1950

NEW ZEALAND

NEW ZEALAND FOREST SERVICE

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1950

Presented to Both Houses of the General Assembly Pursuant to Section 68 of the Forests Act, 1949

The DIRECTOR OF FORESTRY to the HON. MINISTER OF FORESTS.

SIR,— Wellington, 17th July, 1950.

I have the honour to present herewith, pursuant to section 68 of the Forests Act, 1949, the annual report of the operations of the New Zealand Forest Service for the year ended 31st March, 1950.

I have, &c.,

ALEX. R. ENTRICAN,
Director of Forestry.

The Hon. Minister of Forests, Wellington.

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REPORT

CHAPTER I—SUMMARY AND REVIEW

1. *Management.*—The national forest estate was augmented by 84,201 acres while 5,453 acres were withdrawn from reservation, so that at the 31st March the area of State forest land was 9,433,632 acres. The new area planted during the year was 4,879 acres which is the highest since 1939.

During the year 14 working plans were completed and work was in progress on 40 others. Timber appraised amounts to 184,221,000 board feet.

2. *Public and Private Forestry.*—Changes have been made in taxation law relating to farm forestry, and the method of assessment of the incomes of forestry companies is to be varied.

Forest-extension activities by the Forest Service are to be expanded.

3. *Development.*—A further 400,000 acres were covered by the national forest survey, bringing the total area covered to 2,095,000 acres.

Three delegates, including an officer of the Forest Service, attended the World Forestry Congress at Helsinki, and reports will be presented on their investigations while overseas.

4. *Commercial.*—Logging operations by the Forest Service produced 7,856,000 cubic feet of logs. Service sawmills cut almost 22,500,000 board feet of sawn timber of which 15,000,000 board feet was sold, the remainder being used for boxmaking or for departmental purposes.

5. *Engineering.*—Topographic surveys covered nearly 4,000 acres, and 56 miles of new road were surveyed. Eighty miles of new road were formed and 52 miles surfaced. Eighty-nine houses and 328 single men's huts were completed.

There were 57 fires in State forests during the year but little damage was caused; 3 sawmills were destroyed by fire. The fire hazard in North Auckland was the worst for 25 years. In the vicinity of Waipoua Forest 6 fires occurred, but their prompt suppression by the highly organised departmental fire fighters removed the threat to the forest.

6. *Operations.*—The staff and other employees of the Forest Service at the 31st March last numbered 2,688 as against 2,693 at the same date in 1949. Permanent staff has slightly increased but this is offset by a fall in the number of other employees.

The Forests Act was consolidated during the year, and regulations setting up two advisory committees were gazetted.

7. *Industry and Trade.*—Timber-production was 474,000,000 board feet, substantially the same as the previous year. The number of sawmills in operation was 685.

Exports of sawn timber were 24,000,000 board feet while total timber imports were 46,000,000 board feet, both figures are 1,000,000 board feet higher than the previous year.

CHAPTER II—FOREST POLICY

General

1. *Completion of Thirty Years' Operations.*—The New Zealand Forest Service has now completed thirty years of operation. What has it achieved in that time ? In bare retrospect the record to many may be disappointing. Sufficient of the pioneer element is left in the community to deplore the apparent failure to solve the problem of regenerating the indigenous forests. Rural interests cannot forget that for every acre converted to timber ten were sacrificed to the fire-stick, many of them to grow only one blade of grass where two trees grew before. Naturally they would like to see deteriorated lands restored to forest. Equally, the rural interest is concerned over the decline in farm forestry seeing few shelter-belts and wood-lots established to replace the many converted to timber. On the credit side it is generally conceded that an exotic forest resource adequate to the timber demands of the future has been created—but little else.

2. *Shortage of Trained Staff.*—Viewed against the ever-changing background of economic and political developments the record may still be disappointing, but much more understandable. To the Forest Service itself it is doubly disappointing because every Government has been extremely sympathetic in budgeting liberally for forestry development. The limiting factor over many years has been an inherent weakness in personnel. If 20 instead of only 2 professionally trained foresters had been appointed at the inception of the Service there would have been little cause for disappointment. For twenty years the maximum number of professional officers at any one time (including scientists and engineers as well as foresters) was 8. In the depression it was as low as 3, but in 1940 it was raised to 18 and is now 69. Results, from being disappointing have now become distinctly encouraging and will continue to improve as more highly-qualified professional and other officers emerge year by year from their training periods both in New Zealand and overseas.

3. *Outstanding Achievements.*—If the quality of achievement has been disappointing the quantity has been creditable and significant. Even though, indirectly very much more has been achieved in most phases of forestry work than is generally appreciated. It is true that the Forest Service has failed to evolve a practicable system of silviculture for rimu which is the most widespread of indigenous conifers, but at a modest estimate it has preserved from fire 500,000 acres of forest which some day may be regenerated to an indigenous timber crop. It has also added to the permanent forest estate some 7,000,000 acres of indigenous forest and preserved them intact not merely for future management but for the current conservation of soil and water resources. For an annual expenditure of less than 5 per cent. of that on river-control and all other soil-conservation activities the Forest Service has succeeded by organizing a nation-wide fire-protection service for forest and rural lands, in achieving 80 per cent. of all that is economically practicable in soil and water conservation. These are achievements of no mean merit.

4. *Exotic Forests Established Too Quickly.*—The exceptional and unexpected liberality of all New Zealand administrations for forestry developments—in bad as well as in good times—proved an irresistible temptation to over-expand the plantings of exotics. So long as foresters can depend beyond any possible doubt upon an uninterrupted flow of money for continuous future establishment there is no purpose in planting at a greater annual rate than the forest will be used at maturity, but in the absence—as then, and now—of any such assurance the temptation was to plant up at all times to the full extent of such man-power and moneys as were available in case no money should be forthcoming at some future period. The adverse effects have been fourfold : silvicultural treatments at appropriate times—notably pruning and thinning—have been rendered impossible ; many stands must be cut when immature and others when over-mature ; the percentage yield of clear or defect free wood is far too low ; and as measured by compound-interest computations the cost to the national purse has been higher than necessary. The

management of a forest estate established over ten instead of fifty years has posed New Zealand foresters with such extremely difficult problems that future generations are unlikely to repeat the mistake of their predecessors.

5. *Training and Research Essential to Progress and Efficiency.*—Looking forward instead of backward, forest-management may correct the mistakes of the past provided there is continued insistence upon the highest standards of training for Forest Service staff. The ecological complexity of the primitive vegetative cover of the country makes the regeneration and management of the indigenous forest resource a problem of extraordinary abstruseness and requires highly-qualified officers for its solution. Likewise, seemingly easy to manage because of the readiness with which so many of them regenerate, the exotics pose some extremely difficult problems. Many arise from the basic fact that their periods of annual growth are so remarkably long that laterals develop and persist abnormally, not only to create points of weakness in the growing stem, but to yield sawn timber characterized by large knots and—worse still—large knot holes. Only by the complete integration of forest-management and forest-products research are these problems capable of solution.

Management

6. *National Forest Survey.*—The first quarter of a century of the Forest Service was ushered in by a 5-year national forest survey based to some extent upon reconnaissance, but more often upon guesswork owing to the inaccessibility and impenetrability of many of the forests in the 1919–24 period. It had little use other than to prove the inadequacy of the indigenous forest resource for substained timber-production and the necessity for the supplementary exotic capital since created. The second quarter of a century of Forest Service history has likewise been marked by a national forest survey of much improved technique. Aerial photography has replaced guesswork and ground parties penetrate everywhere for sample assessments—working under the direction of trained foresters and ecologists so that not merely timber quantities but forest compositions are determined with accuracy. The work will provide information upon which the forest policy of the future may be based with a confidence hitherto absent.

7. *Management of Beech Forests Holds High Promise.*—Even though the final results of the national survey will not be available for several years, interim results have disclosed the existence of sufficiently large tracts of indigenous forest—three of them each of about 50,000 acres—to allow of the immediate institution of a practicable system of forest-management which will ensure their perpetuation as a source of timber-supplies. All are essentially beech (*Nothofagus*) forests two of which are situated in the western Nelson section of the Nelson-Marlborough Conservancy. As forerunner to their management, another beech forest in the Southland Conservancy is already being silviculturally treated under guidance of the national forest survey. Prior to logging, seed-trees are reserved and the mineral soil of the forest floor exposed by removal of the *Blechnum* fern. After logging, all standing trees, other than those finally selected as seed bearers, are felled and additional usable material salvaged for milling, &c. Ample regeneration will occur within a short time and thrive on the exposed forest floor. Owing to the heavy deer population in this locality the whole managed area is being protected by a deer-proof fence. Typifying the deer damage, which must be prevented, there is one thirty-year-old clearing in this forest in which the beech regeneration instead of now averaging 5 in. DB.H. and 35 ft. high, consists merely of 6 in. high plants with stems up to ½ in. in diameter as a result of continual browsing by deer. Withal, the operation is an economic one as measured by a net forest revenue after selling the produce and paying for all silvicultural and protective measures.

8. *Kauri and Rimu Management.*—In contrast, though it is entirely practicable to restore some of the kauri forests of North Auckland by suitable treatment of the advance growth already existing, only in rare instances will there be sufficient revenue from

mature stands to make the operation self supporting. The rimu forests are in still greater contrast. The shy seeding propensities of this and associated species constitute a basic difficulty in the evolution of a practicable system of silvicultural management. Long-continued research into the physiology and genetics of the various species, coupled with equally long studies in the experimental logging and silvicultural treatment of rimu forests, may eventually evolve a practicable system of management for their perpetuation, but it is unrealistic to anticipate that they can ever make any major contribution to the timber-supply of the country. At the best it will be several centuries before they are restored to maximum productivity.

9. *Timber Sales.*—The long-term indigenous log sales, initiated pre-war, are now to be followed in the case of entirely new indigenous forests by long-term sales of standing timber with revaluations at stated intervals and appropriate safeguards against trafficking in goodwill for cutting rights. All such sales will be covered by working plans as provided for in the Forest Act, 1949. Similar policies will operate in respect to some exotic State forests.

10. A most serious defect in forest administration has been disclosed as a result of recent developments. Under the current policy of conserving the rapidly-diminishing supplies of indigenous timber for high-class joinery and finishing purposes, no new State forests are opened for sawmilling until absolutely necessary. When this arises as a result of the supply of indigenous timber being inadequate for absolutely essential requirements the timber is supposed to be thrown open for free competition either by tender or by auction. Equally important, the quantity to be cut annually from each new forest is supposed to be strictly limited so that each mill will have a long enough cutting life to warrant the establishment of good equipment and reasonable living amenities for workers. Other things being equal, preference is given to operators of proven efficiency, but otherwise the competition is free as it rightly should be in the disposal of publicly-owned resources.

11. A number of operators are attempting to circumvent the equitable disposal of public timber and the efficient management of State forests. Some have even succeeded. The following are typical:

(*a*) An operator not previously in the industry built a mill without any timber resources whatsoever, and then applied on compassionate grounds for sufficient timber from a forest in the adjoining district, even though this would cause the annual allowable cut for this particular forest to be exceeded. Against the Department's recommendation, his request has been acceded to, and what is most important, without there being free competition for the extra resources released from this forest. In this case the Department was to blame for not having a working plan prepared in conformity with the Forest Act, but it is appropriate to emphasize the difficult position in which the Director of Forestry would have been placed if, as would have been necessary in this case, he had refused to recommend the Minister to change the working plan, as he is entitled to do by the Forest Act, and without which change the sawmiller could not have been supplied. It is therefore apparent that the Forest Act should be suitably amended to provide that any proposals or alterations to working plans, whether by the Government or the Forest Service, be fully set out in the annual report of the Department so that they may be fully examined by the House in session. Only by this means may the sanctity of working plans be established and efficiency of forest-management achieved. Another sawmill without any resources has now been erected very much nearer to the same forest.

(*b*) A building concern has recently erected a sawmill and houses estimated to have cost £25,000. Its only timber resources are reported to be about 2,000,000 board feet. No other private timber resources are available in the locality, but adjoining them is a State forest with over 20,000,000 board feet of timber. The company believes that it has thereby a prior claim to this timber, whereas this particular forest was withheld from opening until other mills had been cut out elsewhere when it had been envisaged that they would be able to freely compete for its resources. As the forest is only large enough to give one sawmill a reasonable working life, the equitable disposal of its timber has been jeopardized by the action not of a sawmiller, but of an entirely new operator. Such tactics can only be effectively combated by an appropriate amendment to the Forest Act, providing that any operator establishing himself in any district without first securing State forest timber by free competition shall automatically be precluded from securing any State forest timber for that particular mill.

12. There are innumerable variations of such tactics, but the two foregoing instances have been chosen as illustrative of the necessity for establishing the sanctity of working plans, and for ensuring the equitable disposal of State-forest timber. Suitable recommendations are accordingly being made.

Soil Conservation

13. *Look After the Catchments and the Rivers Will Look After Themselves.*—Ever since its inception the Forest Service has consistently advocated the maintenance of an adequate vegetative cover on the high country of New Zealand as the only possible means of conserving soil and water and of preventing accelerated erosion. Elementary though the fact is, it must be continually reiterated. The root of the problem is in the headwaters and catchments of the rivers, and it is there, and not in the lower reaches, that preventative and remedial action must be taken ; downstream engineering, necessary and valuable though it may be, does not strike at the cause of the trouble and can never be anything but a temporary palliative. The motto for soil erosion must be "look after the headwaters and catchments and the rivers will look after themselves." In addition to representatives on the Soil Conservation Council and the Catchment Boards the Forest Service seconds a professional forester for duty with the Council.

14. *Forest Cover Essential for All Steep Country of High Rainfall.*—In the light of its convictions, the policy of the Forest Service in soil-conservation measures is clear cut. It is simply to initiate or encourage any action which will conserve or improve the existing cover, and, conversely, to prevent or discourage any action which would have the opposite effect. This is the policy which, with varying degrees of success, the Forest Service attempts to follow in the administration of the 6,000,000 acres of protection forest under its control ; and it is the policy which the Forest Service continually advocates for all steep land of high rainfall intensities, irrespective of its tenure.

15. The year under review has seen a major step forward in that the functions of the Forest Service in regard to soil conservation have been given legal definition by the passing of the Forest Act, 1949. The Act refers directly to the responsibility with which the Forest Service is charged for controlling and managing State forest land for the purposes of water conservation, soil stabilization, and balanced-land use. It further provides for the acquisition of land specifically for these purposes. The present policy, therefore, is directed not only to existing State forests but also to land of other tenures which is showing signs of actual or incipient erosion, and for which the protective cover should be arboreal in nature. Such land is generally sub-marginal in character and unsuitable for permanent agriculture ; as opportunity permits it is being acquired as

State forest, and will in future be managed along sound conservation lines. The emphasis will be on the re-establishment of an effective forest cover, preferably by natural means, and only as a last resort by the introduction of an exotic cover.

16. *Fire Protection the First Essential for Soil Conservation.*—The measures necessary to implement a sound conservation policy in protection forests may be summarized as: protection from fire; prohibition or control of grazing; extermination of animal pests; limitation of sawmilling activities; and, in certain cases, artificial re-establishment. Of these fire protection is the most important. Fire is the greatest single menace to vegetation and can in a few hours undo the work of centuries in building up a stable soil-vegetation complex. It is in the control of fire that the Forest Service has made its greatest contribution to soil conservation. The advance gained by the passing of the Forest Rural Fires Act in 1947, which for the first time set up the machinery necessary for the protection of all forest and rural land in the Dominion is now being consolidated by the drafting, in consultation with all the Fire Authorities concerned, of suitable regulations under the Act. It is confidently expected that these regulations will have further beneficial and far-reaching effects on the safety of protection forests and hence on the stability of soil and water resources.

17. *Eradication of Deer and Other Serious Pests Essential.*—Of almost equal importance, and, since the effects are less spectacular, possibly of even greater danger, is the damage being done by introduced animals. Evidence continues to accumulate that many beech-protection forests, particularly in districts of moderate rainfall, must ultimately disappear completely unless the present high deer population is very much reduced. The objective, obviously, should be one of complete extermination, but such a policy is unrealistic and impossible to achieve. The most that can be hoped for, and the objective which must be gained, is the reduction of the deer population to a level which will allow the beech forests to recuperate. The problem of how to achieve this objective has not yet been solved; it is being given the closest attention by the Forest Service as well as by other relevant authorities.

18. *Logging Activities Only Occasionally Threaten Soil Conservation.*—By comparison with fire and animals, the risks attached to sawmilling activities are negligible. This does not mean, however, that as a policy matter the Forest Service does not exercise the greatest care in the administration of logging operations in State forests. With the sawmilling industry moving further back into hill-country forests, the need for vigilance is greater than ever before. The Forest Service performs an unspectacular, but nevertheless valuable, function in continually resisting applications for cutting rights on forest where, for one reason or another, the vegetative cover must be preserved intact. On many soils removal of a relatively few large trees per acre in no wise endangers soil stability, and, in many cases, replacement of an over-maturing forest by a young growing stand will actually improve soil stability and decrease water run off, but in other cases the reverse may operate, in which event the forest is closed to logging operations. This work, which is of routine nature, tends to go unnoticed by the general public; it is a valuable contribution to the whole problem of soil and water conservation.

19. *Sand-dune Stabilization Essentially for Maximum Development of Farm Land.*—The Forest Service contention that sand-dunes should be managed primarily to restore as much of the land as possible to farming production is rapidly winning wide recognition. Originally, due to certain legal defects in the Forests Act, 1921–22, responsibility for dune work finally passed to the Public Works Department during the depression period of the thirties, since when it has been confined to fore-dune stabilization and tree-planting for timber-production. The legal defects having since been removed, the Forest Service believes that it is the most suitably staffed to co-operate with the Department of Lands and Survey in minimizing and effectively managing a protective screen of forest for the maximum development of farming-lands behind.

Public and Private Forestry

20. *Cheap Tree Seedlings Essential to Forestry Extension.*—A great impetus was given to public and private forestry in the 1921 to 1929 period when the Forest Service raised seedlings for sale and planting under the guidance of Forest Extension Officers. With the discontinuance of this work in 1929 the movement rapidly lost headway and, with few exceptions, has languished ever since. Meantime, observations by Forest Service Officers travelling abroad have established the difficulty of attaining a maximum effort in public and private tree-planting unless based on the supply of reasonably-priced tree-stocks by governmental or other agencies interested in the promotion of large-scale forestry. As commercial nurseries invariably benefit from the much expanded demand for tree-stocks, it is proposed to discuss the future of forestry-extension work with the New Zealand Nurserymen's Association, in the hope that by expansion of demand prices for high quality stock may be reduced to lower levels while still high enough to cover production costs. It is significant that in some countries even private companies, in order to assure themselves of future supplies of pulp-wood, &c., from surrounding lands, sell tree-stocks to farmers at low prices.

21. *Encouragement of Forestry Extension by Amelioration of Taxation.*—Other than the lack of cheap tree-stocks the chief factor militating against the maximum development of private forestry has been the incidence of taxation upon both farmers and companies. The Forest Economist, Mr. M. B. Grainger, spent a year studying forest taxation in Northern Europe with a view to recommending appropriate reforms as a much more desirable corrective than the use of subsidies to encourage tree-planting. His report is in press, but meantime some relief has been accorded farmers by sections 6 and 7 of the Land and Income Tax Amendment Act, 1949, providing both for recognition of establishment and maintenance costs as an item of farm expenditure and for spreading the income from sale of trees and logs over a period of five years. Still further concessions are being recommended in order to encourage the re-establishment of farm shelter and wood-lots. Other recommendations provide that trees shall not be valued separately from the land for estate duties and that in any case these shall not be paid until any timber is actually cut and sold, thus preventing the sacrifice of essential shelter in order to avoid duplication or even triplication of estate duties due to the untimely deaths of successive owners.

22. Forestry companies were likewise accorded some relief by agreement of the Commissioner of Taxes to allow all maintenance charges as working-expenses for entire forests instead of for only those compartments being currently worked for revenue production. Further proposals cover relief from the graduated land-tax and recognition of expenditure on fire-fighting equipment as a working-expense in lieu of fire-insurance protection which is not available to forestry companies.

Training and Research

23. *Report on Higher Forestry Education and Research.*—Following the return of the New Zealand delegation to the Third World Forestry Congress at Helsinki a report has been approved for publication in which, *inter alia*, Mr. T. C. Birch, the head of the delegation and Inspector in Charge of Training and Research, has reported on these aspects of forestry work in Northern Europe.

24. His report will be considered at pending discussions with the Auckland University College on the future of higher forestry education in New Zealand. After careful examination of the standard of professional forestry training abroad he questions the practicability of organizing a sufficiently high standard in any New Zealand institution except at an exorbitant cost, owing to the necessity for having almost as many professors and lecturers as there will be students, the annual requirement for which may not exceed eight and could be as low as six. Hitherto, the Forest Service has strongly advocated the establishment of a University School of Forestry at Rotorua,

but it is unable to ignore the manifestly clear advantages of continuing to send B.Sc. students with practical forestry training to complete their professional studies at overseas Universities where both tuition of a high standard and advanced practical training are available.

25. Mr. T. C. Birch also considers that in accordance with Northern European practice all forestry research in New Zealand, including that at the Rotorua Forest Research Institute, should be co-ordinated by a committee representative of all interests, and it has been recommended accordingly that a Forestry Research Advisory Committee be set up under the appropriate provision of the Forest Act, 1949, to advise the Minister and the Government on this important subject and to achieve economy of effort and avoid needless duplication of work.

26. *Youth Recruitment.*—With a complete turnover of forest labour now reduced to less than a year, it is impossible to develop a reasonable standard of efficiency in general employment. Less that half of the labour force can be regarded as even semi-permanent. The only long-term corrective appears to lie in the development of a tradition and pride in craftsmanship by recruiting suitable youths preferably with some secondary education. By giving them good living-conditions with their own organized sports and hobbies, by combining practical forest training with technical classes on wet days and in evenings, and by providing inspired leadership and discipline it is belived that a highly-efficient permanent labour force can be built up and retained by the attraction of excellent married accommodation, village amenities, good pay, stable employment, and pride in achievement. Work to this end during the past year has been largely exploratory, but it is hoped that the first recruitments under this scheme will take place at the end of the 1950 school year.

27. *Rotorua Training Centre.*—The work at the Rotorua Training Centre has now proceeded to a point where it has demonstrated beyond all possible doubt the superiority of formal training to the usual on-job teaching. In morale, in *esprit de corps*, and in efficiency the Forest Service staff has made marked progress as a result of its training activities at Rotorua. Only one officer was newly appointed for this work, the remainder of the teaching staff—representing many of the best officers of the Department—having been withdrawn from current administration as and when required. It has thus been necessary to make a short-term sacrifice in the quality of current administration for the benefit of the long-term advantages inherent in a trained staff. The Forest Service has been just as short of staff as many other organizations, but instead of believing as others have done, that officers could not be spared either for teaching or for training, it was convinced that if efficiency was to be secured, officers must be spared. The results have already confirmed the correctness of this judgment, even though the Training Centre will not attain the optimum of its development until 1952 or 1953, when it is planned to institute courses of several months' duration covering the higher aspects of forest administration. Without qualifying in this course, no officer whether of the professional, general, or clerical division of the general Public Service will be able to advance to senior administrative responsibilities.

Commercial Activities

28. *Developmental and Demonstrational.*—Although managing its industrial activities on strictly commercial lines, the Forest Service has continued to use them primarily as developmental and demonstration units for the benefit of the industry. Not only is information freely made available to other operators, both on costs and operating and designing techniques, but staff is lent for advice and assistance and expensive saws repaired for the industry. The outstanding achievement of the year was the successful inauguration of marketing packaged exotic softwood on the Australian market. Packages of even-length kiln-dried timber, varying from 600 to 1,000 board feet, are now wired at the Waipa Mill and handled in this form from mill to port, to ship, to wharfside in

Australia, and finally to the user's machines for planing, &c. It has cut ship-loading time by one-third, unloading time by half, and port-to-user period by a half. According to numerous authorities it has set a new high standard for timber merchandising on the Australian markets. The savings which it makes possible will significantly strengthen the competitive power of New Zealand timber on the Commonwealth markets as both Scandinavian and North American timbers decrease in price.

29. In accordance with the Forests Act, 1949, revenue accounts and balance-sheets for all operating-plants are presented in Appendix XVIII. They have been presented in the narrative form as recommended by accountants societies throughout the English-speaking world. In addition, much valuable information is presented in Chapter VI, so that a very much more detailed account of operations is available than in the case of most commercial undertakings.

The Murupara Project

30. *General.*—Last year's report presented a twenty-four-year review of the history and development of the Department's proposals for the establishment of an integrated sawmill and pulp and paper plant at Murupara, on the Rangitaiki River, about 40 miles south-east of Rotorua. Since that review, final reports have been secured both on the sawmill and pulp and paper sections of the plant and on the logging proposals for the supply of sawlogs and pulp-wood. All confirm the essential economic soundness of the scheme. Meantime, currency revaluation has converted the project from a marginal profit-earner of the order of 6 per cent. after taxation to more like double that figure. The most important development of the year was the acceptance of the departmental recommendation that an industrial development of such magnitude necessitated both private management and direction, and with this object in view negotiations were initiated with representative British interests and are being continued. The essential features of the project are presented for public information.

31. *Raw Material.*—The raw material is to be supplied from the Murupara working circle, comprising of 284,000 acres of Kaingaroa State Forest. The annual potential sustained yield of the forest (in perpetuity) is 32,000,000 cubic feet against the project requirements of 28,000,000 cubic feet. The margin of 4,000,000 cubic feet has been provided to allow for contingencies due to insect and fungal attack and other possible losses. The forest resources are unique in that, unlike any other similar area in New Zealand, there is a diversity of species so that in the event of the insignis-pine resources being irretrievably damaged by insect or fungal attack alternative sources of supply for both sawlogs and pulp-wood will be available. Likewise they are safeguarded by the most efficient fire-fighting organization in the Dominion being inclusive of both aerial patrol and radio communications.

32. *Integration.*—Integration of a large-scale sawmill and pulp and paper plant is the basic foundation requirement of the Murupara scheme for financial success. It provides for common wood yard, steam and power plant and all engineering services for a combined sawmill, groundwood pulp-mill, sulphate pulp-mill, and newsprint and printing-paper mill. In the wood yard, tree-length logs will be cut to best advantage to feed all sections—straight top logs free of heartwood for the groundwood mill, large straight butt logs (many with heartwood) for the sawmill, and the remaining logs (crooked, and with heartwood) for the chemical pulp-mill. These three classes of raw material will be barked, and the bark, together with offcuts in trimming, &c., sent to the steam-plant as fuel. Each section of the integrated set-up takes the particular kinds of raw forest material most suited to its production and thereby secures these at a minimum price. Some operate on the waste of others, and all unusable material is employed as fuel. Yet by the sharing of common facilities, both capital and operating-costs per unit of product are so reduced that the forest-owner can realize a higher total value for his raw material.

33. *Quality of Sawn Timber.*—As to the competitive quality and price of the sawn timber on the Australian markets the Waipa Sawmill was established as a prototype of the Murupara plant both to develop operating technique and efficiency and to test the Austalian markets. In both it has been successful. From the Waipa experience it has been possible to design a plant of sufficient size to reduce operating-costs by almost 40 per cent. On the Australian markets it is freely conceded by both New Zealand producers and Australian users that the Waipa sawn timber has set a new high standard of quality production and merchandizing. This is best reflected by the premium which it commands. As a further result of sawing at Murupara only the larger and better quality logs and of pulping the smaller and lower quality also now being sawn at Waipa, the average dimension and quality of sawn timber will be so improved that it is confidently anticipated that the Murupara product will be able to compete at world-parity prices on the Australian market against competition from both North America and Northern Europe.

34. *Quality of Newsprint.*—A long series of laboratory pilot plant and full-mill scale tests had established the suitability of New-Zealand-grown insignis pine for the production of acceptable grades of both sulphate pulp and newsprint and various printings and writings, but it was deemed advisable to have further large-scale mill trials run at the only mill in the world then successfully manufacturing newsprint wholly from pine pulp-wood. Accordingly, whilst in America in 1949, the New Zealand delegation to the World Wood Pulp Conference at Montreal concluded negotiations with the Southland Paper Mills, Ltd., of Lufkin, Texas, for a commercial trial of its process for eliminating resin trouble in the manufacture of newsprint from New-Zealand-grown insignis pine. Preliminary tests by the company had indicated that the resin in New Zealand pulp-wood so resembled that in the southern pine pulp-wood, which it regularly used, that it would respond to the same method of treatment for resin control. The basic difficulty in using any pine-wood for the production of groundwood, which forms about 80 per cent. of the pulp required for newsprint, is that without suitable treatment resin accumulates on the paper-machine wire mesh until large holes occur all over the paper and make it unusable. The rate of accumulation varies widely due to numerous factors such as age of tree, heartwood content, density of wood, season of cutting, period of drying, &c. Previously about 100 tons of newsprint has been produced at the Australian Newsprint Mills at Boyer, Tasmania, but on that occasion every precaution had been taken to use wood in which the resin content was abnormally low. The test showed that newsprint of good colour could be produced, but due to the necessity of using the same grinding conditions as employed for making eucalypt groundwood the finish of the paper was very rough, and nothing like as smooth as either eucalypt newsprint or the usual high-quality Canadian product.

35. *Newsprint Tests at Lufkin, Texas.*—The Lufkin trials were accordingly shaped to test the practicability of controlling resin accumulation on the paper-machine wire and of producing a smooth sheet. They were successful in both respects, but due to unavoidable shipping delays the wood when ground at Lufkin was far too dry to give optimum results. Firstly, the colour was somewhat greyish as compared with the creaminess of the Boyer trial sheet and the high blue-white of the usual Eastern Canadian paper. Secondly, as it was also necessary to use the same grinding conditions as for the denser southern pine pulp-wood, considerable difficulty was experienced in making the newsprint at the full basis weight of 32 lb. For these reasons it was necessary to use 26 in place of the usual 20 per cent. of chemical pulp, but had the wood been as green as in the case of the Boyer trial there would have been no difficulty in producing a 32 lb. sheet of much better colour with even less than 20 per cent. of chemical pulp. As it proved, however, the very difficulties themselves yielded invaluable results on the extraordinary strength of the New Zealand sheet which, even allowing for the slightly higher percentage of chemical pulp, would still be almost twice as strong as the

best Canadian sheet of similar composition. This exceptional strength is reflected in the fact that it was possible to produce a 28 lb. sheet at 1,440 ft. per minute, which is probably a world's record for such a light-weight product and justifies the design of a paper-machine to produce a New Zealand newsprint at several hundred feet per minute faster than has previously been anticipated. A printing test by the Lufkin *Daily News* demonstrated that the sheet could be used with only minor modifications in printing technique, and that with proper grinding conditions for freshly-felled wood the newsprint could be regarded as equally good as either Canadian or Scandinavian newsprint. Any slight inferiority which it might have in respect to colour would be more than offset by its superior strength.

36. *Quantities and Values of Products.*—In full production the integrated plant will produce over 70,000,000 board feet of timber annually, 100,000 tons of newsprint, 10,000 tons of other printings and writings, and 15,000 tons of pulp. Sixty million board feet of timber will be exported annually and 60,000 tons of newsprint, and between 10,000 and 15,000 tons of pulp, mostly to Australia. At prevailing values the production ex-mill would be worth £7,000,000 and the export £4,000,000.

37. *Capital Requirements.*—To establish the integrated plant and provide working capital a total sum of £15,000,000 will be required. A further sum of £13,000,000 will be required to provide all the necessary public-work facilities to give access and accommodation but all these latter should ultimately prove self supporting, and it is clear from the outset that the railway connection at the prevailing freight rates will prove the most profitable operating-line in the whole railway system of the Dominion.

38. *Return on Investment.*—At prevailing values the project would return in full production a profit-rate of 10 per cent. after taxation, but even by substantially reducing values to cover the first twenty years of full operation the profit-rate will be of the order of 7 per cent. The project will give employment in forest and plants to over two thousand workers.

39. *Dollar Savings to Sterling Area and Improvement of Trade Balance With Australia.*—Of no little importance is the fact that at these same reduced values the export potential is of the order of £3,500,000 or a reduction of the adverse trade balance with Australia *by one-third*. But most important of all is the fact that again at these same reduced values the project will save the sterling area (Australia and New Zealand) *at least $16,000,000 annually*, $16,000,000 which can be converted to motor-cars and the innumerable other goods which the people want from North America and cannot now obtain because this self-same sum is spent on newsprint and timber from Canada and the United States of America. The project can compete at world parity for these products on the Australian markets and achieve these results. Who will gainsay that it cannot be to New Zealand what Broken Hill is to Australia ? Will New Zealand have the high courage to persevere with this venture—*now*—for if not now it will be never. The forests have arrived at a stage in their development when they can render a maximum return. With every year's delay that return must decrease, and the time is not far distant when the large-scale development which is possible now can no longer be proceeded with because the forests will have grown too much heartwood and there will be insufficient sapwood for newsprint production.

40. *Prejudice Against Large-scale Enterprises.*—The Forest Service fully appreciates the inherent pyschological difficulties hindering public acceptance of the scheme. New Zealand is essentially a country of individualists. Even large-scale co-operatives are suspect. How much more so must be a company which will have an output of sawn timber alone equal to the production of one hundred existing sawmills ? The natural thought, if not instinct, is not merely to suspect but to resist. The unpleasant truth to the individualist is that only by this large-scale production will New Zealand be able to reduce costs sufficiently to compete at world parity in Australia so that in either event there will be no one hundred millers—merely unused forest ! The Forest Service hopes

that the same type of enterprise which gave New Zealand the largest co-operative dairy company in the world will likewise give it the largest integrated sawmill and pulp and paper company in the Southern Hemisphere.

Engineering

41. *Good Engineering Economical.*—In engineering as in every other phase of its activities the Forest Service has made quality a major consideration. Whether in the case of simple single-man huts or of major works such as sawmills it has found as a result of studying experience in industry and elsewhere that it is more economical in the long run to build relatively good structures with low-maintenance costs than relatively cheap structures with high-maintenance charges.

Fire-fighting

42. *Co-operation Between County Fire Authorities and Catchment Boards.*—The third year of operations under the Forest and Rural Fires Act has failed to disclose any major defect in the legislation but some conflict has occurred between county Fire Authorities and Catchment Boards, both of whom have powers under different Acts. Recommendations to remedy the position are now under consideration.

Legislation

43. *Forests Act, 1949.*—As foreshadowed in last year's report, a Bill to consolidate and improve the Forests Act, 1921–22, and its amendments in twelve different statutes was presented to Parliament last session and with improving amendments duly made into the new Forests Act, 1949. In drafting this Bill the tenet was followed of confining it to principles and fundamental rules, the former as applying to organization, &c., and the latter as to relations with individuals, &c., which will explain why fire offences formerly dealt with under regulation have been transferred to statute law. Flexibility in administration was the objective in setting out in detail and separately the various purposes for which regulation could be made. The Forest Service had in mind its wartime experience in timber control in which it often—though not always—proved the practicability of achieving many objectives by negotiation with individuals and groups and by delegation of duties and responsibilities to trade associations but always with joint recognition that in the event of failure resort to regulatory control was inevitable. The Forest Service believes that regulations should be invoked only as and when required as a last resort.

Wood-preservation

44. *General Policy.*—A major change in wood conversion and utilization policy has been forced upon the Forest Service as the result of the last ten years of its experience in promoting the proper and efficient use of exotic softwoods. Hitherto it has advocated the practicability of educating the building and constructional industry and other users in the wise use of such timber without resort to wood-preservation. The wish seems to have been the father of the thought. Enough of the exotic softwood timber now being produced from immature stands is being so poorly handled and used that if current practices continue much longer it will be a matter of only a few years before home-owners, local bodies, and lending institutions are seriously prejudiced against its future use. The Forest Service now advocates compulsory and appropriate treatments to remedy the position.

45. *Suitability of Different Preservatives for Various Purposes.*—The exotic softwoods from immature stands are so susceptible to sap-stain, mould, and incipient decay that mishandling should not be allowed. At most producing sawmills it should be entirely

practicable to either dip them against sap-stain attack or kiln dry them and afterwards treat appropriately with some suitable preservative according to their final use. Water-soluble preservatives are inherently suitable for the treatment of timbers which are either to be painted or used under continuously dry conditions, and should therefore dominate the building field, in which they have only one disadvantage. The immature softwoods absorb moisture so readily that although treated house-framing may have been extremely well dried prior to erection it may be seriously distorted if subjected to continuous rain during erection. This is a disadvantage in high-class construction which suggests the necessity for developing a water-repellant treatment. In turn, oil-soluble treatments cause no swelling or shrinkage and have some water-repellant properties but are more costly. They are therefore better suited for pre-cut buildings, joinery, and furniture, &c. Creosote of course is the only preservative well suited to most New Zealand exterior conditions where the timber is unprotected by paint or is in contact with the ground. Long continued exposure to the leaching effects of the alternating wet and dry conditions so characteristic of New Zealand's high and well-distributed rainfall does not favour the use of water-soluble treatments except in conjunction with creosote, &c.

46. *Growing of Heartwood Will Obviate Preservation Treatment.*—It is appropriate to stress, however, that the ultimate objective of Forest Service management policy is to manage its exotic forests on a sufficiently long rotation so as to yield sawlogs with a very high percentage of heartwood so that the necessity for wood-preservation will be obviated. Even the most economical of treatments are an unnecessary expense if heart grades of timber can be produced seeing that they possess not only inherent resistance to both insect and fungal attack—particularly in buildings—but greater resistance to moisture absorption and therefore greater dimensional stability.

CHAPTER III—MANAGEMENT DIVISION.

Acting-Inspector in Charge: Mr. W. P. Pollock

Introduction

1. Forestry in New Zealand was founded on the experience and teachings of European countries, but although there is no doubt that the principles of silviculture and forest-management are applicable the whole world over, experience in the practice of forestry in New Zealand is now leading to the development of forestry technique adapted to the special conditions ruling in this country. To quote an example, the management of exotic forests in New Zealand is influenced by the fact that insignis pine, plantings of which make up about 50 per cent. of the total area planted, grows extremely rapidly here—at twenty years of age some stands reach a height of 100 ft. and an average diameter at breast height of 13 in., yielding 7,000 cubic feet an acre (to a 6 in. top i.b.). Maturity for marketing is therefore reached by this species at a very early age, and financial returns and the freeing of capital are correspondingly early. In the tending and management not only of these forests but of all our exotic and indigenous forests adaptations of foreign practice are called for; and to this end the prescriptions in working plans are being based on local experience and statistical information.

2. As New Zealand's prosperity depends on the agricultural and pastoral industries, questions of land use are of paramount importance, and farming must have the first priority in land use. No land regarded as permanently suitable for farming is taken for State Forest, and proposals to acquire new land are therefore critically examined by a committee consisting of officers of the Lands and Survey Department and the Forest Service. Even though land has already been proclaimed as State forest land, if under to-days' improved methods of agriculture it is found more suitable for permanently economic farming, then some or all of the unplanted areas may be released for farming by the revocation of its setting apart for forestry.

Forest Resources

3. *Land.*—There are two categories of State Forest land: permanent State forest and provisional State forest land: the former may be alienated only by Act of Parliament, but the latter may be withdrawn from reservation by proclamation for settlement purposes or for public reserves. In addition, certain lands which are not State forest lands are administered under various statutes as State forest lands.

Figures for the past year are as follows:—

	Acres.
Land placed under reservation	84,201
Land withdrawn from reservation	5,453
Provisional State forest land permanently reserved	14,406
Total area of State forest land at 31st March, 1950	9,433,632
Non State forest land administered as State forest land at 31st March, 1950	27,552
The areas of land withdrawn from reservation were—	
For settlement	5,362
For scenic reserves	91

The proportion of State forest land to the total land area is 14·2 per cent. Detailed figures for past years analysed into conservancies are given in Appendix I.

Silviculture

4. *General.*—Progress with silvicultural operations has been good, although the programmes that were practicable were still restricted by the shortage of labour to less than the targets which had been set. The aggregate acreage dealt with by planting, pruning, and thinning was 10 per cent. greater than that of 1948–49; Appendix II summarizes the silvicultural operations for the year. The labour force has improved numerically, but the men offering were not on the whole up to the desired standard of suitability. Immigrant labour of various nationalities relieved the shortage to some extent and is providing some good forest workers. To economize in manpower, mechanical saws are being used to fell thinnings in Kaingaroa State Forest, as the investigation mentioned in last year's report showed that this method was satisfactory under favourable topographic conditions on the Kaingaroa Plains. In the case of stands in the older age-classes thinning and pruning are concentrated largely on those stands which are likely to give the best response to these treatments.

5. *Natural Regeneration.*—Some of the more commonly grown exotic species regenerate freely after a sufficient opening of the canopy, but so far no shelterwood systems are being practised. Prolific natural regeneration occurs at Rotorua on the large areas of insignis pine clear felled each year for timber; for instance, on felled areas left untouched for two years after the logging crews had passed, counts revealed stockings ranging from 200 seedlings an acre on bare exposed ground to 10,000 seedlings an acre where seedlings had received shade from slash and vegetation. Germination resulting after an accidental fire in a nineteen-year-old stand of insignis pine, on count two years later, showed a stocking of up to 65,000 seedlings an acre, 18 in. in height. Every endeavour is made to bring about successful establishment by natural restocking because it obviates costly nursery work and planting, and is expected to provide crops which are better both in form and growth. Very high stocking has its disadvantages, however, and has given rise to problems concerning thinning procedure. The various treatments which have been tried have yielded evidence that from the combined silvicultural and economic points of view the first thinning should be in the third or fourth year, and should leave a stand spaced approximately 6 ft. by 6 ft. Costing of such treatment indicates that it is considerably cheaper than artificial re-establishment. The total area in exotic forests now classed as fully stocked by natural regeneration is 1,059 acres.

6. In beech forests (*Nothofagus* spp.) the prospects of obtaining natural regeneration in good mast years are assured, but the question of the best preparatory measures for securing regeneration under varying conditions is under investigation. Seeding fellings of varying intensity are being made in silver and red beech stands in several conservancies. Deer are such a menace to the young growth, however, that failing their near extermination which seems impracticable, it is likely that protection of beech stands will entail heavy expenditure on deer-proof fences. In mixed podocarp forests the problem of natural regeneration is much more complicated, owing to the diversity of species present and the parent trees being dioecious—*i.e.*, male and female flowers are on different trees.

The working plan for Pouakani State Forest prescribes the conservation of 5 acres of bush in every 100 acres opened to milling; and the stocking of young podocarps in the surrounding milled land resulting from the seed-trees in the reserved areas will be watched. Needless to say, all advance growth of indigenous forest trees is guarded, and where it occurs in timber-sale areas it is made the subject of special conditions in sawmilling licences.

7. *Interplanting.*—The area of land on which interplanting took place during the year amounted to 562 acres as against 344 acres the previous year. The species used were in the main Japanese cedar, western red cedar, Douglas fir, insignis pine, southern pines, and kauri. The types of stand interplanted were logged podocarp forest, heavily thinned larch, and other exotics. An investigation of the results of interplanting, mentioned in last year's report, has been completed, and the report of the investigation is receiving careful study, as it will form the basis of a policy directive. The practice of using young pine stands as "nurses" for kauri plantings was continued in the Auckland Conservancy.

8. *Afforestation.*—A summary of planting, blanking, and replanting in the past four years is given below; details of the areas concerned are given in Appendix II.

Year.	Planted.	Blanked.	Replanted.
1946–47	834	685	925
1947–48	2,819	956	883
1948–49	4,568*	1,334	832
1949–50	4,879	1,435	535

* Error in last year's report—see Appendix II.

During 1949–50, in addition to the above, direct sowing was carried out with lodgepole pine over 40 acres at Karioi and with Douglas fir and *Eucalyptus gigantea* over 7 acres at Alton in Southland. The Douglas fir has struck well, but it is as yet too early to estimate the success of the other sowings. A survey of the 1948 direct sowing of insignis-pine seed over 873 acres at Kaingaroa has shown that results were fairly successful on land of site qualities I and II, but these sites represented only about 20 per cent. of the area sown, and poor germination and insufficient survival resulted on land of site quality III.

9. *Seed.*—The total quantities of seed collected in the last four years were:—

	lb.
1946–47	3,284
1947–48	3,120
1948–49	2,591
1949–50	1,934

The year just past was not a heavy seeding year for exotic species, but the reserves of seed held against this contingency enabled a full sowing programme to be carried out. Orders from overseas forest authorities were fulfilled by making special collections to a total amount of 481 lb., the major portion of which was supplied to Rhodesia.

10. *Nursery Operations.*—The sowing of 1,936 lb. of seed yielded 11,855,000 seedlings. The total number of seedlings lifted for planting was 8,000,000, and stocks in the nurseries at the end of the year were 17,805,000. Three new nurseries are being brought into operation, one being for the purpose of raising suitable stock for interplanting in indigenous bush that has been milled.

11. *Tending of Indigenous Forests.*—The most encouraging response to management has been obtained in certain beech stands, and as further experience is gained, the conclusions drawn are being applied more widely. Silvicultural treatment has already been given to a number of beech stands in the Southland, Westland, Nelson, Wellington, and Rotorua Conservancies, and young kauri stands in the Auckland Conservancy. In the beech stands treated in the Kaimanawa Ranges in the Rotorua Conservancy the principal object of management is the utilization of mature trees and the conversion of the present stands to healthy, regenerating stands of pure red beech; the treatment consists of the branding of over-mature trees and trees of unwanted species whose removal would open up the canopy to allow natural regeneration, and the felling of the branded trees by permittees for splitting into fence-posts. Regeneration has occurred in the areas already worked, especially where the opening of the canopy has coincided with a good mast year. In the Westland Conservancy and the Reefton district in the Nelson Conservancy, where coal-mining is a major industry and calls for large supplies of timber, thinnings and sawlogs find ready markets as mine timber and furniture timber respectively; so management for a sustained yield is the principal object in the treated stands. At Rangataua in the Wellington Conservancy the treatment of stands by opening up the canopy was continued, the produce extracted being split into fencing. In the beech forests west of Tuatapere in the Southland Conservancy the whole forest floor is being opened up by the clearing of the present mature to over-mature stands, except for carefully selected seed-trees, so that natural regeneration will bring about a fully-stocked, even-aged stand of silver beech. The treatment of beech forests at Woodlaw in the same conservancy, chiefly thinning, was continued, the produce being sold as mining timber. In the Auckland Conservancy young kauri was released from competing growth, a total of 146 acres being so treated as compared with 95 acres in the previous year.

12. *Tending of Exotic Forests.*—A summary of the areas dealt with in tending operations during the year is given below, together with figures for three previous years. Full details by forests are given in Appendix II.

Year.	Release Cutting.	Low Pruning.	High Pruning.	Thinning.	Clear-felling.
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
1949–50	1,852	7,580	1,827	2,640*	480

* Includes 302 acres in natural regeneration.

Forest Protection

13. *Animal Damage.*—Opossums, rabbits, and deer are still causing the greatest amount of damage, but goats are reported to be on the increase in some areas. The recorded number of vermin destroyed in State forests for the past four years is as follows:—

Year.	Rabbits and Hares.	Opossums.	Deer.	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
1949–50	78,017	35,432	2,395	4,086	4,907	1,164

14. *Opossums.*—The continued low price of skins and the consequent decrease in trapping operations are reflected in the smaller number killed. These animals are on the increase in all parts of the country and are certainly extending their range, the greatest increase being probably in the Wellington and Westland Conservancies. The latter conservancy reports that they appear to be increasing at an alarming rate. Control measures are meantime by trapping and poisoning, but poisoning is resorted to by the Forest Service only under permit for special cases; and methods used are those recommended provisionally and to some extent controlled by the Department of Internal Affairs. Experiments in methods of control are being carried out by the Wildlife Branch of the Department of Internal Affairs.

15. *Deer.*—Deer-destruction parties employed by the Department of Internal Affairs have reduced the numbers of deer in the Wairarapa, but the general position has not otherwise changed. In beech forests throughout the country and in high-country protection forests in Southland, deer cause severe damage by destroying regeneration, and they are one of the major problems confronting the Forest Service.

16. *Rabbit Control.*—Very broadly speaking, the large-scale extermination of rabbits is no longer a problem of such direct concern to the Forest Service as it was ten years or more ago when large areas were being planted annually and the young trees were very vulnerable to rabbit and hare depredations. This particular phase of the problem is still relevant at Gwavas, and on a few of the other areas where smaller annual plantings have taken place; but the emphasis of the problem as it occurs in forests as a whole, has shifted to the concern necessitated by a good-neighbour and good-husbandry policy. From being directly concerned with depredations to forest stock the Forest Service has become indirectly concerned with depredations on adjacent farm lands, the owners of which, having of recent years adopted a policy of increased intensity of rabbit-killing, tend to regard protected and non-rateable forests as a reservoir for a rabbit population that replenishes the depleted farm population.

17. The increasing intensity of the national campaign against rabbits has seen an increase in the number of official organizations to direct the campaign—the Rabbit Destruction Council, a greatly increased number of local Rabbit Boards, the Animal Ecology Section of the Department of Scientific and Industrial Research, the Wildlife Branch of the Department of Internal Affairs. All of these organizations now handle various aspects of a problem in addition to those dealt with by the Department of Agriculture and the comparatively few Rabbit Boards of long standing. The Forest Service task is to co-operate with them all and be a good neighbour to all and it is not the simplest task, when policies (sometimes even of adjacent organizations) differ, as they are bound to do in matters of detail at least. So far as is humanly possible, the Forest Service now tries to make its policy and methods in each locality conform to that of the organization controlling rabbits on adjacent or surrounding land. This of necessity, means that in some details the Forest Service practice is no longer uniform for the whole Service. As a result of this, revenue from sales of skins and from permits to trap rabbits on State Forest no longer figures as an item of forest revenue, and *ex gratia* payments duly authorized as payments in lieu of the Rabbit Board rates as paid by adjoining landowners figure as items of forest expenditure in many localities. This follows from Service adoption of the general national policy advocated by the Rabbit Destruction Council that no product of the rabbit pest shall be commercialized. One effect of it which has had to be carefully watched is that there has been a tendency to offer for Forest Service purchase deteriorated properties on which Rabbit Board rating tended to fall heavily. Many properties which could be offered for forest reservation on grounds of protection from erosion, really meant no more than that the rabbit-rate burden would be transferred from the occupier's shoulders to that of the general taxpayer. Unless such a property could be promptly dealt with by immediate afforestation, this transference of pest burden seems unfair; and much discretion was exercised in consequence in accepting properties offered for acquisition by purchase.

18. Co-operation with the recently established Animal Ecology Section of the Department of Scientific and Industrial Research was effected by the setting aside of a definite area of Gwavas State Forest for the site of its field research station. Despite a certain amount of public incomprehension, this station marks an advance in research on rabbit problems that carries New Zealand to the world forefront; and the Forest Service is glad to have the opportunity to be associated with it even though it is only in the role of passive but interested spectator and guardian. Already the station has begun tabulated observations on the anatomy, physiology, parasite population, and allied phenomena of over five hundred carcasses collected and dissected at the station; and the permanence of the station affords the investigating officers the chance of making recurrent seasonal observations on an almost uncontrolled rabbit population on a scale that no other zoological station has yet achieved. Locally it means that a small, otherwise unused area of the forest is not administered for rabbit-control purposes in quite the same way as the rest of the forest; and this has given rise to some adverse local comment. But Forest Officers and Rabbit Destruction Council members are in close touch with what the zoologists are attempting and doing: and are more than convinced that the potential accretions to present zoological knowledge of the rabbit which will accrue from the consistent operation of the station over a considerable period of time will far more than compensate for any temporary local inconvenience of administration.

19. *Goats.*—These destructive animals are on the increase, particularly so in South Westland (where damage of considerable extent has been reported, in some cases almost all undergrowth being attacked), in Hawke's Bay, and in the area between the Buller and the Motueka Rivers. On Great Barrier Island damage has been caused to kauri, saplings being completely ring barked. A more intensive war on this pest has been waged during the year, and it will continue until some measure of control has been established.

20. *Insect Damage.*—With the exception of *Sirex noctilio* and *Nascioides enysii* (both referred to below) damage by insects has been normal and no new dangerous species have been recorded. Local attacks of a minor nature have been recorded as follows: In Gwavas Forest some defoliation of young larch by the manuka beetle (*Pyronota festiva*); on Great Barrier cicadas (*Melampsalta* spp.) damaged kauri saplings; in Waiotapu Forest underplanted Douglas fir was attacked by the bronze beetle (*Eucolaspis brunneus*); in the regeneration of insignis pine resulting from the 1946 Taupo fires some mortality from *Tortrix*; while in Whakarewarewa Nursery considerable mortality among Douglas-fir seedlings was caused by the grass grub (*Odontria* spp.).

21. Sirex noctilio (*Steel-blue Wood Wasp*).—The depredations of the steel-blue wood wasp reached epidemic proportions in the Rotorua Conservancy during the summer of 1948–49, and in consequence a committee known as "The Sirex Advisory Committee" has been set up to advise the Minister of Forests on control measures. By the end of the year under review, although activities of *Sirex* were reported from all districts, populations appeared to be receding in most areas. Deaths were in the main of unthrifty trees, but a few apparently healthy trees were also attacked. (See Chapter V.)

22. Nascioides Enysii (*Beech Buprestid*).—One of the periodic attacks on beech by this native beetle occurred in the Reefton district, and was also reported as causing mortality in mature red and silver beech at Rangataua in the Wellington Conservancy. The reasons for these outbreaks were probably the same as for the *Sirex* epidemic—namely, overstocking in this case in natural forest, coupled with climatic conditions particularly favourable to the insect.

23. *Manuka Blight.*—Although not primarily a forest pest this "blight," through its evil effect on a valuable "nurse" species, is a matter of moment to foresters, and reported sales of infected manuka to North Island districts has given rise to concern. Further mention is made of this in the paragraph headed "Soil Conservation."

24. *Damage by Fungi.*—No serious outbreak of damage caused primarily by fungi has occurred. There have been the usual isolated attacks by *Diplodia*, following frosts, and *Armillaria mellea* (honey fungus), which caused isolated deaths in eight to ten year old insignis pine.

25. *Climatic Damage.*—Little or no damage has been reported from climatic causes. No violent storms occurred during the year, but droughts were experienced in the Auckland and Canterbury districts where deaths of exotic trees occurred in parks, gardens, and farm plantations. On Great Barrier Island wind caused browning off and mortality in patula pine stands, and in Southland a certain amount of windthrow. In Kaingaroa Forest frost caused fairly heavy damage to the 1949 plantings of insignis pine, pit-planted stock suffering the heaviest mortality, and at Te Whaiti late frost burned back spring growth of tawa.

26. *Fire Damage.*—Fire damage is dealt with in Chapter VII under the heading of "Fire Prevention and Control."

27. *Forest Offences.*—Convictions for offences against forest law during the year number 36, of which 22 were obtained under the penal sections of the Forests Act, 1921–22, and 14 under the provisions of the Forest (Fire Prevention) Regulations 1940. Fines imposed amounted to £91 10s., the heaviest being £10 for unlawful cutting of forest produce. Costs and damages totalled £328 11s. 4d. Particulars of these offences are given in Appendix IX. The offences were for the most part of a minor nature. There were 10 convictions for unlawful cutting of forest produce, but in no case was the quantity cut or removed large; the biggest sum recovered in one information being £79 6s. 4d., as compared with the previous year's £1,428 19s. 1d. in a single case. There was a sharp increase in convictions for the offence of unlawfully entering a State forest, but a considerable decrease in offences in connection with fires; there being only 7 convictions under the fire-prevention provision of the forest laws as against 15 convictions for such offences in the previous year. In all cases where prosecution was undertaken convictions were secured.

Management

28. *Forest Working Plans.*—Forests may serve a community directly by producing timber or indirectly through their influence on water-supply and soil stability, not to mention their enjoyment in recreation and the non-material values of forests. Where forests are managed for the production of timber, profits are expected as in any other business: so the growing of timber crops must therefore be managed according to prudent business principles and methods. To-day the need for economy is emphasized more than ever, and in such a long-term business as forestry economy can only be obtained by well-thought-out plans. A forest working plan is therefore no needless affair but a sound business document laying down the various operations to be undertaken throughout the life history of a given forest or group of forests for the purpose of maintaining intact or of increasing the capital value of the forest asset; the working plan is necessary to ensure continuity in the management of a forest. Section 26 of the Forests Act, 1949, requires that working plans shall be prepared for all State forests to specify:—

(i) The silvicultural operations to be carried out:
(ii) The maximum area from which forest produce may be removed:
(iii) The maximum quantity of forest produce that may be disposed of:
(iv) The protection and development operations to be carried out.

Following very strong recommendations from the Fifth British Empire Forestry Conference in 1947, it was decided to accelerate the production of working plans by the preparation of skeleton plans for the numerous indigenous forests which called for management on a broad basis only. This form of plan has also been applied to immature exotic forests and those in course of establishment.

29. Assessment of growing stock in exotic forests has proceeded apace, so that information will be available for the preparation of working plans. Field-work has been completed in Tairua, Maramaru, Karioi, Golden Downs, Balmoral, Raincliff, and the Tapanui group of forests, totalling in all approximately 48,000 acres. In addition, the assessment on an ecological basis of the site quality of a number of compartments in

Kaingaroa Forest was commenced. Completed working plans duly signed under the Forest Act, each covering a period of ten years, are now in operation for Blackmount, Craig Rankin, Kaimanawa, Mangatawhiri, Mount Grey, Mount Robertson, Murupara, Ngaruawahia, Okahukura, Oxford, Pouakani, and Raepahu Forests—a total of 438,000 acres. A further 49 plans—32 for indigenous and 17 for exotic forests—which cover a combined area of over 1,000,000 acres, are in various stages of preparation, a large proportion being nearly complete.

Forest Mensuration

30. 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.	
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
1949–50 ..	191	133,738,000	19	38,650,000	42	11,833,000	184,221,000

The quantity appraised is slightly less than the record established last year, but the generally high level has been maintained, and the reduction was caused by the decision of some Maori owners of standing timber to dispense with appraisals by the Forest Service. The total quantity appraised includes the following quantities which were appraised by the sampling method :—

	Bd. ft.
1947–48	26,512,000
1948–49	11,113,000
1949–50	18,625,000

To estimate timber stands approximately for furture timber sales, three reconnaissances were made covering 7,201 acres estimated to yield 82,719,000 board feet. The Check Appraisal Officer carried out 6 checks and the Conservators' staffs made a further 24 checks of appraisal work by the field staff.

Timber Sales

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

Species.	1949–50.	1948–49.	1947–48.
	Bd. ft.	Bd. ft.	Bd. ft.
Rimu and Miro	105,349,000	112,056,000	86,514,000
Matai	7,306,000	11,374,000	10,820,000
Totara	4,342,000	5,483,000	4,780,000
Kahikatea	9,474,000	4,956,000	7,728,000
Tawa	5,060,000	5,509,000	5,650,000
Beech Spp.	12,789,000	9,402,000	10,973,000
Others	1,597,000	2,101,000	1,271,000
Total quantity ..	145,917,000	150,881,000	127,736,000
Total value	£234,000	£264,200	£194,900

Method of sale was as follows :—

	Bd. ft.
(1) By appraised quantities	121,430,000
(2) By log-scaling	5,398,000
(3) By mill output	19,089,000

In addition a total of 85,000 board feet of sawn exotic timber valued at £269 was sold from State forests during the year. The value of other forest produce of indigenous species sold under permit amounted to £17,142 and exotic forest produce sold under permit to £461.

32. *Outturn Under Licence, Permits, &c.*—The total quantity of milling timber removed and paid for under log sale agreements, licences, and permits was 194,543,000 board feet (1948–49, 180,198,000) of which 168,192,000 was indigenous constituting 52 per cent. of the total indigenous cut. Other forest produce was removed under permits as follows :—

	1949–50.		1948–49.		1947–48.	
	Indigenous.	Exotic.	Indigenous.	Exotic.	Indigenous.	Exotic.
	Number.	Number.	Number.	Number.	Number.	Number.
Poles	6,900	..	10,300	..	9,600	..
Strainers	30,200	..	23,300	..	21,000	..
Posts and stakes	549,800	..	565,700	..	430,600	..
Stays	21,900	..	13,700	..	8,100	..
Sleepers	7,100	..	14,100	..	20,000	..
House blocks and pole blocks	13,600	..	17,700	..	14,300	..
Battens	956,400	..	1,164,800	..	1,136,100	9,390
Bridge Stringers	400	..	40	..	10	..
Survey pegs	..	..	500	..	..	..
Firewood (cords)	900	20	900	50	600	30
Mining timber (pieces) ..	153,700	12,100	55,000	9,700	61,400	12,700
Rails	500	..	240	..	..	..
Chopping-blocks	200	..	100	..	1,200	100
Tomato stakes	1,700	..	1,400	..	38,600	..
Shingles	..	..	..	..	184,500	..

Indigenous and exotic timber extracted by the Forest Service itself is dealt with in Chapter VI, Section 8.

Soil Conservation

33. *General.*—The preservation of forests on steep hill country for the protection of highly-productive farm lands below has been so large a part of the Forest Service's work in its first thirty years, and the definition of this function in the Forests Act, 1949, is of such importance that the conservation policy of the Service is stated in some detail in Chapter II—Forest Policy, of this report. The control of forest and rural fires, which is of permanent importance in soil conservation, is dealt with in Chapter VII.

34. *Manuka Blight.*—It remains to record here developments regarding the spread of " manuka blight " mentioned in last year's report. The attitude of the Forest Service towards the use of the blight in pasture-management has been uncompromising. The vast tracks of hill country, particularly in the North Island, on which manuka constitutes the only vegetative cover and the ideal nurse crop for the regeneration of native forest must not be exposed to the risk of denudation ; and the Service regards the dissemination of the disease as wholely unwarranted. Following a series of meetings at which representatives of interested Departments discussed the problem, arrangements have been made that the *Journal of Agriculture* should explain the disastrous consequences which

dissemination of the blight might entail; farmers are being advised in their own interests as well as those of the community to refrain from using the blight; and it is being pointed out that where it is economic good farming is the most effective means of preventing manuka invasion of pasture land.

35. *Protection Forests.*—Of the land placed under reservation as State forest land during the year, 33,900 acres were land on which a permanent forest cover is necessary. Negotiations are in hand for the purchase of another 18,000 acres of such land.

36. *Soil Conservation and Rivers Control Council.*—Senior officers of the Forest Service represent it on the Soil Conservation and Rivers Control Council and the twelve territorial Catchment Boards, which cover nearly 60 per cent. of the Dominion. These officers have given their advice on the tree-planting and forest operations administered by the Council and the Boards; and take part, with officers of the Lands and Survey Department, the Department of Agriculture, and the Ministry of Works, in inspecting and reporting on any properties where decisions on land use must be reached. A professional forester seconded to the staff of the Council maintains an effective liaison in all forest matters. The Council and other Departments have also received the Service's co-operation in small-scale studies of natural and assisted regeneration on land denuded of forest by fire and impoverished by repeated burning and stock-grazing.

Miscellaneous Forest Uses

37. *Grazing.*—The number of grazing leases in operation at the end of the year totalled 224. The land at Dusky State Forest over which grazing-rights were leased has been withdrawn from forest reservation, reverting to the Lands and Survey Department. All grazing-rights are now being reviewed with the objective of varying leases in order to ensure the maximum productivity of the land for such purposes.

38. *Mining Privileges.*—The Mining Warden granted 2 coal-mining rights and 132 mining privileges over State forest land. Section 35 of the Forests Act, 1949, makes the granting of such privileges by the Mining Warden subject to the consent in writing of the Minister of Forests; the usual conditions imposed by the Minister in consenting are the protection of the forest from fire and bird-life from shooting.

39. *Recreation.*—A policy of reserving forest adjoining highways is being followed in order to preserve the scenic beauty of this country; an active part was taken in conjunction with the Lands and Survey Department during the year in securing extensive forested areas along the Mananui–Tokaanu Highway for this purpose. Valuable forest land was also added to Tongariro National Park with the assistance of the Forest Service.

40. The general public is making increasing use of State forests for pleasure and recreation, especially for tramping, climbing, and hunting expeditions, and certain forests are particularly interesting to tourists. To encourage these activities the Forest Service is providing facilities in some forests. During the year the roads in Omahuta Forest leading to the grove of large kauris have been improved and signposted; and in Puketi Forest a turning place has been constructed on the access road. To both of these forest, in particular there has been a considerable increase in the number of visitors. The track in Waipoua Forest leading to "Tanemahuta" was kept in good order, and a new protective palisade was placed around the tree. Great Barrier Island is regularly visited by yachtsmen and trampers, so tracks have been opened and signposts erected for their use. Many other forests in the Dominion attract hunters and members of tramping clubs, and several clubs hold leases of small sections on which they have built huts to be used as bases for expeditions. In the exotic forests at Tapanui, Hanmer, and elsewhere picnic parties make use of facilities provided, and parties are conducted through the forests.

41. *Other Privileges.*—Other privileges which were operative in State forests at the end of the year were 21 sawmill-site leases, 69 tramway and road licences, 35 housing-site leases, and 15 miscellaneous privileges.

42. *Water Conservation.*—The Forest Service is very conscious of its responsibilities towards urban areas in respect of water conservation, and precautions are taken to protect catchment areas under its control and to safeguard them against pollution.

43. *Nassella Tussock Control Reserves.*—A nassella tussock control reserve at Omihi in Canterbury, which is administered by the Forest Service as if it were State forest land, as explained in last year's report, was planted in trees, and despite a long period of dry weather a good strike was obtained. The Forest Service's reservations regarding the effectiveness of tree-planting as a control measure were mentioned in last year's report.

CHAPTER IV—PUBLIC AND PRIVATE FORESTRY

General

1. The most significant events in public and private forestry during the year were the amendments to land and income tax law to give some relief to farmers planting trees, and the agreement reached with the Commissioner of Taxes regarding the working-expenses of afforestation companies. Other important advances in the development of public and private forestry have still to be made. Only a few of the private, local-body, and company forests in New Zealand are under technical management, so the need is great for the dissemination of technical advice and other assistance in forestry work. In addition, in the interests of the best utilization of the Dominion's land resources, there must be an active encouragement of the forestry use of land unsuitable for farming, waste portions of local-body reserves, and elsewhere; but, unfortunately, staffing difficulties have prevented the Forest Service from establishing during the year, as had been intended, a Division of Public and Private Forestry.

2. The compilation of an inventory of private exotic forests, started some years ago, is being pursued as staffing permits; this information is required in planning to meet local timber requirements of each district.

Forest Taxation

3. *General.*—Since the establishment of exotic forests first began in earnest nearly thirty years ago, there has been a growing conviction in the minds of those closely connected with New Zealand forestry, that the general tax system was ill adapted to deal with the peculiar needs of forestry, and that significant changes were necessary if private forestry was to function economically. In 1947 and 1948 the Service's forest economist, who received an ex-serviceman's grant from the Rehabilitation Department, carried out an investigation of forest taxation in selected European countries to provide a basis for a general review of New Zealand tax practice in its application to forest property and forestry operations. In April of last year a report was submitted to the Government giving details of the European tax system studied, and setting out the alterations necessary to secure an equitable incidence of taxation on forestry in this country. This report is to be published, and it is expected that the printing will be finished by July, 1950.

4. *Taxation of Farm Forestry.*—Several important amendments of tax law have already been effected by statute, and it is expected that others will be dealt with in the 1950 session of Parliament. Sections 6 and 7 of the Land and Income Tax Amendment Act, 1949, remove two obstacles which hitherto have impeded attempts to encourage an interest in farm forestry. Farmers have been reluctant to expend money on the establishment of wood-lots because deduction of the expenditure from farm income for tax purposes has been disallowed; the ruling of the taxation authorities was that such

expenditure could be deducted only when the trees were ultimately sold. Section 6 now permits a farmer to deduct from his farm income any expenditure incurred for the following purposes :—

(i) Planting trees for shelter or to prevent erosion or otherwise for agricultural or pastoral purposes :
(ii) Maintaining trees already planted :
(iii) Erecting or maintaining fences to protect such trees.

Section 7 gives relief from the incidence of the graduated income-tax where intermittent or occasional sales of timber-trees are made by farmers. A farmer who sells trees from his property may apply to the Commissioner of Taxes, not later than twelve months after the close of the income year, and be granted permission for the income from the timber sales to be apportioned between that income year and the four succeeding income years. This overcomes the serious objection against the former taxation procedure whereby revenue from the sale of trees was treated as income for that year only, and was added to the general farm income, and taxed, through the operation of progressive taxation, at high rates.

5. The Act stipulates that these two concessions shall be available in respect of " trees planted to provide shelter or to prevent erosion or otherwise for agricultural or pastoral purposes." The Forest Service considers that these conditions are too restrictive, and takes the view that they should be entirely waived so that the concessions may embrace all farm wood-lots. But although the Forest Service intends to press for the removal of these restrictions, it is believed that in practice there would be few farm timber sales that would not qualify for the concession. Where wood-lots are established on a farm without any specific thought to shelter or the control of erosion it is normally on portions of the farm relatively unsuited to general farming purposes ; hence it becomes a question of optimum land use, and discussion with the Commissioner of Taxes indicates that the clause " otherwise for agricultural or pastoral purposes " is wide enough to cover any case that can be decided on the broad issue of optimum land use.

6. *Taxation of Company Forestry.*—Taxation has also been a very thorny question with the afforestation companies, but one of the biggest issues was dealt with during the year, a satisfactory agreement being reached with the Commissioner of Taxes. This related to the method of assessing forest income for tax purposes, and provides for all expenditure of a non-capital nature to be deducted before tax is charged, irrespective of what particular area that expenditure refers to. This means that the forest is now regarded as a unity, and it is no longer the case that expenditure on blocks not being actively exploited has to be capitalized until cutting commences. The significance of this amendment is that it provides an incentive to the companies to adopt a higher standard of forest maintenance and protection.

7. There are still several aspects of taxation which call for revision and amendment—particularly the application of the graduated land-tax. These are under review at the time this report is made.

Forest Extension

8. *General.*—Forest-extension work in the past year was pretty well limited to advice to farmers and others in response to personal inquiries or letters, and to addresses to farmers' organizations, rotary clubs, chambers of commerce, and other groups who specially requested them ; Forest Officers carried out this work in addition to their normal duties.

9. *Private Nurseries.*—The complaint is often heard that private nurseries are unable to supply trees for farmers' planting projects, but the shortage of trees is largely due to a lack of forward ordering ; if they had placed their orders one or two years beforehand they would have had little trouble, because the nurserymen could have

extended their stocks without facing the risk of having to plough in unwanted trees occupying valuable nursery space. It is unlikely, however, that the number of trees raised by private nurseries will greatly increase until the Division of Public and Private Forestry gives an impetus to farm planting, which, in turn, will enable nurserymen to reduce the cost of trees by large-scale production to meet an assured demand.

Farm Forestry

10. Inquiries from farmers about species suitable for planting in various areas, sources of supply of trees, methods of planting and raising trees, diseases, and other topics are commonly in the Forest Service's mail. Plantings by farmers are reported to be on the increase again, but they are still well behind the fellings of mature trees; the reason is partly the general shortage of labour, but chiefly the extremely high cost of the protective fencing required. Part of the recent plantings has been subsidized by the Soil Conservation and Rivers Control Council through Catchment Boards, but such subsidies are, of course, restricted to plantings for the control of erosion and are not available for the establishment of ordinary farm wood-lots.

Company Forestry

11. A new afforestation company, a small one, was registered during the year (the term "afforestation company" means a company which plants forests out of bond or share capital), and an existing company was subdivided to meet the wishes of shareholders. The remainded of the 33 companies operating in New Zealand continued their activities, some of them very aggresively. Several large sawmills and one groundwood pulp-mill and paper-board mill and one softboard and hardboard plant are already in operation, and a sulphate pulp-mill is in course of erection. As the area of cut-over forest increases, companies are making plans for re-establishment; one company is burning slash in wind-rows, and planting afterwards, while another is relying on natural regeneration.

Local-body Forestry

12. According to the information to hand, 620 acres at least have been added to the area of exotic forest planted by local bodies. Several local bodies are marketing produce from their older stands; and the Selwyn Plantation Board in Canterbury has almost completed its salvage of wind-thrown trees. The Dunedin City Council has been given legal authority for the sale of its forest produce by the Dunedin City (Forestry) Empowering Act, 1949, which requires the preparation of a working plan to cover forest operations for five years at a time; further details of the Act are given in Chapter VIII under the heading "Legal." It is expected that other local bodies will soon be seeking special empowering legislation in respect of the sale of forest produce. Besides exotic forest, a significant area of indigenous forest is controlled by local bodies for the conservation of municipal water-supplies. Further information about local-body forests is given in last year's report.

Government Departments

13. At least 12 Departments besides the Forest Service control forest lands, and the Service has co-operated with them as in other years; the Lands and Survey Department, the Ministry of Works, and the Department of Maori Affairs, in particular, have asked for appraisals and valuations of stands, and inspections and reports on other topics have been requested by various Departments. The Ministry of Works has carried out small plantings in various parts of the Dominion, but its work of afforesting and stabilizing sand-dunes has been reduced pending a Government decision on departmental responsibility for this work.

Maori-owned Forests

14. *Incorporations.*—Several groups of Maori owners have in recent years formed incorporated bodies for the purpose of exploiting the timber on their forest lands. There are now 18 such incorporations, and their operations were extended during the past year so that the quantity of timber coming on to the market from this source is considerable. Some incorporations are carrying on logging operations only, selling mainly to local sawmillers, but also sending logs to sawmills and veneer factories in and around Auckland; other incorporations have successfully engaged in sawmilling and the distribution of sawn timber as well as logging.

15. *Forest Management.*—Although a number of the more far-sighted Maori elders have shown a desire for the management of permanent communal forests on tribal forest lands, the indifference of other owners or their satisfaction with the current financial returns have so far prevailed against any suggestions for the introduction of proper forest-management in Maori-owned forests. The advantages to Maoris in employment as well as money from a long-term investment yielding steady returns, in contrast to a large, single, monetary return from timber-sales were mentioned in last year's report.

16. *Sale of Maori-owned Forest.*—The consent of the Minister of Forests, who may with the concurrence of the Minister of Maori Affairs refuse or impose conditions, is required before the right to cut or to remove trees is granted by the Maori Land Court or a Maori Land Board; and at the request of Maori Land Boards the Forest Service has appraised and valued standing timber in connection with proposals to grant cutting rights. During the year 19 appraisals covering 36,960,000 board feet of indigenous milling timber were completed.

CHAPTER V—DEVELOPMENT DIVISION: TRAINING AND RESEARCH

Inspector in Charge: Mr. T. T. C. Birch

Recruitment

1. *Professional Staff.*—Only 3 professional officers were recruited from beyond New Zealand during the year; one New Zealand ex-serviceman bursar returned with a forestry degree to rejoin the Service. The 35 University-trained foresters at present employed represent less than 5 per cent. of the permanent staff of the Service, which is still far below the minimum establishment. Preliminary steps have been taken this year to supplement recruitment of trained New Zealanders by the careful selection of a further small group of British ex-servicemen forestry graduates.

2. *Clerical Staff.*—The drive for recruitment of junior clerical staff was maintained and, except in the City of Wellington, considerable success was achieved by the appointment of 18 cadets and 47 juniors to Class VI. Unfortunately, the standard of applicants was not high, and the appointments were not as selective as they would have been during normal times. This factor has contributed in no small measure to the staff turnover, the over-all loss of cadets alone being 9 for the year, including 1 of the new recruits and 8 from earlier appointments.

3. *Field Staff.*—The long-term policy of recruiting annually a group of young men keen to take up a forestry career was continued, and 16 technical trainees were appointed from 44 applicants. The number selected is lower than the previous year (21), partly because of a 20 per cent. smaller number of applicants than in 1948. The purpose of this recruitment scheme, however, continues to be the maintenance of a high standard rather than adherence to a fixed quota of appointments.

Training

4. *Rotorua Training Centre.*—Training achievements during the year were outstanding. Fifteen courses were held, at which 234 officers attended, constituting a record and extending the facilities of the Training Centre to their fullest capacity. The most notable feature of these courses has been the excellent attitude and general keenness of staff participating in them. The inclusion of field and professional officers from the Forest Service, together with clerical representatives from other Departments, has contributed to the success of the courses and improved the relationships between all ranks. The same principle was applied to field-staff courses by the inclusion of representatives of the Clerical Division. It is recognized that formal training can be a burden to both student and teacher alike, and this is a symptom of inexperience from which the Training Centre has not been entirely free. At times too fast a pace has been set, and at others the treatment of the subject-matter has lacked skill; but with the broadening experience of the instructing staff these defects are being eliminated, and results recently achieved warrant a sober optimism for the future. The attempt to combine theory with practice and bridge the gap between class-room and field has undoubtedly met with success, and this must be one of the main objectives in a forestry education. In addition to the 3 officers permanently attached to the Centre, 32 officers have delivered one or more lectures, mainly in specialized subjects.

5. The facilities of the Rotorua Training Centre are available to other Departments or countries where their work impinges on forestry, and officers from other State Departments have attended Forest Service courses. Six months' indigenous forest training was provided for a junior officer of the Fiji Forest Service, concluding in his attendance at a Timber Measurers' Course. It is anticipated that there will be further opportunity to provide staff training for Pacific Island territories.

6. *Higher Forestry Education.*—The problem of forestry education in New Zealand remains unsolved. Early in 1947 preliminary discussions were held between Auckland University College Council and this Service, but further meetings were deferred pending the return to New Zealand of the Inspector in Charge of Training and Research, who was engaged in investigating both higher forestry education and the organization of forest research in Europe.

7. *Overseas Professional Training.*—Meanwhile, with due regard to its obligation to ensure a steady intake of University-trained foresters, the Department was able to send 6 graduate officers overseas to complete their forestry education, 3 at the Australian Forestry School, Canberra, and 3 at Edinburgh University. The number of graduate officers overseas is now 10, of whom 6 are at Canberra, 3 at Edinburgh and 1 at Oxford.

8. *Basic Science Training.*—Evidence of the advantages of a basic science degree prior to University forestry training is accumulating, and the Forest Service is confident that New Zealand foresters of the future so trained will vindicate a system which, although not as yet widely adopted, has many supporters amongst leading forestry educationists.

Ten technical trainees were selected at the beginning of the year to commence University study in basic sciences with a view to higher forestry education; 6 completed B.Sc. degrees at the end of 1949. Twenty-eight trainees are at present undertaking University studies, the majority on a part-time basis.

9. *General Division Training.*—In spite of the disruption of the war years, good progress has been maintained in the field-experience training of potential Forest Rangers since the inception of the trainee scheme eleven years ago. The status of Forest Ranger is earned by trainees after four to six years' training (according to progress made). These apprentice years include at least four courses at the Rotorua Training Centre and a period of training at the Waipa Sawmill. Forty-one trainees are at present being trained throughout the seven conservancies, and it is gratifying to record that the number of Rangers promoted from trainees now totals 15 (5 per cent. of the General Division staff): a proportion which will increase and which may be expected to raise

the standard of technical competence in the field staff proportionately. A considerable amount of field training has been provided at the Rotorua Training Centre as well as in conservancies, and, at the former, promising forest workmen nominated by conservancies are given the opportunity to qualify for appointment to the staff as Forest Foremen, and of the 9 Foremen appointed during the year 5 qualified at a Timber Measurers' Course at the Training Centre.

10. *Clerical Division Training.*—The last twelve months can be recorded as the most successful period of clerical staff training, and there is now ample evidence to show that the short-course method practised at the Rotorua Training Centre has been responsible for a marked improvement in the standard of work in all offices. Senior officers continue to attach great importance to the value of these courses, and the general eagerness for nomination by all officers has brought about a healthy keenness and desire to take full advantage of the instruction given. Eight courses were held throughout the year, involving 127 officers, 110 of these having passed through the Training Centre. Female clerical staff have been given equal opportunities within the training scheme and have also played a full part at the Training Centre. Special attention has been paid to the training of cadets and other junior officers, particularly those situated in isolated districts or small offices where training methods are difficult to apply.

11. *On-Job Training.*—A reorganization of conservancy offices throughout the year has facilitated the on-job training through the delegation of training to section leaders. Rotation of duties within each office and between stations has been organized and practised and has given officers a much wider appreciation of the job as a whole.

Research

12. *Organization.*—The administration of forestry and forest products research is directly from Head Office, and most of the work is centred at the Forest Research Institute, Rotorua. There is direct liaison between the forest products research staff at the Institute and the Engineer in Forest Products in Head Office, and ultimately similar liaison will be established in respect of forestry research.

13. *Research Staff.*—The staff has not increased appreciably during the past year; it is still inadequate and lacks a balanced proportion of experienced research foresters and allied technicians. Thus, in addition to the chief administrative forester, of the total technical strength of 14 only 4 can be described as experienced or senior research officers. Staff is obviously, therefore, a serious limiting factor and, with due regard to the inadvisability of further depleting conservancy professional staff, efforts are still being made—though so far without appreciable success—to recruit experienced research foresters from overseas, and selected junior staff are being developed in research experience.

14. *Forest Research Institute.*—The justification of research in general and forestry research in particular is largely measured by steady progress towards long-term objectives within the framework of an ordered programme of work rather than endeavours to accomplish spectacular results within the relatively brief period of twelve months. This is particularly true during the developmental period of a newly-established institution such as the Forest Research Institute. The headquarters of the Institute is now established at Rotorua in recently completed temporary quarters, and considerable progress has been made in the organization of its activities, which will extend over many years and which can be expanded as required. The work of the Institute has been classified under the following headings: Silviculture, management, forest pathology, national forest survey, and forest products—and current work under these heads is reported below.

During this formative period it has, however, become more apparent that if long-term research is to be carried out to the best advantage of all interests concerned, a greater degree of constitutional permanency for the Institute and a clearer definition

of its scope must be recognized, and to this end the Inspector in Charge of Research has recommended that a Forestry and Forest Products Research Advisory Committee be set up.

15. *Library.*—The Research Institute Library now consists of some 3,500 books and pamphlets covering a wide range of subjects related to forestry. The collection is being continually added to, and contributions of bulletins, leaflets, and pamphlets have been received from many overseas forestry organizations.

16. *Publications.*—The Institute will, in addition to the publication of completed research, make available for general circulation brief progress reports on current investigations, and the first of a series of *Forest Research Notes* has been prepared and is in process of publication.

Other publications by the Institute staff, either issued or in the printer's hands, are listed in Chapter VIII.

Botanical and Silvicultural Research

17. *Herbarium.*—The herbarium at the Forest Research Institute has developed in quantity and quality during the year. Acquisitions have included flowering and fruiting material of species formerly represented only by sterile specimens. Two private collections of *Eucalyptus* species have been received as gifts. The collection. which now contains some 3,200 specimens, is well mounted, recorded, and indexed

18. *Arboreta.*—The aboretum at the Forest Research Institute is being extended for research and training purposes, and also as a source of interest to visitors to Rotorua. Additional ground has been made available for extension of the Rotorua Aboretum, and mapping has been done in preparation for development and tree-stocks raised in readiness. Specimens of nine species of pine, two species of *Agathis*, and a few small native trees were planted out, and a number of defective and unwanted trees removed. The Northern Arboretum at Waipoua Forest has been further augmented and now contains over 3,000 trees. Almost half the arboretum is devoted to the genus *Agathis* of which the most important species is the kauri. The remainder of the collection comprises hoop pine, tanekaka, and toatoa.

19. *Forest Tree Genetics.*—Experimental grafting of *Pinus radiata* and Douglas fir has achieved sufficient success to indicate methods likely to be suitable for use on a larger scale in future. A number of type trees have been selected in Rotorua and Wellington Conservancies for collection of materials for future work Plantings of *Pinus radiata* and Douglas fir have been made to provide stocks for grafting experiments. The rooted cuttings of *Pinus radiata* raised in the experiments described in last year's report were transplanted into the forest. A recent count shows 84 per cent. survival over all.

20. *Interplanting.*—The field-work for a review of the results of planting exotic conifers in native forest after felling and logging was completed and the report was submitted shortly after the close of the year.

21. *Sample Plots.*—The establishment of permanent sample plots in exotic forests to study the response to thinning and to obtain data regarding yields was continued. Practically all the important species had previously been included in the programme, and the feature of the year's work was the extension of the study over a wider territorial range. All conservancies have been visited, demonstrations of correct procedure given, and tentative sites for plots selected. The availability of technical staff and labour in conservancies has controlled the progress made in establishing plots. Twenty-five plots were established or remeasured during the year, twelve of which were in Canterbury Conservancy; the territorial distribution of this work is shown in Appendix XV.

22. Advantage was taken of the facilities kindly provided by Messrs. New Zealand Forest Products, Ltd., and Messrs. Afforestation Proprietary, Ltd., to establish a comprehensive set of sample plots in dense natural regeneration of exotic conifers after

destruction of the original forest by fire. The bulk of the regeneration is *Pinus radiata*, of which there are crops aged three, seven, and twelve years, but there is also a substantia area of *Pinus pinaster*, aged three years. Some eighty sub-plots have been laid out.

23. The sample plots mentioned in the last report, for investigation of the effects of thinning and pruning *Pinus radiata* at various seasons on the incidence of casualties from *Sirex* attack, were re-examined, but the mortality from all causes was small and did not vary significantly in relation to different treatments. Observations will continue.

24. *Forest Soils.*—Only a limited amount of advisory work on forest soils was possible. Assistance was given on the layout of experiments to study the effects of fertilizers on kauri seedlings in Waipoua Forest nursery, and to the Railway Forestry Officer in regard to experiments at Athenree where fairly severe needle fusion occurs on *Pinus* species. To study methods of remedying soil deficiencies experimental plots were laid out in naturally regenerated insignis pine at Eyrewell State Forest, Canterbury Conservancy. The trees in the plot were treated with one of the following trace elements: manganese, copper, zinc, or boron. As the district has a low rainfall and is stony, the trees in two additional plots were free from competition by other vegetation, and in addition one of these plots was given a dressing of superphosphate. From the data available to date, zinc sulphate has proved successful in stimulating extra growth on the short-needled and comparatively backward trees. It is still too early, however, to assess the true statistical or economic significance of the treatment. Applications of boron and potassium were made to sample plots in plantations of pines in Rotoehu Forest, Rotorua Conservancy, where excessive casualties in the first ten years were suspected to be due to soil deficiency. It is still too early to judge results, but mortality from the attacks of *Sirex noctilio* appears likely to vitiate the experiments as far as insignis pine is concerned.

25. *Beech Forests.*—Basic research and silvicultural investigations in the beech forests have proceeded steadily throughout the year. In broad terms the programme of work in hand may be broken down into the following problem groups:—

(*a*) Ecological studies concerned with the structure, distribution, origins, and trends of these forests, since it is only by the acquisition of a sound understanding of them that successful management for any desired purpose will prove possible:

(*b*) The mapping and assessment of the forests through the national forest survey, in order to provide reliable data concerning the extent, condition, and quality of the forest estate:

(*c*) The selection of forest areas of optimum potential for intensive sustained yield management for each of the timber-producing species concerned, having regard to questions of timber quality, growth rate, regeneration, prospective future demand, markets and transport, and the initiation of intensive management within these areas:

(*d*) The development of improved techniques in the exploitation of beech forests not selected for intensive but for extensive management in order that, at least, they may be left in a better condition for growth than they were in their "wild" state; and

(*e*) Studies of the protection forests, particularly directed towards the elucidation of the real effects of exotic animals (deer, chamois, &c.) on the continued existence, well-being, and efficiency of these forests.

26. The field of investigation is very wide and many of the problems are complex, but real progress is being made particularly following recent improvements in the staff position. The number of qualified men available for the work is still, however, too small considering the importance, size, and wide geographical distribution of the beech forests, and in view of the very considerable physical labour involved in their survey and study. In illustration it might be mentioned that, during the year, field studies have been carried

out in Western Southland, in Fiordland as part of the programme of work of the New Zealand – American Fiordland Expedition, in the Rakaia, Waimakariri, and Hurunui Catchments in Canterbury, in the Grey and Ahaura Valleys in Westland, in the Inangahua, Buller, and Maruia Valleys in western Nelson, and, for the North Island, on Mount Ruapehu and in the Lake Waikaremoana watershed.

27. The most obvious progress during the year has been made in the delimitation of optimum intensive management units for silver beech in western Southland and for red beech in western Nelson. In both cases it is believed that all major silvicultural and economic difficulties are well on the way to solution and, in the former case, intensive management on a large scale, as opposed to small-scale experimental management, has already been initiated.

28. The most serious problem encountered is the problem of the maintenance in an efficient condition of the watershed protection forests in the catchments of eastern rivers in the face of pressure from heavy deer populations. In the silver beech production forests the presence of deer is also serious, but in this case there is ready access and a solution is possible. No such solution is in sight, however, for the equally important but frequently remote protection forest areas. The rifle only postpones the crisis. This problem will require continued and unremitting study. To sum up, it might be said that work in the beech forests during the year justifies a degree of optimism in the case of the production forests, but the same cannot be said in the case of the watershed protection forests of the lower rainfall areas.

Forest Management Research

29. *Yield Tables.*—Data collected from temporary sample plots in Rotorua Conservancy were used as the basis for preparation of an empirical yield table for ponderosa pine. The range of age-classes in the larch forests was found to be too small for a satisfactory table to be compiled. A note describing the method of preparation and explaining the limitations of the empirical yield tables for insignis pine, Corsican pine, Douglas fir, and ponderosa pine was written for issue with the tables.

30. *Tree Volume Tables.*—A change in the method of presentation of volume tables for exotic coniferous species has been introduced during the year. Hitherto generalized tables showing volumes, usually above stump to 6 in. and 4 in. tops inside bark, have been prepared for all height classes combined. These have now been replaced by basic tables, which are in effect combination taper and volume tables showing volumes up to and diameter inside bark at stated heights above the ground. There are separate tables for each 10 ft. total height class. Generalized tables to any desired standard of utilization can be derived arithmetically from the combination tables without re-examination of the data and can be assumed to have the same accuracy as the parent tables. Basic volume tables by height classes were compiled for European larch and ponderosa pine in Rotorua Conservancy and for Corsican pine and ponderosa pine in Southland Conservancy. Similar tables for insignis pine and Douglas fir in Rotorua Conservancy are under preparation. A generalized table for *Pinus radiata* in Rotorua Conservancy to a 9 in. top inside bark, was supplied in response to a special request.

31. The central North Island volume table for rimu, issued in 1926, was critically examined, and a new table based on more data prepared. The existing Westland rimu table was also tested. Though found accurate for the data from which it was prepared, it failed in all tests for other trees. During the course of this study it was discovered that there was a possibility of compiling a rimu table which would be satisfactory for the three main production localities (central North Island, Westland, and Southland) and information is being collected for an investigation on these lines.

32. *Log Volume Tables.*—Log volume tables for insignis pine and Corsican pine in Southland Conservancy were issued. Extensions were made to the Rotorua Conservancy log volume table for insignis pine to show volumes for lengths up to 50 ft. and small-end diameters up to 24 in. Certain defects revealed in the use of these tables indicate that the original table requires careful testing.

Forest Pathology Research

33. *Entomology.*—The major entomological problem during the year has been the study of *Sirex noctilio*, known sometimes as the steel-blue sawfly or wood wasp, which has been causing considerable damage in pine forests, and this insect is separately reported on below. In the silviculture of the New Zealand beech there are several insects about which information is being collected. The most important of these is *Nascioides enysii*, which kills trees at any age through the feeding of the larvæ in the cambium region. Predisposing factors are of outstanding importance. Another important insect is the ghost moth (*Charagia virescens*) the larvæ of which tunnel the wood of beech and other hardwood. This insect occurs only in the North Island and its control is necessary if silviculture is to be practised in the area. *Navamorpha lineatum*, an insect attacking Douglas fir, has been the subject of a study which has revealed that damage to the twigs by cicada or other agency is not necessary for successful oviposition. Bud scales at the base of the new season's shoots are frequently selected, but oviposition can be successfully accomplished even when no growth has taken place.

34. *The Sirex Problem.*—Broadly speaking there has been a decrease in the incidence of *Sirex noctilio* in the forests of Rotorua Conservancy where it had developed so conspicuously since 1946. Locally it has been very abundant and its attack severe, but conditions during the summer, although dry, were less favourable to *Sirex* than in recent years. The rainfall in the principal forest areas during the critical period was very little short of the average for the past thirty-five years. Dry periods occurred, but at no time were drought conditions experienced.

35. The insignis-pine forests maintained a generally good appearance and it is expected that the trees will be able to resist *Sirex* attack. Stands where mortality took place previous to 1949 now show tufts of dark-green foliage, a feature that is interpreted as indicating recovery of vigour and benefit from the increased root space resulting from the casualties. It was found that in the majority of infected trees examined only a small proportion of the larvæ have developed. A new factor that has come into play is the absence of small and suppressed trees in areas where there was heavy mortality last year; so there is now a relatively large *Sirex* population and a shortage of trees suitable for successful attack. It was possible that the *Sirex* would therefore migrate to more suitable sites, but no appreciable migration has been observed, the *Sirex* attacking the trees which remained alive. A new feature is the attack and killing of large branches of marginal trees on which the living branches extend to the ground.

36. A technique for breeding *Sirex* under conditions of controlled temperature and humidity has been evolved, making it possible to secure *Sirex* when required for development of parasites from the Northern Hemisphere. *Rhyssa persuasoria* reared in the insectary have been liberated in forest areas. This parasite of *Sirex* has been recovered in forests in which they were released some years ago. Negotiations are in progress for introduction of *Ibalia leucospoides* to supplement the effects of *Rhyssa* in limiting the *Sirex* population. The first importations took place soon after the close of the year.

37. Chemical control of *Sirex* has been given considerable attention. Tests of D.D.T., toxaphene, benzene hexachloride, chlorodane, and rothane, using *Sirex* as a test insect, gave no indication that these insecticides would be effective under field conditions. It is possible that by strictly controlled experiments with a large variety of insecticides, solvents, and carriers, an effective chemical control for *Sirex* may be

found. As reported in Chapter VIII an Advisory Committee, including representatives of private exotic forest-owners, has been formed to study the problems presented by *Sirex* and its control.

38. *Mycology.*—There are three types of forest mycological research. First, study and control of parasitic fungi damaging or killing the trees—for example, the honey fungus (*Armillaria mellea*) which attack and kill *P. radiata*, *Nothofagus menziesii*, and other species. Attacks by *Armillaria* frequently coincide with attacks by *Sirex* on pine and the *Buprestid* on beech, and its successful attack probably arises *from the same causes*. Species of *Tyteria* cause considerable damage to *Nothofagus menziesii*. They are being studied with the object of devising a silvicultural system which will lessen or eliminate the damage. Other parasitic fungi being studied are *Diploidia pinea*, *Phomopsis strobi*, and *Dasyscyphy calydiformin;* all attack insignis pine as well as the unnamed fungus which enters trees with the eggs of *Sirex*, and which is the actual lethal factor of the attack.

The second subdivision of the work is the study of fungi causing sap-stain of timber during seasoning, heart rot of living trees, and decay of timber in use. The third subdivision is the study of beneficial fungi, particularly those associated with the formation of mycorrhiza in forest trees. It has long been known that without a suitable symbiotic fungus forest trees would fail to maintain healthy growth, and it is, therefore, necessary to study these fungi and make sure that the particular fungus is prevalent which is most suited to a particular tree in any given site. Fungi which attack insects are generally beneficial and are being studied as opportunity offers. The projects at present in operation include the study of fungi associated with *P. radiata*, *Nothofagus menziesii*, *Agathis australis*, and *Beilschmiedia tawa*. These projects include fungi, whether saprophytic, parasitic, or symbiotic, and in conjunction with similar entomological projects will eventually be duplicated to include all important forest-tree species. Routine mycological work includes the maintenance of an herbarium of stock culture and proportion and distribution of information to foresters.

National Forest Survey

39. *Progress.*—Field-work was carried out under the national forest survey in the Coromandel, East Coast, Taranaki, Westland, and Reefton areas, approximately 400,000 acres being covered during the year. Seventy per cent. of this area was located in Coromandel and Westland in equal proportions. In Westland the main timber stands lying between the Taramakau and the Haast Rivers have been practically completed, the only remaining areas being marginal hill country carrying no timber. Work in the Westland area, however, did not progress as fast as was desired due to many staff changes and the necessity for training replacements. In Coromandel the field-work for the unit was completed, the whole area from Cape Colville to the Waikino Gorge being completed. A new area was commenced in the Taramakau-Buller locality with headquarters at Reefton. This unit covers some of the best beech forest in the northern half of the South Island and an investigation into its potential is important. It will form the major part of the work during 1950–51. The project also covered an area in Waikaremoana-Hangaroa (East Coast, North Island) a little-known forested area containing a belt of millable timber to the east. In Taranaki the area covered was mainly steep bush country carrying a low volume per acre of doubtful merchantability. The total area covered by the project calculated proportionately from the sampling pattern is now over 2,000,000 acres (Appendix IX). This figure may prove to be an underestimate as certain areas have been typed and described in the field but contain very few plots.

40. *Computing.*—As no staff has been available for computing work since last November this work which promised to keep pace with the field-work has now fallen behind. Apart from the Westland area, however, computing will not be of great proportions. It may be possible to use some of the party leaders on this work during the winter months.

41. *Mapping.*—The positon of the mapping work has shown no improvement during the year in spite of the Forest Service taking over some of the work preliminary to final plotting and supplying some staff to the Photogrammetric Branch of the Lands and Survey Department. At present some thirteen sheets of the West Waiau area await plotting, and a further six will be completed as far as preliminary work is concerned in the matter of a few weeks. Approximately twenty sheets of West Taupo and Rotorua could be prepared for final mapping at short notice. To rectify this unsatisfactory position an order has been placed for a small transferring device in order that the Service may complete at least some of its own type maps. The undertaking of this work will entail the training of draughting staff for this specialized work, while further junior staff will be necessary. Mapping work also included the preparation of photographs for field-work, colouring and taking out areas of the three type maps which were completed during the year. The aerial photograph library now contains 12,615 prints and covers a considerable area of bush country which has not yet been assessed. Unfortunately, no cover as yet exists for certain areas which have a high priority with this project—for example, certain East Coast (North Island) forests and areas to the west of Lake Brunner (Westland).

Forest Products Research

42. *General.*—In many of the wood-using industries the gradual changeover from the use of indigenous timbers in their respective familiar grades is being hastened. Exotic softwoods, among which insignis pine is pre-eminent, are good general utility timbers, but producers and users are faced with many problems pertaining to seasoning and preservation techniques, to limitations imposed by the grade of the sawn products, and to fundamental properties determining their uses. Investigations have, to a major degree, been focused upon those immediate problems and similar ones affecting the extended use of indigenous hardwoods.

43. Laboratory work on forest products will be facilitated by the recent transfer of operations to the Forest Research Institute at Rotorua. Until machines are available at the Institute timber testing will be continued in Wellington, in addition to liaison with the timber and wood-using industries and Government Departments, the technical advisory service, and the organization and control of industrial studies. There is an obvious need for the dissemination of technical information on timbers which is being met by the preparation of leaflets and bulletins, by correspondence, by preparation of standards pertaining to forest products, and by lectures. In addition to the publications listed in this report, a bulletin on strength properties of indigenous timbers is practically completed, while other leaflets and technical papers are awaiting publication. Fourteen lectures were delivered to various wood-using associations and wood-technology groups.

44. *Building-timbers.*—Pre-eminent among timber problems are those relating to building. The answers must be drawn in part from fundamental data on properties of those species becoming available in increasing quantities—in part from local experience (obviously the best guide where it is available)—in part from analogy with experience in other countries with similar timbers, grading systems, seasoning techniques, wood-preservatives and preservative processes, and building technique. Shortages in

the supply of the common indigenous softwoods can be met by the use of other timbers for most parts of buildings, but to do so it is necessary to overcome deep-rooted prejudices. As the background to recommended changes, it is pointed out:—

(*a*) That there are a number of timbers with adequate strength for building provided that they are graded correctly—exotic pines, larch, Douglas fir, and kahikatea.

(*b*) That the extending facilities for wood-preservation provide the means for giving durability to the non-durable species.

(*c*) That sap-stain in the light-coloured timbers can be largely avoided by the use of chemical dips or kiln drying at the production source.

(*d*) That non-heart grades of the several beech species are certainly as durable as non-heart rimu, and that the heart grades of red and hard beech are stronger and more durable than equivalent grades of heart rimu.

(*e*) That immunization of tawa and other *Lyctus*-susceptible hardwoods is to be carried out in plants now being erected to improve their utility for interior woodwork, furniture, and flooring.

(*f*) That the production of good grade structural sizes, 5 in. or more in width, from exotic pines is practicable. The disadvantages of large knots, pith, and warping tendency in the smaller scantling sizes become less significant in the larger sizes as the ratio of knot size to face width decreases.

45. More specifically, it may be noted that treated tawa and treated (or heart) silver and red beech provide high-class flooring, and that "flooring grade" exotic softwoods are suitable after preservation for covered or light-wear floor. Weatherboarding from treated kahikatea and exotic softwoods in the appropriate grades is being used more widely. For sub-floor work the supplementary timbers include treated exotic softwoods, heart larch, and Douglas fir, and heart red beech. It is a much more difficult matter to supplement the supply of exterior joinery timbers for which heart totara, redwood, and western red cedar have set a high standard; the treated sap-wood of kahikatea, totara, and of insignis pine from clear timber between knot whorls is potentially-important material, provided that paint-coats are well maintained. Another problem in building is the difficulty in meeting the requirements for long-length timbers of high grade used in pitched roofs; this applies to the normal scantling sizes but not to the wider sizes used in light-truss construction employing insignis pine. It may also be remarked that the deep joists and sarking in flat-roof construction are uses for insignis pine in which grade requirements are easily fulfilled.

46. *Grading of Timber.*—The largest study undertaken during the year was of a fundamental nature and involved the examination of 16,000 board feet of insignis-pine boards at the Waipa Mill. An average run of logs in each of the 10 in., 12 in., 14 in., and 16 in., small-end-diameter classes was gang sawn. The nature, size, and position of all defects in each face of every board was drawn on sheets specially prepared for this purpose. This method of recording defects was adopted only after photographic methods had been found unsatisfactory. Analysis of the defects recorded in this study is necessarily slow. The board grades considered in this study include "finishing" and "dressing" grades as defined in the New Zealand Standard Specification No. 169, another grade intended for factory use, and several variations of those grades. It may be remarked at this juncture that "finishing grade" (as specified) admits a maximum of 5 per cent. and "dressing grade" (as specified) a maximum of 26 per cent. of the total sawn product of the two diameter classes analysed to date. Among the conclusions drawn from inspections of painted and creosoted weatherboarding of insignis pine on occupied houses is the need to exclude large knots extending to the arris on the face.

47. *Timber Mechanics.*—Tests of green and air-dry material of mountain beech were completed during the year, but computation of values for the latter are incomplete. Five tree-green values show the timber in a slightly less favourable light than was indicated by one-tree values reported tentatively last year. However, there is no doubt that the timber will have a high use-value as a medium weight, close and even textured, white hard-wood, well above average (for its density class) in toughness. Values for air-dry material tested at 13·4-per-cent. moisture content, and uncorrected (as yet) to the standard 12-per-cent. figure, show that mountain beech is superior to the denser red beech in toughness (as indicated by work to maximum load in bending—15·8 in. lb./cu.in), and extreme fibre stress in bending (14,460 lb./sq.in.). The density in the air-dry condition is 41 lb./cu.ft. as compared with 44 lb. for red beech and 34 lb. for Southland silver beech.

48. Tests on the Denison toughness tester confirmed the unsuitability of some imported hickory and ash for use in handles; indicated the limitations of rata and tanekaha for a similar purpose; and failed to show any significant difference between sap-stained and non-sap-stained insignis pine. A series of tests in progress on tawa is concerned with the toughness/moisture content relationship at moisture contents ranging from green to air dry.

49. *Timber Physics.*—Work on wood anatomy may conveniently be considered under four headings:—

(*a*) The assembly, sectioning, examination, and description of material from species absent from or poorly represented in the Forest Service reference collections. Permanent slides added during 1949–50 totalled 180. Identification keys are constantly being revised for the major commercial woods. Photomicrographs taken during the year using excellent equipment loaned by the Wellington Technical College are to illustrate a comprehensive bulletin on the identification of the indigenous timbers. A critical study of the indigenous-tree and small-tree species of the family Myrtaceæ was completed during the year by a member of the staff as an honours degree thesis.

(*b*) Identification by macroscopic features or microscopic examination of commercial timbers from local and overseas sources. The identity and properties of many timbers, whose importation for special purposes has been proposed, are requested in many inquiries received from importers and from Government Departments; during the year inquiries concerned timbers from all over the world. Samples requiring microscopic identification exceeded fifty during the current year.

(*c*) Identification of fragmentary, partially decomposed, or fossilized woody material to assist botanical and geological studies. Inquiries of this type have increased considerably; Police Department inquiries were among those handled during the year.

(*d*) Studies correlating structure with other physical properties or indicating fibre characteristics as an index to use. Variation in mountain-beech timber is being studied from the microstructure angle.

50. Studies of physical properties of indigenous and exotic timbers again comprised an important part of timber-research work. One intensive study relating to Corsican pine planted in 1907 in Whakarewarewa forest and sampled in 1949 showed a range of density of 29 to 37 lb. a cubic foot (at 12-per-cent. moisture content).

51. The experiments in chemical poisoning of larch and Corsican pine, designed to retain the ease of barking characteristic of spring and early summer by killing the trees at that time, were completed by felling and examination of the balance of the treated trees. The treatment had been ring-barking and the application of sodium arsenite in flour paste in the spring of 1948. The interim results reported last year were that larch

responded satisfactorily, but Corsican pine was so susceptible to sap stain and insect attack that the timber was of little value. Later fellings confirmed these general conclusions.

52. *Kiln Drying.*—As in the past, assistance has been given to firms operating or installing drying-kilns. A local company is studying the practicability of using the vapour-drying process (developed by the Taylor Colquitt Co. in the United States of America) for drying sawn timber. From the pilot-plant phase the process has now been translated to commercial-plant operation. Methods have been suggested for improving vapour circulation by alterations to stacking procedure, as the result of inspection by Forest Service Officers of the initial charges dried in the commercial cylinder.

53. *Wood Chemistry.*—The most important work in progress relates to resin content in several pine timbers. Most of the ether-soluble determinations (quantitative tests) and also the more fundamental qualitative tests of resinous extracts from insignis, Corsican, and lodgepole pines are made by the Dominion Laboratory. Some conclusions drawn from the tests of ether-soluble content are: Pith in insignis pine may contain as much as 46 per cent. (based on oven-dry weight) of ether-soluble resin. The benzidine test is in general a good index of the heartwood of insignis pine in so far as ether-soluble resin content is concerned. The effect attributable to seasonal change upon ether-soluble resin content of the wood of Corsican and lodgepole pines was tested on trees representing the three crown classes, felled in July (dormant period), in October (two weeks after height growth commenced), and in November. In Corsican pine the commencement of growth was reflected by doubling of the ether-soluble content at the 6 in. and 4 in. diameter levels in dominant and co-dominant trees; later a comparable increase occurred in the suppressed tree class, while a slight decrease was recorded in the other crown classes. In lodgepole pine there was no well-defined change.

54. A chemical study of tawa wood is concerned with the nature of an oily substance noticed on freshly-cut cross-sections, the corrosive action of wood (or bark) contents upon metal-work at kiln temperatures, a constituent causing dulling of planer blades and other edged tools, and chemical substances which cause black flecks, pink staining (result of hot-water treatment), and other discolorations.

55. *Wood-preservation.*—With the increase in production of creosoted fence-posts and telephone poles during the year, and further increased production planned for the future, the limited availability of locally-manufactured creosote has been a matter for some concern. While every endeavour is being made to increase the production of suitable grades of coal-tar creosote in the country, attention has also been paid to creosote petroleum-oil mixtures. Tests in this connection have shown that the majority of petroleum oils available in New Zealand at economic cost for this purpose are not compatible with creosote. However, with suitable bridging solvents sludge formation can be controlled, and tests in laboratory and pilot plant indicate that a suitable mixture of low-temperature creosote and some petroleum oils, available in the country, can be formulated for commercial wood-preservation purposes.

56. The air-drying of large-dimension Corsican-pine stock such as poles, under unfavourable conditions, is accompanied by appreciable degrade due to decay. The rate of drying and the effect of light-preservative treatments prior to stacking for air drying have been investigated. The immersion of Corsican-pine poles and posts in heated solutions of sodium pentachlorphenate, followed by air drying, retards and minimizes but does not entirely eliminate infection by decay or staining fungi. Timber treated in this manner appears to be in a satisfactory condition for sterilization, preservative treatment, and subsequent use. A quantitative analysis of the degree of fungal activity and its progress throughout the year, particularly in relation to reductions in the strength properties, are important considerations in connection with the successful utilization of this species, particularly in the form of preserved poles.

57. In order to examine possible means of improving the staple-holding powers of creosoted-pine posts, tests were carried out on untreated totara, creosoted larch, creosoted Douglas fir, and creosoted Corsican pine, using both barb and shear staples. There was not much to choose between the staple-holding powers of untreated totara, creosoted larch, or creosoted Douglas fir. The staple-holding powers of Corsican pine were somewhat inferior, but this difference was minimized by increasing the length of the staple by ½ in. Barb staples were found to have poorer holding-powers.

58. With the experimental pressure-impregnation plant suitable treatment schedules for the preservative treatment of larch, Corsican-pine, and Douglas-fir poles have been determined, while considerable work has been done on the preservative treatment of insignis-pine sleepers. The conditioning of green timber in the pressure-cylinder so that it can be impregnated without prior drying has been examined, but minor alterations to the plant will be necessary before further tests can be undertaken.

59. Service testing of creosoted rimu and larch poles, and insignis-pine sleepers, in co-operation with other Government Departments, was continued. Additional specimens have been installed in "graveyards" maintained by the Forest Service for the testing of wood-preservatives, and arrangements have been made to test the natural durability of several New Zealand timber species in co-operation with overseas laboratories. The tests have been designed so that it will be possible to compare the natural durability of New Zealand timbers with the natural durability of some of the better-known species of other countries.

60. The testing of wood-preservatives against marine-borer infestation in co-operation with the Auckland Harbour Board has been in progress for some time. After seven years' exposure, specimens of exotic softwoods, including insignis pine, treated with coal-tar creosote in accordance with recommended practice for marine piling, are free from attack. Similar test specimens, pressure impregnated with a group of wood-preservatives which have shown promising results in overseas tests for this class of work, are now being treated for exposure in Auckland Harbour.

61. The wood-preservation section continued to deal with many requests for assistance or technical advice from the industry, the public, and from Government Departments. Information on methods of sap stain prevention, borer control, methods of formulating toxic chemicals in organic solvents, and general wood-preservation requirements was frequently sought.

CHAPTER VI—COMMERCIAL DIVISION

Inspector in Charge: Mr. W. C. Ward

Log-production

1. *General.*—Despite various difficulties the production of logs from departmentall logging operations created a new record. Labour was continually short and at times new equipment was unobtainable. Nevertheless, the total log deliveries represented 9 per cent. of all log supplies to the sawmilling and the plywood industries. Activity was concentrated mainly in the North Island where 7 per cent. of the log input of indigenous species and 15 per cent. of the exotic species required by the major industries were provided. The Forest Service filled all contractual requirements.

2. To ensure that the forest-owner obtains the maximum return for his forest and the sawmiller receives a constant supply of reasonably-priced sawlogs it is necessary that the logging operations in any particular forest should be conducted at a level which will provide for the maximum economic use of logging equipment. It has been found that when one logging operation is conducted for the supply to a group of normal indigenous sawmills that a more efficient use of equipment and man-power can be obtained and at the same time the sawmills are provided with better log supply than they could obtain

from the smaller logging operation. Experience has shown that in such cases the sawmills, through having a constant and regular supply of logs, have been able to produce more timber than they would have had they been supplied from bush operations designed to supply one mill only.

3. *Auckland Conservancy: Pureora Forest.*—This logging scheme was responsible for a record production of 1,068,000 cubic feet during the year. This was largely due to the acquisition of new mechanical equipment and improved servicing facilities. Three mills were regularly supplied with logs and a fourth mill temporarily. The average stand per acre for this forest is 21,000 board feet, the principal species being rimu and matai. Log-extraction is by tractor; special heavy-duty trucks are used in the delivery of logs to the sawmills over pumice roads. Further working areas in the forest were opened up by roading and 750 acres were covered by reconnaissance in readiness for future logging. The forest village at Pureora is now well advanced and more than 30 houses have been erected for bushmen and sawmill employees. Almost half of these houses have been provided under the Timber Workers' Housing Scheme. (See Chapter IX.)

4. *Rotorua Conservancy: Whakarewarewa Forest.*—In accordance with working-plan prescriptions for this exotic forest, work was concentrated largely on thinning and other silvicultural activities. With the consequent curtailment of clear-felling operations, sawlog-production was 27 per cent. less than the previous year, but on the other hand the production of posts, poles, mine-props, &c., increased by 12 per cent. Equipment used in the extraction of sawlogs consisted mainly of tractors with winch and logging arch, while a log-hauler was used in particular cases; loading was carried out by a mobile log-loader. In thinning operations horses were used to haul logs to the skids. Transport of all logs to Waipa Mill was by heavy trucks. In clear-felling operations the average stand per acre was 43,000 board feet in the case of insignis pine and 27,000 board feet in larch. Almost half of the total sawlog-production consisted of insignis pine; the remainder being larch and Corsican pine.

5. *Kaingaroa Forest.*—Although working-hours were reduced from forty-eight to forty-four per week for the greater portion of the year, a record output of 2,527,000 cubic feet was attained, this being largely due to the use of new and improved logging equipment. Although plant and equipment like that used at Whakarewarewa was employed in logging, the scale of operations was much larger. Eighty-nine per cent. of the total log output was obtained from the clear felling of 318 acres, mainly insignis pine, while the thinning of 193 acres of Corsican pine, larch, and Douglas fir yielded small quantities of sawlogs in addition to other produce. The stand per acre for clear-felled areas was approximately 35,000 board feet. In addition to providing all the sawlogs required by the Kaingaroa Sawmill, this forest supplied 55 per cent. of the logs sawn in the Waipa Mill. The forest now has 47 houses for married personnel and over 150 huts for single men.

6. *Whirinaki Forest.*—Working in State Forest No. 58 (in the Rotorua Conservancy) with an average stand per acre of over 25,000 board feet, this logging operation delivered sawlogs to three sawmills operating in the forest, while another mill was supplied for a portion of the year. In addition, a steady supply of first-class peeler logs amounting to approximately 8 per cent. of the total log output was despatched to plywood factories. Log-extraction was performed mainly by tractors although a skyline rig was employed in the logging of steep slopes and rougher areas. An overhead rig was used with success in the loading of trucks and trailers which delivered logs to the sawmills. In addition to Forest Service houses, the Minginui Forest Village now has 50 houses provided under the Timber Workers' Housing Scheme for the accommodation of bushmen and sawmill employees.

7. *Canterbury Conservancy.*—Apart from minor operations in other forests, logging activities were confined to the salvage of millable logs in wind-thrown insignis-pine stands in Balmoral Forest. Two hundred and nineteen acres of wind-damaged areas were worked over, the yield being approximately 7,000 board feet per acre plus some firewood. Horses were used in the extraction of logs, which were transported to the nearest railhead by logging trucks equipped with loading cranes. At Hanmer Forest thinning operations in larch stands yielded poles and fencing-material, some of which were sold locally and the remainder treated in the departmental creosoting plant. Eyrewell Forest produced over 1,500 cords of firewood from thinning and clearing operations in wind-thrown insignis-pine stands which was sold to firewood-merchants.

8. *Southland Conservancy.*—Logging operations on a small scale were conducted in six exotic forests. Almost 70 per cent. of the logs produced were obtained from thinning operations, horses being used mainly in extraction. With the exception of logs from Conical Hill Forest, which were delivered to the departmental sawmill in that forest, all logs were sold to private sawmillers. More than 70 per cent. of the logs sold were insignis pine, the only other significant species being Corsican pine.

9. *Log Sales.*—Sawlogs and peeler logs again amounted to 89 per cent. of all produce sold from departmental logging schemes, the remaining 11 per cent. comprised minor forest produce such as posts, poles, &c. The volume and value of sales during the last three years were :—

——	Indigenous.	Exotic.	Total.	Value.
	Cu. ft.	Cu. ft.	Cu. ft.	£
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
1949–50	2,704,000	4,265,000	6,969,000	298,600

10. The value of Forest Service logging is perhaps best illustrated in the sales analysis which follows. Apart from the three departmental sawmills, eleven private sawmills received regular supplies, while twenty-three other sawmills received significant additions to their normal supplies :—

Purchaser.	Indigenous.	Exotic.	Total.	Percentage.	Number of Mills.
	Cu. ft.	Cu. ft.	Cu. ft.		
Private sawmills—					
Regular supplies	2,402,000	319,000	2,721,000	39	11
Small quantities	303,000	369,000	672,000	10	23
	2,705,000	688,000	3,393,000	49	34
Forest Service sawmills	..	3,576,000	3,576,000	51	3
Total	2,705,000	4,264,000	6,969,000	100	37

Departmental Sawmilling Operations

11. *Sawn Output.*—Sawn timber produced by departmental sawmills amounted to 21,741,000 board feet for the year ; which is approximately 5 per cent. of all timber sawn in New Zealand this year, and 15 per cent. of all exotic timber sawn. Of this total, 15,082,000 board feet were sold as sawn timber, the balance being 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 XII while operating accounts and balance-sheets are shown in Appendix XVII.

12. *Rotorua Sawmills.*—The Service operates two mills in the Rotorua district, one at Waipa and one at Kaingaroa. As from 1st April, 1949, to 13th March, 1950, working-hours were reduced from forty-eight to forty-four per week. Notwithstanding this reduction of 8½ per cent. in hours, the total sawn output decreased by only 5½ per cent. on last year's figures. A night shift was again worked in the circular sawmill as the demand for the framing timber produced by this mill was still far in excess of the supply. Logs sawn consisted of insignis pine, 76 per cent.; larch, 11 per cent.; Corsican pine, 10 per cent.; Douglas fir, 2 per cent.; and other species 1 per cent. The two lines of log frames at Waipa produced 12,058,000 board feet of sawn timber while the circular sawmill cut 4,479,000 board feet. At Kaingaroa a production bonus scheme was introduced during the year. Since the inception of the bonus scheme daily production has increased appreciably, and total output for the year was 4,587,000 board feet. Profit this year at Waipa amounted to £21,000 or £2,000 more than last year; while Kaingaroa showed a profit of £5,500, or almost double last year's figure. Total stocks of sawn timber on hand at the 31st March were 2,963,000 board feet. Of the 21,125,000 board feet of timber produced in these mills, a total of 11,393,000 board feet or 54 per cent. was kiln-dried at Waipa. Based on the assumption that the plant is capable of drying for 335 days of twenty-four hours, the kiln operating factor for the year was 92 per cent. Minor alterations in the dry kilns continue; a recent simple alteration resulting in an improvement in the air-flow by approximately 50 per cent. and giving an appreciable shortening in drying times. Timber used in the box-factory amounted to 7,127,000 board feet, leaving a total of 14,473,000 board feet for sale in addition to timber used in departmental building operations. This quantity was disposed of as follows:—

Condition.	Sales Within New Zealand.	Exports to Australia.	Total.	Percentage.
	Bd. ft.	Bd. ft.	Bd. ft.	
Green	8,077,000	1,080,000	9,157,000	63
Air-seasoned	700,000	32,000	732,000	5
Kiln-dried	2,093,000	2,491,000	4,584,000	32
Total	10,870,000	3,603,000	14,473,000	100
Percentage of total production	75	25	100	..

13. Due to the continued shortage of trucks, rail transport for the distribution of sawn timber to markets throughout the North Island again presented difficulties. The position was worse this year than previously, and a total of 1,988,000 board feet was transported by road from Rotorua to markets in and around Auckland. Timber usage in New Zealand continues at an unprecedented level, and demand for the product of the Forest Service mills has far exceeded supply. There is increasing evidence that the high standards adopted at Waipa for the grading and marketing of sawn timber have created a very favourable impression among customers. Many merchants freely admit that they judge insignis pine purchased from other sources by Waipa standards, and endeavour to obtain their requirements from Waipa before approaching other producers. Similarly, in Australia a widespread preference has been expressed for Forest Service timber.

14. During the year a dry-sorting chain was erected under cover adjacent to the dry kilns. At the head of this chain an end-trimming and branding machine has been installed, and now all dry timber for export is end-trimmed, crosscut to length, and branded in the one operation. The experiments reported on last year in connection with the packaging of timber for export have been continued and have proved highly successful—so good in fact that now all Forest Service timber shipped overseas is assembled

in this manner. Agents, timber-merchants, and users in Australia speak highly of this advance in merchandising, and shipping companies have acknowledged the efficiency and economy of this method by granting freight reductions on bundled timber.

15. *Conical Hill Sawmill.*—The small pilot mill installed to cut timber for the construction of the main mill produced a total of 617,000 board feet this year. The main construction work on the gang-frame mill has now been completed and much of the machinery is ready for installing. It is expected that the unit will come into operation during the latter part of 1950. Stocks of timber on hand at the end of the year amounted to 239,000 board feet.

16. *Waipa Box-factory and Planing-mill.*—The box-factory has operated at a steady level throughout the year, the throughput of 7,127,000 board feet being slightly below last year's figure of 7,957,000 board feet mainly on account of the reduction in hours. Some orders from Australian firms were accepted, but on the whole domestic demand remained at a sufficiently high level for the factory to operate at a satisfactory capacity without seeking an export trade. Box-shook sales for the year were valued at £154,250 and the profit amounted to £17,900.

Wood-preservation Plants

17. *Waipa.*—One new 37 ft. treating-tank was installed and this extra capacity, coupled with the fact that ample seasoned stocks were available, resulted in a record production of creosoted posts and poles. It was found necessary, however, to import creosote from Australia because local production of creosote complying with the New Zealand Standard Specification was insufficient to keep the plant in full operation. A total of 128,000 posts, &c., 12,400 poles, and 17,000 cubic feet of other material were treated during the year, consuming 149,000 gallons of creosote.

18. A very keen demand exists for all produce which can be supplied from this plant, and it is expected that this demand will tend to increase as supplies of Australian hardwood posts and poles become both harder to obtain and more costly. It is encouraging to receive advice from farmers and others who have used creosoted produce that they have been so satisfied with the durability and ease of handling of the creosoted product that they now often prefer it to other classes of fencing-material. Stocks on hand in the seasoning yard at the end of the year amounted to 172,000 posts, &c., 9,300 poles, and 3,700 cubic feet of other produce.

19. The experimental pressure plant continued in operation throughout the year, and with the help of the information gained by such treatments it will be possible to commence full-scale activities as soon as the main plant has been installed.

20. *Hanmer.*—Because of the shortage of creosote this plant was unable to operate at capacity during the year, though ample stocks of imported creosote are now available. Nevertheless, owing to the good stocks of seasoned produce, the throughput of the plant at 20,300 cubic feet was almost double that of any previous year. A total of 7,200 posts, &c., 1,600 poles, and 2,100 cubic feet of other material were treated, consumption of creosote being 10,200 gallons. Stocks on hand in the seasoning yard at the 31st March were 29,000 posts, &c., 2,400 poles, and 800 cubic feet of other produce.

Utilization Projects Committee

21. A committee comprising the four senior officers connected with the utilization activities of the Service was formed early in 1949, with the Inspector in Charge of the Commercial Division as Chairman. It functions as a Board of Directors, and reports to the Director of Forestry on policy matters affecting the various utilization projects. The Committee meets regularly once a month. Its principal duty as the direct controlling authority is to promote operating efficiency in existing units, but it is also responsible for the broad design and layout of new units.

CHAPTER VII—ENGINEERING DIVISION

Inspector in Charge: Mr. V. C. Rapson

Surveying and Mapping

1. *Surveys.*—Survey work completed shows an appreciable increase, notwithstanding the continued shortage of trained staff and the concentration of much of the available staff on surveys in connection with village development and utilization projects. Engineering surveys included subdivisional layout, street formation, water-supply, sewerage, and power reticulation for forest villages. Considerable progress was made in the survey of the main logging routes in the Murupara Working Circle, Kaingaroa Forest; 60 square miles being covered by detailed reconnaissance and survey. With a view to economy in log transport a reconnaissance survey was made of a road location joining Waiotapu and Whakarewarewa State Forests, the distance being about 15 miles.

A summary of the survey work carried out during the year is as follows:—

	Acres.
(*a*) Exotic forests—	
Topographical surveys	3,965
Subdivision into compartments	6,824
Forest-type surveys	546
(*b*) Indigenous forests—	
Boundary surveys; 209 timber appraisal areas ..	21,652
Reconnaissance surveys	7,937

Other work included:—

(*a*) Surveying 56 miles of new roads.
(*b*) Surveying 17 miles of tracks.
(*c*) Demarcation of 17 miles of roads.
(*d*) Reconnaissance of 15 miles of roads.
(*e*) Surveying 564 chains of forest boundary.

2. In connection with the proposed village at Murupara, wind and air-current observations have been taken with the aid of meteorological balloons in order to ascertain the possible effects of atmospheric pollution from the proposed pulp-mill project. These observations are still proceeding.

3. *Mapping.*—The staffing position is slightly better and many necessary map records have been built up and renewed. The following work was completed during the year. One hundred and ninety-five plans were prepared and 255 new plans recorded; 1 stock map was drawn and 3 stock maps redrawn. Twenty-nine forest atlas sheets were renewed or prepared. The Forest Service library of aerial photographs was enlarged by addition of 3,311 prints and 6 mosaics and now contains 16,341 prints and 88 mosaics. Thirty mosaic copies were obtained for the use of conservancy and district offices.

4. Mapping for the national forest survey unfortunately made little progress, only 3 type maps being completed. The field-work has been completed for a further 13 sheets and several more are practically complete. Mapping for this project has been retarded by shortage of staff. The Aerial Mapping Branch of the Lands and Survey Department was no longer able to undertake this work and as a result Forest Service draughtsmen had to be seconded to the Aerial Mapping Branch to enable the work to continue.

Civil Engineering

5. *Roads and Bridges.*—When the earlier forests were established roads were located primarily to give access to camp-sites and to facilitate the distribution of planting-stock. If subsequent utilization activities were considered at all it is certain that present-day transport conditions and logging methods were not foreseen. Similarly, it is possible that roads being surveyed or constructed to-day may be out of date in another thirty

years; nevertheless in establishing any new forests the objective now is to locate roads where they will serve both for planting requirements and also for future utilization activities. These routes may be left merely as unplanted strips, or constructed to a low standard initially and subsequently brought to a higher standard when the traffic demands it. Construction of new roads and metalling or other surfacing carried out on Forest Service roads during the year were as follows:—

Conservancy.	New Roads Formed.	Metalling or Other Surfacing.
	M. ch.	M. ch.
Auckland	15 28	14 69
Rotorua	7 55	7 60
Wellington	11 13	9 6
Nelson	28 77	..
Westland	4 26	6 53
Canterbury	..	..
Southland	13 28	14 18
Total	80 67	52 46

6. In addition some 7 miles of road were reformed or widened. Lack of labour and machinery unfortunately continues to limit both the volume and the standard of work. Only one new road bridge was completed, but two others are in progress. Several structures of a temporary nature were built for the extraction of forest produce, and a number of short bridges were replaced by culverts. Ten and three-quarter miles of new access tracks were formed.

7. *Water-supply.*—The policy of the Forest Service is to provide, wherever practicable, a water-supply sufficiently reliable to enable a water-borne sewage system to be installed. In continuance of this policy several new water-supply and drainage systems were commenced and existing systems extended. The past year saw the completion of the standpipe at Kaingaroa, the sinking of bores at Tairua, Ashley, Eyrewell, and Balmoral, and the partial completion of the system at the Golden Downs Village. Water-supplies at Kaingaroa have been augmented by the installation of extra pumping capacity, and at Minginui by the building of a small earth dam, pipeline, and additional tank storage. A temporary supply has also been provided for the new village of Kiorenui near Murupara, as well as a number of small supplies to isolated houses or small groups of houses at such places as Waitangi, Puketi, Ahaura, and Mamaku.

8. Gauging and sampling of the source of supply for the proposed pulp and paper mill at Murupara has been continued. As in the case of the Rotorua Borough supply, tests on the Waipa Mill supply show that it has become contaminated, and steps have been taken to obtain a chlorinating plant. Operations at Conical Hill mill have been served by a temporary supply, but pipes have already arrived and pumps for the permanent installation are expected shortly.

9. *Water-supply for Fire-fighting.*—Provision of water-supplies for forest-fire fighting was not up to schedule, activity being limited to the installation of a number of 1,000-gallon steel tanks in several localities. In areas without surface water or where subsurface supplies would be expensive to develop, the level of the water in emergency storage-tanks can be maintained by rainfall on a relatively small catchment; and this type of storage is to be extended considerably in the near future.

10. *Drainage.*—Sewer drainage has been extended to meet the expansion of forest villages, notably at Rotoehu, Waimihia, Waipa, and Kaingaroa. Drainage ditches were excavated at Woodlaw Forest to carry off storm water, and an open drain was also dug at Balmoral to lower the ground water-level in the vicinity of the village. At the Conical Hill Mill provision has been made for the rapid run off of surface water and emptying of

the log pond by lining with concrete a ditch running direct to the river. The main storm-water drains in the millyard have been piped. At the Waipa Mill proposals have been prepared for straightening the Waipa Stream and for additional storm-water drainage for the mill area. In addition to providing a quicker run off for storm water this will provide a larger area for the creosote yard.

Building and Community Planning

11. *Buildings.*—Rotorua, Nelson, and Canterbury Conservancies continue to make more progress in the construction of living-accommodation, stores, workshops, garages, &c., than other conservancies. This may be attributed in part at least to the remoteness and wide distribution of the forests in other conservancies, as a result of which it is difficult to obtain either contractors or tradesmen on wages. The following schedule shows the buildings erected and in course of erection both by contract and day labour. The schedule does not include operations either at Waipa Mill or Conical Hill Mill which are shown separately.

Type of Building.	Completed During Year.	In Progress at 31st March.
Houses—		
Standard type	62	65
Sawmill workers' type	26	14
Temporary	1	..
Dormitory blocks	3	..
Single-men's huts	328	15
Camp ablution block and/or sanitary block	13	5
Camp kitchen—dining-room	1	..
Recreation-rooms	3	1
Plant workshop	4	1
Plant garage (including fire depots)	8	6
Power-house (for Diesel-driven generators)	3	..
Stable	1	..
Blacksmith's or carpenter's shop	4	1
Fire lookout	1	..
	3*	..
Office	2	4
Store	3	6
House renovations	27	2
Buildings removed and re-erected	7	2
Buildings enlarged or altered	24	2
Miscellaneous small buildings	114	11
Sixteen-unit flat	..	1

* Temporary.

12. Building operations at the Waipa Mill included extensions to the office and the hostel dining-room and ablutions. Additional covered storage for dry timber has been provided by roofing the area which will ultimately become the cooling-off space for kiln-dried timber when the kilns have been made into double-ended units. A green sorting-table with sap-stain bath was built for the circular mill. Work in progress includes extensions to the Central Plant Workshop and a new ablution and sanitary block for the mill. Maintenance items include the renewal of some of the floor and floor-beams in the main mill near the log inhaul. Other work by mill carpenters included pile driving and caps for the overhead travelling crane (log handling): foundations for an additional engine and alternator, and alterations to power-house; extensions to the conservancy office; insectaries and other additions and alterations at the Forest Research Institute.

13. At the Kaingaroa Mill a sorting-table and sap-stain bath were constructed. Conical Hill Mill has made steady progress during the year, and the shell of the main mill building which was being built by contract was completed. Other portions of the plant have been built by day labour because of difficulty in arranging suitable contracts, these include completion of the log-pond, log-inhaul structure, sorting-table, also fitters' shop, power-house, and boiler-house. The plant workshop (included in the schedule above) was also built by day labour.

14. *Community Planning.*—The Housing Division, Ministry of Works, plans the layouts of all forest communities. Life in such small isolated communities as these can be very much more attractive when there is a well-planned layout, effective landscaping, reasonable recreational facilities, community buildings, and the more important amenities of town life. This is the objective in all forest communities, and progress towards it is encouraging in spite of the delays due to the labour shortage and the necessity for concentrating on housing. Unfortunately, it has not yet been possible to provide any permanent community buildings, including shopping facilities, but progress with general development, landscaping, and recreational facilities has been good. The Golden Downs Village is an excellent example of the way in which these small settlements could and should be developed. In fact, it is primarily through the development of well-organized forest communities provided with all reasonable amenities that the Forest Service expects to find a permanent solution to that outstanding need—a stable and contented body of efficient forest employees.

Mechanical Engineering and Transport

15. *Utilization Plant, Waipa.*—In view of the general power shortage it is pleasing to record that the Waipa Mill reduced its total consumption and at the same time increased the ratio of power generated to power consumed from 65·1 per cent. to 67·37 per cent. The power-plant has operated satisfactorily, but an additional 287 kVA. alternator is being installed to allow more extensive overhauls to plant which has been running for several years with only such maintenance as can be given during the Christmas shut-down. An improved supply of circulating water for the surface condenser is under way, alterations have been made to the exhaust lines of steam-engines, and condensate formerly wasted is now collected and passed through the feed water-filter.

16. As a check on the efficiency of steam-production the Railway Department was requested to carry out a test of the boilers. Lack of draught was indicated and is being rectified; as also is the sealing of cracks in the brickwork of the flue which was disclosed by excessive carbon-dioxide readings of the flue gases. The angle of three of the step-grates has been altered from 40 degrees to 45 degrees and the remainder will be altered as opportunity offers. Power generated and consumed was as follows;—

Total connected load	2,307 h.p.	..
	1949–50.	1948–49.
Power generated	1,255,415	1,322,039
Purchased from Tourist Department	685,185	707,158
Total power generated and purchased	1,940,600	2,029,197
Less units fed back to Tourist Department ..	77,250	97,150
Actual plant consumption	1,863,350	1,932,047
Power generated as percentage of total plant consumption	67·37	65·16

17. The overhead travelling crane for the unloading of logs had been completed by the 31st March, but was not quite ready for continuous operation. The hydraulically operated crosscut-saw has functioned well. As a result of operating experience, however, it could be improved—as could any future installations—by using a pump of larger

capacity and a better type of control valve. New items of plant installed include the trimming and branding machine, hopper feed to the Jonsered band-saw, and a treating-tank fitted with steam-coils for the creosote plant.

18. The plant generally was maintained in good condition; among the items of maintenance being the renewal of traverser bearings, new drive-shafts for the log-roller conveyor, renewal with long-link chain of the main longitudinal and inclined conveyors, and considerable attention to the 201 Bolinder planer. The workshop has also been engaged in the manufacture or overhaul of many items required for Kaingaroa and Conical Hill Mill, such as manufacture of slasher-saw assembly and log-turning winches and the overhaul of boiler equipment and pumps. One fire broke out in the shavings-bin and another in the Central Plant Workshop, both being dealt with efficiently by the mill fire-brigade. All major units of plant are protected by sprinkler installations.

19. *Conical Hill Sawmill.*—The Waipa Sawmill was set up as a demonstration unit to introduce the Swedish gang saw method of timber-production to New Zealand. The initial difficulties which attend a new system have been largely overcome, and information regarding original layout and design and their subsequent improvements has been freely given to those interested. Experience at Waipa is the basis for the layout and design of the Conical Hill Mill, which will be the most up to date in Australia or New Zealand. The installation of machinery has already commenced, the chief items on which work has been done being No. 1 boiler, No. 1 engine and generator, and jet condenser.

20. *Plant Workshops.*—Most conservancies now have at least one well-equipped plant workshop which can deal with a wide range of work; these being located at Pureora, Rotorua, Kaingaroa, Golden Downs, Ashley, and Conical Hill. In the Wellington Conservancy the plant workshop at Karioi, although in an old building, has been renovated, and with the installation shortly of a Diesel-driven generator and motorized equipment, it will be capable of handling most of the work required. The Central Plant Workshop, Rotorua, is proving too small, as is the Kaingaroa Workshop where increased log-production both at Kaingaroa and Te Whaiti is causing so much congestion that more field repair work than is desirable has to be done. The new workshop at Minginui will not relieve the pressure on Kaingaroa to any marked extent as it is intended that work at Minginui should be limited to running repairs, and that for major repairs and overhauls the vehicles should be sent to Kaingaroa.

21. *Transport.*—Sixty-nine new vehicles were added to the fleet during the year. Ten went to Auckland Conservancy, 34 to Rotorua, 8 to Wellington, 6 to Nelson, 2 to Westland, 4 to Canterbury, and 8 to Southland. The number received, however, has not overcome the shortage of additional and replacement vehicles which still remains acute. The following table shows how deliveries during the year fell short of requirements:—

Type of Vehicle.	Number Required.	Number Delivered.
Car	10	4
Light truck, 15–20 cwt.	39	35
Medium truck, 3 ton	38	10
Medium truck, 5 ton	..	12
Heavy truck, 10 ton	8	..
Land rover	..	8
Total	95	69

22. It will be noted that heavy-truck requirements were not met. However, near the end of the financial year when commercial operations were seriously embarrassed and many times on the point of collapse due to frequent breakdown of the logging-trucks, a number of medium-capacity trucks were supplied at short notice.

23. *Logging and Earthmoving Equipment.*—Twenty-five new tractors complete with ancillary equipment were purchased during the year and have been delivered. These machines are engaged in the production of logs, extraction of thinnings, and maintenance of log-extraction routes. The machines were allocated as follows: 6 to Auckland Conservancy, 18 to Rotorua, and 1 to Canterbury. In addition, 2 Smiths B21 loading cranes and 1 Berger log pre-loader were obtained. One loading crane went to Conical Hill, Southland, and the other, together with the Berger pre-loader, to Rotorua.

Forest-fire Prevention and Control

24. *Fire Conditions in Auckland Conservancy.*—A long period of dangerous fire weather suffered by Auckland Conservancy was the main feature of the 1949–50 fire season. The drought was most severe in North Auckland and Coromandel Peninsula: from 23rd December, 1949, until 31st March, 1950, the rainfall was only 2 in. instead of the 12 in. or so normally expected. Heavy rains had fallen early in the season, and this enabled forest vegetation to stand the drought better than it had in the summer of 1946, but there were many reports that mature taraire and tawa were dying in the Kaikohe district, and that *Coprosma* spp. and *Geniostoma* were drooping in the under growth of indigenous forests throughout the conservancy. These reports are an indication of the inflammable condition of the forests: the fire season in Auckland Conservancy has been summed up as the most dangerous since that of 1927, in which a considerable area of kauri forest was burnt. The Fire Officer in each county in North Auckland and Coromandel Peninsula had at one time or another to prohibit the lighting of fires in the open without a permit. There was some critical periods in which radio broadcasts were used to warn the public that the lighting of fires in the open was entirely prohibited.

25. *Fire-fighting in Auckland Conservancy.*—The reporting of fires seen by pilots was valuable assistance given by the aero clubs of the Auckland and Thames districts, the National Airways Corporation, the Royal New Zealand Air Force, and the Air Department. Forest Officers and Forest Service fire-crews were on the alert constantly for the whole of the danger periods. They fought 29 fires within State forests, spending 875 man-days in actual fire-fighting, and twice had to give their assistance to local bodies in critical fire-fighting operations. The result of their efforts was that only 50 acres of standing timber, 92 acres of forest regeneration, and 274 acres of cut-over land were burnt in forests under their control. The Forest Service fought 6 fires in the vicinity of Waipoua Forest, any of which would have caused widespread damage in the kauri forest if it had not been brought under control in its incipient stages; the threat of fire immediately brought into action a well-equipped fire-fighting organization whose plans had been laid in advance to deal with fire in any part of the forest or the surrounding land.

26. *Fire Conditions Elsewhere.*—The fire weather in Rorotua Conservancy was broken several times by heavy rain which prevented the hazard from rising to an extreme. A fire-patrol detachment from the Royal New Zealand Air Force, stationed at Rotorua, carried out 83 patrol flights over 1,000,000 acres of State and privately-owned forest in this region. The central districts of Nelson had only 2·5 in. of rain in the three months from the beginning of January, but the humidity was generally high—it fell below 45 only three times at Golden Downs and once at Rai Valley. Canterbury Conservancy had a hot, dry summer.

27. *Fatalities.*—In the past year 2 young married men were killed in the course of fire-fighting duty. The first death occurred in a privately-owned forest in Waimea County very early in the fire season. A fire-fighting party under the leadership of the county's Fire Officer was trapped in a back fire, the leader lost his life, and 3 other men were seriously burnt in escaping. The second death occurred near Waitangi in North Auckland; a Forest Service workman was hit by a falling branch from a burning dead puriri tree, which he was in the act of felling.

28. *Training in Fire-prevention.*—The Forestry Training Centre in Rotorua held a ten-day course for Forest Officers in the principles of forest-fire control, and another ten-day course for workmen in the use and maintenance of fire-fighting equipment. Two of the principal afforestation companies, the Lands and Survey Department, and the Ministry of Works sent members of their staffs to the course for officers.

29. *Meteorological Forecasting of Fire Weather.*—The Meteorological Office again gave the Forest Service special weather forecasts, which were most useful in predicting the development of fire hazards. The Forest Service now has thirty-five fire-weather stations, including new stations at Otautau in Southland, Te Whaiti in the Urewera, and the Rai Valley in Nelson.

30. *Fire Lookout Stations.*—Permanent fire lookout cabins were built during the year for the Tapanui group of forests and Rai Valley State Forest. Ordinary single-men's cabins were sited at Golden Downs, Riverhead, and the Waitangi endowment area. A permanent lookout cabin will later be built at Waitangi, and one perhaps at Golden Downs.

31. *Telephone Communications.*—The construction of 9 miles of metallic circuit telephone-line and 4 miles of earth-working circuit has brought the total length of telephone-lines in State forests to 549 miles, of which 222 miles are metallic circuit. A total of 285 fixed instruments have been installed, and 84 portable instruments are held for emergency, patrol, and test purposes. Kaingaroa State Forest presents the extreme example of the value of telephone communications in both fire-control and forest administration in New Zealand. This forest is about 50 miles long and 15 miles wide, irregular in shape, and like other exotic forests in New Zealand it is almost entirely coniferous in constitution—the devastation of large tracks of coniferous forest in France in 1949 showed how inflammable coniferous forests sometimes become. The basic system of communications is the network of telephone-lines, on which depend the supervision of fire districts, the early reporting of fires, and the quick moving of fire-crews to outlying points of alarm.

32. *Radio Communication.*—Radio telephones also have an essential place in the fire-fighting methods evolved by the Forest Service. Inspection parties report by radio as soon as they reach the scene of the fire, and when a field headquarters is set up in fire-fighting operations, the radio telephone is its chief means of communication with forest headquarters. In the fire prediction and warning service the fixed radio-stations are used to relay fire-weather reports to the fire-control headquarters in Wellington so that the development of fire hazards throughout the Dominion can be assessed. During the year new fixed radio-stations were established at Kaikohe, Tairua, Te Kuiti, Kakapiko, Golden Downs, Rai Valley, Hanmer, Balmoral and Eyrewell, and the power of the Tapanui Station was increased to 25 watts. The total number of fixed stations is 32, and there are 49 portable and man-pack sets available. The Post and Telegraph Department has alloted 67 call-signs to the Forest Service. Additional radio-stations are under construction at Maramarua and Opango, and there are proposals for another 6 stations. The present distribution of radio-telephone sets is as follows:—

Conservancy.	Fixed Sets.	Radio-equipped Vehicles.	Sets Portable by Vehicle.	Man-pack Sets.
Auckland	9	..	18	..
Rotorua	13	3	17	2
Wellington	2	..	..	..
Nelson	2	..	3	..
Canterbury	4	..	5	..
Southland	2	..	..	..
Head Office	..	1	..	..

The appointment of a specialist communications officer to Head Office marked a further stage in the development of radio communications in the Forest Service.

33. *Fire Damage in State Forests.*—The number of fires in State forests during the year was 57, of which 46 were in indigenous forests and 11 in exotic. The fires burnt on 1,781 acres of land but the damage was confined to only 26,000 cubic feet of millable timber, 92 acres of natural regeneration of indigenous forest, and less than 3 acres of exotic forest.

34. *Fire Danger Outside State Forests.*—There were 103 recorded fires outside State forests, and they burnt on 10,590 acres, of which 102 acres were in exotic forest. Three sawmills were destroyed by fire—the mill of J. H. Evans at Paeroa, Lines Bros. (N.Z.), Ltd., at Wekaweka, and New Zealand Forest Products, Ltd., at Atiamuri. Fire statistics for the past five years are given in the following tables :—

Year.	Fires in State Forests.		Other Recorded Fires.		Sawmills Destroyed: Number.
	Number.	Area.	Number.	Area.	
		Acres.		Acres.	
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
1949–50	57	1,781	103	10,589	3

Forest and Rural Fires Act

35. *County Fire Authorities.*—The 1949–50 fire season was a severe test for the organization created under the Forest and Rural Fires Act, and it has shown clearly the value of County Councils as Fire Authorities, especially in districts where a high fire hazard does not occur every year. Many County Councils found it necessary to prohibit the lighting of fires in the open during periods of fire danger, but there were few complaints of hardship, and public co-operation was generally forthcoming. There were, unfortunately, some breaches of orders issued by Councils under section 18 of the Act, and in several cases convictions were entered by the Courts.

36. *Rural Fire Districts.*—To protect exotic forests and some indigenous forests in which high fire hazards recur annually, rural fire districts with a specified closed fire season have been constituted under the Act. There are now 66 rural fire districts, 4 of which were constituted during the year, and they cover a total area of 4,351,560 acres. The Fire Authority for a rural fire district is either the Minister of Forests or a rural fire committee representing the landowners and other affected interests such as sawmillers, the landowners having a majority on the committee. In the case of forests owned by a local body, the Council is appointed as the Fire Authority. The Minister of Forests has appointed 88 Forest Officers to be the Rural Fire Officers of districts in which he is the Fire Authority, and other Fire Authorities have appointed Fire Officers as required by the Act. A summary follows showing the number of districts controlled by the various Fire Authorities and the forests which are protected :—

Fire Authority.	Number of Fire Districts.
Minister of Forests	48
Rural fire committee	7 and 1 pending.
Local bodies	11 and 1 pending.
Property protected—	
State forests (one district includes a national park) ..	40
Watershed reserves	6
Private forests	6
Forests owned by local bodies	5
Development areas administered by other Departments	5
National parks, a scenic reserve, and an endowment ..	4
Crown and Maori land (a rural fire committee appointed)	1

37. *Power to Borrow by Rural Fire Districts.*—There was mention in the annual report, 1949, that there was no power for a rural fire committee to borrow money to meet expenses in an emergency. Section 40 of the Forest and Rural Fires Act has been amended by section 19 of the Statutes Amendment Act, 1949, to give this power subject to the Minister's consent, and one rural fire committee, whose district protects a privately-owned forest, has received the Minister's consent to its borrowing.

38. *Some Basic Provisions of Act.*—The principal legislation governing the protection of State forests from fire is the Forests Act, 1949. When this Act was passed, the experience gained in the administration of the Forests Act, 1921–22, had already provided a basis for the drafting of the Forest and Rural Fires Act, and there are now important parallels between the law regarding the protection from fire of State forests and the law regarding forest and rural fires generally. Of some interest to the general public is the new Forest Act's extension from a quarter-mile to 1 mile of the distance within which it is unlawful to light a fire if trees or other forest produce are endangered or burnt. Fire districts and closed fire seasons giving further control over burning in the vicinity of State forests are, however, constituted under the Forests and Rural Fires Act. In practice, fire districts are constituted only for those State forests at which there is a Forest Officer to act as a Rural Fire Officer and in which the hazards are likely to be fairly high. It sometimes happens that a County Council's order prohibiting burning in a period of fire danger applies to land within a mile of a State forest. In such cases the county Fire Officer usually consults a local Forest Officer about any application for a permit, and if a permit is granted, the Forest Officer keeps in close touch with the person authorized to burn.

39. *Proposed Regulations under Act.*—To complete the Dominion's organization against forest and rural fires, it is necessary for regulations to be made under the Forests Act and the Forest and Rural Fires Act, and a single set of regulations has been drafted for issue under the authority of the two Acts. The scope of the proposals includes the fire equipment and fire patrols to be provided in sawmilling and other industrial operations, conditions regarding fires lit under permit, the powers and duties of Fire Authorities, the conditions of fire-fighting service, road-signs, and Rural Fire Officer's warrants. All the affected interests have been sent copies of the proposals, and when the draft has been revised in the light of their comments, a conference representative of the affected interests will be held in Wellington.

Publicity Campaign.—The publicity campaign for the prevention of forest fires is described in Chapter VIII, " Operations Division."

CHAPTER VIII—OPERATIONS DIVISION

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

Organization and Staff

1. *Organization.*—The Forests Act, 1921–22, created several statutory positions within the Forest Service, but the authority to make these appointments was altered by the Public Service Amendment Act, 1946, and the position has been further varied by the Forests Act, 1949. The Director of Forestry is now the administrative head of the Forest Service, and the appointment of Conservators of Forests for each conservancy is provided for ; all such appointments to be as officers of the Public Service. Some designations as in the past will continue, but the officers concerned will hold office as public servants and not by statutory appointments. The 1949 legislation also makes provision for a deputy of the Director or of any Conservator of Forests.

2. *Staff.*—The recruitment of suitable additional staff has been difficult particularly in some of the larger centres. In the case of junior clerical staff there is a considerable " turnover " which militates against the attainment of a high level of efficiency. The permanent staff now totals 766 and temporary staff 24, making a total of 790, which is a net increase of 33 over last year's figures. New appointments numbered 126, but there

were 93 resignations and transfers; the new appointees include 17 technical trainees who have commenced practical and theoretical training as future forest officers. Twenty-one officers are on leave without pay, of whom 13 are taking a full-time course of study at Universities—5 being in New Zealand and 10 overseas. Statistics of staff for the past three years are as follows:—

Year.	Permanent Staff.	Temporary Staff.	Total.
1948	600	59	659
1949	737	20	757
1950	766	24	790

3. *Honorary Staff.*—Honorary rangers are now appointed under section 11, Forests Act, 1949. During the year 3 appointments terminated and 5 appointments were made; the present total is 119.

Forest Employment

4. *General.*—During the year under review the average number of workmen employed by the Forest Service was 2,026, the highest figure recorded in recent years. At the 31st March, 1950, the total actually employed was 1,898. The table below shows corresponding data for recent years:—

Year.	Number of Employees as at 31st March.			Average for Year.
	Forestry Workers.	Timber-workers.	Total.	
1945–46	866	433	1,299	1,108
1946–47	1,120	511	1,631	1,513
1947–48	1,100	630	1,730	1,675
1948–49	1,175	761	1,936	1,881
1949–50	1,125	773	1,898	2,026

5. It is a matter for concern that little, if any, progress has been made toward the attainment of an adequate and stable labour force and, as the following table shows, the turnover of workmen is very high in relation to the number employed:—

—	Forestry Workers (Establishment and Maintenance).	Timber-workers (Utilization).	Totals.
Strength at 31st March, 1949	1,175	761	1,936
Commenced during year	2,079	634	2,713
Left during year	2,129	622	2,751
Strength at 31st March, 1950	1,125	773	1,898

6. *British Immigrants.*—A total of 123 immigrants from the United Kingdom commenced work at various projects during the year, but many have since left to take up other employment. Those remaining in the Service show a real interest in forest work and a desire for advancement. Among these immigrants are some who have trained under the schemes of the British Forestry Commission, and those who have had two or three years' experience with the Commission have a useful background and are welcome additions to the skilled labour force. Another group were 23 tradesmen who have assisted in the Service's construction programme and in the maintenance of mechanical plant and equipment.

7. *European Immigrants.*—The Forest Service has given employment to 20 married and 55 single men from the party of new settlers from Europe brought to New Zealand under the auspices of the International Refugee Organization. It is pleasing to report that these workers are industrious and capable, and over half of them have already advanced beyond the status of labourer. It does appear that people from the Baltic countries adjust themselves readily to a forest environment.

Safety of Employees

8. *General.*—The safety of employees in both bush and mill is continually under review. First-aid instruction is now given on all courses for field staff at the Rotorua Forest Training Centre, and technical trainees are expected to obtain a recognized certificate before promotion to forest ranger.

9. *Equipment.*—The use of safety helmets for bush workers is being investigated, and preliminary reports on the particular type of helmet being tried out are very favourable. A review has been made of industrial hygiene at Service wood-preserving plants and it has been found to comply with overseas standards. Barrier creams are used to obviate the possibility of skin irritation arising from contact with the preservatives used and protective clothing is also available to employees in these plants.

10. *Ambulances.*—The Forest Service now maintains five ambulances in isolated localities. These ambulances besides being available in the event of accident in the bush or local sawmills are an important amenity to the communities served and cases of illness where delay would have been serious have been speedily transported to hospital. During the year the ambulances made 171 trips of which 118 concerned employees of the Service injured at work, 32 employees or members of their families sick or injured otherwise than at work, and 21 trips for persons resident in the district but not directly employed by the Service.

11. *Accidents.*—It is reported with regret that 2 fatal accidents occurred, one on 15th September, 1949, when a heavy log rolled on a bushman at Pureora, and the other on 17th January, 1950, when, during fire-fighting operations near Russell, a labourer was struck by a falling limb from a burning tree. In neither case was there any suggestion of negligence on the part of the Forest Service and verdicts of "accidental death" were returned at the inquests. A total of 510 accidents occurred during the year as follows:—

(Previous year's figures in parentheses.)

Fatal	2 (..)	Bruises and crushes ..	96 (102)
Cuts	140 (152)	Septic wounds ..	51 (71)
Fractures	26 (18)	Eye injuries ..	28 (31)
Strains	111 (129)	Miscellaneous ..	56 (49)

Compensation paid to employees:—

Year.	Total Payments.	Total Wages.	Compensation per Centum of Wages (Approximately).
	£	£	£ s. d.
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
1949–50	15,037	810,173	1 17 2

The estimated premium payable for a comprehensive accident policy for the year would have been almost £27,000, so that a saving of approximately £12,000 has been effected.

LEGAL

12. *Forests Act.*—The existing forest legislation was consolidated and amended during the year under the Forests Act, 1949, which came into force on 1st January, 1950. This Act repeals the Forests Act, 1921–22, and all amendments except sections 3 and 7, Forests Amendment Act, 1926, dealing respectively with national-endowment land and with the validation of certain timber-cutting rights in Karamea and Westland Mining Districts. A number of other statutes affecting the administration of State forests have also been repealed and their provisions included in the new Act where still required. Among these is section 17, Finance Act, 1924, providing for the payment to local authorities of fifths or tenths of certain forest revenue.

13. The most important changes in the legislation are as follows: The Minister's title is changed from Commissioner of State Forests to Minister of Forests and that of the Department from State Forest Service to New Zealand Forest Service. Statutory recognition is given to forest conservancies and Conservators of Forests. The Minister's powers have been extended to include the generation and sale of electrical power, the entering into contracts or agreements, carrying on of farming operations incidental to forest-management, and the execution of documents required under the Act on behalf of His Majesty the King. The Minister may delegate such of his statutory powers as he thinks fit. All references to State forests in any Act, document, &c., are deemed to be references to State forest land. The reservation of permanent State forest land which could previously be revoked pursuant to a resolution of both Houses of Parliament, is now to be revoked by Act of Parliament.

14. The period for which a working plan is prescribed has been extended to a maximum of twenty years as against ten years previously. The legislation covering protection of State forest land from fire has been altered and extended and now parallels that under the Forest and Rural Fires Act, 1947. The distance from State forest land within which it is unlawful to light a fire if any forest-produce is thereby burnt or endangered, is increased from a quarter mile to 1 mile. The number of offences with respect to State forest land has been increased to include failure to remove cattle, unlawful entry, and unlawfully receiving forest-produce; a person convicted of an offence is made liable for damage caused by the act which constituted the offence. The sale of Maori-owned forest which under the previous Act required the consent of the Minister now requires the additional consent of the Minister of Maori Affairs. The joint consent may be granted with or without conditions, or may be refused. The power to make regulations has been widened to include traffic control on public roads during fire-fighting operations, fire-fighting equipment to be provided by licence-holders, setting-up of advisory committees, timber measuring, use of timbers in short supply, &c.

15. *Regulations.*—The Timber Regulations 1948, Amendment No. 1 (1949/72), revoked the restrictions relating to the use, sale, or other disposal of kahikatea or white pine, and the Timber Regulations 1948, Amendment No. 2 (1950/78), revoked the restrictions in respect to heart and medium kauri.

16. *Timber Production Advisory Committee.*—The Timber Production Advisory Committee Regulations 1949 provide for the appointment of a committee to advise the Minister of Forests with respect to the organization amd more efficient working of the timber industry in relation to the production of timber. The Committee is composed as follows:—

The Minister of Forests (Chairman).
The Director of Forestry.
W. C. Ward, representing the New Zealand Forest Service.
H. Parsonage, representing the Department of Labour and Employment.
R. L. McPhail, representing the Ministry of Works.
K. C. A. Carter, representing the Dominion Federated Sawmillers' Association (Inc.).

A. L. McKay, representing the West Coast Sawmillers' Association.
F. Craig and R. E. Collins, representing the New Zealand Timber Workers' Industrial Union of Workers.
F. L. Turley, representing the Nelson, Westland, and Marlborough Timber Industry Employees' Industrial Union of Workers.
D. G. O'Toole, representing the New Zealand Timber Merchants' Federation.

17. *Sirex Advisory Committee.*—The Sirex Advisory Committee Regulations 1950 provide for the appointment of a committee of five to advise the Minister in respect to the adoption of possible control measures to prevent damage to pine forests by the insect *Sirex noctilio.*

The committee is constituted as follows:—

The Inspector in Charge, Management Division, New Zealand Forest Service	F. W. Foster.
The Senior Entomologist, Nelson, Department of Scientific and Industrial Research	L. J. Dumbleton.
The Forest Pathologist, New Zealand Forest Service ..	G. B. Rawlings.
Two foresters nominated by the Dominion Forest Owners' Federation (Inc.)	O. Jones. J. L. Harrison-Smith.

18. *Fire Control Legislation.*—The Forest and Rural Fires Act, 1947, has been amended as follows: Section 40 is amended by sections 18 and 19, Statutes Amendment Act, 1949. Section 18 provides that moneys owing to a Fire Authority shall be recoverable as a debt. Section 19 adds a new section—Section 40A—to the principal Act under which a Fire Authority may with the Minister's consent borrow money to provide for any expenditure or costs which it may lawfully incur. Sections 2, 9, 13, 14, 28, 44, and 51 (4) are amended by section 86, Fire Services Act, 1949. Section 2 is amended by redefining the term "brigade" or "fire-brigade"; and the definition of the term "county area" is amended to exclude a district controlled by an Urban Fire Authority." Section 9 is similarly amended. Sections 13, 14, and 44 are amended by replacing the term "Fire Board" with "Urban Fire Authority." Section 28 is amended by adding to paragraph (*b*) a proviso that the senior brigade officer present shall have control of operations in connection with any building which may be on fire. Section 51 (4) is amended by extending the time within which regulations shall be laid before Parliament after making from fourteen days to twenty-eight days.

19. *Other Legislation.*—Sections 6 and 7, Land and Income Tax Amendment Act, 1949, authorize the deduction from a farmer's assessable income of expenditure incurred in planting or maintaining trees and for the apportionment of income derived from the sale of timber from trees. Section 24, Maori Purposes Act, 1949, authorizes the Waikato-Maniapoto District Maori Land Board to extend the term of a timber-cutting licence held by Ellis and Burnand, Ltd., of Hamilton. The Dunedin City Forestry Empowering Act, 1949, confers additional powers upon the Dunedin City Council in relation to forestry, and authorizes the acquisition of land, the establishment, management, and protection of forests, and the manufacture and sale of forest-produce. The Council is required to have working plans prepared for approval by the Minister of Forests and is required to submit for approval within one year or approved extended period, a working plan concerning operations in respect of a period of not less than five years. In June of each year the Council is required to furnish to the Minister of Forests an annual report for the year ending the 31st March immediately preceding, together with a plan of operation for the ensuing year.

Finance and Accounting

20. *Principles of Finance.*—Forest Service finance has been the subject of special comment in the last three annual reports, and the time now seems opportune to summarize developments over the past few years. Prior to the passing of the 1948 Amendment Act, all activities had been financed by loan moneys in so far as forest revenue was insufficient to meet expenditure regardless of the fact that projects may not have justified the investment of loan-moneys. In effect, the whole of the activities of the Service (including general administration and assistance to general Government and local-body finance) had been financed from capital moneys as the revenue mentioned above was, until a few years ago, almost wholly derived from the exploitation of indigenous forests, and the necessity for replacing those forests out of the revenue had never been recognized. While the use of loan-moneys may be justified for the purpose of bringing our areas of productive forest up to the minimum desirable for a balanced national economy, the long-term objective in forest finance (as in forestry itself) must be to place successive generations in such a position as we (as inheritors of a once adequately forested area) should occupy to-day. To do this, the redemption of loans raised for national forestry purposes should be recognized as the function of general Government funds so that, eventually, the Dominion may have both adequate productive forested areas and a substantial national income from the forests in perpetuity, both the forests and the revenue from them being free of financial encumbrance. Accepting the foregoing as an ideal we must also accept as a fact that to carry out the large amount of forest-development work still urgently needed from current revenue alone would place an impossible burden upon Consolidated Fund. We must have the forests and, in practice, therefore, we cannot adhere closely to our financial ideals but we *can* keep those ideals in view. To achieve those ideals must of necessity be a long-term project but, as the following paragraphs will show, we *are* now keeping them in view.

21. *Application of Financial Principles.*—The passing of the 1948 amendment to the 1921–22 Forests Act opened the way for a more rational method of finance. The main financial provision was to abolish the self-contained State Forests Account (financed from either forest revenue or loan-moneys) and to give the necessary authority to enable funds to be provided out of general Government revenue as well as out of loan-moneys. This was followed by the provision under the 1948 Appropriation Act for a vote for "Forest Administration" under Consolidated Fund and one for "Forest Development" under Public Works Account and these two votes were provided for in the 1948–49 estimates. Under this arrangement, Consolidated Fund carried the cost of general administration of forestry while the Public Works Account (out of forest revenue and loans, together with a contribution from Consolidated Fund) carried the cost of administration, development, and management of State forests. Consolidated Fund, in addition, provided for the payment of up to £223,500 as a contribution to Public Works Account. That only a token sum of £10,000 was actually paid, was on account of the development of the accounting system lagging behind the development of the financial policy set out above and not to any abrogation of that policy. For the same reason, there was only a similar token contribution made during the year just ended. For the coming year, provision is being made for the whole of the cost of administration of State forests to be met out of Consolidated Fund. This represents a contribution from general Government revenue of between £200,000 and £250,000 for the year, leaving a balance of £2,000,000 (approximately) to be provided out of Public Works Account, of which sum £800,000 is to be met out of forest revenue and £1,000,000 from loan-moneys. This may not seem a very material step forward, but in considering it, several facts must be remembered, viz.:—

(*a*) Our exotic forests (which must fill the gap left by the near exhaustion of indigenous resources) are, as yet, in the development stage, not one as a complete unit being at the stage of producing a sustained yield of mature timber in perpetuity.

(*b*) Although some of our exotic forests are now earning material amounts of revenue, we have a large programme of construction works which is essential to the development of the newer forests and to place those forests nearing maturity of the first crop on a proper basis for long-term management.

(*c*) Before the exotic forests can be expected to produce satisfactory timber on an economic basis, we must face up to the problem of arrears of silvicultural treatment which have accumulated not only during the war years and the post-war labour shortages, but also, in many cases, right from the time that the originial planting was done. All this will need finance as will also the necessity for correcting to a balanced age-group basis, the depression and pre-drepression block-planted forests.

(*d*) The proposals for the current year include provision of loan-moneys to meet an estimated expenditure of £200,000 on the development of the Murupara project, so that loan-moneys required for forestry proper for the coming year is £1,000,000, which is not entirely disproportionate to the provision of up to £250,000 from Consolidated Fund.

However, in spite of the capital expenditure still required to complete development, the next five years should see a gradual trend towards a reduction in expenditure on capital improvements, an increase in revenue from exotic forests, and thus a reduction in the drain upon loan-moneys.

22. *Accounting Principles.*—Forest accounting must be based on the principles of finance, and while the basis of our finance has been under discussion the principles of the accounting system have also received attention. Although nothing seems to have been laid down as a hard and fast rule, the conventional conception of forestry as far as both finance and accounting are concerned has been (possibly as a result of the mass plantings in the early days of exotic forest development) of a series of self-contained and independent units (a unit representing possibly a given year's plantings in one forest), each of which presents a separate financial and accounting problem. While there are some purposes for which accounting information is essential on such a basis, the length of time taken for each cycle of operations (with the changes in the value of money, working methods, &c., during the cycle) makes any exact accounting impossible and this basis for finance must be correspondingly nebulous. The problem is analogous to that of a factory where, although each productive unit and each servicing unit must be costed separately, the basis for finance and for the determination of profit or loss must be the factory as a whole. Another convention which cannot be applied to forestry is the acceptance of a year as representing a complete cycle of operations. Forest accounting must be sufficiently flexible to recognize two different cycles of operations, the first being the cycle of the individual unit already mentioned, and the second being a cycle relating the cutting of a given volume of mature timber to the growth of a similar volume elsewhere. In neither case, however, can the annual accounts give that exact statement of financial gain or loss which can be expected of the annual accounts of, for instance, a purely trading concern. All that can be produced by accounting routines are basic figures from which an intelligent and informed study will produce a statement of the unit or over-all financial position. To provide a basis for such a study, forest accounting must, therefore, record and classify not only monetary values but also physical quantities.

23. *Accounting System.*—It became obvious, therefore, that, with the recasting of the basis of finance and with the impending transition from forest establishment and development to forest management as the real function of the Service, a reorganization of the accounting system was essential. The first problem was one of staff. The accounting section had never really existed as a separate section of the clerical staff and the position was further accentuated not only by depletion of staff during the war years, but also by diversion of remaining staff to other duties during the period of the war.

However, notwithstanding the very substantial arrears of work that had accumulated under the old accounting system and the serious shortage of accounting staff of any sort, the decision was taken to reorganize the system as from 1st April, 1947, and at the same time to build up and train a proper accounting staff. Both the arrears of work under the old system and the additional work entailed by the change laid a severe strain upon the, as yet, junior and untrained staff. However, the strain was taken and the publication of the annual accounts up to March, 1950, as an appendix to this report reflects the highest credit upon accounting staff, particularly those in conservancy offices upon whom the decentralized system cast the heaviest burden. The system itself has proved sound and practicable and although many comparatively minor adjustments are now being made, it has shaken down sufficiently to enable the great majority of the routine work to be mechanized and electrical punched-card accounting machines are being installed. As mentioned in the last report, the accounts still need to distinguish more clearly between forest development and subsequent management. The publication of accounts herein marks the point where the accounting staff has mastered the installation of the new accounting routines and the volume of work involved, but their main merit is perhaps more in their arithmetical accuracy than in their over-all factual accuracy. The installation of the mechanical accounting equipment will free a now trained staff from mere recording to tackle the much more important task of interpretation so essential if factual accuracy is to be equal to the arithmetical accuracy.

24. *The Accounts.*—Appendix XVII shows the departmental accounts and balance-sheets as at the end of each of the last three years together with the specialized accounts for the Rotorua Utilization Branch (Waipa and Kaingaroa Mills) for the year ended 31st March, 1950. Neither set of accounts has yet been audited but, as no very material alteration is expected as a result of audit, it is considered that they should be published as a part of this report. The departmental accounts are presented in a new form comprising:—

A General Revenue Account showing the net cost of general government administration for each year.

A Statement of Expenditure and Income on Capital Account for each year which shows in the final summary the excess of capital expenditure over income of a capital nature.

A Balance-sheet as at the end of each of the three years.

Reverting to the preseding paragraph hereof relating to finance, a comparison between the net expenditure of capital moneys as shown in the Statement of Expenditure and Income on Capital Account and the growth in loan liability shows that, for the three years, approximately £3,380,000 has been added to the loan liability while capital assets have been increased by approximately £3,670,000. The accounts and Balance-sheet for the Rotorua Utilization Branch should be read in conjunction with the explanations given in Chapter VI regarding activities at Waipa and Kaingaroa.

Publications and Library

25. *General.*—Broadly speaking, two series of publications have been undertaken by the Forest Service since 1948: a research series publishing the results of scientific inquiry such as that carried out by the Forest Research Institute, and an information series whose scope includes economic surveys and technical advice for forest-owners, farmers, and wood-using industries, as well as works of interest to the general reader. Two major works belonging to the research series are in advanced stages of preparation—namely, "Some Problems of Forestry in New Zealand" by C. M. Smith, and "Physical and Mechanical Properties of New Zealand's Indigenous Timbers" by A. R. Entrican, W. C. Ward, and J. S. Reid. The former will be the first comprehensive text-book on

New Zealand forestry ever to be published. The second presents in collected form all the results of strength tests previously reported for individual timbers over the last twenty-five years. It will companion similar text-books issued in Great Britain, Canada, and the United States of America. A third most important publication is already in the hands of the printer: a bulletin entitled "Principles of Wood-preservation—Their Application Under New Zealand Conditions" by D. R. Carr and J. H. Smith. Since there is a widespread need in New Zealand for basic information about wood-preservation—there is even a need for the subject to be placed in its proper economic perspective—the exposition of the principles of wood-preservation has been made very comprehensive, and care has been taken in writing and editing it to make the subject understandable to the general public.

26. *Progress.*—At the end of the year under review the progress made with publications was as set out below:—

Published during the year—
"Accounting in the Timber Industry" by A. T. Jewell.
"Forestry in New Zealand."
Report of the New Zealand Delegation to the World Wood-pulp Conference at Montreal, Canada, 1949 (published as a parliamentary paper).

In the hands of the Government Printer—
"Forest Taxation in Europe and New Zealand" by M. B. Grainger.
"Insignis Pine as a Building Timber" by J. S. Reid.
"Principles of Wood-preservation—Their Application under New Zealand Conditions" by D. R. Carr and J. H. Smith.
"Properties and Uses of Rimu, Miro, Matai, Totara, Kahikatea, Kauri" (separate bulletins) by J. S. Reid.

In course of preparation—
Report of the New Zealand Delegation to the Third World Forestry Congress, Helsinki, 1949 (to be submitted for publication as a parliamentary paper).
"Physical and Mechanical Properties of New Zealand's Indigenous Timbers" (provisional title) by A. R. Entrican, W. C. Ward, and J. S. Reid.
"Some Problems of Forestry in New Zealand" by C. M. Smith.
"Wood-preservation on Farms" by D. R. Carr.
"Cause and Prevention of Sap-stain" by D. R. Carr.
A reprint of "Trees of New Zealand" by L. Cockayne and E. Phillips Turner.

Forest Research Institute:—
In the hands of the Government Printer—
"Forest Research Notes" (first of a series to appear several times a year).
Rimu Volume Tables (4) (revised).
Tawa Volume Table (revised).
In course of preparation—
"Identification of Forest Trees Commonly Found in New Zealand" by A. C. Forbes (information series).

27. *Papers in Journals.*—During the past year members of the Forest Research Institute staff and officers of the Forest Service have contributed to various journals, including the *New Zealand Journal of Forestry*, the *New Zealand Manufacturer—Timber Section*, and *Unasylva* (published by F.A.O.). Among the Forest Research Institute's contributions to the *New Zealand Journal of Forestry* was "*Sirex noctilio* as a Beneficial and Destructive Insect to *Pinus radiata* in New Zealand" by G. B. Rawlings and N. M. Wilson. A paper on the interpretation of forestry data obtained by air survey written by A. P. Thomson and a paper on sawmill techniques in the conservation of forest resources written by A. R. Entrican are being published in the proceedings of the United Nations Scientific Conference on the Conservation and Utilization of Forest Resources in New York in 1949.

28. *Library.*—Access for all Forest Officers to the technical literature of forestry and forest-products is necessary to the proper functioning of the Forest Service, and it has been a point of policy to build up a comprehensive library of forestry literature. More than 2,000 books and 7,000 bulletins and pamphlets are held in the Forestry Library in Wellington, and it receives about 100 technical and trade periodicals regularly. Many of the books in the library are the only copies in New Zealand; this applies also to the back numbers of certain periodicals, which are kept for the valuable information contained in them. Through the library inter-loan system operated by the National Library Service, the resources of the Library, except for some irreplaceable works, are available to private foresters and those engaged in wood-using industries throughout the country.

Publicity

29. *Forest-fire Prevention Publicity.*—The publicity campaign for the 1949–50 fire season began with the theatrical release throughout the Dominion of a dramatic documentary film produced by the National Film Unit. It told the story of a fire endangering Golden Downs State Forest, Nelson, from the alarm mobilizing well-equipped fire-crews to the completion of the action on the fire-line, in a sequence of operations laid down in the fire-plan for the forest; the film was so authentic in its treatment that it will serve for training purposes also. The main continuity of the publicity campaign, which lasted from October to March, was provided by an informative series of display advertisements carried by rural newspapers and national magazines, and a series with a different treatment which appeared in metropolitan newspapers. The National Broadcasting Service broadcast messages from the Forest Service from time to time as fire hazards developed in various parts of the country. Newspapers featured stories of the anti-fire organization and followed the development of local fire hazards—their co-operation was most valuable and the Forest Service was happy to give reporters all the information at its disposal.

30. The R.N.Z.A.F. released to newspapers an excellent series of photographs taken on the forest air-patrol. Roadside propaganda hoardings were erected in all conservancies to warn motorists of their approach to forest lands, and standard signs marked the boundaries of rural fire districts. A striking lithographed poster was displayed in all parts of the country with the assistance of the Post and Telegraph Department, the New Zealand Junior Chamber of Commerce, the Retail Motor Trades' Association, the Women's Division of the Federated Farmers, and the New Zealand Women's Institutes. A set of brightly-coloured posters—"How a Tree Grows," "The ABC of Forest-fire Prevention," "Wood is a Good Servant," and "Don't Rob Our Birds of Their Homes"—was sent to every primary school in the Dominion. To public and private lending libraries and school libraries a quarter of a million coloured bookmarks were distributed. Screen-slides were shown in cinemas, especially in centres near forests, and emergency screen-slides were specially designed for screening in centres near the principal State and private exotic forests in times of extreme fire hazard.

31. The public's response to the campaign may be illustrated by the reaction to an appeal to report even small scrub or forest fires: one such fire burning in a remote part of the Rotorua district was reported to the nearest Fire Officer by no fewer than ten people. The Forest Service's experience of the use of publicity confirms that since practically all New Zealand's forest fires are started by people, publicity is a primary and economical defence against forest fire. The publicity campaign not only protects the national investment in State forests, it is a service rendered in return for the taxation paid by afforestation companies on their forest land, and it is the principal defence against fire in the non-commercial indigenous forests.

32. *Victorian "Save the Forests Campaign."*—Early in 1950 the Hon. C. E. Isaac, M.L.C., Honorary Campaign Director of the "Save the Forests" Campaign in Victoria, toured New Zealand forests: the "Save the Forests Campaign" is an association of established organizations and public bodies for the purpose of an educational publicity

campaign. Discussions between the Hon. C. E. Isaac, the Hon. E. B. Corbett, Minister of Forests, and the Director of Forestry provided an opportunity for a reconsideration of the New Zealand approach to forest-fire prevention. In the light of experience in Victoria it appears that it is desirable to give more opportunity for public-spirited men and women to participate in educational publicity concerning forests, and consideration will be given in the coming year to setting up an advisory committee on publicity under the Forests Act, 1949.

33. *Documentary Films and Newsreels.*—" Exotic Forests of New Zealand " is the title of a valuable documentary film produced by the National Film Unit with Miss Margaret Thomson as director. The film has been screened in theatres throughout the Dominion, and 16 mm. copies are held by the Forest Service for extension work and lending overseas. The Australian Fox Movietone newsreel included a relatively long item on New Zealand exotic forests. Mr. Peter Hennessey, a cameraman-director of the J. A. Rank organization, was given facilities for filming New Zealand forests for a documentary on New Zealand in the " This Modern Age " series. The Soil Conservation and Rivers Control Council commissioned a film entitled " Green Horizons," half the cost of which was met by the Forest Service. Dr. R. N. Chrystal's scientific film " The *Sirex* Wood Wasp " was obtained for the use of the Forest Research Institute, and a United Nations Film Board production, " Green Gold," was obtained for forest-extension work.

CHAPTER IX—INDUSTRY AND TRADE

Timber-production

1. *Sawn Output.*—The rapid expansion in timber-production which had been in progress since 1945 was not maintained last year. Provisional figures put production at 475,000,000 board feet, which is almost the same as 1948–49. The stabilization of production at this high level is an indication that the industry is now making the maximum use of the man-power available, though it should be noted that a reduction in working-hours in some units towards the end of the year led to some loss in output.

2. While the total production of sawn timber showed little variation from the previous year this did not mean that the industry was static. There was a significant increase of 12,000,000 board feet in the production of the major indigenous species which was offset by a fall in the production of minor species and a fall of 9,000,000 feet in the production of exotics. For the first time since insignis pine has been of commercial importance production declined, being 7,000,000 board feet less than the previous year. The decline in exotic production was most marked in the Auckland and Canterbury Conservancies. In Auckland, exotic production has come largely from farm shelter-belts and wood-lots which are now becoming depleted, while in Canterbury production in the previous few years has been augmented by the sawing of windthrown trees. In the Rotorua Conservancy production was much the same as in previous years and no substantial new mills commenced cutting in the exotic forests.

3. The increase in the output of indigenous timbers must be attributed mainly to the timber-workers' accommodation scheme which, although it began three years ago, has had its greatest effect during the past year. In addition, a number of new sawmills which were established in indigenous forest during the previous year came into full production this year. The combined production of rimu, miro, and matai increased by 8,000,000 board feet ; white pine, tawa, and beech each showed an increase of 1,000,000 board feet ; totara was approximately the same ; while for the first time on record the output of kauri fell below 1,000,000 board feet, so that kauri is now insignificant as a commercial species.

4. The North and South Islands continued to contribute to production in the same proportions, but there were some changes among conservancies. Auckland, Nelson, and Southland all show small increases; Wellington and Westland remain the same as last year; and Rotorua and Canterbury both show a small decline. Contributing to the lower output in the Rotorua Conservancy was the power shortage—some sawmills have been working double shifts and cutoffs during operating-hours have interrupted production. Statistics of the sawmilling industry and timber-production are shown in detail in the Appendix. Appendix V gives the results of the census of the industry taken by the Government Statistician for the year ended 31st March, 1949, this being the latest available. Appendix VI gives the provisional statistics of timber-production collected by the Forest Service through the registration of sawmills for the year ended 31st March, 1950.

5. *Sawmills in Operation.*—The number of mills registered at the 31st March, 1950, was slightly less than the number for the previous year, statistics for the past five years being as follows :—

Year Ended 31st March,	Sawmills Registered.
1946	445
1947	527
1948	608
1949	692
1950	685

6. The distribution of sawmills by conservancies illustrates the difference in forest conditions. Auckland, which possesses mainly scattered small patches of forest, has the largest number of mills but, with the exception of Nelson, the smallest average output. Rotorua, though only third as regards number of mills, has both the largest single output and the largest average cut per mill; reflecting the high density of exotic-forest resources and the advantage of large milling-units. Westland has only 67 mills, but has the second highest overage output; reflecting the largest remaining areas of indigenous forest. Particulars for each conservancy are as follows :—

Conservancy.	Number of Mills.	Average Annual Output.
		Bd. ft.
Auckland	178	490,000
Rotorua	92	1,620,000
Wellington	114	700,000
Nelson	88	340,000
Westland	67	830,000
Canterbury	63	510,000
Southland	83	510,000

7. *Equipment and Supplies.*—The sawmilling industry is still hampered by shortages of equipment. While haulage ropes, saws, axes, and transmission gear of some types may be more easily procured, the over-all position is not yet easy. Rails and spikes have been in acutely short supply, and in some cases construction could only be carried out with used rails which has been the cause of the poor standard of some extensions. In some cases production has been held up by lack of parts for trucks and tractors. Because of the dollar shortage the demand for tractors has exceeded supply, and machines have therefore been allocated by a committee acting under the supervision of the Ministry of Works.

8. *Tractors.*—Crawler tractors of specifications approximating to American machines are now being manufactured outside the dollar area, notably in Italy and France. Italian machines have been used in sawmilling in Australia, and, it is reported, with outstanding success. The use of such machines in New Zealand to save dollars must be seriously considered. Ancillary equipment is being constructed in Australia.

9. *Employment Situation.*—The improvement in the labour strength of the sawmilling industry noted last year was not continued during the year ended 31st March, 1950; in fact there was a slight falling off, though not more than commensurate with the slight decrease in the number of sawmills in operation. Statistics published by the Department of Labour and Employment show the employment level in bush sawmills to be as follows:—

	Men Employed.
October, 1946	5,280
October, 1947	5,800
October, 1948	6,370
October, 1949	6,300

10. Wellington Conservancy reports a slight easing of the employment situation during the year, though there is still some shortage. Southland reports that most units are reasonably well staffed as far as numbers are concerned, but good bushmen and specialists in the sawing department are difficult to obtain. There is an apparent reluctance on the part of young men to take up work in the bush. Canterbury reports the position much worse than in previous years, with even the town mills having difficulty in obtaining men. In the Westland Conservancy it is stated that almost without exception mills are short staffed; and that if fully staffed Westland mills could increase their timber output by upwards of 10 per cent. Auckland reports no serious shortage except where mills are isolated and living conditions inferior; and the fact that in the Auckland Conservancy timber-production shows an appreciable increase is probably evidence of a reasonably good labour situation.

11. In commenting on the forest employment situation the Department of Labour and Employment states in its recent half-yearly survey that "an important aspect in forestry and sawmilling is the extensive movement of workers into and out of these industries. Recruitment is at a high level but so also is turnover. In both the bush and town sawmilling industries male-labour turnover rates have been consistently in excess of those applying to male workers throughout industry in general. In forestry the rates are higher still—*e.g.*, over six times as rapid as the general rate applying to all industries. To some extent this high turnover results from regular seasonal changes to employment offering in other fields such as harvesting, shearing, and freezing-works." This indicates something of the difficulty under which the sawmilling industry operates. On the figures published by the above Department the rate of labour turnover in bush sawmills over the past four years has been steady at about 30 per cent., whereas the average rate for all industries surveyed was only 17 per cent.

12. It must not, of course, be overlooked that timber-production is now about 50 per cent. above the pre-war level, and in the light of the general demand for labour since the war, it might be claimed that the industry can consider itself fortunate in securing sufficient workers to achieve such a phenomenal increase in production. However, unless there is soon some diminution in the over-all labour demand or additional workers can be secured through immigration, it appears that further expansion of timber-production within the next few years may be limited by a lack of men.

13. *Accommodation.*—Since the Sawmill Housing Scheme commenced in September, 1946, the Department of Housing Construction has let contracts covering the construction of 621 houses, and 464 of these are now occupied. The number of new houses occupied during the year was 152, a further 52 being under construction at the end of the year.

In accordance with the terms of the Timber Workers' Housing Regulations 1948 applications for houses closed on 1st September, 1949. Before the scheme terminated, applications had been received by the Timber Production Advisory Committee from 232 mills and were dealt with as follows :—

Committee's Decision.	Mills.	Houses.
(1) State Advances Corporation recommended to approve application	133	734
(2) Deferred for further consideration	4	16
(3) State Advances Corporation recommended to decline application	82	252
(4) Subsequently withdrawn by applicant ..	13	34
	232	1,036

14. The total number of houses to be erected under the Sawmill Housing Scheme will therefore be approximately 750, as against the original estimate of approximately 1,000. Nevertheless, after considerable discussion, the Timber Production Advisory Committee decided that as timber-production had now exceeded the objective no extension of the scheme should be considered. The impact of the scheme cannot be measured by the number of houses erected because they will have a widespread effect, not only directly by attracting men to the industry, but also indirectly by establishing a good housing standard for the industry as a whole. The Sawmill Housing Scheme provided for advances to improve existing buildings, but the number of requests for such assistance was extremely small, and only one was approved.

15. The standard set by the housing scheme is well known throughout the industry and some sawmillers have erected good houses without assistance. However, there are still mills where the accommodation is unsatisfactory, and it follows that those who continue to offer such unsatisfactory accommodation cannot in the long run retain an efficient staff. Assistance has been granted to sawmillers on a liberal scale, and provided an applicant for houses had the necessary two-year cutting life in indigenous forest and was known to be an efficient operator, assistance was usually given. Workers' organizations are known in some cases to have urged millers to apply for assistance. Under these circumstances it can be claimed that the requirements of individual operators and the industry as a whole have been reasonably met, so far as was possible under the provisions set down in the Finance Act (No. 2), 1946. The finance for the scheme comes from hire-purchase payments by the sawmillers receiving the houses and from a levy of 6d. per 100 board feet on all timber produced.

Home Timber Trade

16. *Supply and Demand.*—Although timber-production was sustained at the all-time high level reached the previous year, demand remained keen and complaints regarding shortages were still heard. Consumption was apparently somewhat higher than last year; for after allowing for the effect of imports and exports of sawn timber the total quantity available was 475,000,000 as compared with 460,000,000 last year. No regular statistics have ever been collected to show the year to year variation in stocks except during the war years, so consumption statistics are not necessarily accurate over such short periods as one year. At the conclusion of the war timber stocks were depleted to a dangerously low level, but with a very high sawn output during the past two years the stock position has improved considerably.

17. *Per capita* usage is at a high figure but there is some evidence that the peak of demand has now been passed. In the North Island a number of the larger users of insignis pine are becoming more critical of grade and specification, while in the South Island the refusal or reluctance of responsible members of the building industry to accept insignis pine, and their decision to await the delivery of rimu even though it meant delay, indicate that the shortage of rimu relative to demand is not as serious as complaints would indicate. It was also noticeable in the spring of 1949 that some sawmillers were finding difficulty in disposing of low-grade lines. Relaxation of building restrictions, particularly those relating to garages and sheds, immediately altered the position, but it is doubtful if the rush of work which followed the relaxation of building controls will be sustained.

18. A significant development since the termination of the war has been a major change in the structure of the timber industry arising out of the critical supply position during the first two post-war years. Before the war there was a fairly rigid division of functions as between the sawmiller, the timber merchant, and the consumer builder, and, with few exceptions, each confined himself to his respective sphere. Timber was plentiful so there was little incentive for either merchant or builder to extend his activities into the field of sawmilling. This has been radically changed as a result of the post-war timber shortage. Merchants had to compete for supplies and soon saw the advantage of acquiring a controlling interest in sawmills, with the result that some merchants extended their operations to include sawmilling. Then as the housing programme developed, builders found it increasingly difficult to obtain regular deliveries of timber from the merchants, and they, in turn, also saw that a controlling interest in the source of production was the best means of ensuring adequate deliveries. Thus the second phase was the entry of building firms or groups of builders into sawmilling for the specific purpose of supplying their own needs. The result has been a measure of integration that the timber industry has never before known and some of which is likely to be a permanent feature. It, undoubtedly, means more stability, and among other things it makes for better co-ordination between supply and demand and probably also leads to economies in utilization.

19. *Timber Prices.*—Following the general wage pronouncement, the Court of Arbitration amended all timber-workers' awards as from 1st June, 1949, and from this date the Price Tribunal approved price increases for indigenous timbers to cover the consequential increase in costs; the price increases being 9·718d. net for Westland, 6·605d. net for Nelson and Marlborough, and 9·24d. net per 100 board feet for the remainder of New Zealand. A corresponding increase, amounting to 6·428d. net, was granted for exotic timbers as from 1st January, 1950, millers bearing the added costs in the meantime. These increases have all been incorporated into the approved sawmillers lists. Timber-merchants, except those being members of the Hawke's Bay and Gisborne Associations, were required to absorb the increase in sawmillers' prices arising from the new awards. Members of all associations other than the South Auckland, Hawke's Bay, Gisborne, Nelson, and Marlborough Associations, were also required to absorb increased yard costs.

20. By arrangement with the New Zealand Timber Merchants' Association, the Price Tribunal introduced new retail price-lists for rimu, matai, and totara for all areas excepting Taranaki, incorporating standard margins as well as standard extras and conditions of sale. Apart from any advantage from the standpoint of price control, this is of advantage to consumers. It has yet to be proved, however, that all associations are able to operate continuously under these standard margins. Early in 1950 new retail and wholesale lists for insignis pine were approved, setting prices for dressing grades. This should encourage the wider use of this timber.

21. During the year price control on wooden fencing-posts and pit-props ceased to operate. The demand for fencing-posts is strong, prices for totara posts having risen to an extent which encourages the use of totara as split posts rather than as sawn timber. This may be only one symptom of the general pricing position in the timber industry, but the position must be carefully watched. Price control, though admittedly necessary, has been based on cost of production, and in some cases prices no longer reflect the relative usefullness of different species and grades of timber. The consequence is that there is more possibility of wasteful use of timber and of undesirable trade practices. The Tribunal endeavoured to meet the position in 1948 by granting a premium of 2s. to induce sawmillers to cut to standard building sizes, and also this year by granting an allowance of 1s. to timber-merchants to cover cost of resawing in their yards. When the supply of timber approaches demand, the prices of the various grades could, with advantage, be permitted to assume a more realistic relationship.

22. *Utilization.*—Significant though not spectacular changes in timber utilization continue. The high level of housing activity with its abnormal pressure on the supply of the traditional indigenous building softwoods has led to a wider usage of other timbers for building purposes. Local bodies have gradually extended their building by-laws, and tawa, white pine, and beech are now being used freely; their utility being increased by preservative treatment. In the past white pine was used mainly for butter boxes; consumption for this purpose amounting before the war to over 20,000,000 board feet annually. As production of this species declined, however, the dairy industry was compelled to change over to fibre containers, with the result that white-pine boxes are now used only in very small quantities. Nevertheless, production of white pine is still up to about 17,000,000 board feet annually, so it is fortunate that a steady demand for other purposes has followed the virtual cessation of its use by the dairy industry. Largely as a result of the general intensity of the timber demand a wider acceptance of beech species has developed, particularly in the South Island. Although the production of beech in the South Island is now almost double the pre-war level, sawmillers nevertheless report difficulty in satisfying orders.

23. Progress has been made towards the general acceptance of exotic timbers for house-framing and their usage has now been extended to weatherboarding and flooring. However, it is a matter for regret that because demand has been so keen builders have not been as critical of exotic timber supplies as desirable, nor have they always exercised reasonable care in its use. As a result some insignis pine both inferior in grade and unsatisfactory in condition has been used for house construction. It is therefore probable that in some cases early replacement of defective timber may have to be faced on account of decay. If used correctly insignis pine will give satisfaction, but the building industry has a heavy responsibility to its clients to see that subnormal grades of timber are not used and that care is taken to rigidly exclude any timber infected by decay or containing stain in excess of that permitted in the grading rules promulgated by the New Zealand Standards Institute.

24. Following a temporary recession in the demand for tawa in 1948, trade revived considerably in 1949, and at the close of the year tawa sawmillers held a substantial file of unfilled orders. The industry, under the guidance of the Tawa Sawmillers' Association, has worked actively towards consolidating the markets secured for tawa, and has paid special attention to means of immunizing the sap-wood of this species against attack by the Powder Post Borer (*Lyctus* spp.) As a result of the association's investigations, work has commenced on the erection of two plants to treat tawa with boric acid at Tauranga and Edgecumbe; and a further treating plant, using preservatives based on sodium fluoride, is contemplated at Whakatane. These salts have already been widely used in plants established at Auckland and Marton for the treatment of tawa sap-wood against *Lyctus* attack and decay, and it is understood that further plants are contemplated.

Overseas Timber Trade

25. *Timber Imports.*—Statistics for the year 1949 are not yet available from the Customs Department, but preliminary figures supplied by importers of North American softwoods in New Zealand and exporters of hardwoods in Australia indicate that total imports amounted to 46,000,000 board feet, or virtually the same as for the previous year. The outstanding difference this year is the much higher proportion of building softwoods; North American timbers at just over 16,000,000 board feet, being double the quantity imported in 1948. Of these building softwoods, Douglas fir accounted for almost 12,000,000 board feet, with redwood and cedar each about 2,500,000 board feet. It was therefore in Douglas fir that the principal increase occurred; the combined imports of redwood and cedar being only about 1,000,000 board feet above the 1948 figure.

26. Australian hardwoods totalled 27,000,000 board feet, with railway-sleepers at 15,000,000 board feet accounting for the bulk of the imports. *Prima facie* sleepers were a good deal lower than the 22,000,000 board feet shown for the previous year, but since statistics from Australian sources place the export of sleepers to New Zealand in 1949 slightly above the 1948 level, there must be some doubt about the accuracy of the extremely high figure shown for 1948. However due to the arrears of work arising out of the war, the Customs Department is not yet in a position to quote authoritative statistics for the more recent years, so the provisional nature of the figures for the past five years should be borne in mind when using the detailed information given in Appendix IV. Trade in Japanese oak revived almost to pre-war levels; imports of this popular furniture timber amounting to a little over 2,000,000 board feet.

27. *Timber Exports.*—Customs export statistics for timber are not yet available for 1949, but preliminary information suggests that timber exports increased by 1,000,000 board feet to 24,000,000 board feet. This increase reflects the sustained improvement in the shipping position and the high level of timber-production. Indigenous timber at 8,000,000 board feet was the same as last year; a reduction of 1,500,000 board feet in rimu being compensated by a small increase in the export of matai and an increase of 1,000,000 board feet in white pine. It is again emphasized that permits for the export of indigenous species are restricted entirely to non-heart grades. Exports of insignis pine were about 1,000,000 board feet higher than last year, the total in sawn timber and box-shooks amounting to 16,000,000 board feet. Statistics of exports by species are shown in Appendix III for the past five years.

Timber Inspection

28. *General.*—Methods of co-operation have been discussed between representatives of all Government Departments and local bodies interested in quarantine. As a direct result of this a revision of quarantine regulations is under action to improve New Zealand's barriers against the introduction of undesirable plants and animals. A Termite Advisory Control Committee has been established on which the Forest Service is represented, and this will give local-body officers the opportunity to discuss points of mutual interest with representatives of the Government Departments concerned.

29. Ways and means of improving the quality of exotic-timber exports and eliminating the risk of insect infestation—and consequent heat treatment in overseas countries—have been an important part of discussions between the Forest Service and representatives of the trade. A number of suggestions are at present under consideration; an example being the proposed elimination of wane from all exports not kiln dried. A step such as this will eliminate the presence of bark beetles and will reduce the risk of young stages of *Sirex* being present on the arrival of timber at overseas ports.

30. *Imports.*—Further evidence of the presence of harmful insects in imported timbers showed that the constant vigil kept by officers of the Forest Service on wharves throughout the country was fully warranted. Great care was exercised by all members of the Timber Inspection Branch and a high degree of immunity from borer introduction was attained. Inspections were made both at the ship side and at pre-arranged destinations. In all possible cases check inspections were carried out for some weeks after the initial inspection. Off-loaded dunnage was included in the activities of the Inspectors.

31. Such inspections have a twofold effect on the trade. In the case of Australian hardwoods it has resulted in better inspection in Australia before export, and as a direct result of this an improved product is now landed in New Zealand. The amount of infested timber set aside for treatment or destruction was less than 1 per cent. of the total imports, and an increased number of shipments were entirely free from infestation.

32. *Quarantine.*—At Auckland great difficulty has been experienced in obtaining a suitable permanent site for a quarantine yard, but new methods are under review which, if accepted, may obviate the necessity for a quarantine yard in this port. Due to unsettled conditions in connection with the establishment of a new deep-water port, the Tauranga quarantine area has not been set out with permanent fixtures, but a hygienic quarantine area has been maintained at this port. The Wellington quarantine yard has been set out with steel-rail skids on creosoted piles, and additions in the form of a new sleeper skid and a lock-up store are in process of erection. For treating infested material the approved creosote method and the use of toxic chemicals under heat and pressure were continued; though destruction of a few timbers showing serious active infestation was sometimes necessary.

33. *Exports.*—Inspections were efficiently carried out, and without doubt have improved the quality and appearance of the produce now reaching overseas customers. The inclusion of a few pieces of sub-grade timber after inspection resulted in two cases in heat treatment of the entire shipments in Australia. One case in particular, where the common Huhu beetle (*Prionoplus reticularis*) was discovered by the Australian Quarantine Authorities in two boards of a shipment, was a costly lesson to those millers cutting timber from dead, decaying trees. The other case was a few boards infested by *Sirex*. Both were probably due to the loading of a few pieces of rubbish from the vicinity of the inspected export stacks. It is virtually impossible at the ship-side inspection to pick up an isolated board or two not previously inspected, and in this respect meticulous care by the individual exporter is required. Fortunately, in the majority of cases, co-operation is readily forthcoming.

Trade Relations

34. *Timber Production Advisory Committee.*—The Committee held two meetings during the year, the membership remaining unchanged. Matters relating to the sawmill housing scheme were dealt with, and recommendations made to the State Advances Corporation as in the past. Other subjects discussed were the closing of applications for sawmill houses on 1st September, 1949; the rate of the sawmill housing levy and its incidence; the subsidy on overtime worked in the sawmilling industry and its possible abuse; ambulance services in country districts; immigration to New Zealand from Finland and elsewhere, including that of displaced persons.

35. The Committee found it necessary to exercise its powers under section 10 of the Timber Workers' Housing Regulations 1948 to assess millers who failed to furnish returns for the sawmill housing levy. Many of the assessments were subsequently withdrawn when the millers complied with their obligations, and the position for the year ended 31st March, 1949, is now reasonably satisfactory.

36. *Liaison and Advisory Services.*—The Forest Service co-operated with other authorities in administrative matters affecting the industry as follows:—

(*a*) Making recommendations to rationing officers in connection with petrol licences and butter rationing.

(*b*) Furnishing assistance to the Department of Industries and Commerce and the Customs Department in connection with import licensing.

(*c*) Furnishing reports to the Timber Production Advisory Committee on applications for sawmill workers' houses, and the provision of site plans. With the closing of applications in September, 1949, this work has diminished.

37. It is pleasing to record that relations of the Forest Service with the members of the sawmilling industry and the timber trade remain amicable and co-operative. Special mention must be made of the assistance which the West Coast Sawmillers' Association has given in ensuring that the timber produced by its members is distributed in an equitable manner throughout the South Island. The Tawa Marketing Association has done extremely valuable work in fostering the demand for tawa and in ensuring that this timber reaches wide markets under conditions which protect its future marketing and use.

38. *Timber Control.*—The Timber Control Regulations of 1948 were amended during the year by revoking control over the use of kahikatea or white pine. The extremely low production of kauri has made it impractical to attempt to control the distribution of this species to cover essential needs, and after the close of the year under review the regulations covering the control of heart and medium kauri were revoked. The only controls left now refer in all cases to marketing, and cover:—

(*a*) Beech species (necessary to sell under correct names).

(*b*) Tawa.

(*c*) Rimu, miro, matai, and totara (to be sold under the national grading rules).

All these controls, in which incidentally the sawmilling industry co-operates to the full, are maintained to protect the consumer on a sellers' market.

APPENDIX I

Areas of State Forest Land as at 31st March, 1950
(With summary for years 1920–49)

Conservancy and/or Year.	Permanent State Forest.		Provisional State Forest.		Total Areas of State Forest Land.	Percentage of Total Land Area Under State Forest Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Auckland	448,335	89,789	136,748	13,719	688,591	8·0
Rotorua	703,782	286,760	193,605	62,572	1,246,719	15·8
Wellington	1,121,415*	41,135	29,261	3,808	1,195,619	9·9
Nelson	1,167,597	213,150	791,363	522,217	2,694,327	38·45
Westland	924,901	357,183	363,101	224,070	1,869,255	48·4
Canterbury	486,101	3,647	..	..	489,748	4·9
Southland	571,931	56,234	607,468	13,740	1,249,373	7·35
Totals, 1950 ..	5,424,062	1,047,898	2,121,546	840,126	9,433,632†	14·2
1949 ..	5,349,065	1,046,401	2,118,028	841,636	9,355,130	14·09
1940 ..	4,220,368	817,794	2,304,772	1,107,612	8,450,546	12·72
1930 ..	1,945,218	91,029	3,947,154	1,715,850	7,699,251	11·6
1920 ..	1,666,302	..	3,293,372	..	4,959,674	9·4

* Includes 62,274 acres vested in the Wellington City and Suburban Water Supply Board. † Does not include 27,552 acres administered as State forest land.

APPENDIX II—Summary of Planting and Silvicultural Operations in State Exotic Forests as at 31st March, 1950.

(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.
Mangonui ..	1944	8,927	3	..	..	..	..	..
Waipoua ..	1925	12,600	4,626	203	263	45	75	..
Puhipuhi ..	1904	1,565	1,209	..	6	..	..	..
Glenbervie ..	1945	5,075	384	174	..	..	..	..
Whangapoua ..	1948	20,000	58	48	..	..	..	..
Riverhead ..	1926	11,965	10,592	..	115	152	387	..
Tairua	1930	47,212	14,020	208	175	..	..	..
Kauaeranga ..	1940	4,000	802	41	23	..	..	..
Maramarua ..	1928	14,087	11,953	..	388	4	282	4
Rotoehu ..	1937	38,559	6,034	262	1,020	23	188	..
Whakarewarewa ..	1898	10,065	7,707	59	1	..	356	135
Patunamu ..	1949	6,074	5	5	..	..	..	..
Kaingaroa ..	1901	354,483	268,043	713	586	51	603	318
Tongariro ..	1937	4,500	2,783	349	..	..	..	..
Erua	1930	6,648	4,390	..	41	..	..	..
Karioi	1927	26,079	17,022	100	206	9	..	..
Esk	*	10,432	..	..	..	..	..	..
Gwavas ..	1944	8,931	808	295	..	..	..	..
Ngaumu ..	1942	6,751	601	240	..	..	..	..
Golden Downs ..	1927	53,982	22,055	569	328	2	34	..
Moutere Hills ..	*	3,382	..	..	..	..	..	..
Rai Valley ..	1940	2,000	672	303	66	..	..	..
Granville ..	1947	2,000	255	57	..	..	..	..
Rimu	1922	5,839	3,091	..	87	..	..	..
Hanmer ..	1901	10,663	7,691	..	778	50	83	..
Balmoral ..	1916	24,138	21,141	..	1,155	..	..	..
Eyrewell ..	1928	19,268	17,312	..	1,726	2	84	..
Ashley	1939	9,087	2,589	113	47	..	..	..
Naseby	1900	4,032	3,068	..	..	133	13	20
Herbert ..	1948	3,269	65	60	..	..	..	..
Berwick ..	1946	7,700	511	202	..	..	..	..
Allanton ..	*	1,676	..	..	..	..	..	..
Akatore. ..	*	4,383	..	..	..	..	..	..
Dusky	1898	4,955	4,266	..	41	234	413	..
Tapanui ..	1901	6,086	2,365	5	5	408	42	1
Beaumont ..	1927	10,000	6,562	8	14	82	16	..
Conical Hills ..	1903	4,952	4,473	30	59	283	12	..
Pebbly Hills ..	1930	5,330	4,367	..	330	349	52	2
Minor areas ..	1875–1949	13,520	4,599	843	120	..	..	..
	..	794,215	456,121	4,879	7,580	1,827	2,640	480

* New projects.

APPENDIX III

Annual Exports of Sawn Timber From New Zealand, 1945-49

Source of Data.—Provisional figures furnished by Customs Department.

(Volume in thousand board feet)

Calendar Year.	White-pine.	Rimu.	Beech.	Matai.	Kauri.	Insignis Pine.		Other Species.	Total.
						Sawn.	Cases.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1945 ..	38	690	927	75	19	575	1,249	560	4,133
1946 ..	50	2,615	650	362	24	1,535	2,582	133	7,951
1947 ..	3	1,289	909	762	26	4,575	1,259	33	8,856
1948 ..	140	4,040	1,177	2,300	9	13,612	816	752	22,846
1949 ..	1,371	2,517	1,136	2,689	3	14,493	1,640	325	24,174

(Value in pounds)

Calendar Year.	White-pine.	Rimu.	Beech.	Matai.	Kauri.	Insignis Pine.		Other Species.	Total.
						Sawn.	Cases.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	£	£	£	£	£	£	£	£	£
1945 ..	530	10,220	16,230	1,070	870	8,920	32,990	14,900	85,730
1946 ..	660	40,800	15,200	5,700	1,100	26,500	73,100	2,100	165,100
1947 ..	80	22,700	19,500	16,300	1,400	86,000	33,900	1,000	180,880
1948 ..	3,220	91,310	28,670	56,180	480	283,040	23,480	225,300	508,910
1949 ..	41,040	60,850	29,320	67,600	160	278,490	51,190	8,170	536,820

Notes.—(i) These figures are provisional pending publication of authoritative statistics by the Census and Statistics Department; (ii) long-term statistics will be published at five-yearly intervals; refer to page 68 of 1949 annual report.

APPENDIX IV

Annual Imports of Timber Into New Zealand, 1945–49

Source of Data.—Provisional figures furnished by Customs Department.

(Volume in thousand board feet)

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)
1945	6,434		3,253	97	3,751	2,552	..	..	775	16,862
1946	5,794		6,836	1,323	7,276	274	201	3	199	21,906
1947	1,790	1,301	6,376	5,176	13,400	88	3,149	..	1,897	33,177
1948	4,447	1,451	22,574	4,863	4,816	1,371	2,182	732	2,595	45,031
1949	7,000		15,000	5,000	11,700	2,300	2,500	2,200	..	45,700

(Value in pounds)

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)
	£	£	£	£	£	£	£	£	£	£
1945	173,000		69,000	3,000	48,000	75,100	..	..	22,200	390,300
1946	151,940		132,000	33,050	115,200	8,000	9,770	140	9,600	459,700
1947	53,700	25,200	153,100	126,300	440,200	4,400	152,100	..	97,000	1,052,000
1948	136,800	43,100	412,900	127,000	154,100	62,300	101,800	30,800	4,100	1,072,900
1949										

Notes.—(i) Value represents value in country of origin plus 10 per cent.; (ii) column (5) includes small quantities of species other than Australian hardwoods; (iii) figures under "logs and poles" are not strictly comparable, in that up to 1947 desapped and squared poles were included under "sawn and hewn"; (iv) these figures are provisional pending publication of authoritative statistics by the Census and Statistics Department; (v) long-term statistics will be published at five-yearly intervals; refer to page 70 of 1949 annual report; (vi) the 1949 figures are based mainly on statistics from exporters in Australia and importers in New Zealand; values are not available, and all figures are tentative.

APPENDIX V

Sawmilling and Sash and Door Manufacturing, 1948–49

Provincial District.	Character of Organization.							Persons engaged in connection with Felling, Hauling, &c.						Persons engaged in connection with Production of Sawn Timber from Logs.							
	Number of Mills or Establishments.	Individual.	Partnership.	Registered Company. Public.	Registered Company. Private.	Co-operative and Miscellaneous.	Government.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.	Wage-earners.	Contract.	Total.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.		Wage-earners.	Contract.	Total.	
								M.	M.	M.	M.	M.	M.	M.	M.	M.	F.	M.	M.	M.	F.
Auckland	222	31	39	35	103	2	12	23	62	16	879	205	1,185	82	127	74	28	1,949	59	2,291	28
Hawke's Bay ..	26	1	4	3	18	..	..	2	7	..	64	23	96	4	10	7	..	149	..	170	..
Taranaki	23	3	2	2	16	..	..	..	4	..	105	10	119	8	7	3	1	155	8	181	1
Wellington ..	61	11	1	4	45	..	..	3	13	1	244	15	276	7	27	19	6	347	4	404	6
Marlborough ..	8	6	..	..	2	..	..	..	1	..	12	..	13	5	..	..	1	25	1	31	1
Nelson	55	8	11	2	33	..	1	24	10	..	231	14	279	20	27	7	3	225	10	289	3
Westland	36	2	2	4	28	..	..	1	12	2	319	16	350	3	26	13	..	350	4	396	..
Canterbury ..	61	14	17	1	29	..	..	16	5	..	84	48	153	29	19	6	5	291	8	353	5
Otago—																					
Otago portion ..	26	4	3	3	15	1	..	..	4	..	62	3	69	11	11	1	1	87	..	110	1
Southland portion	39	4	8	..	26	..	1	7	12	..	212	2	233	10	28	9	2	273	..	320	2
Totals 1948–49..	557	84	87	54	315	3	14	76	130	19	2,212	336	2,773	179	282	139	47	3,851	94	4,545	47
,, 1947–48..	594	99	106	56	322	3	8	79	127	20	2,096	321	2,643	218	274	122	49	3,377	58	4,049	49
,, 1946–47..	487	89	78	52	264	2	2	51	109	14	1,876	263	2,313	162	245	132	53	2,893	48	3,480	53

Provincial District.	Persons engaged in connection with Resawing, Dressing, &c.									Persons engaged in connection with Total.									Salaries and Wages paid to Persons engaged in connection with Felling, Hauling, &c.	Production of Sawn Timber from Logs.		Resawing, Dressing, &c.		Total.	
	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.		Wage-earners.		Contract.	Total.		Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.		Wage-earners.		Contract.	Total.								
	M.	M.	M.	F.	M.	F.	M.	M.	F.	M.	M.	M.	F.	M.	F.	M.	M.	F.	£	£	£	£	£	£	£
Auckland ..	4	54	51	23	787	21	2	898	44	109	243	141	51	3,615	21	266	4,374	72	614,227	1,073,152	7,526	388,818	12,580	2,076,197	20,106
Hawke's Bay ..	..	4	6	..	62	..	..	72	..	6	21	13	..	275	..	23	338	..	47,574	72,899	..	28,643	..	149,116	..
Taranaki ..	..	8	5	3	141	..	..	154	3	8	19	8	4	401	..	18	454	4	59,615	79,670	280	61,690	646	200,975	926
Wellington ..	..	22	19	11	265	..	..	306	11	10	62	39	17	856	..	19	986	17	145,879	180,784	1,374	117,607	2,416	444,270	3,790
Marlborough ..	..	..	..	..	..	..	..	..	..	5	1	..	1	37	..	1	44	1	5,451	12,689	250	1,391	..	19,531	250
Nelson	..	7	5	2	68	..	..	80	2	44	44	12	5	524	..	24	648	5	139,739	131,887	517	30,483	387	302,109	904
Westland ..	..	2	1	3	11	..	..	14	3	4	40	16	3	680	..	20	760	3	189,914	179,257	..	5,592	558	374,763	558
Canterbury ..	5	15	17	6	274	..	..	311	6	50	39	23	11	649	..	56	817	11	76,184	154,209	1,040	117,363	1,423	347,756	2,463
Otago—																									
Otago portion ..	..	9	3	5	138	..	..	150	5	11	24	4	6	287	..	3	329	6	34,474	48,575	200	58,655	1,112	141,704	1,312
Southland portion	1	6	2	1	45	..	..	54	1	18	46	11	3	530	..	2	607	3	112,636	147,480	590	23,945	390	284,061	980
Totals 1948–49	10	127	109	54	1,791	21	2	2,039	75	265	539	267	101	7,854	21	432	9,357	122	1,425,693	2,080,602	11,777	834,187	19,512	4,340,482	31,289
,, 1947–48	9	127	108	50	1,622	31	4	1,870	81	306	528	250	99	7,095	31	383	8,562	130	1,272,639	1,816,038	13,027	742,162	20,455	3,830,839	33,482
,, 1946–47	10	124	121	63	1,602	22	..	1,857	85	223	478	267	116	6,371	22	311	7,650	138	1,026,532	1,381,562	10,354	685,002	17,541	3,093,096	27,895

APPENDIX V—*continued*

SAWMILLING AND SASH AND DOOR MANUFACTURING, 1948–49—*continued*

Provincial District.	Expenses of Operation, other than Salaries and Wages and Cost of Materials.																							Cost of Materials used or operated upon.			
	Production of Logs at Mill.							Production of Sawn Timber from Logs.							Resawing, Dressing, and Manufacturing from Sawn Timber.												
	Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Stumpage.	Logs purchased.	Rough-sawn Timber purchased and other Materials.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Auckland ..	6,790	73,508	20,800	83,488	165,578	64,769	414,933	9,342	56,001	55,902	90,196	162,921	127,763	502,125	4,839	13,274	20,169	38,761	48,779	44,763	170,585	286,080	1019652	1,241,583	2,547,315
Hawke's Bay ..	36	6,027	2,123	7,728	16,163	2,305	34,382	470	2,876	5,783	5,074	11,030	4,194	29,427	165	877	1,525	1,381	1,247	1,428	6,623	23,316	40,629	14,748	78,693
Taranaki ..	55	7,438	2,302	6,027	11,074	2,548	29,444	416	3,215	5,036	5,747	8,521	4,829	27,764	379	1,590	2,795	2,883	6,546	4,189	18,382	16,219	100,380	..	116,599
Wellington ..	1,538	13,114	6,211	15,102	48,538	12,423	96,926	1,110	10,914	10,447	12,037	29,611	18,172	82,291	1,274	4,433	6,596	7,165	10,363	10,261	40,092	66,851	102,573	438,134	607,558
Marlborough ..	20	1,559	580	285	1,481	471	4,396	8	1,470	967	720	1,312	1,034	5,511	..	..	..	..	..	..	..	1,965	..	..	1,965
Nelson	465	11,227	5,666	10,329	22,007	7,346	57,040	2,181	8,389	6,257	7,953	20,568	9,481	54,829	520	1,667	913	2,068	2,701	1,392	9,261	36,132	24,817	107,170	168,119
Westland ..	1,057	11,894	7,749	8,087	25,996	9,077	63,860	1,121	7,816	7,530	7,687	19,765	7,566	51,485	96	196	322	287	356	266	1,523	38,658	11,016	20,978	70,652
Canterbury ..	121	11,158	3,378	5,088	6,321	12,082	38,148	1,471	8,478	12,115	10,289	18,405	16,717	67,475	1,194	4,493	6,434	6,769	7,687	6,165	32,742	45,743	143,669	324,119	513,531
Otago—																									
Otago portion ..	100	3,397	2,347	2,864	7,103	2,506	18,317	358	2,897	3,153	3,923	6,654	4,795	21,780	1,745	1,609	2,977	2,744	5,519	4,199	18,793	12,711	36,374	185,618	234,703
Southland portion	472	12,470	6,234	10,576	21,873	8,158	59,783	660	4,149	7,559	12,154	18,301	8,271	51,994	362	784	1,286	2,460	1,879	1,647	8,418	39,260	9,006	95,469	143,735
Totals 1948–49	10,654	151792	57,390	149574	326,134	121,685	817,229	17,137	106205	114749	155780	297,088	202,822	893,781	10,574	28,923	43,017	64,518	85,077	74,310	306,419	566,935	1488116	2,427,819	4,482,870
,, 1947–48	4,882	127088	52,497	125805	284,577	92,837	687,686	12,466	87,695	99,663	112752	275,487	201,697	789,760	10,118	26,517	45,819	59,121	77,755	85,506	304,836	538,361	1181642	2,594,179	4,314,182
,, 1946–47	1,481	104937	40,335	104096	224,947	52,993	528,789	9,885	63,648	74,280	88,308	230,350	146,788	613,259	10,982	26,815	39,687	55,557	75,093	80,189	288,323	419,631	602,494	2,521,410	3,543,535

Provincial District.	Total Costs of Operation (including Salaries and Wages).				Products.										Total Value of all Products.
					Log Sawmill Products.				Resawing and Planing-mill Products.						
	Felling, Hauling, and Delivering Logs at Mill.	Production of Sawn Timber from Logs.	Resawing, Dressing, and Manufacturing from Sawn Timber.	Total.	Rough-sawn Timber.		†Other Products.	Total.	Planed Flooring, Skirting, Moulding, &c.		Sashes and Doors.	Joinery.	Butter-boxes.	Cheese-crates.	Fruit-cases.	Other Products.	Total.	
					Quantity.	Value.			Quantity.	Value.								
	£	£	£	£	£	£	£	£	Ft. B.M.	£	£	£	£	£	£	£	£	£
Auckland	1,516,611	2,401,084	1,813,566	5,731,261	229,972,993	3,901,130	411,162	4,312,292	37,549,000	1,155,516	189,481	334,145	48,560	82,772	119,006	436,899	2,366,379	6,678,671
Hawke's Bay	125,091	123,136	50,014	298,241	18,233,010	278,981	1,912	280,893	1,988,343	56,704	4,000	23,126	..	..	21,806	13,664	119,300	400,193
Taranaki	115,708	197,664	80,718	394,090	18,493,717	342,468	3,920	346,388	4,249,141	143,821	32,452	86,042	..	24,299	..	10,743	297,357	643,745
Wellington	326,735	349,943	598,249	1,274,927	40,293,284	717,450	40,347	757,797	13,261,184	430,355	40,032	98,079	3,063	27,547	781	70,057	669,914	1,427,711
Marlborough	11,812	18,450	1,391	31,653	1,974,784	35,083	2,604	37,687	..	..	..	..	..	..	..	..	..	37,687
Nelson	250,566	194,395	147,301	592,262	24,555,506	503,013	1,546	504,559	483,438	12,541	1,490	18,633	1,180	3,213	100,936	28,162	166,155	670,714
Westland	299,248	234,942	28,651	562,841	45,485,739	643,057	5,844	648,901	1,082,869	26,555	..	..	4,116	..	..	741	31,412	680,313
Canterbury	166,706	359,762	475,647	1,002,115	34,759,032	586,325	10,790	597,115	9,121,581	284,550	..	109,227	2,632	6,209	51,874	86,499	540,991	1,138,106
Otago—																		
Otago portion ..	65,502	106,929	264,178	436,609	12,063,769	196,027	919	196,946	5,770,781	189,102	8,573	51,722	..	5,961	12,021	21,141	288,520	485,466
Southland portion ..	211,834	208,015	128,222	548,071	28,713,155	485,763	731	486,494	2,676,158	81,205	..	..	1,157	6,900	29,207	39,886	158,355	644,849
Totals 1948–49 ..	3,089,813	4,194,320	3,587,937	10,872,070	464,544,989	7,689,297	479,775	8,169,072	76,184,495	2,380,349	276,028	720,974	*60,708	*156,901	*335,631	707,792	4,638,383	12,807,455
,, 1947–48 ..	2,676,786	3,622,367	3,661,632	9,960,785	428,114,000	6,521,010	459,270	6,980,280	63,217,908	1,858,135	341,878	581,836	58,052	152,739	273,918	777,129	4,043,687	11,023,967
,, 1946–47 ..	2,116,289	2,466,332	3,512,276	8,094,897	353,954,740	4,919,824	145,414	5,065,238	67,831,556	2,034,441	251,038	416,633	85,903	158,804	222,599	581,184	3,750,602	8,815,840

* Butter-boxes made numbered 452,248; cheese-crates, 1,263,937; fruit-cases, 4,170,037. † Laths, posts, waste products, &c.

APPENDIX V—*continued*

SAWMILLING AND SASH AND DOOR MANUFACTURING, 1948–49—*continued*

Provincial District.	Motive Power used for Hauling and Delivering. Kind of Engine. Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Motive Power used for Production of Sawn Timber from Logs. Kind of Engine. Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Motive Power used for Resawing, Dressing, and Manufacturing from Sawn Timber. Kind of Engine. Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric	Water.	Total.	Total Horse-power available.	Approximate Value. Sawmill. Land and Buildings.	Tram-ways and Tram Plant.	Logging and Hauling Equip-ment.	Other Machinery	Total.	Planing and Resawing Mill. Land and Buildings.	Tram-ways.	Other Machinery	Total.	Total Value
																									£	£	£	£	£	£	£	£	£
Auckland ..	38	..	222	113	1	..	374	16,063	83	4	101	42	505	..	735	19,144	7	..	5	1	817	..	830	8,733	542,838	129,925	450,129	689,177	1,812,069	263,866	5,341	245,113	514,320	2,326,389
Hawke's Bay	7	..	16	13	..	..	36	1,620	10	..	9	..	42	..	61	1,611	4	..	..	..	87	..	91	769	23,769	2,091	31,061	36,816	93,737	12,778	147	14,621	27,546	121,283
Taranaki ..	12	..	22	6	..	..	40	1,167	10	..	7	3	47	..	67	1,903	1	..	..	..	147	..	148	930	18,806	24,347	22,088	28,715	93,956	30,479	..	18,604	49,083	143,039
Wellington ..	25	..	69	24	..	..	118	3,709	24	..	19	12	67	..	122	2,955	6	..	1	..	268	..	275	2,805	44,936	36,495	90,558	89,514	261,503	47,960	1,126	49,748	98,834	360,337
Marlborough	..	..	5	1	..	..	6	182	..	..	4	2	10	..	16	329	..	..	..	..	..	..	..	..	3,395	800	2,205	4,134	10,534	..	..	..	..	10,534
Nelson ..	32	..	82	16	..	..	130	4,582	22	..	9	13	65	..	109	3,573	4	..	..	..	58	1	63	534	52,691	31,179	65,454	61,199	210,523	5,153	..	10,022	15,175	225,698
Westland ..	64	..	46	1	5	..	116	2,755	22	..	9	7	32	1	71	2,768	..	..	..	2	5	..	7	138	53,904	55,442	41,967	47,826	199,139	1,566	..	1,586	3,152	202,291
Canterbury ..	16	..	43	5	..	..	64	1,491	8	..	8	5	128	..	149	2,943	6	..	..	..	309	..	315	2,443	48,427	82	31,074	82,842	162,425	37,939	..	42,783	80,722	243,147
Otago—																																		
Otago portion	10	..	14	2	..	..	26	652	11	..	2	1	32	..	46	1,201	1	..	..	..	92	..	93	1,044	15,078	5,525	16,922	28,447	65,972	17,815	..	20,822	38,637	104,609
Southland portion	29	..	42	5	..	..	76	1,723	27	..	4	6	47	..	84	2,352	3	..	..	..	47	..	50	503	32,096	13,519	59,544	79,090	184,249	7,381	688	20,951	29,020	213,269
Totals—																																		
1948–49	233	..	561	186	6	..	986	33,944	217	4	172	91	975	1	1460	38,779	32	..	6	3	1830	1	1872	17,899	835,940	299,405	811,002	1,147,760	3,094,107	424,937	7,302	424,250	856,489	3,950,596
1947–48	252	..	533	195	6	1	987	31,385	261	..	168	96	873	4	1402	36,282	32	..	10	15	1673	1	1731	16,610	707,294	284,388	694,704	1,034,886	2,721,272	434,294	3,641	413,660	851,595	3,572,867
1946–47	249	..	451	149	9	1	859	26,607	259	..	104	55	590	1	1009	28,433	36	..	7	9	1555	1	1608	16,185	589,361	249,183	561,078	690,563	2,090,185	456,341	6,765	400,174	863,280	2,953,465

Provincial District.	Number of Log-sawmills.	Approximate Sawn Output of various Kinds of Timber at Log-sawmills during the Year 1948–49. Kauri.	Rimu.	Kahikatea.	Matai.	Totara.	Beech.	Tawa.	Miro.	Insignis Pine.	Other and unspecified.	Total.	Average Mill Output.	Maximum Daily Capacity of Mills (8 Hours).	Area Cut.
		Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Acres.
Auckland	188	1,339,069	93,036,806	7,873,151	19,733,441	10,275,414	228,227	8,488,107	1,548,760	84,387,387	3,362,691	229,972,993	1,223,261	1,274,661	12,345
Hawke's Bay	21	..	10,677,855	1,072,935	1,713,315	155,677	483,754	43,339	18,625	3,510,421	556,890	18,233,010	868,239	100,000	838
Taranaki	17	..	9,071,839	1,031,437	2,489,113	871,395	14,274	154,626	..	4,735,524	125,509	18,493,717	1,087,866	96,950	..
Wellington	46	..	20,873,765	1,342,427	4,741,419	1,803,780	764,310	3,083	428,362	9,504,127	832,011	40,293,284	875,941	186,036	1,676
Marlborough	8	..	474,405	26,892	24,637	6,347	84,522	..	..	1,107,630	250,351	1,974,784	246,848	12,500	2
Nelson	51	..	18,095,702	1,518,063	292,087	6,152	4,906,981	..	3,944	9,595,988	136,589	34,555,506	677,559	225,900	..
Westland	35	..	41,809,040	2,979,294	167,745	37,267	438,086	..	..	..	54,307	45,485,739	1,299,593	257,500	2,299
Canterbury	45	..	296,090	77,247	31,171	..	5,000	..	..	32,242,842	2,106,682	34,759,032	772,423	151,750	..
Otago—															
Otago portion ..	20	..	5,717,242	6,030	102,012	5,352	541,767	..	..	5,365,644	325,722	12,063,769	603,188	72,400	..
Southland portion ..	38	..	12,426,281	1,574,781	277,387	102,443	9,060,010	..	30,718	5,174,647	66,888	28,713,155	755,609	145,600	2,339
Totals, 1948–49 ..	469	1,339,069	212,479,025	17,502,257	29,572,327	13,263,827	16,526,931	8,389,355	2,030,348	155,624,210	*7,817,640	*464,544,989	990,501	2,523,297	19,370
1947–48 ..	501	2,569,891	195,046,953	19,489,620	25,898,211	12,907,719	11,975,958	12,298,657	2,869,464	134,524,451	7,533,384	428,114,328	854,520	2,579,013	27,184
1946–47 ..	400	2,282,796	170,528,598	15,116,359	19,673,525	9,626,696	11,606,973	7,614,968	1,565,524	111,590,849	7,348,452	353,954,740	884,887	2,219,775	25,647

* Details for 1948–49 include eucalypts, 2,151,498 ft. b.m.; poplar, 372,664 ft. b.m.; taraire, 132,741 ft. b.m.; rata, 311,035 ft. b.m.; macrocarpa, 990,745 ft. b.m.; mangeao, 209,777 ft. b.m.; pukatea, 242,486 ft. b.m.; rewarewa 339,924 ft. b.m puriri, 165,137 ft. b.m.; tanekaha, 302,609 ft. b.m.; hinau, 214,402 ft. b.m.; other and unspecified 2,384,622 ft. b.m.

* Another 5,800,000 board feet of timber was produced by operators sawing less than 100,000 a year, details of which are not included in the principal collection. Thus total output in 1948–49 reached 470,345,000 board feet.

APPENDIX VI

Output of Sawn Timber for Year Ended 31st March, 1950

(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	38·82	9·78	4·55	6·24	..	0·92	1·14
Rotorua	65·96	9·28	4·19	2·80	1·18	..	8·01
Wellington	38·17	12·07	4·46	3·86	0·83	..	0·02
North Island	142·95	31·13	13·20	12·90	2·01	0·92	9·17
Nelson	13·29	0·29	0·01	0·69	3·58	..	..
Westland	49·27	0·16	0·16	3·84	1·97	..	..
Canterbury	0·31	0·11	0·03	0·03	..	..	..
Southland	18·23	0·61	0·11	1·11	10·09	..	..
South Island	81·10	1·17	0·31	5·67	15·64	..	..
Total, 1949–50	224·0	32·3	13·5	18·6	17·6	0·9	9·2
1948–49	217·6	30·3	13·7	17·2	16·7	1·6	8·0
1947–48	197·9	25·9	12·9	19·5	14·9	2·6	12·3

Conservancy.	Insignis Pine. (9)	Eucalypts. (10)	Larch. (11)	Other Species. (12)	Total. (13)	Sawmills Registered at 31st March, 1950.
Auckland	23·2	0·28	..	1·81	86·74	178
Rotorua	53·47	0·24	1·92	1·77	148·82	92
Wellington	17·85	0·48	..	1·57	79·31	114
North Island	94·52	1·00	1·92	5·15	314·87	384
Nelson	11·46	..	..	0·24	29·56	88
Westland	..	..	..	0·05	55·45	67
Canterbury	28·61	1·24	0·65	1·38	32·36	63
Southland	11·79	..	..	0·47	42·41	83
South Island	51·86	1·24	0·65	2·14	159·78	301
Total, 1949–50	146·4	2·2	2·6	7·3	474·6	685
1948–49	153·3	2·6	4·1	8·7	473·8	692
1947–48	134·5	1·7	*	5·9	428·1	608

* Incuded in " Other Species."

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

APPENDIX VII

Forest Offences, 1949–50

Offence.	Law Under Which Proceedings Were Taken.	Number of Convictions.	Fines.	Costs and Damages.
			£ s. d.	£ s. d.
Unlawfully entering State forest	Regulation 12 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	11	24 10 0	22 14 0
Unlawful cutting and removal of forest-produce	Section 43 (1), Forests Act, 1921–22	10	46 0 0	250 4 1
Unlawful hunting in State forest	Section 47 (*a*), Forests Act, 1921–22	6	1 0 0	2 5 0
Lighting fire without lawful authority in State forest	Section 44 (1) (*a*), Forests Act, 1921–22	4	13 0 0	16 12 11
Interfering with State forest buildings	Section 46, Forests Act, 1921–22	2	..	8 8 6
Operating engine without efficient spark-arrester	Regulation 6 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	3	7 0 0	28 6 10
Totals		36	91 10 0	328 11 4

APPENDIX VIII

Training and Recruitment, 1949–50

Course.	Serial No.	Period.	Number Attended.
Clerical Junior (C, VI)	4	3 weeks ..	16
Clerical Cadets	5	2 weeks ..	18
Clerical Junior (C, VI)	6	3 weeks ..	14
Clerical Staff Clerks	7	2 weeks ..	12
Clerical Junior (C, VI)	8	3 weeks ..	18
Clerical Cadets	9	2 weeks ..	17
Clerical Senior Refresher	10	2 weeks ..	15
Entomology	3	2 weeks ..	18
Fire Protection	4	2 weeks ..	16
Fire Protection	5	2 weeks ..	18
Leading Hands	14	8 weeks ..	18
Fourth Grade Ranger	4	8 weeks ..	14
Trainee Intermediate	6	8 weeks ..	10
Trainee Preliminary	7	4 weeks ..	16
Timber Measurers	8	8 weeks ..	14

APPENDIX IX

National Forest Survey: Forest Research Institute

Unit.	Total to 31st March, 1949.		Total 1st April, 1949, to 31st March, 1950.		Total to 31st March, 1950.	
	Number of Plots.	Area.	Number of Plots.	Area.	Number of Plots.	Area.
		Acres.		Acres.		Acres.
Coromandel ..	1,484	236,000	870	139,000	2,354	375,000
Rotorua	1,087	328,000	..	..	1,087	328,000
Te Whaiti	438	67,000	..	..	438	67,000
West Taupo ..	1,222	278,000	..	..	1,222	278,000
East Coast	58	13,000	120	33,000	178	46,000
Taranaki	139	22,000	73	12,000	212	34,000
Westland	1,322	211,000	896	145,000	2,218	356,000
Reefton	..	..	222	71,000	222	71,000
Woodlaw	345	8,000	..	..	345	8,000
West Waiau ..	1,001	322,000	..	..	1,001	322,000
Longwood	310	80,000	..	..	310	80,000
Waikaia	130	130,000	..	..	130	130,000
Totals ..	7,536	1,695,000	2,181	400,000	9,717	2,095,000

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

APPENDIX X

FOREST AND RURAL FIRES ACT, 1947: ADDITIONAL RURAL FIRE DISTRICTS CONSTITUTED AS AT 31ST MARCH, 1950

Name and Conservancy.	Area.	County.	Fire Authority.	Property Protected.	Closed Fire Season.	*Gazette* Reference.
AUCKLAND FOREST CONSERVANCY						
Helensville - South Head	70,000	Waitemata ..	Minister of Forests ..	Sand-dune areas and gum-lands	1st October to 30th April	No. 58, 1949, p. 2406.
ROTORUA FOREST CONSERVANCY						
Rangitaiki ..	19,000	Whakatane ..	Rangitaiki Development Co., Ltd.	Land owned by Rangitaiki Development Co., Ltd.	1st October to 30th April	No. 11, 1950, p. 175.
WELLINGTON FOREST CONSERVANCY						
Puketitiri ..	7,950	Hawke's Bay ..	Minister of Forests ..	Puketitiri Scenic Reserve and the Hutchinson Domain	1st October, to 30th April	No. 13, 1950, p. 218.
Ngaumu	9,600	Masterton	Minister of Forests ..	Trees and other plants on State forest land	1st October to 30th April	No. 13, 1950, p. 218.

APPENDIX XI

NEW ZEALAND FOREST SERVICE LOGGING OPERATIONS: TOTAL PRODUCTION FROM ALL OPERATIONS

(All quantities in cubic feet)

Forest.	Year Ended 31st March, 1950.			1948–49 Total	1947–48 Total.
	Logs.	Other Produce.	Total.		
Omahuta	205,000	..	205,000	245,000	129,000
Pureora	1,068,000	..	1,068,000	1,017,000	705,000
Whakarewarewa	1,202,000	298,000	1,500,000	1,905,000	1,896,000
Kaingaroa	2,285,000	242,000	2,527,000	2,267,000	1,594,000
Whirinaki	1,430,000	7,000	1,437,000	1,445,000	870,000
Rangataua	..	51,000	51,000	*	*
Balmoral	303,000	30,000	333,000	163,000	107,000
Hanmer	3,000	59,000	62,000	66,000	36,000
Eyrewell	3,000	137,000	140,000	121,000	136,000
Naseby	77,000	3,000	80,000	36,000	16,000
Pebbly Hills	54,000	..	54,000	8,000	..
Dusky	146,000	..	146,000	140,000	154,000
Tapanui	74,000	..	74,000	69,000	44,000
Beaumont	18,000	..	18,000	..	..
Conical Hill	93,000	15,000	108,000	109,000	82,000
Other	8,000	45,000	53,000	12,000	49,000
Totals	6,969,000	887,000	7,856,000	7,603,000	5,818,000

* Not previously included.

APPENDIX XII

FOREST SERVICE SAWMILLING OPERATIONS: OUTPUT AND DISPOSAL OF SAWN TIMBER, 1946–50

(All quantities in board feet)

Details.	Year Ending 31st March,				
	1950.	1949.	1948.	1947.	1946.
Sawn output—					
For green sales	9,651,000	8,337,000	5,628,000	5,846,000	3,917,000
For air seasoning	1,527,000	3,456,000	2,670,000	3,167,000	2,486,000
For kiln drying	10,563,000	11,038,000	9,577,000	7,126,000	7,355,000
Total	21,741,000	22,831,000	17,875,000	16,139,000	13,758,000
Kiln drying—					
Quantity dried	11,393,000	11,880,000	9,773,000	8,246,000	7,827,000
Percentage of total cut ..	55	52	55	51	57
Sales—					
Within New Zealand—					
Green	8,251,000	7,913,000	4,156,000	5,398,000	3,851,000
Air seasoned	1,134,000	229,000	209,000	1,271,000	135,000
Kiln dried	2,093,000	1,668,000	1,212,000	234,000	445,000
Total	11,479,000	9,810,000	5,577,000	6,903,000	4,431,000
Percentage of total cut ..	53	43	31	43	32
Exports—					
Green	1,080,000	62,000	630,000	..	..
Air seasoned	32,000	25,000	69,000	26,000	..
Kiln dried	2,491,000	3,242,000	841,000	885,000	537,000
Total	3,603,000	3,329,000	1,540,000	911,000	537,000
Percentage of total cut ..	17	15	9	6	4

APPENDIX XIII

Production of Rough Sawn Timber in New Zealand by Species, 1921–50

(Volume in thousand board feet)

Source of Data.—(1) "Factory Production" published by the Census and Statistics Department. (2) "Sawmill Registration Statistics" compiled by the New Zealand Forest Service in 1949 and 1950.

Year Ended 31st March,	Softwoods.							Hardwoods.							Other Species.	Grand Total.
	Kauri.	Miro and Rimu.	White-pine.	Matai.	Totara.	Insignis Pine.	Tane-kaha.	Beech.	Tawa.	Rata.	Puka-tea.	Taraire.	Rewa-rewa.	Mang-eao.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1921	20,394	153,529	73,169	21,329	17,984	9,712	..	6,349	728	50	..	..	..	..	4,424	307,668
1922	21,436	157,454	68,487	24,830	19,571	10,815	111	4,863	678	74	98	188	16	8	6,343	314,972
1923	22,461	155,940	66,088	23,747	20,844	7,684	43	5,227	607	116	14	116	36	25	1,404	304,352
1924	19,743	181,262	56,699	24,326	18,904	7,386	221	6,529	509	373	70	36	64	45	901	317,069
1925	22,892	195,862	65,572	23,948	18,510	7,706	143	6,836	491	82	143	51	54	118	1,692	344,095
1926	22,766	196,181	75,635	26,141	14,110	7,072	33	8,701	468	282	64	116	34	70	1,552	353,224
1927	18,475	170,860	65,490	19,380	14,179	6,668	136	8,596	239	210	71	132	47	77	1,113	305,675
1928	15,875	156,783	53,736	15,207	10,728	7,695	19	7,923	310	239	98	2	26	52	1,090	269,783
1929	10,743	156,803	56,790	15,753	8,611	9,168	58	9,846	301	228	49	..	22	52	1,790	270,214
1930	10,471	164,252	58,505	17,972	9,046	10,382	106	10,225	385	215	56	..	3	50	737	282,405
1931	8,943	126,077	49,009	13,917	9,468	12,740	68	7,681	455	294	68	35	9	25	680	229,468
1932	6,891	71,310	43,161	7,475	5,344	13,405	79	5,757	163	122	..	161	1	5	318	154,193
1933	5,410	76,634	47,998	8,161	6,347	14,676	198	5,781	290	72	20	440	16	14	211	166,269
1934	4,946	96,796	47,949	10,760	7,197	21,494	171	6,973	214	97	15	417	7	13	605	197,655
1935	5,553	126,403	52,294	13,880	8,867	27,312	264	7,725	746	92	99	4	23	31	489	243,782
1936	7,332	158,403	52,075	19,069	11,778	34,105	294	8,855	302	126	88	6	14	10	618	293,075
1937	7,791	176,556	46,959	20,295	11,444	31,484	175	8,809	439	155	21	107	18	7	1,631	305,889
1938	11,575	186,083	43,662	21,255	12,794	36,359	164	8,825	454	56	85	40	37	37	1,339	322,766
1939	6,203	191,009	33,432	22,776	11,237	41,868	126	9,036	117	47	7	63	37	100	658	316,716
1940	5,066	208,181	33,043	21,212	10,882	46,762	110	9,008	459	110	8	44	22	57	1,026	335,991
1941	3,048	206,405	31,849	22,392	12,980	53,445	198	9,326	1,537	71	36	31	23	50	815	342,208
1942	2,561	194,437	29,733	18,672	10,456	56,247	85	9,327	1,116	159	50	..	66	36	1,529	324,474
1943	2,646	200,361	24,357	19,338	11,984	67,067	76	10,928	1,304	160	157	270	65	..	2,801	341,515
1944	4,308	191,587	20,931	18,373	11,161	83,229	388	12,333	2,801	345	200	382	..	64	4,646	350,748
1945	2,878	182,781	17,990	19,181	11,253	85,713	285	11,074	4,136	342	263	589	118	137	3,393	340,133
1946	2,801	175,965	17,043	18,835	10,561	96,819	75	12,123	5,327	341	154	434	113	202	3,930	344,723
1947	2,283	172,095	15,116	19,674	9,627	111,591	130	11,607	7,615	179	151	308	175	203	3,201	353,955
1948	2,570	197,916	19,490	25,898	12,908	134,524	270	14,976	12,299	136	267	607	236	190	5,828	428,115
1949	1,600	217,600	17,200	30,300	13,700	153,300	*	16,700	8,000	*	*	*	*	*	15,400	473,800
1950	920	224,050	18,570	32,300	13,510	146,380	*	17,650	9,170	*	*	*	*	*	12,100	474,650

* Included in "Other Species"; 1949 and 1950 figures are subject to confirmation and will be given in greater detail when the Government Statistician's analysis is complete.

APPENDIX XIV

TIMBER PRICE-INDEX: MOVEMENT OF TIMBER PRICES IN COMPARISON WITH PRICES OF OTHER BUILDING-MATERIALS AND THE GENERAL PRICE-LEVEL

(Base: 1926–30 = 1,000)

Source of Data.—(1) "Timber Prices," prepared by the New Zealand Forest Service. (2) "Bricks and Cement" computed from information supplied by the Census and Statistics Department. (3) "Wholesale Index," "New Zealand Official Year-Book."

Calendar Year.	Timber.		Other Building-materials.		General Wholesale Price-index.
	Rimu, Matai, Totara.	Insignis Pine.	Bricks.	Cement.	
(1)	(2)	(3)	(4)	(5)	(6)
1920	984	*	986	1,234	1,536
1921	1,050	*	1,129	1,529	1,428
1922	1,012	1,215	1,052	1,328	1,194
1923	1,043	990	1,004	1,140	1,115
1924	1,120	1,020	1,007	1,092	1,120
1925	1,121	990	1,018	1,071	1,114
1926	1,100	1,043	993	1,032	1,053
1927	980	1,006	977	1,011	1,001
1928	950	993	977	1,002	994
1929	985	973	1,020	995	988
1930	990	979	1,029	960	963
1931	826	956	1,022	947	901
1932	790	846	1,017	938	878
1933	670	755	1,065	967	902
1934	681	738	1,047	970	907
1935	756	783	1,013	970	936
1936	915	808	1,041	947	945
1937	1,054	862	1,233	932	1,022
1938	1,116	935	1,268	934	1,036
1939	1,126	945	1,271	934	1,071
1940	1,141	1,006	1,299	953	1,195
1941	1,182	1,120	1,330	975	1,311
1942	1,209	1,185	1,459	1,038	1,416
1943	1,220	1,299	1,600	1,101	1,513
1944	1,228	1,360	1,699	1,116	1,558
1945	1,321	1,430	1,842	1,139	1,584
1946	1,521	1,570	1,831	1,134	1,589
1947	1,612	1,690	1,671	1,069	1,649
1948	1,690	1,890	1,840	1,221	1,837
1949	1,886	*	2,085	1,300	1,825

* Not available.

APPENDIX XV

PERMANENT SAMPLE PLOTS IN EXOTIC FORESTS: FOREST RESEARCH INSTITUTE

Species.	Conservancy.					
	Auckland.	Rotorua.	Wellington.	Nelson.	Canterbury.	Southland.
Pinus radiata	3	2	..	2	5	10
Pinus taeda	1	..	..	..	..	..
Pinus caribea	1	..	..	..	..	..
Pinus laricio	..	5	..	2	3	3
Pinus ponderosa	..	4	1	..	3	3
Pinus strobus	..	4	..	..	..	..
Pinus murrayana	..	1	1	..	2	1
Pinus austriaca	..	..	..	..	1	..
Pseudotsuga taxifolia	..	6	..	2	2	2
Larix leptolepsis	..	..	..	1	..	..
Larix decidua	..	..	..	..	..	..
	5	22	2	7	16	20

APPENDIX XVI

Climatological Summary 1949: Averages of Observations for the Year

Station.	General Observations as at 0900 Hours Daily.				Temperature Extremes.				Rainfall.		Weather (Number of Days Recorded).			Total Hours Sunshine.
	Dry Bulb Temperature.	Relative Humidity.	Amount of Cloud.	Number of Calm Days.	Mean Daily Maximum.	Mean Daily Minimum.	Extreme Maximum.	Extreme Minimum.	Total for Year.	Number of Days.	Gales.	Snow.	Ground Frost.	
	°F.	Per Cent.			°F.	°F.	°F.	°F.	In.					
Waipoua	59·1	83	5·2	68	65·0	48·7	79·8	32·0	75	216	2	0	9	1,633
Glenbervie	59·9	79	4·8	55	65·3	47·8	82·0	27·0	57	170	1	0	32	..
Riverhead	59·6	81	5·2	81	65·4	46·2	81·0	26·0	51	189	1	0	33	..
Whangamata	60·0	82	4·7	3	66·0	47·9	81·0	28·0	69	182	2	0	39	..
Maramarua	57·4	84	5·1	26	64·5	47·0	82·0	27·8	43	181	1	0	19	..
Rotoehu	57·9	77	4·2	151	65·3	44·2	86·0	25·3	56	122	0	0	63	..
Whakarewarewa	54·8	78	5·0	16	63·8	44·9	86·3	26·4	59	156	0	1	56	2,008
Pukahunui (for East Kaingaroa)..	50·3	81	5·3	0	..	39·0	..	..	69	205	2	3	128	..
Taumarunui (for King-country) ..	54·6	79	6·1	94	65·9	44·5	92·1	27·6	52	177	0	1	27	..
Karioi	51·6	75	5·4	46	59·0	..	81·0	22·0	46	152	2	8	73	..
Gwavas	55·2	68	4·1	43	63·6	41·8	85·0	24·0	48	139	1	2	..	..
Golden Downs..	52·6	78	3·4	118	61·2	38·6	82·0	21·0	52	106	0	1	146	..
Hanmer Springs	50·0	68	3·7	79	61·0	38·4	86·8	18·5	45	123	1	13	208	2,093
Hokitika (for Westland) ..	52·2	86	5·8	20	58·3	43·6	74·3	28·0	120	211	4	2	57	..
Balmoral	52·4	63	4·0	90	61·2	..	90·5	..	26	118	0	3	162	..
Waipiata (for Naseby)	47·2	65	4·7	82	57·2	39·0	86·4	21·4	15	114	2	27	164	2,093

APPENDIX XVII

General Revenue Account for the Three Years Ended 31st March, 1950

	Years Ended 31st March,					
	1948.		1949.		1950.	
Charges incurred directly in respect of—	£	£	£	£	£	£
Fire prevention and precaution and administration of fire districts	8,149		9,215		10,086	
Technical investigations, research, &c.	18,345		14,955		25,629	
National forest survey	13,460		17,924		38,239	
Assistance to public and private forestry	2,310		2,288		2,543	
Co-operation with Soil Conservation Council and Catchment Boards	207		1,385		448	
Timber inspection and termite control	3		2,388		3,497	
Timber control	3,092		6,503		5,082	
Work for other Departments ..	7,122		10,822		9,191	
Staff training including Rotorua and Tapanui Training Centres	28,360		12,798		16,001	
Payments to local authorities for roading purposes ("Fifths") ..	..		22,475		29,519	
	81,048		100,753		140,295	
Less fees for inspections, recoveries from other Departments, &c.	5,790	75,258	11,288	89,465	9,253	131,042
General administrative expenses—						
Salaries, overtime, and contribution to Government Superannuation Fund	116,902		119,180		154,938	
Travelling and transfer expenses of officers including expenses of officers travelling overseas	17,883		14,443		16,004	
Postages, cables, printing and stationery, &c.	13,284		15,268		12,977	
Maintenance and depreciation of administrative buildings, equipment, &c.	8,605		7,906		17,471	
General office expenses	14,579		16,054		17,448	
Miscellaneous general expenses ..	249		1,831		2,220	
	171,505		174,682		221,058	
Less amounts charged against forests and other activities as "overhead"	54,896	116,609	118,791	55,891	269,443	48,385 *Cr.*
		191,867		145,356		82,657
Less miscellaneous revenue ..		324		1,047		1,400
Net deficit in Revenue Account transferred against Treasury Adjustment Account in balance-sheet		£191,543		£144,309		£81,257

APPENDIX XVII—*continued*

STATEMENT OF EXPENDITURE AND INCOME ON CAPITAL ACCOUNT FOR THE THREE YEARS ENDED 31ST MARCH, 1950

	Years Ended 31st March,								
	1948.			1949.			1950.		
FOREST DEVELOPMENT AND MANAGEMENT									
Managed Forests—									
Direct expenses of development and management—	£	£	£	£	£	£	£	£	£
Establishment	88,320			114,929			205,737		
Tending	64,161			85,995			96,255		
Protection	94,505			109,769			125,921		
Maintenance of permanent assets	91,550			120,635			123,327		
Miscellaneous administrative expenses	95,785			121,597			223,424		
		434,321			552,925			774,664	
Provision of permanent assets—									
Buildings (including housing, camps, &c.)	169,589			257,355			334,241		
Roads, bridges, tracks, &c.	63,129			93,411			65,920		
Plant, vehicles, equipment, &c.	103,950			92,520			148,347		
Other improvements, stocks, &c.	170,196			166,212			145,750		
		506,864			609,498			694,258	
Acquisition of land	..	79,000		..	57,244		..	22,372	
Miscellaneous specific reserves, pools, and suspenses	..	89		..	6,504		..	8,318	
			1,020,274			1,226,171			1,499,612
Less income from managed forests—									
Sales of logs	259,868			201,530			210,243		
Less costs of logging, transport, &c.	218,357			115,584			148,668		
		41,511			85,946			61,575	
Sales of standing timber	80,724			45,177			47,785		
Less costs of appraisal and supervision	15,228			12,167			12,333		
		65,496			33,010			35,452	
Miscellaneous revenue	..	18,192		..	14,407		..	18,866	
			125,199			133,363			115,893
			895,075			1,092,808			1,383,719

APPENDIX XVII—*continued*

STATEMENT OF EXPENDITURE AND INCOME ON CAPITAL ACCOUNT—*continued*

	Years Ended 31st March,								
	1948.			1949.			1950.		
Non-managed Forests—	£	£	£	£	£	£	£	£	£
Income from non-managed forests—									
Sales of standing timber	119,422			214,292			187,363		
Less costs of appraisal and supervision	16,083			21,990			26,119		
		103,339			192,302			161,244	
Sales of other produce	9,412			10,811			19,096		
Less expenses of supervision, &c.	2,670			2,615			3,417		
		6,742			8,196			15,679	
Miscellaneous revenue	..	1,046		..	1,408		..	1,426	
		111,127			201,906			178,349	
Less costs of administration, protection, &c. ..	..	27,256		..	11,698		..	39,131	
			83,871			190,208			139,218
			811,204			902,600			1,244,501
Less net profit from Rotorua Utilization Branch ..	..	..	34,962	..	..	27,263	..	..	33,367
Net expenditure of capital moneys on forest development and management	..	..	776,242	..	..	875,337	..	..	1,211,134
DEVELOPMENT OF UTILIZATION UNITS									
Waipa Mill—									
Fixed assets	84,139			83,356			128,346		
Less increases in specific reserves	7,312			6,701			3,839		
		76,827			76,655			124,507	
Increases in stocks, stores, &c.	..	44,928		..	*Cr.* 1,160		..	16,710	
			121,755			75,495			141,217

Conical Hill Mill—									
Fixed assets	14,329			48,785			104,269		
Less increases in specific reserves	..			784			*Cr.* 136		
		14,329			48,001			104,405	
Increases in stocks, stores, &c.	..	416		..	16,705		..	25,117	
			14,745			64,706			129,522
Murupara Pulp, Paper, and Sawmilling Project—									
Preliminary expenses including net costs of tests and trials	..	..	22,512	..	..	54,417	..	..	101,994
Net expenditure of capital moneys on development of utilization units	..	..	159,012	..	..	194,618	..	..	372,733
DEVELOPMENT OF ADMINISTRATIVE ESTABLISHMENTS									
Buildings	..	5,711		..	13,587		..	14,462	
Roads and miscellaneous improvements	..	*Cr.* 668		..	2,242		..	623	
Equipment, stores, &c.	..	17,278		..	13,239		..	18,683	
Net expenditure of capital moneys on development of administrative establishments			22,321	..		29,068	..		33,768
SUMMARY									
NET EXPENDITURE OF CAPITAL MONEYS ON									
Forest development and management	..	..	776,242	..	..	875,337	..	..	1,211,134
Development of utilization units	..	..	159,012	..	..	194,618	..	..	372,733
Development of administrative establishments	..	..	22,321	..	..	29,068	..	..	33,768
Grand total	..	..	£957,575	..	..	£1,099,023	..	..	£1,617,635

APPENDIX XVII—*continued*

BALANCE-SHEET AS AT THE END OF EACH OF THE THREE YEARS ENDED 31ST MARCH, 1950

	As at 31st March,					
	1948.		1949.		1950.	
Assets	£	£	£	£	£	£
Land taken over or purchased	1,738,178		1,795,422		1,817,793	
Indigenous standing forests taken over or purchased	34,028,190		34,028,190		34,028,190	
		35,766,368		35,823,612		35,845,983
Net costs to date of forest development and management	7,172,718		7,402,079		7,933,582	
Less reserves as at 31st March, 1947	2,132,910		2,132,910		2,132,910	
		5,039,808		5,269,169		5,800,672
Buildings, including houses and camps	607,562		932,002		1,391,155	
Roads, bridges, tracks, &c.	459,516		552,927		618,852	
Plant, vehicles, equipment, &c.	658,466		808,445		1,045,072	
Miscellaneous improvements	183,849		270,368		397,456	
Stocks and stores	345,841		474,508		581,328	
		2,255,234		3,038,250		4,033,863
Net interest capitalized but not charged against specific assets	..	1,098,022	..	1,303,183	..	1,547,327
Preliminary expenses of Murupara pulp, paper, and sawmilling project	..	22,512	..	76,929	..	178,922
Sundry debtors	..	167,467	..	250,230	..	256,258
Value of miscellaneous assets held on charge pending authority to write off	4,146		5,318		1,534	
Less amounts reserved for same	4,146		5,318		1,534	
		..		..		..
		£44,349,411		£45,761,373		£47,663,025

Liabilities					
Capital—					
Value of forests and land taken over free of charge	36,451,893		36,467,982		36,468,031	
National development loans	5,977,439		..		..	
Public Works Account capital	..		6,790,705		8,307,384	
Liability to Consolidated Fund—						
Advances	87,405		87,405		87,405	
Interest	1,787,261		2,011,687		2,279,400	
Loans redeemed	141,554		141,554		141,554	
	44,445,552					
Less cash in Public Account	143,604		..		..	
		44,301,948		45,499,333		47,283,774
Treasury Adjustment Account—						
Balance at 1st April	..		*Dr.* 191,543		*Dr.* 20,713	
Net payments for the year	..		315,139		225,308	
	..		123,596		204,595	
Net deficit in General Revenue Account	*Dr.* 191,543		*Dr.* 144,309		*Dr.* 81,257	
		Dr. 191,543		*Dr.* 20,713		123,338
Accumulated profits of Rotorua Utilization Branch (Waipa)	..	77,673	..	104,936	..	138,303
Miscellaneous reserve, pool, and suspense accounts	..	67,987	..	66,732	..	46,915
Liability for cash held on deposit	30,707		33,403		17,381	
Less cash held against same	30,707		33,403		17,381	
	..		..		..	
Sundry creditors	..	93,346	..	111,085	..	70,695
		£44,349,411		£45,761,373		£47,663,025

NOTES.—(1) Land and indigenous forests other than areas purchased have been valued as follows: prairie value, 5s. per acre; protection, £1 per acre; merchantable forests, £10 per acre; accretions during year have been brought into the accounts at the prairie value of 5s. per acre. Pending completion of the national forest survey, no debit has been made in the accounts and no reduction has been made in the asset "indigenous standing forests" in respect of the value of timber or timber rights disposed of. (2) Up to 31st March, 1940, the cost of establishment of exotic forests included compound interest on the net expenditure from year to year. (3) The liability for advances from Consolidated Fund is fixed by section 21 of the Finance Act, 1926, and section 3 of the Finance Act, 1927, at £104,250. Of this amount £87,405 only is shown as a liability, the balance of £16,845 representing the expenditure on sand-dune reclamation which was transferred without statutory authority to the Crown Lands Account.

APPENDIX XVII—*continued*

UTILIZATION BRANCH—ROTORUA CONSERVANCY: STATEMENT OF OPERATING ACCOUNTS FOR THE YEAR ENDED 31ST MARCH, 1950 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)

NOTE.—The accounts for the year ended 31st March, 1950, 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

1948–49. £	£	*Income*	1949–50. £	£
143,900		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 ..	172,742	
112,628		The value of transfers of sawn timber to the box-factory and to capital and maintenance works in connection with the plant was	89,325	
256,528			262,067	
8,173 (increase)		During the year stocks of sawn timber on hand were reduced to the extent of	8,787	
	264,701	The total income derived from sawn timber produced during the year was therefore		253,280
		Expenses		
109,753		The cost of logs sawn during the year was	94,011	
57,660		Wages and salaries and allowances for compensation and holiday pay totalled	58,621	
78,059		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	79,821	
	245,472	The total expenses incurred in production were		232,453
	£19,229	Deducting the expenses from the income gives a net profit for the year of		£20,827

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

KAINGAROA SAWMILL OPERATING ACCOUNT

£	£	*Income*	£	£
46,024		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 ..	44,668	
7,044		The value of sawn timber transferred for use in other sections of the plant was	18,646	
53,068			63,314	
1,939 (increase)		During the year stocks of sawn timber on hand were reduced to the extent of	4,317	
	55,007	The total income derived from sawn timber produced during the year was therefore		58,997
		Expenses		
24,976		The cost of logs sawn during the year was	25,605	
11,678		Wages and salaries, bonus payments, and allowances for compensation and holiday pay totalled	14,454	
14,769		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	13,392	
	51,423	The total expenses incurred in production were		53,451
	£3,584	Deducting the expenses from the income gives a net profit for the year of		£5,546

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, 1950 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)—*continued*

WAIPA BOX-FACTORY OPERATING ACCOUNT

1948—49.			1949—50.	
£	£		£	£
		Income		
171,138		The net receipts from sales of box-shook for the year after allowing for selling and transport expenses were.. ..	152,599	
1,183		Transfers of processed timber for use in capital and maintenance work, &c., were valued at	935	
707	(reduction)	In addition to making the above sales and transfers the stocks on hand were increased by	481	
	171,614	The net income derived from production during the year was therefore		154,015
		Expenses		
109,774		The cost of sawn timber used in production was	95,740	
22,537		Wages and salaries and allowances for compensation and holiday pay totalled	22,006	
19,701		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	18,336	
	152,012	The total expenses incurred in production were		136,082
	£19,602	Deducting the expenses from the income gives a net profit for the year of		£17,933

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

WAIPA WOOD-PRESERVATION PLANT OPERATING ACCOUNT

£	£		£	£
		Income		
32,915		The net receipts from the sales of treated produce after allowing for transport and selling expenses totalled ..	51,869	
2,158		Transfers of treated produce were charged out at	3,152	
3,466	(reduction)	In addition to making the above sales and transfers the value of stocks of treated produce on hand was increased by	464	
	31,607	The net income attributable to treatment operations for the year was therefore		55,485
		Expenses		
7,876		The cost of untreated produce treated during the year was ..	16,465	
		To this must be added seasoning-yard costs, which were—		
3,542		Wages and salaries and allowances for compensation and holiday pay	4,633	
1,358		Other expenses, including maintenance and office and general expenses	1,619	
12,776		Thus the total cost of operating the seasoning-yard and providing seasoned produce for the treatment plant was ..	22,717	
		The expenses of operating the treatment plant were—		
2,146		Wages and salaries and allowances for compensation and holiday pay	2,715	
6,717		Creosote and other preservatives used	11,670	
5,855		Other expenses, including power and steam, maintenance, and office and general expenses	5,754	
	27,494	The total expenses for the year were therefore		42,856
	£4,113	Deducting the expenses from the income gives a net profit for the year's operations of		£12,629

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, 1950 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)—*continued*

PROFIT AND LOSS AND APPROPRIATION ACCOUNTS

1948–49. £	£		1949–50. £	£
		The net profits of the individual units as shown in the operating accounts above were—		
19,229		Waipa Sawmill	20,827	
3,584		Kaingaroa Sawmill	5,546	
19,602		Waipa Box-factory	17,933	
4,113		Waipa Wood-preservation Plant	12,629	
	46,528	This gives a profit over all for the year of		56,935
	19,265	Against this profit has been made a charge for interest on the capital employed in the undertaking of		23,569
	27,263	Leaving a net surplus for the year of		33,366
	77,673	The net profits brought forward from operations in previous years (after a total of £135,980 has been charged for interest) were		104,936
	£104,936	Thus giving a net profit since the inception of operations (after charging of £159,549 for interest) of		£138,302

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 with temporary overdraft accommodation as required, the appropriation of the overall profit for the year would have been—

£		£
13,534	Interest on loans	15,962
18,906	Income-tax	23,477
(5 per cent.) 14,088	Available for dividend .. .. (5 per cent.)	17,496
£46,528		£56,935

Many additions to assets made during 1949–50 and for previous years have not yet developed their maximum earning capacity.

APPENDIX XVII—*continued*

UTILIZATION BRANCH—ROTORUA CONSERVANCY: STATEMENT OF OPERATING ACCOUNTS FOR THE YEAR ENDED 31ST MARCH, 1950 (SHOWING ALSO FIGURES FOR THE PREVIOUS YEAR)—*continued*

BALANCE-SHEET AS AT 31ST MARCH, 1950.

31st March, 1949.				31st March, 1950.	
£	£			£	£
		Current assets were as follows—			
		Sundry debtors—			
70,811		Trading accounts		95,831	
19,858		Other departmental undertakings		29,314	
	90,669				125,145
		Stocks and stores on hand—			
2,498		Logs		1,890	
57,433		Sawn timber		44,328	
11,708		Box-shook		12,188	
3,892		Treated produce		4,356	
18,528		Untreated produce		26,704	
1,539		Creosote		5,599	
54,051		General stores		71,294	
	149,649				166,359
	240,318				291,504
		Current liabilities were—			
	40,802	Sundry creditors			53,665
	199,516	The working capital involved in the undertaking was therefore			237,839
£		The fixed assets were valued as follows—	£		
289,339		Plant at cost	356,299		
79,935		*Less* depreciation	98,473		
209,404			257,826		
18,506		*Less* reserves for abnormal depreciation and maintenance of general plant and for renewals and maintenance of motor-vehicles	17,128		
	190,898			240,698	
206,055		Buildings at cost	270,849		
28,926		*Less* depreciation	35,374		
	177,129			235,475	
17,701		Tools, furniture, fittings, &c.	20,583		
7,039		*Less* depreciation	8,039		
	10,662			12,544	
79,162		Other installations	103,680		
13,388		*Less* depreciation	16,600		
	65,774			87,080	
28,488		Other costs of establishment which were capitalized	28,488		
12,677		*Less* depreciation	14,287		
	15,811			14,201	
	460,274				589,998
	659,790				827,837
	18,569	Reserves which have been built up against the value of assets shown above in respect of possible losses by fire amount to			23,786
	£641,221	The net amount invested in the undertaking is therefore			£804,051
	£	The net amount invested as shown above has been provided—			£
	536,285	By interest-bearing advances of			665,749
	104,936	By accumulated profits as shown in the Appropriation Account			138,302
	£641,221				£804,051

GLOSSARY

1. Indigenous

(*a*) *Softwoods*—
Kahikatea or white-pine (*Podocarpus dacrydioides*).
Kauri (*Agathis australis*).
Matai (*Podocarpus spicatus*).
Miro (*Podocarpus ferrugineus*).
Rimu (*Dacrydium cupressinum*).
Totara (*Podocarpus totara* and *P. hallii*).

(*b*) *Hardwoods*—
Beech (*Nothofagus* spp.).
Black beech (*Nothofagus solanderi*).
Hard beech (*Nothofagus truncata*).
Black maire (*Olea cunninghamii*).
Rata (*Metrosideros* spp.).
Red beech (*Nothofagus fusca*).
Red manuka (*Leptospermum scoparium*).
Rewarewa (*Knightia excelsa*).
Silver beech (*Nothofagus menziesii*).
Taraire (*Beilschmiedia taraire*).
Tawa (*Beilschmiedia tawa*).
White manuka (*Leptospermum ericoides*).

2. Exotic

(*a*) *Softwoods*—
Corsican pine (*Pinus laricio*).
Cypress (*Cupressus* spp.).
Douglas fir or Oregon pine (*Pseudotsuga taxifolia*).
European larch (*Larix decidua*).
Insignis pine (*Pinus radiata*).
Japanese cedar (*Cryptomeria japonica*).
Loblolly pine (*Pinus taeda*).
Lodgepole pine (*Pinus murrayana*).
Macrocarpa (*Cupressus macrocarpa*).
Muricata pine (*Pinus muricata*).
Patula pine (*Pinus patula*).
Ponderosa pine (*Pinus ponderosa*).
Redwood (*Sequoia sempervirens*).
Strobus pine (*Pinus strobus*).
Western red cedar (*Thuya plicata*).

(*b*) *Hardwoods*—
Australian hardwoods, principally *Eucalyptus* spp.
Eucalyptus (*Eucalyptus* spp.).
Poplar (*Populus* spp.).
Teak (*Tectona grandis*).
Willow (*Salix* spp.).

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