph, and reflects a tendency towards a smaller-capacity mill in the South Island. This in turn is a reflection of the relative weakness of the South Island in timber resources.

It is evident that new mills continue to greatly exceed mills cutting out and ceasing operations; nevertheless, the current high level of almost 700 sawmills must be near the peak, with little likelihood of any further significant increase. Many of the mills, of course, are quite small; some are only part-time ventures which cut very nominal quantities of timber. The average output for all registered mills was only a little over 500,000 board feet.

(3) *Equipment and Supplies.*—The general position has not improved to any significant extent since the previous year. Tractors, trucks, and spare parts are still very difficult to obtain, and many of the tractors at present in use by sawmillers are too old to give satisfactory service in bush operations. Saws, too, have been in short supply, especially large circular saws and crosscuts. Wire rope also has been difficult to obtain. The high cost of essential supplies is reflected in a recent consignment of tram spikes obtained from Sweden by an operator in Southland, the price being £144 per ton, as compared with £38 for a similar article of English origin in 1938.

In some districts power saws are being used to an increasing extent in felling operations. There has also been a further advance in the conversion from steam to Diesel haulers, locomotives, and tractors, and the adoption of electric power in place of steam for driving mill machinery is on the increase.

(4) *Man-power.*—Statistically there has been a decided improvement in the man-power position during the past two years, as shown by the following comparative figures published by the Department of Labour and Employment for the labour strength of bush sawmills:—

	Men Employed.
October, 1946	5,280
October, 1947	5,800
October, 1948	6,370

This is an increase of 20 per cent., which for a period of only two years can be considered very good. However, it must not be overlooked that production has moved to levels far above all past attainments, and the demand for timber is still keen; and that is why, despite the statistical improvement, there is still a relative shortage of men. In some districts the position is reported to be satisfactory, but on the whole there is a shortage of experienced men. Units in isolated localities, also those which can provide only sub-standard accommodation, naturally experience the greatest difficulty in staffing their operations. The sawmill housing scheme is generally acknowledged to have been of great value in attracting and retaining men. In isolated situations where housing of a good standard is already available, sawmillers are endeavouring to improve the position further by providing recreational facilities and other amenities. In certain operations working-hours are staggered to enable residents of isolated communities to visit shopping centres without loss of wages.

During the past year a considerable number of immigrants were allocated to the sawmilling industry, and, while these men cannot yet be considered skilled personnel from the viewpoint of New Zealand conditions, it is believed that those who remain in the industry will give good service. Unfortunately, a significant proportion clearly do not intend to stay beyond the expiry of their two-year term.

(5) *Accommodation.*—Good progress has been made with the erection of houses under the Sawmill Housing Scheme, 250 being erected during the year. In addition, a further 68 were in course of erection at the end of the year. Houses in occupation totalled 312 at 31st March, 1949.

Since the inception of this scheme 207 applications, covering 823 houses, have been before the Timber Production Advisory Committee. These applications have been dealt with as follows:—

Committee's Decision.	Applications.	Houses.
(1) State Advances Corporation recommended to provide houses	157	661
(2) Deferred for further consideration	5	12
(3) State Advances Corporation recommended to decline application	45	150
(4) Subsequently withdrawn by applicant ..	7	18

At the close of the year a further 12 applications for 49 houses were under action. The 318 houses already erected under the Housing Scheme were a most welcome help in improving the standard of accommodation in the industry; and by attracting men to the industry, the scheme has proved a very material factor in increasing timber-production. In addition to receiving assistance from the scheme, some millers have also erected good accommodation on their own account.

Assistance from the Sawmill Housing Scheme has been confined to improving accommodation for married men at mills operating in indigenous forest. The period during which the scheme was to operate is due to expire on the 1st September, 1949, and with timber-production now at a satisfactory level, and with a substantial number of houses yet to be erected, an extension of the scheme cannot be supported.

Home Timber Trade

(1) *Supply and Demand.*—Production of timber is now in excess of domestic demand, and such difficulties as do exist arise chiefly from the altered incidence of species and grades as compared with the supply in pre-war years. In other words, though the physical timber-supply is more than sufficient for all requirements, consumers generally are still sensitive to the restricted supply of the better grades on indigenous timber. The shortage is purely one of quality, and it is becoming of less and less significance as the use of exotic species widens. Export markets provide a ready outlet for all surplus timber.

After allowing for exports and imports, and disregarding stocks which cannot be accurately ascertained, the total sawn-timber supply during the year was a little over 460,000,000 board feet, as against approximately 440,000,000 board feet the previous year. Buyers are exercising greater discrimination as regards quality and grades, and merchants' stocks have improved. There are, however, certain local exceptions: Wairarapa, Taranaki, and the Gisborne – East Coast region are deficient in timber as a result of negligible local resources and the relative remoteness of these districts from timber-producing centres. The most satisfactory long-term solution is the establishment of exotic forests and farm woodlots in these areas. In the short-term, however, these districts undoubtedly can improve their position by a better appreciation of the merits of exotic timbers as substitutes for indigenous timber.

The demand for the secondary commercial species, tawa and rewarewa, declined during the year, and in some cases applications were received from sawmillers for the exclusion of these species from block timber sales. The prospects for an improvement during the coming year are good now that the industry is conscious of the necessity for treating the sapwood of these timbers against insect attack and decay, and is taking steps to install plants for this purpose.

The wider acceptance of exotic species for building purposes has contributed in no small measure to the easing of the supply situation; and the relaxing of restrictions on the erection of garages and farm buildings has facilitated the disposal of the lower grades both of exotic and indigenous species. The demand for white-pine has altered with the reduction in usage of the wooden butter-box by the Dairy Board, and difficulty has been experienced in disposing of some grades of this species. Consequently, since the year closed control over the use of this species has been abandoned.

(2) *Timber Prices.*—In July the Dominion Federated Sawmillers' Association submitted at a public hearing their application to the Price Tribunal for price increases to cover higher labour costs arising out of the West Coast Timber Workers' award of 12th April, 1948. The association also submitted the results of the conomic survey of the industry conducted in 1947, claiming increases to restore the economic position to that of 1939, to cover increased incidental costs, adequate depreciation, the cost of insurance, and the balance of the amount claimed to cover increased costs arising from the general wage increase of October, 1947, which had not been granted in full by the Tribunal. The Tribunal granted the following increases operative from 11th August, 1948:—

(*a*) *Indigenous Timbers:*—

	North Island.	Nelson and Marlborough.	West Coast.	Southland and Otago.
	(Per 100 board feet)			
	s. d.	s. d.	s. d.	s. d.
Balance increased wages cost arising from award of 1st October, 1947	0 4	0 3	0 3	0 4
Increased wages cost, West Coast award of 12th April, 1948	..	..	1 1	..
To cover increased incidental costs ..	0 3	0 3	0 3	0 3
To restore 1939 profit margin ..	0 9	..	..	0 5
Total	1 4	0 6	1 7	1 0

b) *Exotic Timbers.*—An increase of 3¼d. net was granted throughout the Dominion to cover increased wage costs.

The Tribunal decided that price-lists should be amended to remove certain anomalies in sawmillers' lists, approving for this reason a premium of 2s. for 100 board feet on certain sizes and grades of building timbers. It is to be hoped that this premium will curb the tendency of some millers to cut timber to large sizes rather than incur the increased cost of cutting to building dimensions in common demand.

On the 5th January, 1949, a new New Zealand Timber Workers' award came into operation providing for increased wages and also travelling-time. As from the 8th March, 1949, the Tribunal granted a price increase of 15·4648d. per 100 board feet net for indigenous timber produced in the North Island and Southland, and 11·1614d. for Marlborough and Nelson. An increase of 10·956d. net was granted for exotic timbers. Prices for white-pine produced in North Auckland have been placed on a basis "ex mill yard." Corresponding increases were granted to timber-merchants, who also in some cases received approval to pass on increased yard costs.

The rate of increase in prices has accelerated during the year, and it is to be noted that prices for indigenous timbers increased more than those for exotic timber. This trend is desirable in view of the pending decline in indigenous-timber production, and the desirability that prices should reflect the true relative worth of indigenous and exotic timbers. It is also inevitable if indigenous timbers are to be extracted from the more remote areas. Indeed, to ensure proper utilization, prices for indigenous timbers should be considerably above present levels.

(3) *Utilization.*—Although production of indigenous building timbers again increased substantially, further progress was made during the year in their substitution by insignis pine, larch, white-pine, and tawa. The concentration of carpenter labour on housing led to the building of approximately double the number of dwellings erected annually during the peak pre-war years, and this was largely responsible for the scarcity of rimu, matai and totara, and their partial replacement by other timbers.

Good progress was made in the use of insignis pine for house framing above ground-floor level, and growing interest was shown in this timber for weatherboarding and flooring. For these latter purposes users generally demanded that the timber be treated with preservatives, but for scantling, although some treated insignis pine was used, the bulk of supply was untreated. The Forest Service lost no opportunity to stress the necessity for adequate precautions in handling and storage if insignis pine is to give satisfactory use without preservative treatment.

White-pine and tawa when used in first-class housing work were invariably treated with preservatives. In most instances these timbers were used to replace rimu and matai for flooring.

It is somewhat anomalous that the greatest use of insignis pine and other woods in substitution for timbers usually used occurred in towns which had the best supply of rimu and matai. In Taranaki, Wairarapa, and Gisborne, where indigenous building timber is generally in acutely short supply, progress in the use of substitutes has been much less than in Auckland. It is true that none of the districts named possess a single dry kiln or adequate facilities for timber treatment, but failing provision of such services locally it is inevitable that timber-users in those areas will have to rely to an increasing extent upon drying and treating facilities in other provinces.

The abnormal housing programme has entailed such an increased usage of timber that other industries have been compelled to seek substitutes for the general-purpose indigenous timbers, particularly rimu. Joiners, cabinetmakers, and furniture-manufacturers have found it necessary to vary their normal customs of timber usage and to accommodate their designs and technique to the use of insignis pine to an increasing extent. In these fields good progress was made during the year, and it can now be said that a solid foundation has been laid for the permanent substitution of rimu by insignis pine for a wide range of cabinet work and furniture.

Overseas Timber Trade

(1) *Timber Imports.*—Total imports were much higher than the figure for the previous year, but this was entirely due to very large shipments of railway sleepers. Of the total inwards timber traffic of 45,000,000 board feet, almost 23,000,000 board feet were sleepers. Sleepers, of course, have been in short supply for some years, but imports for the past year are the highest since the peak in 1924. The volume of the import trade was due to a very marked improvement in the shipping position.

Sawn timber accounted for only 16,000,000 board feet, as against 20,000,000 board feet in the previous year; Douglas fir was very much less, due to the scarcity of dollar funds, and cedar also was slightly less. Redwood, on the other hand, showed a significant increase. One of the important developments in the import trade was the reappearance of Japanese oak for the first time since Japan entered the war, the popularity of this timber for furniture-manufacture being such that at 730,000 board feet supply was very much below demand. Total imports at 45,000,000 board feet are the highest since 1930. Long-term import statistics are given in Appendix V.

(2) *Timber Inspection.*—Evidence of injurious insects entering the country in imported timber, despite inspection at the source of shipment, has shown the need for meticulous care if New Zealand is to be protected from serious depredations by introduced insects. Termites entering the country in poles, sleepers, and other hardwoods imported from Australia have been giving cause for concern, and during the year a Timber Inspection Branch was set up with full responsibility for carrying out control measures at ports of entry. All timber imports are inspected, inspection being carried out both at the ship's side during all hours of unloading and also at nearby holding-yards approved for this purpose. Quarantine yards were established at Auckland and Wellington, and several sites were inspected at Tauranga preparatory to the establishment of a yard at the latter port. At other ports the owners of infested produce have it treated under the supervision of a Timber Inspector. Infested material is treated by two main methods:—

(*a*) Creosote treatment as laid down in the basic inspection directive.
(*b*) Pressure treatment with wood preservatives composed of chemicals of proven toxicity. (This treatment has been tentatively approved for large quantities of infested produce that cannot be handled by a quarantine yard or the staff at present available for this work.)

Great care is exercised during the inspections, and a very high degree of immunity from termite infestation is secured. With the present precautions being taken—*i.e.*, import inspections by the Forest Service and destruction of established colonies by the State Advances Corporation and various local bodies—it is unlikely that there will be any significant increase in the termite menace. It appears that this pest is fairly successfully controlled at present, and the longer these precautions are in force the more successful control will become. It is highly improbable that an epidemic situation will result from introduced termites, as conditions over the greater part of New Zealand are against the establishment of the various Australian species. A reduction in the termite colonies that have become established has already been achieved by local bodies as a result of conscientious application of sound control measures. There is no evidence that termites present a serious threat to New Zealand forests.

(3) *Timber Exports.*—Exports reflected the marked improvement in the trans-Tasman shipping position and also the buoyant level of timber-production during the past two years. The total quantity of sawn timber shipped from New Zealand was 23,000,000 board feet, practically all of which went to Australia. This improvement in reciprocal trade has materially assisted this country to secure greater quantities of hardwoods from Australia. The largest single item was sawn insignis pine, 13,500,000 board feet, which was almost treble the previous year's figure. Rimu, matai, beech, and

white-pine all showed increases, the increase in the last mentioned being a reflection of the difficulty in disposing of the lower grades on the domestic market. However, this increase in the export of indigenous species is purely temporary, for within a year or two export of indigenous timber is expected to be down to an insignificant level.

During 1948, exports reached their highest level since 1936, and it is expected that a very important upward movement will develop during the next few years. A graph in the Appendix shows the movement of exports and imports annually since 1885, with exports projected to show the rapid rise in outward shipments which will follow the wider development of the exotic forests. This graph not only shows the high levels reached by the timber export trade in past years, but also shows that within a few years exports are likely to be as much as 50 per cent. above the previous peak year.

Exports of exotic timber are inspected both in the mill yard and at the ship's side for the presence of harmful insects, sapstain, and incipient decay, and also to check moisture content and over-all general appearance, including square end docking and freedom from bark. Exports of white-pine are also checked to ensure that only permitted grades are exported. Long-term statistics of exports by species are given in Appendices III and IV.

Trade Relations

(1) *Timber Production Advisory Committee.*—The Timber Production Advisory Committee was originally constituted under Emergency Regulations, but by the Timber Production Advisory Committee Regulations 1949 the Committee becomes a permanent body with the same functions as under the Emergency Regulations.

The Committee held three meetings during the year, the membership remaining unchanged. Among the matters considered by the Committee were immigration, both from Great Britain and of displaced persons, ambulance services in country districts, and problems of transport. The Committee continued to advise the State Advances Corporation concerning the Sawmill Housing Scheme, and assisted with the collection of the sawmill housing levy.

(2) *Timber Control.*—The Timber Control Emergency Regulations 1939 were revoked in December, 1948, and were replaced by the Timber Regulations 1949. With the revocation of the Timber Emergency Regulations, the office of Timber Controller was abolished and control over sales of standing timber was discontinued. Control over the sale of heart and medium kauri, and white-pine, was reimposed by the Timber Regulations 1949.

(3) *Liaison and Advisory Services.*—The principal activities under this heading during the past year were—

(*a*) Investigation of sawmillers' applications for houses under the Sawmill Housing Scheme, and submission of reports to the Timber Production Advisory Committee.

(*b*) Investigations in connection with the rationing of butter and petrol; and furnishing of recommendations to the Oil and Food Controllers.

(*c*) Assistance to the timber industry in regard to items of essential equipment in short supply.

(*d*) Investigations on behalf of the Rehabilitation Department in the case of applications for rehabilitation assistance from ex-servicemen in the sawmilling industry.

APPENDIX I

Area of State Forests as at 31st March, 1949

(With summary for years 1920–48)

Conservancy and/or Year.	Permanent State Forest.		Provisional State Forest.		Total Area Under State Forest.	Percentage of Total Land Area Under State Forest Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	
Auckland	443,216	89,789	134,713	13,719	681,437	7·92
Rotorua	702,210	286,760	180,374	62,572	1,231,916	15·6
Wellington	1,094,190*	41,135	37,615	3,808	1,176,748	9·72
Nelson	1,124,828	213,151	793,113	522,217	2,653,309	37·86
Westland	923,946	355,685	364,105	225,580	1,869,316	48·38
Canterbury	488,223	3,647	..	..	491,870	4·94
Southland	572,452	56,234	608,108	13,740	1,250,534	7·36
Totals, 1949 ..	5,349,065	1,046,401	2,118,028	841,636	9,355,130	14·09
1948 ..	5,215,847	1,046,429	2,119,154	846,115	9,225,549	13·9
1947 ..	5,157,086	1,047,671	2,114,874	847,978	9,167,609	13·81
1946 ..	5,189,996	1,047,671	2,104,118	847,978	9,189,763	13·84
1945 ..	5,110,032	1,047,671	2,093,471	847,989	9,099,163	13·7
1944 ..	5,038,649	1,050,839	2,089,565	847,998	9,027,051	13·6
1943 ..	4,862,291	1,010,971	2,189,932	889,600	8,952,794	13·5
1942 ..	4,704,289	1,010,971	2,174,690	912,219	8,802,169	13·26
1941 ..	4,668,127	1,008,600	2,169,874	915,478	8,762,079	13·20
1940 ..	4,220,368	817,794	2,304,772	1,107,612	8,450,546	12·72
1939 ..	4,045,082	739,337	2,404,633	1,165,809	8,354,861	12·58
1938 ..	3,651,327	731,922	2,574,472	1,164,969	8,122,690	12·24
1937 ..	3,465,314	727,825	2,593,510	1,168,740	7,955,389	11·98
1936 ..	3,309,726	733,967	2,693,975	1,172,504	7,910,172	11·91
1935 ..	3,185,053	687,403	2,792,841	1,222,988	7,888,285	11·88
1934 ..	2,634,558	391,231	3,345,021	1,510,761	7,881,574	11·87
1933 ..	2,552,678	367,328	3,388,371	1,533,061	7,841,438	11·81
1932 ..	2,033,218	162,815	3,892,660	1,739,430	7,828,123	11·79
1931 ..	2,029,008	97,829	3,888,202	1,746,127	7,761,166	11·69
1930 ..	1,945,218	91,029	3,947,154	1,715,850	7,699,251	11·60
1929 ..	1,973,485	91,029	3,946,325	1,733,611	7,744,450	11·6
1928 ..	1,947,872	..	5,664,347	..	7,612,219	11·66
1927 ..	1,861,213	..	5,669,361	..	7,530,574	11·54
1926 ..	1,770,581	..	5,686,700	..	7,457,281	11·38
1925 ..	1,758,513	..	5,630,668	..	7,389,181	11·3
1924 ..	1,674,844	..	5,661,830	..	7,336,674	11·2
1923 ..	1,611,212	..	5,619,466	..	7,230,678	11·06
1922 ..	1,689,511	..	5,404,806	..	7,094,317	10·8
1921 ..	1,678,672	..	5,134,651	..	6,813,323	10·25
1920 ..	1,666,302	..	3,293,372	..	4,959,674	9·40

* Includes 62,274 acres vested in the Wellington City and Suburban Water Supply Board, not previously shown.

APPENDIX II—Summary of Planting and Silvicultural Operations in State Exotic Forests as at 31st March, 1949. (Areas shown in acres)

Forest.	Year of Commencement.	Gross Area of Forest.	Total Net Area Planted.	New Area Planted During Year.	Area Treated During Year.			
					Low-pruned.	High-pruned.	Thinned.	Clear-felled.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mangonui ..	1944	8,927	3	..	..	..	..	..
Waipoua ..	1925	12,600	4,423	250	383	25	59	..
Puhipuhi ..	1904	1,565	1,209	..	6	..	..	..
Glenbervie ..	1945	5,075	410	124	..	..	..	..
Whangapoua ..	1948	20,000	10	10	..	..	..	..
Riverhead ..	1926	11,965	10,592	..	89	172	573	..
Tairua	1930	48,500	13,812	195	865	3	234	..
Kauaeranga ..	1940	4,000	761	80	86	..	..	..
Maramarua ..	1928	14,087	12,311	..	130	7	65	..
Rotoehu ..	1937	38,559	6,034	357	498	2	2	..
Whakarewarewa ..	1898	10,065	7,782*	43	25	112	239	203
Kaingaroa ..	1901	354,503	267,648*	1,005	533	93	272	264
Tongariro ..	1937	4,500	2,434	124	..	..	..	..
Erua	1930	6,648	4,390	..	63	..	..	..
Karioi	1927	25,974	16,922	..	394	126	..	..
Gwavas ..	1944	8,983	513	378	..	..	..	..
Ngaumu ..	1942	6,751	361	269	..	..	..	..
Golden Downs ..	1927	49,521	23,940	588	133	..	27	..
Rimu	1922	5,839	3,091	..	150	..	..	..
Hanmer ..	1901	10,661	7,691	..	171	..	136	..
Balmoral ..	1916	24,138	21,141	..	971	..	6	..
Eyrewell ..	1928	19,268	17,312	..	1,159	..	..	..
Ashley	1939	6,576	2,476	303	193	..	..	..
Naseby	1900	4,032	3,088	..	132	58	3	7
Herbert ..	1948	3,269	5	5	..	..	..	..
Berwick ..	1946	7,554	309	153	..	..	..	..
Allanton ..	†	1,676	..	..	..	..	..	..
Akatore ..	†	3,908	..	..	..	..	..	..
Dusky	1898	6,867	4,266	..	65	889	219	..
Tapanui ..	1901	6,086	2,357	3	68	140	67	..
Beaumont ..	1927	10,000	6,554	..	47	3	41	..
Conical Hills ..	1903	4,923	4,444	105	5	157	21	5
Pebbly Hills ..	1930	5,330	4,369	10	491	456	15	..
Minor Areas ..	1875–1946	13,216	4,417	565	72	..	15	..
Totals, 1948–49	..	765,566	455,075	4,568	6,729	2,243	1,994	479
1947–48	..	735,074	449,738	2,819	6,743	1,983	1,245	451
1946–47	..	721,448	446,923	839	6,556	932	1,055	412
1945–46	..	712,212	447,494	553	5,340	458	574	234
1944–45	..	715,109	447,163	1,748	4,673	391	952	276
1943–44	..	673,157	445,680	1,183	3,887	505	782	145
1942–43	..	654,966	444,441	1,540	2,265	729	1,468	134
1941–42	..	664,730	443,281	3,922	4,917		1,486	167
1940–41	..	663,626	439,804	4,455	9,406		2,518	138
1939–40	..	657,491	437,110	6,447	..		..	..
1938–39	..	644,552	430,742	2,711	..		..	..
1937–38	..	617,568	428,210	1,705	..		..	..
1936–37	..	592,781	426,163	6,701	..		..	..
1935–36	..	598,592	419,553	12,090	..		..	..
1934–35	..	597,151	406,179	12,211	..		..	..
1933–34	..	596,765	393,998	30,532	..		..	..
1932–33	..	595,623	363,677	15,958	..		..	..
1931–32	..	591,012	347,959	41,009	..		..	..
1930–31	..	‡	307,003	53,752	..		..	..
1929–30	..	‡	246,525	56,600	..		..	..
1928–29	..	‡	196,580	57,420	..		..	..
1927–28	..	‡	133,997	35,106	..		..	..
1926–27	..	‡	98,891	19,924	..		..	..
1925–26	..	‡	78,909	15,964	..		..	..
1924–25	..	‡	62,945	11,120	..		..	..
1923–24	..	‡	51,627	7,207	..		..	..
1922–23	..	‡	44,646	2,862	..		..	..
1921–22	..	‡	41,868	3,408	..		..	..
1920–21	..	‡	38,460	1,381	..		..	..

* Includes regenerated areas not previously shown. † New projects. ‡ Not available.

APPENDIX III

Annual Exports of Sawn Timber From New Zealand, 1885–1948

(Volume of exports in thousands of board feet)

Source of Data.—"Trade and Shipping" reports by Census and Statistics Department with provisional figures for years 1945–48 furnished by Customs Department

Calendar Year.	Whitepine.	Rimu.	Beech.	Matai.	Kauri.	Insignis Pine.		Other Species.	Total.
						Sawn.	Cases.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1948 ..	140	4,040	1,177	2,300	9	13,612	816	752	22,846
1947 ..	3	1,289	909	762	26	4,575	1,259	33	8,856
1946 ..	50	2,615	650	75	24	1,535	2,582	133	7,951
1945 ..	38	690	927	30	19	575	1,249	560	4,133
1944 ..	206	2,422	994	78	9	63	507	87	4,318
1943 ..	137	2,261	719	31	18	428	731	167	4,539
1942 ..	334	5,412	142	213	50	685	784	37	7,475
1941 ..	835	13,960	1,273	747	55	..	1,595	1,142	19,073
1940 ..	732	11,808	1,575	490	174	..	1,578	793	17,407
1939 ..	3,137	6,673	1,258	563	303	..	1,222	251	13,334
1938 ..	2,021	7,407	2,427	1,829	666	..	1,263	247	14,594
1937 ..	2,795	8,711	2,076	2,142	639	..	1,478	188	17,716
1936 ..	14,860	6,095	2,033	2,842	937	..	899	77	27,043
1935 ..	22,708	9,010	2,766	..	627	..	1,607	82	39,642
1934 ..	22,791	7,151	2,410	..	679	..	712	827	34,570
1933 ..	19,533	3,642	1,375	..	411	..	692	188	25,841
1932 ..	22,265	2,061	1,475	..	674	..	619	198	27,292
1931 ..	14,823	929	740	..	451	..	418	190	17,551
1930 ..	19,187	3,501	1,974	..	1,088	..	..	947	26,697
1929 ..	30,492	3,123	3,016	..	2,123	..	..	400	39,154
1928 ..	25,438	4,867	2,246	..	1,670	..	..	817	35,038
1927 ..	27,801	3,842	2,581	..	2,476	..	..	476	37,176
1926 ..	31,768	4,008	2,393	..	1,987	..	..	5,556	45,712
1925 ..	39,748	3,710	2,221	..	3,239	..	..	2,630	51,548
1924 ..	33,376	5,451	1,329	..	1,946	..	..	1,221	43,323
1923 ..	34,898	7,575	1,267	..	3,011	..	..	1,343	48,094
1922 ..	35,178	4,697	710	..	3,018	..	..	611	44,213
1921 ..	31,561	7,834	965	..	2,632	..	..	2,856	48,849
1920 ..	50,064	14,745	221	..	1,179	..	..	3,457	69,666
1915 ..	50,789	14,196	142	..	9,096	..	..	2,609	76,832
1910 ..	..	..	..	..	..	..	..	..	82,000
1905 ..	..	..	..	..	..	..	..	..	75,900
1900 ..	..	..	..	..	..	..	..	..	57,800
1895 ..	..	..	..	..	..	..	..	..	39,400
1890 ..	..	..	..	..	..	..	..	..	43,700
1885 ..	..	..	..	..	..	..	..	..	33,600

Notes.—(i) Figures for early years have been adjusted to include items not given in board feet in published statistics; (ii) details of species not available for 1910 and earlier years. Matai and insignis pine only available for years shown; (iii) some years include small quantities of logs.

APPENDIX IV

Annual Exports of Sawn Timber From New Zealand, 1885–1948
(Value of exports in pounds)

Source of Data.—" Trade and Shipping " reports by Census and Statistics Department, with provisional figures for years 1945–48 furnished by Customs Department.

Calendar Year.	Whitepine.	Rimu.	Beech.	Matai.	Kauri.	Insignis Pine.		Other Species.	Total.
						Sawn.	Cases.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	£	£	£	£	£	£	£	£	£
1948 ..	3,220	91,310	28,670	56,180	480	283,040	23,480	22,530	508,910
1947 ..	80	22,700	19,500	16,300	1,400	86,000	33,900	1,000	180,880
1946 ..	600	40,800	15,200	5,700	1,100	26,500	73,100	2,100	165,100
1945 ..	530	10,220	16,230	1,070	870	8,920	32,990	14,900	85,730
1944 ..	2,520	28,410	15,450	590	420	570	10,840	3,970	62,770
1943 ..	1,670	25,500	11,650	940	820	4,940	14,640	12,440	72,600
1942 ..	3,740	61,230	2,340	370	2,300	8,020	16,310	1,350	95,660
1941 ..	8,200	143,830	18,670	2,420	2,480	..	29,330	15,700	220,630
1940 ..	7,970	110,140	20,560	7,670	6,940	..	29,340	12,750	195,370
1939 ..	40,470	63,920	15,390	4,790	11,270	..	18,660	2,200	156,700
1938 ..	25,790	74,000	30,330	5,520	20,770	..	19,340	2,760	178,510
1937 ..	30,570	84,800	24,570	17,950	21,240	..	19,750	2,670	201,550
1936 ..	140,320	49,800	20,470	16,620	26,470	..	10,760	1,230	265,670
1935 ..	214,240	69,820	29,350	22,810	18,050	..	9,660	1,250	365,180
1934 ..	213,290	51,470	25,410	..	18,490	..	5,620	6,540	320,820
1933 ..	181,030	24,560	12,710	..	10,660	..	7,110	1,550	237,620
1932 ..	199,680	14,230	15,210	..	17,230	..	5,920	1,740	254,010
1931 ..	136,810	6,860	9,510	..	12,740	..	5,100	1,880	172,900
1930 ..	265,930	30,690	26,070	..	27,950	..	..	10,060	360,700
1929 ..	317,990	27,140	39,700	..	51,040	..	..	4,090	439,960
1928 ..	262,390	42,290	29,780	..	35,700	..	..	7,340	377,500
1927 ..	289,980	36,180	37,330	..	57,090	..	..	5,340	425,920
1926 ..	356,860	35,840	33,100	..	46,320	..	..	74,440	546,560
1925 ..	446,300	32,760	28,470	..	63,620	..	..	34,040	605,190
1924 ..	360,200	45,950	17,550	..	38,620	..	..	15,630	477,950
1923 ..	328,700	59,930	16,440	..	60,270	..	..	14,760	480,100
1922 ..	363,670	40,600	10,170	..	58,730	..	..	6,930	480,100
1921 ..	353,460	66,200	12,580	..	46,420	..	..	26,130	504,790
1920 ..	517,470	125,360	2,580	..	18,920	..	..	33,330	697,660
1915 ..	224,510	61,020	970	..	73,560	..	..	24,340	384,400
1910 ..	..	..	..	..	..	..	..	..	408,160
1905 ..	..	..	..	..	..	..	..	..	321,160
1900 ..	..	..	..	..	..	..	..	..	233,520
1895 ..	..	..	..	..	..	..	..	..	147,520
1890 ..	..	..	..	..	..	..	..	..	188,740
1885 ..	..	..	..	..	..	..	..	..	157,780

For explanatory notes, see foot of Appendix III.

APPENDIX V

Annual Imports of Timber Into New Zealand, 1885–1948
(Volume in thousand board feet)

Source of Data.—"Trade and Shipping" reports by Census and Statistics Department, with provisional figures for years 1945–48 furnished by Customs Department

Calendar Year.	Australian Hardwoods.				Douglas Fir.	Redwood.	Cedar.	Oak.	Other Species.	Total.
	Sawn.	Hewn.	Railway Sleepers.	Logs and Poles.						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1948	4,447	1,451	22,574	4,863	4,816	1,371	2,182	732	2,595	45,031
1947	1,790	1,301	6,376	5,176	13,400	88	3,149	..	1,897	33,177
1946	5,794		6,836	1,323	7,276	274	201	3	199	21,906
1945	6,434		3,253	97	3,751	2,552	..	..	775	16,862
1944	6,369		3,780	103	3,798	1,205	..	..	40	15,295
1943	5,674		3,470	632	3,539	1,364	..	..	30	14,709
1942	5,470		5,920	1,205	1,151	..	28	..	602	14,376
1941	7,889		6,006	1,058	2,123	1,528	41	788	204	19,637
1940	8,175		1,744	938	1,867	961	91	2,217	222	16,215
1939	14,945		15,253	705	5,237	3,788	313	2,512	358	43,111
1938	15,938		11,033	2,108	7,048	3,064	284	2,052	1,451	42,978
1937	11,716		7,069	5,376	6,533	1,718	482	3,518	3,035	39,447
1936	8,805		6,455	4,695	4,221	2,145	153	2,691	2,079	31,244
1935	8,087		11,958	3,375	3,472	1,255	149	1,550	1,105	30,951
1934	4,097		3,763	2,493	3,128	752	18	1,655	1,038	16,944
1933	4,096		1,653	1,402	1,338	461	2	1,040	1,920	11,912
1932	2,007		22	854	1,181	292	7	893	1,749	7,005
1931	4,475		2,985	2,252	2,950	1,028	52	157	4,418	18,817
1930	13,615		12,770	7,699	12,807	9,345	637	2,300	12,892	72,065
1929	13,955		3,827	4,342	16,188	11,678	1,335	2,417	8,991	62,734
1928	13,382		5,359	5,109	16,715	7,479	2,065	2,042	8,367	60,518
1927	12,903		5,355	8,140	17,637	7,583	2,390	1,837	5,986	61,831
1926	15,038		1,056	7,331	16,937	..	8,905	2,425	12,306	64,000
1925	17,951		10,775	15,953	17,116	..	6,526	2,719	11,036	82,076
1924	12,973		6,777	24,573	13,835	..	..	2,052	6,377	66,587
1923	10,059		4,183	14,012	8,081	..	..	1,659	2,327	40,321
1922	6,511		..	19,166	3,975	..	..	..	1,680	31,332
1921	11,244		..	20,563	12,432	..	..	..	1,629	45,868
1920	9,899		..	8,773	2,801	..	..	..	7,057	28,530
1915	11,655		..	10,044	4,576	..	..	..	2,352	28,626
1910	..		..	7,751	..	..	..	..	17,769	25,520
1905	..		..	2,926	..	..	..	..	11,212	14,138
1900	..		..	3,461	..	..	..	..	7,385	10,846
1895	..		83	930	..	..	..	..	2,705	3,718
1890	..		..	261	..	..	..	..	2,825	3,086
1885	..		2,493	837	..	..	..	..	2,774	6,104

Notes.—(i) Figures under "Logs and Poles" are not altogether comparable, in that as from the year 1931 desapped and squared poles were included under "Sawn and Hewn" until 1947; (ii) column (5) includes small quantities of species other than Australian hardwoods.

APPENDIX VI

Annual Imports of Timber Into New Zealand, 1885-1948
(Value in pounds)

Source of Data.—" Trade and Shipping " reports by Census and Statistics Department, with provisiona figures for years 1945–48 furnished by Customs Department.

Calendar Year.	Australian Hardwoods.				Douglas Fir.	Redwood.	Cedar.	Oak.	Other Species.	Total.
	Sawn.	Hewn.	Railway Sleepers.	Logs and Poles.						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	£	£	£	£	£	£	£	£	£	£
1948	136,800	43,100	412,900	127,000	154,100	62,300	101,800	30,800	4,100	1,072,900
1947	53,700	25,200	153,100	126,300	440,200	4,400	152,100	..	97,000	1,052,000
1946	151,940		132,000	33,050	115,200	8,000	9,770	140	9,600	459,700
1945	173,000		69,000	3,000	48,000	75,100	..	..	22,200	390,300
1944	151,200		63,100	*	60,000	35,200	..	..	3,000	312,500
1943	150,000		58,000	*	52,200	41,000	..	..	2,700	303,900
1942	136,600		107,000	*	18,700	..	500	..	43,160	305,960
1941	145,210		99,220	15,700	24,190	35,530	870	21,260	12,430	354,410
1940	130,000		24,660	13,030	23,840	21,570	1,790	63,000	790	293,680
1939	232,750		213,020	12,560	41,760	68,650	3,600	53,090	13,410	638,840
1938	241,770		153,170	36,540	53,370	47,500	3,520	42,820	39,970	618,670
1937	167,150		93,210	83,670	53,230	24,760	5,970	66,350	62,910	557,250
1936	122,270		80,010	68,610	37,330	28,120	1,920	40,780	45,620	424,660
1935	110,030		141,480	46,760	25,790	15,980	1,810	24,760	18,210	384,820
1934	60,900		45,160	36,220	24,780	8,530	240	29,760	21,970	227,560
1933	53,810		18,540	17,730	8,660	4,660	30	13,650	27,070	144,150
1932	24,960		180	9,900	8,000	4,080	80	13,010	23,410	83,620
1931	60,860		35,080	23,060	13,590	11,320	620	14,980	56,230	215,740
1930	211,230		188,490	103,650	87,760	100,910	7,210	61,680	144,740	905,670
1929	215,880		56,040	62,900	113,840	130,310	13,530	62,420	110,770	765,690
1928	201,130		77,160	79,990	116,850	87,350	20,690	52,590	103,090	738,850
1927	213,480		81,280	125,070	125,680	85,580	24,270	51,630	78,730	785,720
1926	246,800		14,800	105,210	120,460	..	106,480	63,030	169,670	826,450
1925	307,320		180,720	250,190	125,710	..	81,490	83,750	147,795	1,176,970
1924	229,500		104,820	377,380	122,330	..	..	75,510	109,620	1,019,160
1923	169,800		59,160	202,040	77,470	..	..	57,390	45,460	611,260
1922	129,460		..	304,950	33,190	..	..	..	27,680	495,282
1921	229,270		..	392,680	120,630	..	..	..	42,540	785,120
1920	164,180		..	173,400	29,950	..	..	..	242,800	610,330
1915	118,830		..	127,780	21,020	..	..	..	99,870	367,500
1910	..		..	80,660	..	..	..	..	146,560	227,220
1905	..		..	35,600	..	..	..	..	80,580	116,180
1900	..		..	36,740	..	..	..	..	57,770	94,510
1895	..		710	8,580	..	..	..	..	16,790	26,080
1890	..		..	4,530	..	..	..	..	21,040	25,570
1885	..		6,510	9,830	..	..	..	..	21,870	38,210

See footnotes to Appendix V.

APPENDIX VII

Output of Sawn Timber for Year Ended 31st March, 1949

(Quantities given in million board feet)

(Based on statistics collected by the Forest Service in connection with the annual registration of sawmills)

Conservancy. (1)	Rimu and Miro. (2)	Matai. (3)	Totara. (4)	White-pine. (5)	Beech. (6)	Kauri. (7)	Tawa. (8)
Auckland	31·7	8·1	5·7	5·5	..	1·6	0·9
Rotorua	69·2	9·0	3·6	2·9	0·3	..	7·1
Wellington	38·7	12·1	4·1	2·7	1·5	..	..
North Island	139·6	29·2	13·4	11·1	1·8	1·6	8·0
Nelson	11·5	0·3	..	1·0	3·4	..	..
Westland	49·2	0·2	0·2	3·7	2·2	..	..
Canterbury	0·5	0·1	..	..	..	..	..
Southland	16·8	0·5	0·1	1·4	9·3	..	..
South Island	78·0	1·1	0·3	6·1	14·9	..	..
Total, 1948–49	217·6	30·3	13·7	17·2	16·7	1·6	8·0
1947–48	199·2	26·0	12·7	16·6	16·4	1·5	10·1
1946–47	172·2	19·7	9·6	15·1	11·6	2·3	7·6

Conservancy.	Insignis Pine. (9)	Eucalypts. (10)	Larch. (11)	Poplar. (12)	Other Species. (13)	Total. (14)	Sawmills Registered at 31st March, 1949.
Auckland	25·9	0·5	..	..	2·5	82·4	187
Rotorua	55·6	0·6	3·7	..	1·4	153·4	90
Wellington	18·2	0·4	..	0·1	1·4	79·2	111
North Island	99·7	1·5	3·7	0·1	5·3	315·0	388
Nelson	11·4	..	..	..	0·1	27·7	95
Westland	..	..	..	..	0·1	55·6	67
Canterbury	32·1	1·0	0·4	0·4	0·9	35·4	62
Southland	10·1	0·1	..	0·3	1·5	40·1	80
South Island	53·6	1·1	0·4	0·7	2·6	158·8	304
Total, 1948–49	153·3	2·6	4·1	0·8	7·9	473·8	692
1947–48	136·8	1·8	*	1·2	10·7	433·0	608
1946–47	111·6	1·2	..	0·9	2·2	354·0	527

* Included in "Other."

Note.—These are provisional figures pending publication of detailed statistics by the Government Statistician.

APPENDIX VIII

LOGGING AND SAWMILLING IN NEW ZEALAND: STATISTICAL SUMMARY FOR PERIOD 1921–47

Year Ended 31st March, (1)	Sawmills Reporting. (2)	Total Sawn Output. (3)	Men Employed (Bush and Mill). (4)	Output of Sawn Timber Per Man. (5)	Salaries and Wages Paid. (6)	Average Earnings Per Man. (7)	Stumpage Value. (8)	Index of Unit Value of Output. (9)
	Number.	1,000 bd. ft.	Number.	Bd. ft.	£	£	£	1926–30 = 1000.
1921 ..	323	307,668	7,696	39,978	1,731,906	225	*	1,175
1922 ..	321	314,972	6,794	46,360	1,606,139	236	285,316	1,126
1923 ..	347	304,352	7,108	42,818	1,564,900	220	287,217	1,086
1924 ..	357	317,069	7,584	41,808	1,672,275	221	315,981	1,081
1925 ..	369	344,095	7,863	43,761	1,805,042	230	338,366	1,090
1926 ..	374	353,224	7,557	46,741	1,857,718	246	337,588	1,054
1927 ..	343	305,675	6,380	47,911	1,556,756	244	279,258†	1,040
1928 ..	316	269,783	5,618	48,021	1,327,072	236	237,871	977
1929 ..	292	270,214	5,559	48,608	1,262,734	227	224,551	960
1930 ..	305	282,405	5,788	48,792	1,298,475	224	248,794	968
1931 ..	314	229,468	4,978	46,096	1,060,401	213	220,551	928
1932 ..	260	154,193	3,364	45,836	596,442	177	129,522	824
1933 ..	272	165,269	3,593	46,276	594,330	165	125,553	743
1934 ..	322	197,655	4,106	48,138	666,330	161	148,371	743
1935 ..	357	243,782	4,984	48,913	850,391	171	192,544	792
1936 ..	364	293,075	5,692	51,489	1,051,796	185	232,455	846
1937 ..	385	305,839	6,217	49,202	1,307,940	210	270,090	932
1938 ..	394	322,766	6,426	50,228	1,517,312	236	287,385	1,014
1939 ..	360	316,716	5,988	52,892	1,507,429	252	290,722	1,004
1940 ..	363	335,991	6,363	52,804	1,658,271	261	301,976	1,027
1941 ..	365	342,208	6,288	54,422	1,727,317	275	325,129	1,040
1942 ..	358	324,474	5,949	54,543	1,726,623	290	350,689	1,081
1943 ..	330	341,515	5,645	60,499	1,882,470	330	346,334	1,140
1944 ..	361	350,748	5,842	60,039	2,003,965	343	368,006	1,176
1945 ..	357	340,133	5,777	58,877	2,055,019	356	384,838	1,207
1946 ..	379	344,723	5,924	58,191	2,261,855	382	404,828	1,384
1947 ..	400	353,955	5,793	61,100	2,408,094	416	419,631	1,504

* Not available. † Prior to 31st March, 1927, these figures include a small amount of rent.

APPENDIX IX

FOREST OFFENCES, 1948–49

Offence.	Law Under Which Proceedings Were Taken.	Number of Convictions.	Fines.	Costs and Damages.
			£ s. d.	£ s. d.
Lighting fire in fire district, contrary to provision of Act	Section 44 (1) (*c*), Forests Act, 1921–22	6	13 10 0	15 14 2
Unlawful cutting and removal of forest produce	Section 43 (1), Forests Act, 1921–22	8	37 0 0	1,879 10 8
Operating engine without efficient spark-arrester	Regulation 6 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	1	15 0 0	39 2 6
Failing to report fire in State forest	Regulation 15 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	1	..	1 11 0
Unlawful hunting in State forest	Section 47 (*a*), Forests Act, 1921–22	2	1 0 0	5 8 0
Unlawful occupation of land in State forest	Section 47 (*c*), Forests Act, 1921–22	1	1 0 0	5 15 4
Lighting fire without lawful authority in State forest	Section 44 (1) (*a*), Forests Act, 1921–22	5	4 10 0	9 14 6
Leaving fire in State forest without taking steps to prevent it spreading	Section 44 (1) (*b*), Forests Act, 1921–22	2	..	1 14 6
Unlawful entering State forest	Regulation 12 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	3		
Unlawful hunting in State forest	Section 47 (*a*), Forests Act 1921–22	3		
Allowing dogs to trespass in State forest	Regulation 11, State Forest Regulations (*Gazette*, 15th April, 1909, p. 1031)	3	1 10 0	10 3 0
Unlawfully using dogs for pig-hunting in State forest	Regulation 14, State Forest Regulations (*Gazette*, 15th April, 1909, p. 1031)	3		
Totals	..	38	73 10 0	1,968 13 8

APPENDIX X

Training and Recruitment, 1948–49

Course.	Serial No.	Period.	Number Attended.
Rotorua Forest Training Centre			
Professional Officer	2	1 week ..	14
Fourth-grade Rangers	3	8 weeks ..	18
Fourth-grade Rangers	4	8 weeks ..	14
Soil Science	..	4 days ..	20
Trainee Preliminary	5	4 weeks ..	21
Trainee Senior	2	8 weeks ..	18
Timber Inspectors	..	2 weeks ..	8
Timber Measurers	7	8 weeks ..	15
Clerical Officer	2	3 weeks ..	15
Clerical Officer	3	3 weeks ..	16
Fire Protection	2	2 weeks ..	17
Fire Protection	3	2 weeks ..	18
Tapanui Forest Vocational School			
Junior Labourers	12	2 weeks ..	16
Leading Hand	13	8 weeks ..	19

APPENDIX XI

National Forest Survey

Unit.	Completed During 1948–49.		Total Completed at 31st March, 1949.	
	Number of Plots.	Area.	Number of Plots.	Area.
		Acres.		Acres.
Coromandel	879	140,000	1,484	236,000
Rotorua	15	2,000	1,087	328,000
Te Whaiti	..	..	438	67,000
West Taupo	..	..	1,222	278,000
East Coast	58	13,000	58	13,000
Taranaki	139	22,000	139	22,000
Westland	878	140,000	1,322	211,000
Woodlaw	255	6,000	345	8,000
West Waiau	461	147,000	1,001	322,000
Longwood	..	..	310	80,000
Waikaia	..	..	130	130,000
	2,685	470,000	7,536	1,695,000

The above areas are derived by proportion from the sampling pattern of each unit.

APPENDIX XII

Forest and Rural Fires Act, 1947: Constitution of Rural Fire Districts as at 31st March, 1949

Name and Conservancy.	Area.	County.	Fire Authority.	Property Protected.	Closed Fire Season.	*Gazette* Reference.
	Acres.		Auckland Forest Conservancy			
Riverhead ..	20,900	Waitemata ..	Commissioner of State Forests	Trees and other plants on State Forests	1st October to 30th April	No. 50, 1948, p. 1171.
Herekino	23,000	Mangonui	Ditto	Ditto	Ditto ..	No. 59, 1948, p. 1394.
Hunua	83,000	Manukau and Franklin	Auckland City Council	Lands vested in Auckland City Council	,, ..	No. 59, 1948, p. 1395.
Waitakere ..	57,200	Waitemata ..	,,	Ditto	,, ..	No. 59, 1948, p. 1394.
Waiuku	4,600	Franklin	Commissioner of State Forests	Trees and other plants and sand-dune areas	,, ..	No. 59, 1948, p. 1393.
Warawara ..	25,700	Hokianga	Ditto	Trees and other plants on State Forests	,, ..	No. 59, 1948, p. 1395.
Woodhill-Helensville	20,800	Waitemata ..	,, ...	Trees and other plants and sand-dune areas	,, ..	No. 59, 1948, p. 1394.
Maramarua ..	28,000	Waikato and Hauraki Plains	,, ...	Trees and other plants on State forests	,, ..	No. 60, 1948, p. 1422.
Puhipuhi	5,800	Whangarei	,, ...	Ditto	,, ..	No. 60, 1948, p. 1422.
Waitangi	14,000	Bay of Islands ..	,, ...	Lands vested in Waitangi National Trust Board and land held by the Crown under the name of Waitangi Endowment	,, ..	No. 60, 1948, p. 1423.
Great Barrier ..	27,300	Great Barrier ..	,, ...	Trees and other plants on State forests	,, ..	No. 62, 1948, p. 1483.
Omahuta-Puketi ..	71,000	Hokianga, Whangaroa, and Bay of Islands	,, ...	Ditto	,, ..	No. 62, 1948, p. 1482.
Waipoua	62,500	Hokianga and Hobson	,, ...	,, ...	,, ..	No. 62, 1948, p. 1483.
Tairua	63,800	Thames	,, ...	,, ...	,, ..	No. 67, 1948, p. 1598.
Trounson Kauri Park	4,450	Hobson	,, ...	Trees and other plants on Trounson Kauri Park	,, ..	No. 10, 1949, p. 615.
Hauraki Plains ..	77,000	Hauraki Plains and Piako	,, ...	Trees, flax, and other plants and peat lands	,, ..	No. 10, 1949, p. 616.
Kaitaia	130,000	Mangonui	,, ...	Gum lands, peat lands, and sand-dune areas	,, ..	No. 17, 1949, p. 723.

Manuwao ..	930	Waitemata ..	Manuwao Rural Fire Committee (3 members)	Lands owned by a syndicate formerly known as the Manuwao Afforestation Society, Inc.	,, ..	No. 22, 1949, p. 848.
Pureora	300,000	Otorohanga, Waitomo, Taumarunui and Taupo	Commissioner of State Forests	Trees and other plants on State Forests	,, ..	No. 31, 1949, p. 1213.
			ROTORUA FOREST CONSERVANCY			
Kaingaroa ..	567,000	Taupo, Rotorua, and Whakatane ..	Commissioner of State Forests	Trees and other plants on State Forests	1st October, to 30th April	No. 38, 1948, p. 815.
Rotoehu	38,700	Tauranga, Rotorua, and Whakatane	Ditto	Ditto	Ditto ..	No. 38, 1948, p. 815.
Whakarewarewa ..	31,000	Rotorua	,, ...	,, ...	,, ..	No. 38, 1948, p. 815.
Whirinaki ..	129,700	Whakatane and Taupo	,, ...	,, ...	,, ..	No. 38, 1948, p. 814.
Oraka	16,500	Matamata	Oraka Rural Fire Committee (3 members)	Lands owned by N.Z. Forest Products, Ltd., and Redwood Forests, Ltd.	,, ..	No. 59, 1948, p. 1397.
Tahorakuri ..	55,000	Taupo	N.Z. Forest Products, Ltd.	Lands owned by N.Z. Forest Products, Ltd.	,, ..	No. 59, 1948, p. 1395.
Tokoroa	316,000	Matamata, Rotorua, Otorohanga, and Taupo	Tokoroa Rural Fire Committee (9 members)	Lands owned by N.Z. Forest Products, Ltd., and 11 others	,, ..	No. 59, 1948, p. 1398.
Matahina ..	52,700	Whakatane.. ..	Matahina Rural Fire Committee (5 members)	Lands owned by Whakatane Board Mills, Ltd., and 2 others	,, ..	No. 25, 1949, p. 935.
			WELLINGTON FOREST CONSERVANCY			
Korokoro ..	2,500	Makara and Hutt ..	Petone Borough Council	Lands vested in Petone Borough Council	1st November to 30th April	No. 50, 1948, p. 1171.
Hutt	155,000	Hutt and Featherston	Wellington City and Suburban Water Supply Board	Lands owned by or vested in Wellington City Council	Ditto ..	No. 62, 1948, p. 1481.
Tongariro.. ..	434,000	Kaitieke, Waimarino, Taumarunui and Taupo	Commissioner of State Forests	Trees and other plants on State Forests and Tongariro National Park	1st October to 30th April	No. 64, 1948, p. 1510.
Tuwharetoa ..	235,000	Taumarunui and Taupo	Tuwharetoa Rural Fire Committee (9 members)	Trees and other plants on Maori-owned and Crown land	Ditto ..	No. 24, 1949, p. 905.
Gwavas	13,600	Hawkes Bay and Waipawa	Commissioner of State Forests	Trees and other plants on State forests	,, ..	No. 27, 1949, p. 983.

APPENDIX XII—*continued*

FOREST AND RURAL FIRES ACT, 1947: CONSTITUTION OF RURAL FIRE DISTRICTS AS AT 31ST MARCH, 1949—*continued*

Name and Conservancy.	Area.	County.	Fire Authority.	Property Protected.	Closed Fire Season.	*Gazette* Reference.
	Acres.					
NELSON FOREST CONSERVANCY						
Cobb River ..	44,000	Takaka	Commissioner of State Forests	Trees and other plants on State forests	1st November to 30th April	No. 62, 1948, p. 1481.
Golden Downs ..	50,500	Waimea	Ditto	Ditto	Ditto ..	No. 64, 1948, p. 1510.
Maitai-Roding ..	26,000	,, ...	Nelson City Council ..	Lands owned by or vested in Nelson City Council	,, ..	No. 17, 1949, p. 722.
Miner River ..	11,500	,, ...	Commissioner of State Forests	Trees and other plants on State forests	,, ..	No. 17, 1949, p. 724.
Rabbit Island ..	3,130	,, ...	Waimea County Council	Land owned by or vested in Waimea County Council	,, ..	No. 17, 1949, p. 724.
Rai-Pelorous ..	174,500	Waimea, Marlborough, and Sounds	Commissioner of State Forests	Trees and other plants on State forests	,,	No. 67, 1948, p. 1599.
Tawhai	37,000	Inangahua	Ditto	Ditto	,, ..	No. 27, 1949, p. 983.
WESTLAND FOREST CONSERVANCY						
Rimu	17,000	Westland	Commissioner of State Forests	Trees and other plants on State forests	1st August to 30th April	No. 50, 1948, p. 1171.
Granville	32,300	Grey	Ditto	Ditto	Ditto ..	No. 56, 1948, p. 1319.
CANTERBURY FOREST CONSERVANCY						
Ashley	20,600	Ashley and Kowhai ..	Commissioner of State Forests	Trees and other plants on State forests	1st October to 30th April	No. 60, 1948, p. 1421.
Hanmer	20,000	Amuri	Ditto	Ditto	Ditto ..	No. 60, 1948 p. 1422.
Balmoral	50,400	Amuri and Waipara ..	,, ...	,, ...	,, ..	No. 62, 1948, p. 1483.
Eyrewell	52,400	Oxford and Eyre ..	,, ...	,, ...	,, ..	No. 62, 1948, p. 1482.
Mount Fyffe ..	13,000	Kaikoura	,, ...	,, ...	,, ..	No. 67, 1948, p. 1599.
Waimakariri ..	53,000	Oxford, Eyre, Malvern, Paparua, and Waimairi	North Canterbury Catchment Board	Lands vested in the North Canterbury Catchment Board	,, ..	No. 11, 1949, p. 622.
Chaneys	4,450	Waimairi	Christchurch City Council	Trees and other plants on lands situated within the said area	,, ..	No. 8, 1949, p. 572.
Bottle Lake ..	4,900	,, ...	Ditto	Ditto	,, ..	No. 17, 1949 p. 724.

Dusky	12,850	Tuapeka and Clutha	Commissioner of State Forests	Trees and other plants on State forests	1st August to 30th April	No. 47, 1948 p. 1099.
Pebbly Hills ..	9,950	Southland	Ditto	Ditto	Ditto ..	No. 50, 1948, p. 1170.
Berwick	18,000	Bruce	,, ...	,, ...	,, ..	No. 59, 1948, p. 1396.
Blue Mountains ..	85,000	Tuapeka and Clutha ..	,, ...	,, ...	,, ..	No. 59, 1948, p. 1396.
Naseby	15,100	Maniototo	,, ...	,, ...	,, ..	No. 59, 1948, p. 1396.
Monowai-Lillburn ..	119,000	Wallace	,, ...	,, ...	,, ..	No. 64, 1948, p. 1511.
Pukerau	3,000	Clutha	,, ...	,, ...	,, ..	No. 64, 1948, p. 1511.
Longwood ..	150,000	Wallace	,, ...	,, ...	,, ..	No. 65, 1948, p. 1531.
Tautuku	4,500	Clutha	,, ...	,, ...	,, ..	No. 65, 1948, p. 1531.
MacLennon ..	105,000	,, ...	,, ...	,, ...	,, ..	No. 67, 1948, p. 1599.
Waikawa ..	15,400	Southland	,, ...	,, ...	,, ..	No. 8, 1948, p. 572.
Dunedin	23,000	Taieri and Waikouaiti and Dunedin City	Dunedin City Council	Lands vested in Dunedin City Council	,, ..	No. 17, 1948, p. 723.
Seaward Bush ..	1,850	Southland	Invercargill City Council	Lands vested in Invercargill City Council	,, ..	No. 17, 1948, p. 724.

APPENDIX XIII

STATE FOREST SERVICE LOGGING OPERATIONS: TOTAL PRODUCTION FROM ALL OPERATIONS

(All quantities in cubic feet)

Forest.	Year Ended 31st March, 1949.			1947–48 Total.
	Logs.	Other Produce.	Total.	
Omahuta	245,000	..	245,000	129,000
Pureora	1,017,000	..	1,017,000	705,000
Whakarewarewa	1,638,000	267,000	1,905,000	1,896,000
Kaingaroa	2,093,000	174,000	2,267,000	1,594,000
Whirinaki	1,443,000	2,000	1,445,000	870,000
Balmoral	48,000	115,000	163,000	107,000
Hanmer	..	66,000	66,000	36,000
Eyrewell	4,000	117,000	121,000	136,000
Naseby	22,000	14,000	36,000	16,000
Pebbly Hills	8,000	..	8,000	..
Dusky	136,000	4,000	140,000	154,000
Tapanui	68,000	1,000	69,000	44,000
Conical Hill	64,000	45,000	109,000	82,000
Other	3,000	9,000	12,000	49,000
Totals	6,789,000	814,000	7,603,000	5,818,000

APPENDIX XIV

FOREST SERVICE SAWMILLING OPERATIONS: OUTPUT AND DISPOSAL OF SAWN TIMBER, 1945–49

Details.	Year Ending 31st March,				
	1949.	1948.	1947.	1946.	1945.
Sawn output—					
For green sales	8,337,000	5,628,000	5,846,000	3,917,000	3,629,000
For air seasoning	3,456,000	2,670,000	3,167,000	2,486,000	3,366,000
For kiln drying	11,038,000	9,577,000	7,126,000	7,355,000	5,444,000
Total	22,831,000	17,875,000	16,139,000	13,758,000	12,439,000
Kiln drying—					
Quantity dried	11,880,000	9,773,000	8,246,000	7,827,000	5,683,000
Percentage of total cut ..	52	55	51	57	46
Sales—					
Within New Zealand—					
Green	7,913,000	4,156,000	5,398,000	3,851,000	2,702,000
Air seasoned	229,000	209,000	1,271,000	135,000	35,000
Kiln dried	1,668,000	1,212,000	234,000	445,000	249,000
Total	9,810,000	5,577,000	6,903,000	4,431,000	2,986,000
Percentage of total cut ..	43	31	43	32	24
Exports—					
Green	62,000	630,000	..	..	..
Air seasoned	25,000	69,000	26,000	..	..
Kiln dried	3,242,000	841,000	885,000	537,000	63,000
Total	3,329,000	1,540,000	911,000	537,000	63,000
Percentage of total cut ..	15	9	6	4	1

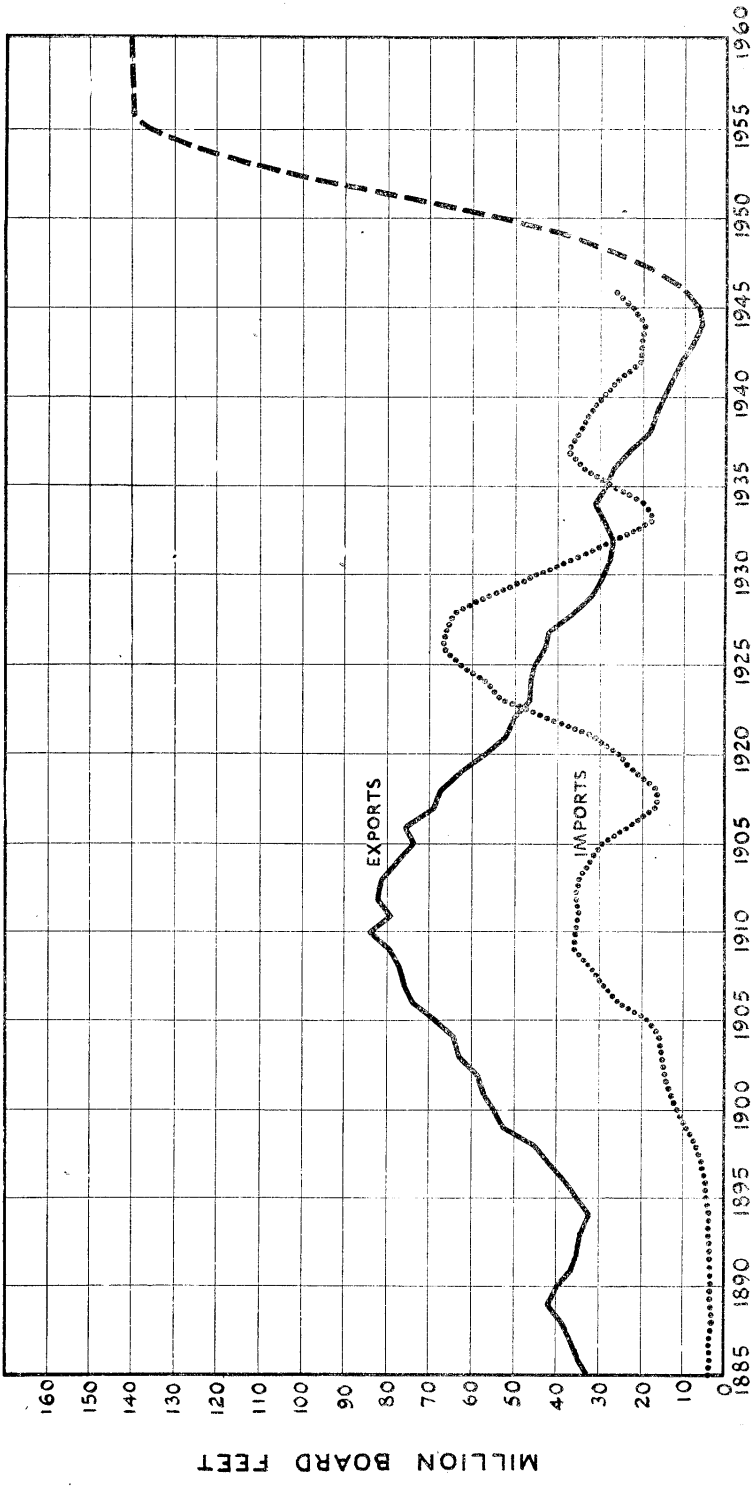
APPENDIX XV

PAYMENTS AND RECEIPTS FOR THE YEAR ENDED 31ST MARCH, 1949, AND FOR PRECEDING FOUR YEARS

Item.	1948–49.	1947–48.	1946–47.	1945–46.	1944–45.
Payments	£	£	£	£	£
Allocation of revenue—					
Consolidated Fund (portion of revenue from national-endowment forests)	*	16,023	..	14,235	16,196
Working Railways Account (section 24 (1), Finance Act, 1936)	*	4,329	3,539	..	..
Local bodies	29,219	21,078	25,750	17,114	12,799
General management charges—					
Salaries	283,869	225,047	187,714	137,984	110,317
General expenses	168,373	144,973	130,770	102,275	56,019
Land purchase	34,188	11,640	18,296	30,098	38,957
Forestry projects under development and management—					
Exotic	1,039,630	811,495	710,376	377,910	346,743
Indigenous	157,503	135,698	79,023	58,808	41,912
Utilization : Sawmill, creosote plant, &c.	500,694	318,826	174,379	133,677	125,931
Pulp and paper making investigations, tests, and trials	23,670	25,023	12,369	..	..
Totals	2,237,146	1,714,132	1,342,216	872,101	748,874
Receipts					
Indigenous forests receipts—					
Sales of standing timber ..	194,934	212,454	155,208	135,913	121,603
Timber royalties and trespass ..	27,382	14,585	11,481	13,451	9,250
Leases, grazing	2,822	2,083	2,229	2,865	1,611
Sawmill sites, industrial, &c. ..	381	378	359	672	308
Miscellaneous	20,247	16,526	16,419	8,960	9,124
Log sales from managed forests ..	129,983	84,864	62,432	67,053	54,716
Exotic forests : Poles, posts, firewood, &c.	57,544	52,525	39,975	38,643	45,938
Utilization projects—					
Sawn timber	214,366	109,716	98,703	63,451	22,529
Creosoted products	11,677	7,216	17,889	17,305	45,918
Box-shooks	187,212	207,192	134,839	182,187	129,126
Miscellaneous	16,168	23,072	12,840	9,532	9,875
Miscellaneous credits	35,960	32,665	37,953	48,292	10,802
Totals	898,676	763,276	590,327	588,324	460,800

* These items have ceased from 1st April, 1947, with the change-over to the new accounting procedure

APPENDIX XVI



TREND OF NEW ZEALAND'S OVERSEAS TRADE IN TIMBER

5-YEARLY MOVING AVERAGE OF EXPORTS AND IMPORTS,

WITH EXPORTS PROJECTED TO SHOW INCREASE

PLANNED FOR NEXT DECADE

APPENDIX XVII

UTILIZATION BRANCH—ROTORUA CONSERVANCY: STATEMENT OF OPERATING ACCOUNTS FOR THE YEAR ENDED 31ST MARCH, 1949 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)

NOTE.—The accounts for the year ended 31st March, 1949, have not yet been audited by the Controller and Auditor-General, but little if any alteration is likely as a result of audit.

WAIPA SAWMILL OPERATING ACCOUNT

1947–48. £	£		1948–49. £	£
		Income		
94,938		The net receipts from the sales of sawn timber after allowing for selling and transport expenses and for the housing levy included as a surcharge in selling prices totalled	143,900	
136,091		The value of transfers of sawn timber to the box-factory and to capital and maintenance works in connection with the plant was	112,628	
4,875		In addition to making the above sales and transfers, the stocks of sawn timber were increased during the year by	8,173	
	235,904	The total income derived from sawn timber produced during the year was therefore		264,701
		Expenses		
102,257		The cost of logs sawn during the year was	109,753	
49,418		Wages and salaries and allowances for compensation and holiday pay totalled	57,660	
61,459		Other expenses of production (including power steam and fuel disposal; maintenance and depreciation of mill buildings, plant and equipment; and office and general expenses) totalled	78,059	
	213,134	The total expenses incurred in production were		245,472
	£22,770	Deducting the expenses from the income, gives a net profit for the year of		£19,229

The disposition of the net profit is shown in the Profit and Loss and Appropriation Accounts.

KAINGAROA SAWMILL OPERATING ACCOUNT

£	£		£	£
		Income		
8,748		The net receipts from sales of sawn timber after allowing for selling and transport expenses and for the housing levy included as a surcharge in selling prices totalled	46,024	
554		The value of sawn timber transferred for use in other sections of the plant was	7,044	
3,529		In addition to the above sales and transfers, the value of stocks on hand was increased during the year by	1,939	
	12,831	The total income derived from sawn timber produced during the year was therefore		55,007
		Expenses		
	..	The cost of logs sawn during the year was	24,976	
	..	Wages and salaries and allowances for compensation and holiday pay totalled	11,678	
	..	Other expenses of production (including power and waste disposal; maintenance and depreciation of mill buildings, plant, and equipment; and office and general expenses) amounted to	14,769	
	13,053	The total expenses incurred in production were		51,423
(Loss)	£222	Deducting the expenses from the income gives a net profit for the year of		£3,584

NOTE.—As this mill was not operating as a going concern for the 1947–48 year, detailed expense accounts were not kept. For the same reason, the loss for that year was added to Establishment Account and thus capitalized. The disposition of the net profit for 1948–49 is shown in the Profit and Loss and Appropriation Accounts.

APPENDIX XVII—*continued*

UTILIZATION BRANCH—ROTORUA CONSERVANCY: STATEMENT OF OPERATING ACCOUNTS FOR THE YEAR ENDED 31ST MARCH, 1949 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)—*continued*

WAIPA BOX-FACTORY OPERATING ACCOUNT

£	£	*Income*	£	£
200,150		The net receipts from sales of box-shook for the year after allowing for selling and transport expenses were	171,138	
776		Transfers of processed timber for use in capital and maintenance work, &c., were valued at	1,183	
200,926			172,321	
2,574	(increase)	During the year stocks on hand were reduced to the extent of	707	
	203,500	The net income derived from production during the year was therefore		171,614
		Expenses		
129,269		The cost of sawn timber used in production was	109,774	
24,549		Wages and salaries and allowances for compensation and holiday pay totalled	22,537	
21,931		Other expenses of production (including power, steam, and waste disposal; maintenance and depreciation of factory buildings, plant, and equipment; and office and general expenses) amount to	19,701	
	175,749	The total expenses incurred in production were		152,012
	£27,751	Deducting the expenses from the income gives a net profit for the year of		£19,602

The disposition of the net profit is shown in the Profit and Loss and Appropriation Accounts.

WAIPA WOOD-PRESERVATION PLANT OPERATING ACCOUNT

£	£	*Income*	£	£
5,201		The net receipts from the sales of treated produce after allowing for transport and selling expenses totalled	32,915	
1,471		Transfers of treated produce were charged out at	2,158	
6,672			35,073	
1,421	(increase)	In the course of making the above sales and transfers the value of stocks of treated produce on hand were reduced by	3,466	
	8,093	The net income attributable to treatment operations for the year was therefore		31,607
		Expenses		
1,724		The cost of untreated produce treated during the year was	7,876	
		To this must be added seasoning-yard costs, which were—		
1,031		Wages and salaries and allowances for compensation and holiday pay	3,542	
365		Other expenses, including maintenance and office and general expenses	1,358	
3,120		Thus the total cost of operating the seasoning-yard and providing seasoned produce for the treatment plant was	12,776	
		The expenses of operating the treatment plant were—		
706		Wages and salaries and allowances for compensation and holiday pay	2,146	
2,231		Creosote and other preservatives used	6,717	
3,867		Other expenses, including power and steam, maintenance, and office and general expenses	5,855	
	9,924	The total expenses for the year were therefore		27,494
(Loss)	£1,831	Deducting the expenses from the income gives a net profit for the year's operations of		£4,113

The disposition of the net profit is shown in the Profit and Loss and Appropriation Accounts.

APPENDIX XVII—*continued*

UTILIZATION BRANCH—ROTORUA CONSERVANCY: STATEMENT OF OPERATING ACCOUNTS FOR THE YEAR ENDED 31ST MARCH, 1949 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)—*continued*

PROFIT AND LOSS AND APPROPRIATION ACCOUNTS

1947–48.			1948–49.	
£	£		£	£
		The net profits of the individual units as shown in the Operating Accounts above were—		
22,770		Waipa Sawmill	19,229	
..		Kaingaroa Sawmill	3,584	
27,751		Waipa Box-factory	19,602	
1,831	(loss)	Waipa Wood-preservation Plant	4,113	
	48,690	This gives a profit over all for the year of		46,528
		Against this profit has been made a charge for interest on the		
	13,728	capital employed in the undertaking of		19,265
	34,962	Leaving a net surplus for the year of		27,263
		The net profits brought forward from operations in previous years (after a total of £116,715 had been charged for interest)		
	42,711	were		77,673
	£77,673	Thus giving a net profit since the inception of operations (after charging of £135,980 for interest) of		£104,936
		NOTE.—Assuming the undertaking to have been operated by a company working on 60 per cent. of share capital and 40 per cent. of loan capital, the appropriation of the over-all profit for the year would have been—		
	5,760	Interest on loans		5,760
	24,685	Income-tax		23,360
(8·4 per cent.)	18,245	Available for dividend	(8·1 per cent.)	17,408
	£48,690			£46,528

APPENDIX XVII—*continued*

UTILIZATION BRANCH—ROTORUA CONSERVANCY: STATEMENT OF OPERATING ACCOUNTS FOR THE YEAR ENDED 31ST MARCH, 1949 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)—*continued*

BALANCE-SHEET AS AT 31ST MARCH, 1949

31st March, 1948.			31st March, 1949.	
£	£		£	£
		Current assets were as follows :—		
		Sundry debtors—		
53,006		Trading accounts	70,811	
9,323		Other departmental undertakings	19,858	
	62,329			90,669
		Stocks and stores on hand—		
2,027		Logs	2,498	
47,320		Sawn timber	57,433	
12,415		Box-shook	11,708	
7,358		Treated produce	3,892	
6,294		Untreated produce	18,528	
2,874		Creosote	1,539	
72,523		General stores	54,051	
	150,811			149,649
	213,140			240,318
		Current liabilities were—		
	27,159	Sundry creditors		40,802
	185,981	The working capital involved in the undertaking was therefore		199,516
		The fixed assets, after making full allowance for normal depreciation, were valued as follows—		
185,719		Plant	209,404	
		Less reserves for abnormal depreciation and maintenance of general plant and for renewals and maintenance of		
15,709		motor-vehicles	18,506	
170,010			190,898	
135,477		Buildings	177,129	
9,098		Tools, furniture, fittings, &c.	10,662	
47,133		Other installations	65,774	
17,996		Other costs of establishment which were capitalized	15,811	
	379,714			460,274
	565,695			659,790
		Reserves which have been built up against the values of assets		
	14,665	shown above in respect of possible losses by fire amount to		18,569
	£551,030	The net amount invested in the undertaking is therefore		£641,221
		The net amount invested as shown above has been provided—		
	473,357	By interest-bearing advances of		536,285
	77,673	By accumulated profits as shown in the Appropriation Account		104,936
	£551,030			£641,221

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