1948

NEW ZEALAND

STATE FOREST SERVICE

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1948

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

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

5th August, 1948.

SIR,—

I have the honour to present herewith, pursuant to section 64 of the Forests Act, 1921–22, the annual report of the operations of the State Forest Service for the year ended 31st March, 1948.

In accordance with the undertaking given by all delegates to the Fifth British Empire Forestry Conference, attended in London during June and July of 1947, that they would bring its resolutions to the notice of their respective Governments, I have incorporated these resolutions in Chapter I, together with a short statement of the measures already initiated to give effect to the various recommendations of the Conference.

I have, &c.,

ALEX R. ENTRICAN,

Director of Forestry.

The Hon. the Commissioner of State Forests.

CONTENTS

	PAGE
Chapter I.—Forest Policy	3
Chapter II.—Administration	13
Chapter III.—Constitution of State Forests	17
Chapter IV.—Forest Management	17
Chapter V.—Silviculture	20
Chapter VI.—Forest Protection	24
Chapter VII.—Forest Engineering	31
Chapter VIII.—Extraction and Commercial Development	33
Chapter IX.—Timber Trade	37
Chapter X.—Forest Technology	41
Chapter XI.—Miscellaneous	53
Chapter XII.—Timber Control	57
Appendix I.—Area of State Forests as at 31st March, 1948	66
Appendix II.—Summary of Planting and Silvicultural Operations in State Forests as at 31st March, 1948	67
Appendix III.—Creosoted Forest Produce	68
Appendix IV.—Imports of Sawn Timber and other Forest Produce	68
Appendix V.—Exports of Sawn Timber and other Forest Produce	69
Appendix VI.—Payments and Receipts for Year ended 31st March, 1948	70
Appendix VII.—Sawmilling and Sash and Door Manufacturing 1946–47	71–73
Appendix VIII.—Sawmills registered under the Sawmill Registration Regulations 1942	75
Appendix IX.—Forest Offences, 1947–48	75
Appendix X.—Localities of Managed Forests	76
Appendix XI.—Training and Recruitment, 1947–48	77
Appendix XII.—Report of the Committee on Education	78
Glossary	80

REPORT

CHAPTER I.—FOREST POLICY

(Resolutions of the Fifth British Empire Forestry Conference and Reviews of Progress in New Zealand Forestry)

Resolution I: Forest Policy

1. The Conference reaffirms Resolution No. 1 of the First British Empire Forestry Conference (Great Britain, 1920), which sets out the fundamental principles of sound forest policy. It reads as follows:—

(*a*) *Forest Policy.*—In view of the great importance to the Empire as a whole, as well as to each of its component parts, of producing a sustained yield of all classes as timber, of encouraging the most economical utilization of timber and other forest products, and of maintaining and improving climatic conditions in the interests of agriculture and water-supply, each of the Governments of the Empire should lay down a definite forest policy to be administered by a properly constituted and adequate forest service.

> "*A definite forest policy was laid down by the first Director of Forestry, Mr. L. Macintosh Ellis, in 1920, and has been under more or less constant review ever since, a special introductory section of the annual report having been devoted to this subject since 1934.*"

(*b*) *Survey of Resources.*—The foundation of a stable forest policy for the Empire and for its component parts must be the collection, co-ordination, and dissemination of facts as to the existing state of the forests and the current and prospective demands on them.

> "*A national forest inventory was undertaken between 1920 and 1924, and a survey of current and prospective demands was presented in the annual report for the year ended 31st March, 1925. A recent check on prospective demand confirmed the validity of the original estimates.*"

(*c*) *Constitution and Status.*—In order to attain continuity in the development of forest resources it is desirable that certain elements of stability be secured in the constitution of the forest policy. This may be done by the following measures:—

(1) The definition (where this has not been done already) of forest policy in a Forestry Act or Ordinance.

> "*The passing during 1947 of the fifth series of amendments to the principal Act, the Forests Act, 1921–22, indicates that legislation has been under constant review, but the time has now arrived when both consolidation and strengthening are necessary, and this work is already in hand.*"

(2) The reservation for the purpose of economic management and development of forest land under conditions which prevent the alienation of any which is primarily suitable for forest except for reasons consistent with the maintenance of the forest policy as a whole.

> "*This objective was achieved in the Forests Act, 1921–22, and over 6,000,000 acres of permanent State Forest have already been so reserved.*"

(3) The assurance to the forest authority of funds sufficient to carry out the accepted policy for a series of years.

"*Adequate funds for most purposes have been made available by all Governments since the inception of the Forest Service in 1920. The one regrettable exception was the curtailment of technical staff, and non-recruitment of any staff over the depression years. This created a gap in the cadre of all staff divisions, which has had an adverse and far-reaching effect upon the subsequent efficiency of the Forest Service. The initiation of an active recruitment and training scheme in 1939 and its ever-increasing intensification is correcting the position as rapidly as practicable.*"

(4) The grant to members of the forestry services of the status of civil servants with due provision for pension.

"*This objective was attained by the Forest Act, 1921–22.*"

(5) The appointment as the chief officers of the forestry service of persons having a high standard of training in forestry, their selection and promotion being by merit alone.

"*The appointment of persons having a high standard of training in forestry as chief officers, implying as it does University forestry qualifications, although endorsed in principle by all Governments, has not been continuously followed, due solely to the shortage of technical staff with adequate administrative ability. Such a shortage may occur at any time in spite of active recruitment and training of technical staff, and it is proposed to safeguard this possibility by providing in the contemplated legislation that either the Director or his deputy, and in each forest conservation region either the Conservator or his deputy, shall be a technically qualified forest officer from the Professional Division. The alternate positions shall be open to officers of the General and Clerical as well as the Professional Divisions, thus ensuring the best administrative talent from all three divisions. As a result of the current recruitment and training of technical officers, this proposal should, however, be capable of early implementation, at least in part. On the other hand, the selection and promotion of all officers by merit alone has been consistently followed, ensuring to all Governments the best possible forest administration from the staff available.*"

(6) The establishment in each of the larger parts of the Empire and for the colonies not possessing responsible government collectively of an officer or officers having special duties of advising as to forest policy and surveying its execution.

"*This applies not to New Zealand, but to such units as Canada and Australia.*"

The Conference draws the attention of Governments of the Commonwealth to the fact that the above statement has been critically examined by successive Empire Forestry Conferences and the soundness of the principles enunciated has remained unquestioned. These principles, however, had not been applied in all parts of the Commonwealth at the beginning of the world economic depression, which affected forestry severely. The advent of war caused further widespread dislocations and largely prevented normal progress towards sound management of the Commonwealth's forest resources. The present world shortages of forest products, particularly saw timber, impose demands for critical examination of forest policies by all member Governments. The Conference, while stressing the necessity of maintaining the concept of sustained yield, realizes that

normally allowable current cutting quotas may have to be increased to meet emergency conditions. Temporary excess fellings should, however, be part of over-all plans which will make adequate provision for compensatory measures to restore growing stock and maintain productive capacity of Commonwealth forests.

"*The indigenous forests have been, and must continue to be for the next twenty years, overcut, but the enormous exotic establishment programme initiated in 1925 has already reduced overcutting by almost 100,000,000 board feet annually, and by 1965 should have reduced the overcut to negligible proportions.*"

Resolution II: Land Use

2. The Conference approves the report of the Land Use Committee and calls the attention of the Governments of the Commonwealth to the recommendations contained therein, and particularly to the following:—

(1) That there is urgent need for clear-cut planning based on the allocation of each type of land to the purpose for which it is best suited in the long-term interests of the national economy. Individual Governments should enact legislation, where it does not already exist, for the establishment of a supreme land use authority, having adequate forest representation, with directive at the highest level, and with the power and funds necessary to implement an approved land planning policy, based on suitable land use surveys and supported by vigorous educational campaigns.

"*This objective has been largely achieved by the Soil Conservation and Rivers Control Act, 1941, which is an Act making provision for the conservation of soil resources and for the prevention of damage by erosion. An inter-departmental committee consisting of representatives of the Department of Agriculture, Lands and Survey Department, Soil Survey Branch of the Department of Scientific and Industrial Research, and of the Forest Service determines the suitability of land for forestry purposes, and likewise excludes from forest reservation all land suitable for farming purposes. The Soil Conservation and Rivers Control Council maintains a vigorous educational campaign.*"

(2) That further research into problems of land utilization and conservation and restoration of the soil should be carried out, and that adequate funds should be made available for this purpose.

"*Extensive research is being carried out by the Soil Conservation and Rivers Control Council in co-operation with all Departments interested in land use.*"

(3) That Governments should take early steps to ensure that private or commercially owned forests and woodlands are managed in accordance with the principles of sound forestry.

"*As mentioned in last year's annual report, existing forest legislation needs to be strengthened in order to provide for this objective, and provision is accordingly being recommended when existing statutes are consolidated.*"

(4) That, in some countries of the Commonwealth, the encouragement of the practice of sound forestry on private or on leased Crown lands will require adjustment of the incidence of taxation and conditions of tenure.

"*A specialist officer, Mr. M. B. Grainger, B.Com., has recently visited Great Britain and Northern Europe in order to study forest taxation. The results of his investigations will be used by the Government as a basis for the re-examination of taxation of private forestry operations.*"

RESOLUTION III: SURVEY OF RESOURCES

3. The Conference adopts the report of the Committee on Survey of Resources and calls the attention of the Governments of the Commonwealth to the recommendations made therein, particularly to the following:—

"In view of the advanced technique developed by the Forest Service, New Zealand was given the honour of Chairing this Committee, sharing credit with Canada for having already initiated a national forest stocktaking to acceptable modern standards."

(1) That a preliminary survey of forest resources be undertaken or continued by all members of the Commonwealth, to be completed by December, 1957, full advantage being taken of recent developments in aerial survey technique, and of all information available from military and civil authorities or organizations.

"A national forest survey commenced in 1945 has already covered over 1,100,000 acres. By the use of aerial photography and co-ordinated ground studies it will be possible, with the aid of modern statistical methods, to achieve the objective of completing much more than a preliminary survey by 1957. It will provide both the basis of New Zealand's timber use economy for the next fifty years and much of the ecological information essential to the formulation of a management policy which will have reference not merely to fifty but to five hundred years ahead."

(2) That His Majesty's Government in the United Kingdom of Great Britain and Northern Ireland set up a Technical Committee on Aerial Survey of Forests, to provide guidance and advice on technique and to disseminate information on improved methods; such Committee to include members appointed from forest authorities of the Commonwealth.

"This Technical Committee is now in process of formation, and Mr. A. P. Thomson, B.Sc.For., who has initiated and supervised the national forest survey, will represent New Zealand."

(3) That the topographical survey of the colonial territories be accelerated to ensure completion of forest areas by 1955, and that forest authorities participate in such survey through allocation of specially recruited and trained personnel.

"New Zealand has already indicated its willingness to assist Colonial territories in the South Pacific in the attainment of this objective by training of subordinate staff."

RESOLUTION IV: FOREST MANAGEMENT, SILVICULTURE, AND PROTECTION

4. The Conference approves the report of the Committee on Forest Management, Silviculture, and Protection, and asks the Governments of the Commonwealth to give serious consideration to the following points:—

(1) That all forest areas should be managed under working plans approved by the highest competent authority, with adequate safeguards against unnecessary deviations.

"The Forest Act, 1921–22, provides that the Director of Forestry shall from time to time prepare working plans for each State forest, which, when approved by the Minister, shall not be altered save by the Minister on the recommendation of the Director. Due to the paucity of technical staff, however, relatively few working plans have been prepared, but in accordance with the Conference Committee's report on forest management, silviculture, and protection, instructions have been issued to prepare a very simple type of plan which can be applied within a reasonably short period to all the more important State forests. The practicability

also of substituting the more modern type of working plan exemplified by current Swedish practice for the older and more voluminous type of European working plan is under investigation. A preliminary study of the Swedish working-plan system during a 1947 tour of that country indicates that it has a strong practical bias as compared with the more academic systems in use in the British Commonwealth."

(2) That, as the long-term element is basic to proper forest management, forest authorities must be assured of continuity in the provision of adequate finance.

"*Whilst the establishment of a long-term forest fund is desirable in principle, it has not been found generally necessary, but, in view of the previous curtailment of technical activities during the depression period, consideration will be given in the consolidation proposals for forest legislation to the provision of such a fund to ensure continuity of essential technical and research work.*"

(3) That a comprehensive programme of research is a necessary corollary to efficient forest management. Special attention is directed to the importance in afforestation of further studies in soils, ecology, genetics, nutrition, and growing space.

"*The establishment of the Forest Experiment Station at Whakarewarewa State Forest at Rotorua forms the first step in the attainment of this objective. Recent staff accessions of technically trained officers from overseas will ensure a comprehensive research programme, and soil, ecological, genetical, nutritional, and espacement studies are already in progress.*"

(4) That the importance of protection of forests cannot be over-emphasized; that adequate legislation and efficient control services are essential; and that these must be supplemented by research in fire-control methods and appliances, and by studies of preventive measures against insect and disease carried out by specially trained personnel.

"*The Forest and Rural Fires Act, 1947, sponsored by the Forest Service as a result of the disastrous Taupo fires of 1946, ensures a means of adequately protecting both forest and rural lands throughout all seasons of the year. Supplementary protection is also provided through the operations of the Soil Conservation and Rivers Control Act, 1941. The Forest Service already operates fire-prevention systems using the most modern detection, communication, and fire-fighting equipment. Modern fire lookouts, aerial patrols, mobile radio installations, and highly efficient fire-fighting machines are in general use, and already, as a result of continuous research, well-equipped fire-hazard stations have succeeded in accurately determining periods of exceptional danger and in economizing the use of personnel and equipment in providing adequate protection.*

"*Preventive measures against insect and fungal attack were studied by the Forest Entomologist in Europe and North America at the conclusion of his war service, and are being further examined by the Forest Experiment Station.*"

(5) That, in many parts of the Commonwealth, both protection of existing forests and the afforestation of degraded lands demand control of shifting cultivation and limitation of the incidence and extent of grazing.

"*The shifting cultivation referred to in the resolution is unknown in New Zealand, but the incidence and extent of grazing is a vital problem in the Dominion. It is already under investigation in co-operation with other Departments as part of the research programme of the Soil Conservation and Rivers Control Council. Limitation of grazing has already been demonstrated to effect a marked improvement in the management of tussock lands.*"

Resolution V: Forest Products Research

5. The Conference adopts the report of the Committee on Forest Products Research and calls the attention of the Governments of the Commonwealth to the recommendations contained therein, particularly to the following:—

(1) That a standing Forest Products Committee, as proposed by the 1935 Conference, be set up, whose functions shall include yet closer co-ordination with forestry, co-operation in extra-national investigations, and promotion of uniformity in research methods.

"*This Committee has already been set up and the Director of Forestry nominated as the New Zealand member. Ever since the inception of the Forest Service uniformity in research methods has been closely followed by co-operation with the forest products laboratories of Great Britain, Canada, Australia, South Africa, and the United States of America.*"

(2) That corresponding Committees should be set up for the purpose of interchange and collation of information on specific research programmes, and to co-ordinate subsequent action thereon.

"*Three corresponding Committees have been set up. Mr. J. S. Reid, M.Sc., has been appointed to the Committees on Timber Mechanics and Composite Wood, and Mr. D. R. Carr, B.Sc., has been appointed to the Committee on Wood Preservation.*"

(3) That co-ordination of research between the forest products laboratories of the Commonwealth requires meetings of specialist officers from time to time, and that these meetings should be supplemented by such staff visits to other laboratories and forestry centres as may be possible to arrange.

"*A meeting of timber-testing officers has been called at Ottawa for 27th September to 11th October, which it is hoped will be attended by Mr. J. S. Reid, M.Sc.*"

(4) That the importance of economic consideration in forest products laboratory programmes requires for some laboratories the appointment of officers specially trained in economics.

"*Two officers specially trained in economics have been assigned, over many years, to part-time work on forest products investigations, and their work has proved the fundamental basis for the expansion of production already achieved and elsewhere referred to in this report.*"

(5) That provision should be made for the appointment of trained utilization officers to those colonial Forest Departments where experimental stations do not exist.

"*Although the resolution is inapplicable to New Zealand, the Forest Service has given assistance for many years in the solution of utilization problems in colonial territories in the South Pacific. References to such work have been recorded from time to time in the annual reports of the Forest Service.*"

Resolution VI: Timber Supplies and Marketing

6. The Conference adopts the report of the Committee on Timber Supplies and Marketing. It is satisfied that there will be a shortage of forest products, particularly saw timber, for an indeterminate period and certainly until the devastation caused by

the war has been repaired. The Conference directs the attention of the Governments of the Commonwealth to the Committee's recommendations, and notably to the following :—

(1) That a considerable all-round and immediate effort in timber production by all members of the Commonwealth is necessary if the Commonwealth is to play its part in restoring the general level of internal and world prosperity.

"*As a result of measures initiated in 1944, a considerable expansion in timber production has already been achieved, current production now running at over 30 per cent. above the pre-war cut. A target production of 480,000,000 board feet has been set for 1955, as compared with the pre-war level of approximately 320,000,000 board feet.*"

(2) That regulated overcutting during the emergency period is necessary and justified, but demands that Governments of the Commonwealth shall pay adequate attention to forest protection and later correction of the overcut by working plan revisions.

"*As discussed later in this report, planned overcutting is necessary not only during the present emergency, but for a period of twenty years, at the conclusion of which it is hoped that silvicultural practices will have been developed to increase the yield of the indigenous forests. A high degree of protection to the indigenous forests has already achieved significant results in conserving existing supplies. The working plans referred to under Resolution IV are being shaped to achieve the concept of sustained yield for the entire Dominion.*"

(3) That priority in allocation of logs should go to production of saw timber, poles, props, and plywood ; and every effort should be made to service other forest products industries with smaller-sized material and utilizable waste. Further research to this end by forest products laboratories is an urgent requirement.

"*Priority allocation of logs for saw-timber production has long been a prominent policy objective of the Forest Service, emphasis thereon having been made in its annual reports from time to time. Similarly, a priority allocation has been accorded the plywood industry from the time of its expansion during the war period. The production of poles and sleepers has likewise been given a high priority, though the resources available are extremely limited. In the development of the pulp and paper industry the policy objective has been to allocate small-size material, in the form of both thinnings and top logs, together with slab waste from sawmills.*

"*Much research has already been carried out by the Products Section of the Forest Experiment Station, and is being continued. The fibre-board products now being manufactured by one company are being produced almost wholly from slab wood, and the paper-board products manufactured by another company have been produced both from thinnings and from logs too small for sawing.*"

(4) That attention should be paid to the possible increase in use of timber derived from tree species now considered of secondary importance, both for the purpose of alleviating current shortages and to provide for more economic working of mixed forests.

"*Continuous research into the use of secondary timbers has already secured significant results. Numerous timbers, such as the various beeches, tawa, taraire, &c., are now being used on a commercial scale. With proper drying and preservative treatment, many of these timbers will find a much wider field of use.*"

(5) That a better understanding between producers and consumers and a revision of specifications would lead to closer utilization. This could be facilitated by personal contacts and through visits and inspections.

"*A better understanding between producers and consumers has already been effected by the Standards Institute, which is continually revising and issuing new specifications, leading to better and closer utilization of both indigenous and exotic timbers. Forest Service officers maintain continuous personal contacts with both producers and consumers through visits and inspections.*"

RESOLUTION VII: EDUCATION

7. The Conference adopts the report of the Committee on Education and calls the attention of the Governments of the Commonwealth to the recommendations contained therein, and particularly to the following:—

"*In view of the importance attached by the Forest Service to its current training proposals, the report of the Committee on Education is reprinted as Appendix XII to the report.*"

(1) That the provision of adequately trained personnel both in the professional and sub-professional grades is essential to proper forestry.

"*The Forest Service now has under consideration by the Senate of the University of New Zealand a comprehensive scheme for the training of both professional and sub-professional staff at the Rotorua Training Centre. Courses for the training of sub-professional grades have been provided at this centre since 1944. Without these facilities it would have been impossible for the Service to function effectively.*"

(2) That forestry schools should be created or maintained only under conditions providing the full-time services of an adequate staff with field experience. Professional schools should concentrate on basic principles as a foundation for practical experience. Research by teaching staff and post-graduate students should be facilitated.

"*This objective can only be attained if effect is given to the Forest Service proposal to establish a Graduate Forestry School for instructing B.Sc. graduates in professional forestry subjects at the Rotorua Training Centre, where, by combining the teaching staff for professional grades with that for sub-professional grades and supplementing these with the research staff of the Forest Experiment Station, it will be possible to provide the full-time services of an adequate staff with field experience. The alternative of an undergraduate professional course at any of the University colleges would be both uneconomic and unsuitable, uneconomic because an adequate staff could not be justified by the small number of graduate officers (8) required annually to meet both State and private requirements, and unsuitable because the standard of tuition in pure science and forestry subjects would be far too low, because the course would lack an essential forestry background, and because it would be divorced from adequate research facilities, which obviously require a forestry environment. Only on account of the much larger number of sub-professional officers (50) being trained annually at the Rotorua Training Centre is it practicable to justify higher forestry education in New Zealand through integration with the Forest Experiment Station.*"

(3) That, inasmuch as exploiting agencies are an integral part of planned management, provision should be made for sub-professional grade training of personnel necessary to enable such agencies to co-operate fully with the forestry services.

"*With the establishment of the Rotorua Training Centre in 1944, provision was envisaged for the introduction of trade training to cover timber measuring, timber grading, and kiln drying, and appropriate courses will be organized as soon as suitable staff is available.*"

(4) That, in many parts of the Commonwealth, recruitment of an adequate trained staff requires pre-selection of forest officer candidates in advance of completion of professional training. In such cases cadet training in the field is an invaluable guide to selection.

"*Field training of candidates for appointment has been carried on for many years and has already proved its value in the selection of technical trainees and forest officers.*"

(5) That qualifying courses on a scholarship basis should be provided for the promotion of outstanding men from sub-professional to professional grades.

"*Some such men are already being assisted by rehabilitation scholarships, whilst others are assisted by being appointed to departmental offices in University centres and by being afforded facilities to attend University lectures.*"

Resolution VIII: Imperial Forestry Institute

8. This Conference recommends that further support should be given by Governments of the Commonwealth to the Imperial Forestry Institute to enable it to carry out more fully the purpose for which it was founded—*i.e.*, to form a centre of higher studies and research in forestry. The provision of scholarships for post-graduate work at the Institute and of facilities for travel and study in Commonwealth countries by members of the Institute staff are suggested as forms such support could most usefully take. The Conference considers that the Institute is well staffed and equipped for training forest officers and for supervising research work in forestry subjects, and it recommends that greater use should be made by Commonwealth foresters of the facilities provided for special study and tours.

"*Following the Conference in July, 1947, arrangements were made for one of the departmental officers, who was awarded a rehabilitation bursary to study forest taxation in Europe, to use the facilities of the Institute. These were found to be extremely helpful, and greater use should be made of these in the future.*"

The Conference notes with satisfaction that the Institute will shortly have a more adequate building and considers it is especially appropriate that it should be well furnished in Commonwealth timbers. The Conference accordingly recommends to Commonwealth Governments that they should help with contributions of suitable material.

"*The New Zealand Government has agreed to supply a small shipment of rimu for flooring and finishing one of the rooms in the new Institute.*"

Resolution IX: Imperial Forestry Bureau

9. The Conference records its appreciation of the work of the Imperial Forestry Bureau, and particularly of the publication *Forestry Abstracts*, which most efficiently provides a valuable means of keeping foresters up to date in the literature of their profession. It notes with approval the expansion in cover of forest products and utilization.

The Conference considers it desirable that the Bureau should continue to deal with both the management and utilization sides of forestry. *Forestry Abstracts* should cover both sides in a single publication; but the abstracts on forest products and utilization

should also continue to be issued separately. It recommends Commonwealth Governments to make *Forestry Abstracts* much more generally available to their forest officers by purchasing and distributing more copies.

> "*With the intensification of research work throughout the Dominion, arrangements have been made to purchase and distribute additional copies of* Forestry Abstracts."

The Conference would like the Bureau's *News Bulletin* to be continued, and is further of opinion that a translation service would form a valuable addition to the activities of the Bureau.

> "*New Zealand first made contributions to the* News Bulletin *in 1946, and agrees that a translation service would be valuable in connection with its research activities.*"

Resolution X: Empire Forestry Association

10. The Conference thanks the Empire Forestry Association for the very useful work it is doing—

(1) In promoting greater interest in forestry throughout the Empire.

(2) In assisting the development of a forest sense in the general public, through its *Review* and other publications.

(3) In undertaking the preparation of an Empire Forestry Terminology.

The Conference urges foresters, the timber trade, and the general public to give ever increasing support to the Association to enable it to extend its activities.

> "*Twenty-nine officers of the Forest Service support the Empire Forestry Association. The local secretary is Mr A. C. Forbes, B.Sc.For., Forest Experiment Station, State Forest Service, Whakarewarewa, who will be pleased to answer inquiries from the trade and the general public regarding membership.*"

Resolution XI: Co-operation with the Food and Agriculture Organization of the United Nations

11. The Conference records its appreciation of the co-operation received from the Food and Agriculture Organization of the United Nations in sending forestry officers to attend certain Conference sessions and to explain the work of the FAO Forestry Division, in which Commonwealth forest authorities are closely interested. The Conference fully expects that the understandings reached will be of mutual advantage to Commonwealth countries and to FAO.

> "*The Forest Service furnishes statistical returns and reports as and when required by the FAO. Dr. M. A. Huberman, a representative of the Forestry Division of this organization, recently visited New Zealand in connection with a pending Pacific Forestry Conference in February, 1949.*"

Miscellaneous Resolutions

12. *Resolution XII: Name of Conference.*—The Conference, having considered the propriety of changing its name to accord with present-day usage, resolves to remit the question to its Standing Committee for further discussion with Governments, with the proviso that it prefers the name British Commonwealth Forestry Conference and proposes that, to preserve continuity, the next Conference be known as the Sixth Conference.

Resolution XIII: Next Conference.—The Conference records its appreciation of the informal invitation received from Canada to hold its next meeting in that country. However, the Conference recognizes that the advent of war prevented the present sessions from being held in India, and accedes to the request of the Indian delegates for an

opportunity to submit proposals to their Governments. The Conference therefore remits the question to its Standing Committee with instructions that a decision as to the location of the next Conference, which shall be held in 1952, shall be reached not later than August, 1949.

Resolution XIV : Vote of Thanks.—The Conference desires to express its high appreciation of the arrangements made by His Majesty's Government in the United Kingdom of Great Britain and Northern Ireland for the conduct of its work, and for the great hospitality that has been extended to delegates. In particular, the successful arrangement of the tours gave the delegates a clear impression of the many intricate problems of British forestry and the techniques developed to overcome them.

The New Zealand delegates to the Conference were—

Mr. A. R. Entrican, Director of Forestry.
Mr. A. D. McKinnon, Assistant Conservator of Forests.

The New Zealand papers presented to the Conference were—

"National Forest Survey in New Zealand" (A. P. Thomson).
"Seed, Seed Supplies, and Silviculture" (C. M. Smith).
"Exotic Forests of New Zealand" (F. W. Foster).
"The Adaptation of Scandinavian Sawing Practices to the Conversion of Exotic Softwoods in New Zealand" (W. C. Ward and J. W. Syme).
"Programme of Forest Products Research 1947–48" (J. S. Reid).

CHAPTER II.—ADMINISTRATION

13. *Permanent and Temporary Staff.*—Permanent, 600 (325); temporary, 59 (225); total, 659 (550). The total includes officers on leave without pay and with the Armed Forces. One officer now remains with the Armed Forces (J Force). The officers on leave without pay number 22, all except 1 being returned servicemen, and 10 are taking full-time study at Universities.

An analysis of the recruitment figures for the year shows new appointments at 211, but the net increase in staff was only 109. Although this is a common problem to-day, such loss of staff, fully or partly trained, is causing considerable administrative difficulties. The Forest Service has accepted as the only solution to the lack of fully trained staff a long-term policy of staff training, but a high turnover, particularly in the junior ranks, will unfortunately delay results.

During the year most of the officers previously on the temporary staff were transferred to the permanent staff in keeping with the policy of the Government. Some recruitments to the permanent staff, mainly for the utilization projects, have been made from the ranks of those previously employed as casual workmen; key men of these projects are now staff officers, and this policy of recruitment, which is showing satisfactory results, will be continued.

A further 21 technical trainees were recruited for development as future forest officers, but the expansion of the Forest Service, necessitating increased general field duties, made it necessary to also appoint 48 forest foremen mostly from the workmen ranks.

Some success has resulted from the campaign to secure qualified foresters from overseas, but officers selected have not been able to take their appointments in New Zealand until after the 31st March, 1948.

The first phase of the large programme for the reorganization of the Forest Service commenced last year is now complete.

14. *Casual Staff.*—Average for year, 1,675 (1,513). The number employed at 31st March, 1948, was 1,730—*i.e.*, 99 above the figure twelve months previously. Additions to and deletions from the numbers of casual staff are unduly high, and until the policy of creating permanent forest settlements at each forest is fully implemented, the attraction of seasonal work with higher earnings will be difficult to counter.

15. *Honorary Staff.*—By section 18 of the Statutes Amendment Act, 1947, which amends section 10 of the Forests Act, 1921–22, all existing appointments of honorary forest rangers lapsed on 31st March, 1948.

All new appointments made under this section will be made for a term not exceeding three years as the Minister thinks fit, and appointees shall hold office only in respect of an area to be determined by the Minister. The nature of the functions and duties may be defined by the Conservator of Forests for the conservancy concerned in each appointment.

No one appointed under this section shall be considered by virtue of such an appointment to be an employee of the Crown or an officer of the State Forest Service, and nothing in the Public Service Act, 1912, shall apply to any such appointment.

The power conferred on the Minister by section 10 of the principal Act, as amended by section 18 above, is extended to authorize the Minister to appoint persons who are not officers of the State Forest Service to act in a part-time capacity as honorary forest officers for particular purposes.

Their functions and duties shall be such as are from time to time determined by the Minister.

16. *Health of Staff.*—Office accommodation is an adverse factor as far as health of staff is concerned. The increase in staff over recent years has crowded out offices at almost every main centre to such an extent that employees cannot possibly function with maximum efficiency. Every effort is being made to secure better accommodation, either by temporary buildings or new allocations of space, in order to relieve the congestion.

Shortage of field officers on exotic forests continues to preclude the granting of leave facilities at the best times of the year and demands correction as rapidly as practicable. A similar shortage of staff on indigenous cruising work continues to involve many officers in an excess of winter field work.

17. *Safety of Employees.*—Total accidents, 421 (382), made up as follows: cuts, 148 (96); strains, 85 (96); fractures, 18 (11); crushes and bruises, 83 (95); septic wounds, 36 (37); eye injuries, 17 (20); miscellaneous, 34 (27). No fatal accident occurred this year. The increase in accidents can be accounted for by the increased number of men employed during the year.

18. *Compensation to Employees:—*

Year.	Total Payments.	Total Wages.	Compensation per Centum of Wages (Approximately).
	£	£	£ s. d.
1946–47	8,708	497,615	1 15 0
1947–48	6,232	629,948	0 19 10

19. *Recruitment and Training Policy.*—Due emphasis was made in the last annual report to delayed staff reorganization and the post-war development of work on a divisional basis put into operation simultaneously with a vigorous staff recruitment and training policy. The initial implementation of the long-term staffing plan was not free from difficulties and even sacrifices of immediate administrative efficiency; current

technical developments demanded urgent measures to provide both professional and ranger staff to fill the many vacancies caused by lack of pre-war recruitment and accentuated by the unavoidable diversion of technical officers to administration positions. The recruitment and training of junior apprentice staff, however actively pursued, cannot serve immediate requirements, thus steps have had to be taken on the one hand to recruit trained forest officers and on the other hand to accelerate the training of officers with some Service experience to qualify them for higher responsibilities. During the past year nine overseas-trained professional officers have joined the staff; whilst, in addition, to much on-the-job training the Service has continued to provide at Rotorua a wide range of short instructional courses to all grades of officers, both clerical and field, the beneficial results of which from a long-term viewpoint far outweigh the administrative inconveniences and consequential interruptions of current activities the immediate effects of which are prone to draw criticisms on a short-term interpretation.

The number of young New Zealanders seeking a forestry career has shown no sign of decreasing, and it is anticipated that as evidence of career prospects accumulates a higher proportion of matriculated applicants will seek appointment, since it is from the latter source that the annual quota of professional students must be drawn.

First-hand overseas evidence accumulated during the past year has strengthened the conviction of the Forest Service that higher forestry education in New Zealand should be based on a graduate science prerequisite, both in recognition of a world trend towards a higher standard of forestry training and of the exceptionally complex problems presented by the indigenous forests.

The training of junior staff to forest-ranger standard is already achieving significant results, particularly amongst those ex-servicemen whose maturity has assisted their development; and the influence of a central educational institution at Rotorua providing close technical contact between professional and sub-professional grades in both the Clerical and General Divisions cannot be over-emphasized in achieving that long-term and worth-while objective—a well-balanced, adequate, and highly trained staff establishment.

20. *Recruitment.*—In addition to normal annual quota of technical trainees and clerical cadets, the past year has seen the recruitment of an appreciable number of professional officers.

The field trainee vacancies were keenly sought and 21 appointments were made; in the same period 17 clerical cadets, including 5 female, joined the Service. In November, 1946, vacancies in the Professional Division were advertised throughout the British Commonwealth, with the result that 9 forestry graduates from the forest services of Great Britain, Australia, India, and Burma were appointed during the year. This overseas recruitment has helped to counteract the effect of the prolonged absence of higher forestry education in New Zealand.

The general failure to recruit clerical cadets during the depression period and immediately thereafter is now having serious repercussions. The current shortage of fully trained clerical officers can only be remedied by recruitment from outside the Public Service, and progress is dependent upon special training facilities being made available, followed by accelerated promotion for the outstanding officers.

21. *Training.*—Of the 33 (34) technical trainees studying for science degrees, 10 are ex-servicemen on full-time rehabilitation bursaries. In addition to these trainee undergraduates, the Forest Service is interested in the progress of 5 (5) New Zealand ex-servicemen bursars who are taking forestry degrees in Britain and of 12 (14) rehabilitation bursars studying for science degrees in New Zealand with forestry careers in view. Four of the United Kingdom group and 4 of the New Zealand group are expected to graduate in 1948 and seek appointments in this Service. All of the New

Zealand University group (12) were employed in forestry work during the long vacation. One officer graduated in forestry at Edinburgh and has returned to duty; while another is expected to graduate at Aberdeen during 1948.

Technical trainees (non-professional) on field training now number 51 (65), the reduction in total from last year being caused by the promotion of 5 senior trainees to forest-ranger status and by resignations and transfers. The trainee grading system is proving most valuable in the assessment of progress and of qualification for promoton. During the year two qualifying courses were held for junior and intermediate grade trainees respectively, and a two-weeks induction course for all newly appointed trainees. The number of senior trainees now stands at 11 (7), several of whom are eligible for further promotion.

The Rotorua Forest Training Centre again provided courses of instruction continuously throughout the year, the courses being for timber measurers, junior field officers, senior trainees, forest survey party leaders, senior officers, timber sales clerks, and junior trainees. An important development at the centre was the appointment of a graduate forester as Officer in Charge.

The Tapanui Forest Vocational School continued to train forest foremen, technical trainees, and potential leading hands, the knowledge gained at this school being unquestionably of marked cumulative benefit to the Service. Five courses attended by a total of 90 men were held. A two-weeks course attended by 8 trainees was held in Auckland for instruction in the inspection of Australian hardwood shipments for termite infestation, combined with general forest entomology.

Particulars of courses are shown in Appendix XI.

22. *Examinations.*—Three technical trainees completed the B.Sc. degree during the year and one completed a forestry degree at Edinburgh University. Three clerical officers passed the Accountants Professional Examination, one completed the B.Com. degree, and one the B.A. degree.

23. *Allocation of Duties.*—The organization of the divisions at Head Office is proceeding quite satisfactorily and key staff are being developed. The principle of providing an understudy for every key officer is being consistently applied as suitable staff becomes available.

24. *Field and Office Inspections.*—In addition to attention by the Chief Inspector and the Office Inspector, divisional controlling officers and section officers have made visits to conservancies on special problems, thus improving the general departmental administration.

Two specialist supervising officers, one for logging and one for the check appraisal of timber, were appointed.

25. *Conservancy Organization.*—District charge officers were appointed during the year as part of the general reorganization of the Service. Visits to districts by senior conservancy officers as well as by Head Office staff have been a regular feature.

26. *Inter-departmental Co-operation.*—The implementing of the expanding programme of works now being undertaken has been facilitated by the helpful action of other Departments affected in this connection. The Forest Service greatly appreciates the services and assistance given by these Departments during the past year.

Close co-operation of other Departments assisted in the framing of the proposals for the Forest and Rural Fires Act, 1947, particularly the Internal Affairs Department, Lands and Survey Department, and the Soil Conservation and Rivers Control Council, the latter body also being directly associated in mutual problems of forest protection for soil conservation.

CHAPTER III.—CONSTITUTION OF STATE FORESTS

27. *Changes in Area and Status.*—As a result of the continuation of land reclassification throughout the Dominion, 63,388 acres were set apart as permanent or provisional State forest and 3,451 acres were withdrawn from State forest reservation during the year, a net increase of 59,937 acres. The area under State forest reservation now totals 9,227,545 acres, representing 13·9 per cent. of the total land area of the Dominion. Of this total, 6,262,276 acres are permanently reserved, comprising 67·86 per cent. of the total State forest area.

Areas of provisional State forest totalling 10,234 acres were permanently reserved as State forest. The areas withdrawn from State forest reservation comprised 2,925 acres for vesting in the Nelson City Corporation for water-supply purposes, 384 acres for settlement, and 142 acres for scenic reserve.

CHAPTER IV.—FOREST MANAGEMENT

28. *Surveys.*—Boundary surveys of 198 areas totalling 18,828 acres were carried out by conservancy staffs in connection with timber appraisals; and timber reconnaissance surveys of 9 areas covered 5,458 acres. Topographical surveys of exotic forests were made covering 99 acres, and forest-type surveys, 231 acres. Topographical surveys for the purpose of industrial, village, and housing sites covered 583 acres.

A total of 3,196 plots representing 849,000 acres (300,000) of forested country were surveyed for the purposes of the national forest survey by the Forest Experiment Station.

29. *Mapping.*—During the year, the conservancy and head office survey draughting staffs were increased by the addition of several junior draughtsmen and draughting cadets, and it is hoped to subsequently build up a staff adequate to carry out the mapping requirements for the expanded programme of the Forest Service. In connection with current operations, 2 stock maps were redrawn and 26 copies of stock maps prepared, 24 forest atlas sheets were renewed, and 55 new plans recorded.

The library of aerial photographs was enlarged during the year by the addition of 3,666 prints and 7 mosaics, and now contains a total of 9,860 photographs and 56 mosaics. Twelve mosaic copies were obtained for the use of the conservancy offices.

The work of delineating forest-type boundaries on aerial photographs for the national forest survey has been continued by the Forest Experiment Station. A total of 2,859 aerial photographs was received during the year, making a total of 6,629 held by the Station, these being included in the total mentioned above. The work of compiling the forest-type maps is being undertaken by the Aerial Mapping Branch of the Lands and Survey Department, but only 3 maps have been completed to date.

30. *Forest Mensuration.*—The following table shows the number of areas and the quantity of timber cruised by conservancy staffs in connection with appraisals for the sale of milling timber:—

Tenure.	1946–47.		1947–48.	
	Number.	Quantity.	Number.	Quantity.
		Bd. ft.		Bd. ft.
State forest	129	116,697,000	160	121,532,000
Maori-owned forests ..	22	43,567,000	24	54,239,000
Other	19	7,756,000	14	6,295,000
Totals	170	168,020,000	198	182,066,000

The quantity cruised during the year—182,066,000 board feet—is the greatest in any twelve months since the Forest Service undertook these duties. Of the total amount involved, 26,512,000 board feet (11,407,000) were cruised by the sample method, and, where possible, the use of this method will be increased. For the approximate estimation of timber stands, 9 (10) reconnaissances were made covering 5,458 acres (14,495) and disclosing estimated stands of 54,641,000 board feet (107,943,000). The appointment of a full-time check appraisal officer has enabled the checking of appraisal work to be carried on throughout New Zealand; 23 such checks were made, in addition to 14 checks carried out by conservators' staffs.

A total of 3,196 plots were measured by the Forest Experiment Station for national forest survey purposes, representing 849,000 acres (300,000), and computations up to the volume-per-acre stage have kept pace with the field work.

The Forest Experiment Station has prepared and issued local tree volume tables for insignis pine, Douglas fir, and rimu; local log volume tables for insignis pine; and a standard tree volume table for tawa (also applicable to secondary hardwood species). Considerable work has been done on testing the accuracy of existing standard rimu volume tables. Work has been commenced on the preparation of an empirical yield table for insignis pine and on the collection of data for normal yield tables for the major exotic species. The standard method of assessment of exotic forest stands has been the subject of field tests, and statistical analyses have been carried out with a view to their improvement.

31. *Management Policy.*—The annual report of 1946 referred, in the chapter on forest policy, to "the national forestry objective of transferring the emphasis on timber production from the indigenous to the exotic forests."

A temporary increase in indigenous-timber production in 1947–48—an increase that will probably be sustained over a second yearly period—brings sharply into focus the strong advisability of firmly implementing without further delay this policy of husbanding our remaining indigenous timber resources. Therefore, it is proposed to take active measures to this end respecting certain State forests in the North Island in the main.

Comparing the last three years, 1946 to 1948, with the three pre-war years, 1937 to 1939, total timber production in the North Island has increased by about one-third. Although indigenous-timber production has diminished from 89 per cent. to 69 per cent. of total production, the actual production in board feet has remained the same. In other words, it is only relatively, and not absolutely, that the exotic timbers are taking more of the load from the indigenous timbers.

In the three years immediately preceding the war period, exotic timbers could have borne the full production load in one year out of every ten; at the present time they can do this in one year out of three. The life of the remaining indigenous resources has thereby been materially lengthened, but the exotic timbers should be taking an even greater share of the load and, inversely, should be enabling the indigenous resources to be reserved to a much greater extent for future cutting. The lower the annual cut of indigenous timbers, the larger will be the remaining resources, and consequently the longer will these resources be available for cutting.

The indigenous timbers in question are rimu, miro, matai, totara, and other species comprising the "mixed bush" of the North Island. Kauri cutting has been controlled under forest working plans since the year 1941 and it is anticipated that a small sustained yield of that species will be available in perpetuity.

The main reason for reducing the annual production of the podocarp timbers such as rimu, &c., are as follows. Firstly, to ensure that when the national forest survey and investigations into the ecology, silviculture, and management of the mixed rain-forest stands have been completed there will still be in existence sufficient State forest

resources in these stands to justify their management on orthodox forestry principles. Secondly, both the low-rotation or maturity age and the high-increment or growth rate of the exotic species present much more scope for forest management than in the case of the long-rotation and slow-growing podocarps. Thirdly, replacing cut-over podocarp stands with an adequate per-acre stocking presents much greater difficulty and will take a longer period than in the case of exotic stands. Fourthly, logging in indigenous State forests has been moving into more remote steeper areas, particularly in the pumice lands of the central North Island region, and the problem of soil and water conservation requires to be kept under constant review: indeed, a number of applications for timber-cutting rights in such areas has already been refused for this reason. Fifthly, the Empire Forestry Conference of 1947, mindful of the enormous post-war demands for timber, recommended that, if feasible, overcutting of the annual increment should be allowed for the following five years, provided that compensatory reductions in cut should later be made. For the second, third, and fourth reasons alone, such overcutting should be made in exotic, rather than in the once over-abundant but now fast disappearing indigenous, forests. Sixthly, exotic timbers are intrinsically suitable for a number of important uses which are customarily made of indigenous timbers. Seventhly, the Forest Service has always keenly realized the danger in placing complete or main reliance upon exotic forests, prone as they are to damage or destruction by insect and fungus epidemics and other hazards, and that the only sound long-term policy must provide for as large a proportion as is possible of indigenous forests.

It has therefore been decided to reserve the timber on certain areas of indigenous State forest under forest working plans pursuant to the Forests Act, and such areas will be reserved from cutting for the next five or, in some cases, ten years. During the intervening period the national forest survey of indigenous timber resources will have been completed. Silvicultural investigations, including experimental felling operations and possibly requiring longer than ten years to complete, will in time increase our knowledge towards the stage at which cutting under strict silvicultural rules involving close supervision of felling will be permissible.

The fundamental concept is wise land use, by reserving for future use the crop most suited to the lands in question and the subsequent replacement of that crop on an adequate scale. In other words, it is proposed to diminish the tempo of further inroads into forest capital, thus reserving this capital until we have amassed sufficient knowledge to enable us to preserve the capital intact and use the income alone.

Late in the year the management staff was augmented by the appointment of 7 overseas forestry graduates; 2 senior officers, however, were promoted to administrative positions, where less time is available for technical duties. At the end of the year the forest management staff consisted of 15 professional officers, including 4 senior officers occupying administrative positions. The new foresters, who have been occupied on more general duties, have not as yet had sufficient time to settle down to New Zealand conditions and strengthen the position of forest management, but it is expected that next year the arrears in assessment work and management records will be appreciably reduced and new forest working plans completed. In the Rotorua Conservancy, officers and men usually employed on assessment work were detailed for a considerable period to assist the Forest Experiment Station on urgent mensuration studies.

32. *Forest Working Plans.*—The working plan for Whakarewarewa Forest was approved by the Commissioner of State Forests during the year, and the first revision of the plans for the kauri working circle and Dusky Forest are now ready for approval. The first five-year revision plans for Hanmer and Whakarewarewa Forests are under preparation. Approval of the revision of the plan for the kauri working circle is delayed pending Parliament's decision on three petitions praying that the whole or the major part of the large Waipoua State Forest be set aside as a national park, but the programme

relating to the cutting of kauri on State forests other than Waipoua is being adhered to. Working plans are under compilation for Herekino, Omahuta, and Whirinaki (indigenous) Forests and Maramarua, Balmoral, Rotoehu, and Naseby (exotic) Forests.

In addition to reconnaissance and typing of indigenous bush areas by the national forest survey, assessments have continued in the exotic forests. Field work on 197 compartments covering 59,630 acres, necessitating the survey and cutting of 1,190 miles of assessment lines, was completed during the year; office computation covering this work is in hand. Volume tables were again used extensively to calculate quantities, but for some areas data from sample-tree measurements were used. At both Tairua and Balmoral, sample-tree measurements were taken for the construction of local volume tables for assessment work.

CHAPTER V.—SILVICULTURE

33. *General.*—Labour and accommodation shortages during the period retarded the progress of silvicultural work to a rate below that desired. The areas treated, however, were greater in extent this year on account of the engagement of immigrant labour, which augmented the local supply and proved generally satisfactory. The most important increases were recorded in the area of new land planted and the area high pruned. Details are shown in Appendix II.

34. *Natural Regeneration.*—Insignis pine regeneration continues to make progress on those areas clear-felled during the past years in the Rotorua district, and only in the case of small scattered areas was it found necessary to fill up blanks by artificial means. In those areas in Whakarewarewa Forest clear felled from 1940 onwards, thinning and low pruning of the naturally regenerated stands were carried out and tree stocking reduced to approximately 1,750 trees per acre. At Kaingaroa Forest, where clear felling of insignis pine commenced the previous year, natural regeneration is such as to assure complete restocking. In the Canterbury district, on those areas now cleared from the damage caused by the 1945 gale, insignis pine, lodgepole pine, and prickly-cone pine all show fair regeneration.

An unusually dry summer—the third in succession—in the Auckland district has again had adverse effects on kauri regeneration, particularly in those areas where little shade was available and the seedlings were fully exposed to the sun. In other indigenous forests, regeneration results were poor, beech in particular having a year barren of seed.

35. *Interplanting.*—Ten acres of worked indigenous forest were interplanted, the species used being kauri (9 acres) and Douglas fir (1 acre).

36. *Afforestation.*—A total area of 2,819 acres of new planting on open land was completed and, in addition, 956 acres were blanked and 883 acres replanted. Tree seed collected comprised 3,120 lb. (including 160 lb. of indigenous species), but of this amount a considerable portion was required to fulfil overseas orders. Throughout the Dominion seed crops were, on the whole, poor and the abnormally dry weather resulted in earlier ripening of the cones.

37. *Nursery Operations.*—Seeds sown in nurseries amounted to 2,367 lb. and yielded 12,843,000 seedlings. A total of 5,938,000 trees were lifted for planting, and 2,978,000 were lined out. At the close of the year nursery stocks totalled 25,000,000 (21,340,000). In the Rotorua Conservancy the raising of Douglas fir wildlings under parent stands has proved satisfactory. Such stocks are lifted and lined out in the nursery.

38. *Tending of Indigenous Forests.*—As far as labour was available, the tending of indigenous forests was pursued to the maximum extent. A total of 340 acres was silviculturally treated, the work including underscrubbing and thinning of beech forests and the release of kauri saplings from competing scrub. In addition, 4 acres of exotic trees interplanted in indigenous forests were freed from competing second growth, and, in the case of beech forests, areas were cleared and scarified to assist natural regeneration.

39. *Tending of Exotic Forests.*—Release cuttings covered 1,389 acres, low pruning 6,743 acres, and high pruning 1,983 acres. A total of 1,245 acres was thinned and 451 acres clear-felled, this latter area including salvage work over 98 acres damaged by gales. In addition, a sawmilling company carried out salvage work on a further 30 acres of wind-thrown areas.

40. *Indigenous Silvicultural Policy.*—The charge has been laid that, in the past, the Forest Service has done nothing for the good and betterment of the indigenous State forests beyond protecting them against fire and placing certain forests "under management." It is desired to stress, however, that forest protection is a *sine qua non* of sound silviculture. It may be termed the first phase of silviculture, though it must also be an enduring adjunct of silviculture.

Turning to silviculture proper, the Service has reserved seed trees from felling on a number of kauri and beech forests, and has acquired for dedication to forestry several considerable tracts of land bearing kauri and beech regeneration and advanced young growth. Moreover, hundreds of acres of worked podocarp forests have been interplanted to shade-bearing exotic species, which do not include any pines. One promising possibility investigated during the past year is the use of exotic pines on open places and forest margins as temporary nurse-trees for natural seedlings of indigenous trees. It is feasible that the pines are proving more effective nurse-trees than manuka, by suppressing dense undergrowth and, following low pruning and later thinning, creating ideal conditions as to light and shelter for the germination and development of indigenous seeds. If this proves to be the case, removal of the pines will leave excellent areas of advance growth which will restock interior openings and extend the indigenous forests outward on to previously unforested land.

In this and in other ways the Service is on the *qui vive* to improve and extend the indigenous forests until the results of the research programme referred to in Chapter X enable a more effective policy to be instituted.

41. *Exotic Silvicultural Policy.*—During the economic depression of the "thirties," employment for large numbers of relief workers was provided in the State exotic forests, but unfortunately this work consisted almost entirely of the planting of new areas. Enormous areas of forest ready for thinning were neglected. Rehabilitation plans for the post-war period were drawn up in 1945 providing for the thinning, commencing in 1946, of 47,500 acres of exotic forest in the ensuing five years. But labour has not been available, and, indeed, in the past two years only 1,820 acres have been thinned.

Inability to commence and pursue this great thinning project to completion has enforced a change in silvicultural policy. No longer would thinning benefit many of the stands concerned, and this stark fact, together with the over-all mal-distribution of age-classes and the policy of changing over from indigenous- to exotic-timber production, which is tied up with silvicultural management of stands with a view to producing high-grade as well as low-grade timber, has left no alternative to the silvicultural policy now decided upon. That policy is one of defining and concentrating upon thinning only those stands which will respond in the greatest degree, and moreover of ensuring that with the man-power available we will within twenty years be producing some defect-free timber for finishing, joinery, flooring, and weatherboarding as well as the knotty stock which comprises all of our present-day production. Stands which do not show promise of benefiting from thinning will be clear-felled and re-established to provide a better distribution of age-classes.

42. *Waipoua Forest Silviculture.*—During the year the policy of submitting the kauri forests to silvicultural management has been vigorously attacked in reference to Waipoua State Forest. These attacks culminated in petitions to Parliament praying that Waipoua, the largest remaining kauri forest, which has been a State forest for more than forty years past, be locked up as a national park.

Dominion and visiting botanists and other scientists and enthusiasts have strongly condemned any attempt towards converting Waipoua Forest from a wild forest, with the attendant waste by decay of wood material, to a useful forest from which mature wood material would be usefully availed of by human economy. The making use of Nature's surplus wood from dead kauri-trees alone has been regarded with horror by those enthusiasts. The old, wasteful mode of exploiting kauri forests by clear-felling them on a face, followed inevitably by firing, has been specifically applied as synonymous with the forester's system of selecting only a few trees for removal, working as closely as possible with Nature, and above all maintaining the forest as a living green forest of trees at all stages of development. Similarly, areas partially treated silviculturally have been erroneously termed "cut-over" areas, doomed to destruction by fire as under the old system of ruthless-exploitation and abandonment.

The argument that "nothing can improve on Nature" can only be regarded as fantastic, more especially when applied to the whole Waipoua area of 40,000 acres. Indeed, in the field of agriculture it should be obvious to all that civilization would never have progressed to its present stage and standards of living if the human race had been forced to subsist on wild crops alone. The man-made improvements on wild wheat is but one instance of careful culture, selection, and breeding leading to greater productivity, higher yields, and, perhaps above all, the production of ample supplies on a minimum land area. Improvements in productivity, yields, and land use have likewise been secured in the field of forestry, outstanding instances being found in the coniferous and broad-leaf forests of Europe and in the teak forests of Burma.

Preservation of forest flora in the primitive state is nevertheless catered for in other lands, and this has been the Forest Service policy respecting Waipoua since the Service's inception, when the area to be so locked up was set at 1,000 acres. The original working plan of 1941 continued this policy, and the lock-up area at present provided for of 7,200 acres of all types of vegetation, including 2,800 acres of kauri, most of it heavy kauri, is regarded by the Service as more than ample for all purposes and allowing for all contingencies. Indeed, it is confidently anticipated that at a future date foresters will be asked to rehabilitate parts of this large wilderness area.

To lock up 40,000 acres, however, as a plant museum or "tree cemetery" would be regarded by the Service and a large body of its supporters as fantastically wasteful of land and natural resources. This view was supported by the findings of the Empire Forestry Conference held in London in 1947—namely, "Where large areas of land are allocated for watershed protection or national parks, there should be no prohibition of the practice of scientific forestry, provided that it is consistent with the primary objects of management." The report adds that such prohibition may endanger the perpetuation of the forest.

Locking up the whole area would, moreover, constitute a lost opportunity of putting to human use the growth of kauri and other wood while gradually improving the vigour of the forest and maintaining it in a living green condition in perpetuity. The art and science of forestry has achieved such a thing in numerous forest types abroad and in both temperate and tropical zones. The concept of perpetuity is admittedly relative: over the centuries Nature is apt to exert a tendency towards changes in plant succession which frankly would, if allowed free play, upset the forester's husbandry. But foresters are ever on the watch for such trends and are, like the agriculturists and horticulturists, equipped by art and science to assist Nature towards pulling in the desired direction. Briefly, this is achieved by change or partial change in silvicultural system, by favouring certain secondary plant species, &c.

It can be accepted as certain that, if there is a tendency for such long-range natural influences to exert themselves, the changes will be more rapid in a locked-up, primeval forest than in one under the care of foresters. Of all the kauri species, essentially denizens

of the tropics, New Zealand kauri is obviously at the limit of the kauri range, and this is intensified by the cooler insular climate of North Auckland relatively to that of tropical and sub-tropical regions. If we are to assume philosophically that our kauri might be a slowly disappearing species, nothing is more certain than that it will disappear faster in Nature than in carefully tended forests where it will be freed where necessary from competition and damage by more aggressive shrubs and trees and encouraged to grow vigorously. The pure botanist has little if any conception of silviculture, but relies on an academic knowledge of the natural growth of individual plants and plant societies. He has no appreciation of the concept of forestry as an art and as an applied science, and yet has purported to advise the public on the future of Waipoua. Of one visiting botanist, and an eminent one, it was published in the press that he had posed certain scientific questions to the resident ranger at Waipoua, but had received the reply, "We do not know." This attitude was adequately replied to by the Government Botanist at a local-authority meeting open to the press, where he was reported as saying, "There were two extremes and the truth probably lay in between. He spoke of the need of proper forest management and of the harvesting of the crops of timber raised. It was quite wrong, he said, to leave a forest alone and exposed to the fire hazard. It was wrong to think that the State Forest Service was exploiting the kauri forest. The eminent English botanist had spent one day in the forest and had questioned a State forest employee who could not answer the questions raised. It was surprising that such a prominent man would make a statement on which he had no facts. The statement was worthless."

Contrary to many of the false allegations made, the State Forest Service has a very sound knowledge of the practicability of perpetuating Waipoua, and, indeed, it must be frankly stated that unless the Forest Service proposals are given effect to, the Dominion will in time lose this magnificent heritage of Waipoua Forest.

These proposals, as set out in a working plan pursuant to the Forests Act, provide for reservation of large individual trees and outstanding clumps, and for a wilderness area of 7,200 acres to demonstrate the eventual doom of Waipoua by allowing Nature to do its worst and not its best. No forest anywhere in the world is managed so crazily as to leave dead and dying trees in the forest—an economic waste and an offence to the eye. The proposals provide, further, for liberating young kauri which are being suppressed or damaged by overtopping vegetation; for thinning kauri saplings and poles where growing in fierce competition; and for felling some of the mature trees to make way for rejuvenating the forest by natural regeneration.

Last, and not least, is a practical problem of management. Once normal economy is restored to the Dominion, once there are adequate transport facilities to enable a greatly increased Dominion population to frequent Waipoua, the fire hazard will be increased a thousandfold. The mere fact that Waipoua may have existed for perhaps four thousand years will not guarantee its continued existence—as a national park—for even four years should a catastrophe occur in one of our periodical dry summers such as those summers in 1928 and 1946.

As a State forest, on the other hand, with a large labour force working in the forest; with the exotic portion extended and managed, and sheltering the indigenous portion and fitting well into the felling plan; with a network of roads and tracks providing rapid access to any part of the forest to deal with fire; and with the silviculturists improving the forest as only they can: then can future generations count on still possessing a Waipoua Forest.

CHAPTER VI.—FOREST PROTECTION

43. *Fire Damage.*—Recorded fires in State forests during the year totalled 48 (44), 34 being in indigenous forests and 14 in exotic. The area involved was 4,198 acres, of which 28 acres were planted exotic forest and the balance was mainly milled bush, tussock, scrub, and fern. There was no significant damage to indigenous forest, and timber was salvaged immediately from the small area burned.

The number of fires recorded outside State forests was 127 (88), covering 24,810 acres. Of this area, 18,000 acres was accounted for by one tussock and scrub fire in the Tongariro National Park starting near the National Park – Tokaanu Road. Practically the whole area covered by those fires was tussock and scrub land, only a very minor amount of timber being destroyed.

During the year, 6 (5) sawmills were destroyed by fire and 1 damaged, as follows:—

Destroyed—

Ellis and Burnand, Ltd., Mangapeehi (Auckland Conservancy).
Ranui Sawmilling Co., Ltd., Ranui (Auckland Conservancy).
Nelson Creek Sawmill, Ltd., Rahui (Nelson Conservancy).
Kopara Sawmilling Co., Ltd., Haupiri (Westland Conservancy).
Fleming Timber Co., Ltd., Myross Bush (Southland Conservancy).
Kilkelly Bros., Ltd., Tautuku (Southland Conservancy).

Damaged—

Robert Curry and Son, Ltd., Koutu (Rotorua Conservancy).

44. *Fire Detection and Control.*—Weather conditions throughout most of New Zealand were moderately dry, with less rainfall than usual during mid-summer and autumn. Particularly was this the case in Canterbury, where one station recorded 68 consecutive days with practically no rain. Dry spells also occurred in other localities as follows: Rotorua - Bay of Plenty, 14 days in December and 38 days in January–February; South Auckland, 52 days in January–March. Shorter periods of considerable hazard occurred in portions of the Nelson and Southland Conservancies.

Fire damage to State forests was negligible, the 14 fires which occurred in the exotic forests and the 34 fires in the indigenous forests being in every instance detected in the incipient stage, and in no case did a fire get out of hand.

By numerous methods and in co-operation with the Soil Conservation and Rivers Control Council, the Forest Service has drawn attention to the potential danger of small fires, and it is felt that as a result the public is becoming increasingly aware of its responsibilities in reporting, suppressing, and preventing fire.

The aerial fire patrol which is established on a permanent basis in the Rotorua Conservancy carried out 31 (54) flights, aggregating 45 hours' flying time, and was valuable in effecting quick reconnaissance of reported fires. The R.N.Z.A.F. provides this patrol and can at brief notice extend it to other localities; this year such extension was unnecessary.

Fire-fighting equipment purchased during the year included a number of portable motor-driven pumps with hose for use where wheeled vehicles cannot operate; and a further 9 fire-engines were completed and allocated to conservancies. A fire equipment officer was appointed for the maintenance of the considerable quantities of valuable equipment held at various stations.

Fire-hazard weather equipment is now located at 25 stations, giving coverage over the greater part of New Zealand. Instruments at these stations are read thrice daily and the readings analysed. Data from 12 stations in the Auckland and Rotorua Conservancies are sent by radio to Wellington twice daily in the fire season, making it possible to have an accurate estimation of the fire-hazard situation throughout those areas within an hour of the reading of the instruments. It is hoped to have the radio network extended to include most of New Zealand during the next fire season.

New lookout stations were erected at Rotoehu, Eyrewell, and Ashley Forests during the year. One erected last year at Golden Downs was destroyed in a severe gale (see para. 51).

On Balmoral Forest, 6 concrete-grouted reservoirs, each of 12,000 gallons capacity, were constructed to provide a readily accessible supply of water for fire-fighting purposes. These reservoirs are constructed with a catchment area double that of the water surface and the rainfall is more than sufficient to balance evaporation.

The assistance given by the R.N.Z.A.F., the Weather Office, and the National Broadcasting Service in the work of fire detection and control is greatly appreciated.

45. *Fire Districts.*—Fire districts containing a total of 5,193,578 acres were in force at 31st March, 1948.

Following the enactment of the Forest and Rural Fires Act, 1947, all fire districts (excluding those under the Fire Brigades Act, which deal with city and urban areas) constituted under other Acts remain in force until 18th November, 1948, or until reconstituted under the new Act, whichever is the earlier.

Forest-fire prevention and control by fire district organization was introduced by section 27 of the Forests Act, 1921–22, which provided for the protection of a State forest by the constitution of a fire district, which in practice embraced a belt of adjoining land of sufficient width to give reasonable protection; and for the declaration of a period (usually confined to the dry summer months) during which it was an offence to light a fire in the fire district except with the permission of a forest officer and subject to such conditions as he might require. In 1925, by amendment to the Forests Act, the forest fire district principle was extended to provide protection to private forests with a minimum area of 200 acres. It may be mentioned that at this time considerable attention was being given to the establishment of exotic forests by public investment, and by 1936 some 300,000 acres had been established by public companies formed for the purpose. It soon became clear that forest protection from fire arising either from uncontrolled burning for land clearing and similar operations, industrial operations, or from causes due to trespass, &c., was a major problem for which there was no adequate remedy under the ordinary laws. Consequently, it was a logical step that the protection afforded State forests by forest fire district organizations, which had proved in a large measure to be successful, should be extended to vulnerable private forests. Control in forest fire districts is, however, by law vested in a forest officer, and in the case of private forest fire districts persons of good standing, usually employees of an applicant afforestration company, were appointed honorary forest rangers, who under the Forests Act were deemed to be forest officers.

In 1932, by an amendment to the Land Act contained in section 9 of the Land Laws Amendment Act, the fire district principle was extended for the protection of peat lands and flax, and in 1941—by an amendment in section 28 of the Statutes Amendment Act—was further extended for the protection of gum lands and sand-dune areas. Fire districts constituted under these amendments to the Land Act were controlled by the Commissioner of Crown Lands for the district in which the fire district was situated.

However, notwithstanding the success of the protection achieved under the fire district law, it was clearly evident during hot, dry periods that its scope was too restricted and extensive rural areas which had little or no protection were repeatedly burnt over during hot, dry weather, and it was inevitable that some suitable organization to deal with an acute problem would have to be devised on a national scale. At the outset it was recognized that the factors of speed, economy, and efficiency were paramount in any organization to effectively deal with fire prevention and control, so that the matter must be attacked from the point of view of available man-power and equipment at the place and time of need, with consideration given to the wide variation of fire-hazard conditions throughout the Dominion.

The high fire hazard which recurs annually in exotic forests and some indigenous forests demands an intensity of fire prevention and control organization which is not justified or necessary in other parts of the Dominion where a high hazard occurs only occasionally and then for only short periods. Consequently, the constitution of permanent fire districts is required only in the case of the former, while the latter can be effectively dealt with by existing County Councils, with power given to each County Council to declare fire-hazard areas within the district under its administration in which the lighting of fires is prohibited except with permission of the County Council's Fire Officer during the period of the restriction. Upon this principle, draft proposals for a Bill were assembled, and after the draft had been considered at several conferences of local authorities, forest owners, farmers and sawmilling industry organizations, fire underwriters and Government Departments, representatives of Fire Boards and fire brigades, and others, the proposals were adopted by the Government and passed into law during the 1947 session of Parliament as the Forest and Rural Fires Act, 1947.

The principal features of the Act may be summarized as follows:—

(*a*) *Rural Fire Districts.*—For the purpose of securing the safety of trees, flax, and other plants, gum lands, sand-dune areas, and peat lands from damage by fire the Governor-General may, by Order in Council, declare any area to be a rural fire district and may declare a period to be a closed fire season during which it is unlawful for any person to light a fire except with the permission of a Rural Fire Officer.

Before such Order in Council is issued the Minister is required to advertise the proposals in a newspaper circulating in the locality and deposit a plan and notice setting out the proposals for public inspection, and any person affected is given one month in which to send to the Minister any well-grounded objection. Any objection is considered by the Minister or by some person appointed by him, and if it is not well grounded the Order in Council is issued.

A rural fire district is controlled by the Minister or by a Rural Fire Committee as the Fire Authority for the district. When a Rural Fire Committee is appointed it is the policy when farming and sawmilling interests are substantially affected to consider the appointment of representatives of those interests to the Committee. The Order in Council is required to specify the property for the protection of which the rural fire district is constituted. The expenses of a Fire Authority of a rural fire district may be met as agreed by the persons interested in the operations of the Fire Authority or by a levy on owners of land containing the property protected.

(*b*) *Soil Conservation Districts.*—These are under the control of the Soil Conservation and Rivers Control Council, which is the Fire Authority for these districts.

(*c*) *County Areas.*—Each County Council is the Fire Authority for the county area under its control, excluding rural fire districts, soil conservation districts, and State forests. The authority of County Councils was effective from 18th November, 1947, the date the Act became law. Many counties used the powers of the Act during the 1947–48 fire season and declared fire-hazard areas by notices in newspapers. A County Council is authorized to charge its expenditure to county accounts.

(*d*) *Fire Authorities.*—The Commissioner of State Forests, Rural Fire Committees, the Soil Conservation and Rivers Control Council, and County Councils are Fire Authorities for their respective districts.

Under the Act every Fire Authority is required to take effective measures for the prevention and control of fires in the area under its control and is required to appoint one or more Rural Fire Officers and such other officers and employees as may be necessary. Fire Authorities of rural fire districts are given certain powers which do not apply to other Fire Authorities.

(*e*) *Rural Fire Officers* are appointed by the Fire Authority for the district under its control. There may be one or more Rural Fire Officers appointed for each district. The powers and duties of a Rural Fire Officer are clearly set out in the Act, and in particular he is required, on being advised of the existence of a fire which in his opinion constitutes a hazard to life and property, to proceed or arrange for a deputy to proceed with all possible speed to the fire and endeavour to extinguish it and prevent its spreading. He may requisition the assistance of male persons over the age of eighteen.

(*f*) The State Forest Service is required to provide a fire prediction and warning service from which warnings and information may be published in newspapers or broadcast from broadcasting-stations. On any day in respect of which a warning has been given by the Minister or Director of an extreme fire hazard in a particular area, no fire may be lit in the open air, notwithstanding the existence of permits to light fires.

In the event of conditions arising which present an extreme fire hazard or when any forest or rural fires have spread or appear likely to spread beyond the district of a single Fire Authority, the Director of Forestry or Conservator of Forests may take charge. The Minister may determine what proportion of the costs incurred are to be borne by the Fire Authorities affected.

(*g*) *A Fires Appeal Tribunal* of three persons is established to which an appeal may be made from such matters as a notice to make a fire-break, a notice requiring maintenance of fire-fighting apparatus, a levy imposed by a Fire Authority of a rural fire district to meet its ordinary requirements, a levy to meet costs of fire-fighting imposed on owners of land affected, and against the Minister's apportionment of fire-fighting costs in a regional fire emergency.

Although the Act has been in force for only a short period, there is already evidence that it will prove to be an effective instrument in reducing the number of forest fires which hitherto recurred annually and in preventing the destruction and widespread damage to both forest and soil cover which resulted.

The reconstitution of fire districts is proceeding smoothly and as rapidly as possible. In addition to State forests and other Crown areas, several applications from local bodies and afforestation companies are at present being dealt with.

46. *Forest (Fire-prevention) Regulations 1940 (Reprint), (Serial Number 1946/246).*—There was no amendment to the regulations during the year. The authority for these regulations is contained in section 63 of the Forests Act, 1921–22, but with the enactment of the Forest and Rural Fires Act, 1947, all fire district provisions of the Forests Act have been repealed and it is now necessary to revise the regulations accordingly. This work is in hand, and when completed the regulations will apply entirely to State forests.

47. *Animal Damage.*—Rabbits and opossums are still the most serious pests, with the opossums becoming an increasing problem in exotic forests, and being reported this year from Rotoehu Forest, Rotorua Conservancy. Deer, pigs, goats, and various other animals are also causing damage, but continual shooting is holding the numbers down in most areas.

48. *Animals Destroyed.*—The following are the recorded numbers of animals killed in State forests: rabbits and hares, 139,507 (34,532); deer (all species), 2,956 (1,534); pigs, 3,225 (1,538); goats, 294 (238); opossums, 6,042 (4,329); other animals, 145 (—).

The very large increase in the numbers of rabbits destroyed is due to operations at Gwavas Forest, where planting areas for the coming season are being intensively poisoned and trapped.

49. *Insect Damage.*—As in past years, significant insect attack has been confined to small local infestations and no abnormal widespread damage has been reported.

At Gwavas Nursery, *Tortix* caused damage to insignis-pine seedlings and it is estimated that the terminal buds were destroyed in 75 per cent. of the trees.

Damage to Douglas fir caused by *Navomorpha lineatum* was again conspicuous in the Rotorua district and is now under investigation.

Sirex caused some concern by emerging from *Pinus* timber in yards and newly constructed buildings. On investigation this was found to be due to the utilization of dead trees.

A hitherto unrecorded bark-beetle, *Phlœosinus cupressi*, was discovered in the Auckland Conservancy beneath the bark of macrocarpa trees. This insect comes from Central California, where it is very destructive to cypress. It is capable of attacking practically all species of *Cupressus*, *Chamaecyparis*, *Cryptomeria*, *Thuya*, *Libocedrus*, and *Retinospora*.

The areas of pine destroyed by the Taupo fires in 1946 were kept under observation in case any insects should breed up sufficiently to cause an epidemic in the adjoining forests, but no damage has eventuated.

The general broad policy of investigating all insects associated with all forest trees was continued and much valuable information was accumulated. In particular, the insects associated with tawa were studied, with special reference to the problem of *Lyctus* attack on tawa timber.

During the inspection of imported timber, instances of termites in Australian hardwoods were detected and dealt with. Besides termites, species of *Lyctus*, *Xylion*, *Coptocercus*, and *Parotellus* were recovered.

A course of instruction was given to train selected officers in the inspection of hardwoods for termites.

50. *Damage by Fungi.*—No serious outbreak of fungous disease was reported, but there was, however, minor damage from damping-off in nurseries; many trees were killed by *Armillaria mellea* in areas at Whakarewarewa State Forest which had been planted with insignis pine following the utilization of eucalypts.

The policy of studying all fungi associated with each species of tree was continued; 65 species of fungi are now being studied with relation to beech species alone. Additional information was obtained with regard to most of our forest trees, both indigenous and exotic; in particular, the black-heart of tawa was studied, and data with regard to fungi causing rots of kauri, insignis pine, and tawa were accumulated.

Other work included the study of galls on redwood, *Taphrina* disease of poplars, and the fungi forming mycorrhiza with trees.

Five sample plots at Erua State Forest were remeasured; these plots were laid off in 1940 to determine the mortality due to *Armillaria*, deer, and other causes. It was found that growth had been satisfactory and deaths negligible.

As usual, physiological diseases accounted for most of the damage to exotics during the year.

Considerable mortality occurred in young pines throughout the pumice country of the Central North Island. Much of this was due to normal suppression, accentuated possibly by unfavourably hot, dry years. In a few instances, however, the mortality rate was much greater than normal, and is giving cause for some concern. These cases were generally associated with thinning and pruning operations, particularly in naturally regenerated stands. *Sirex* and its associated fungus were always present, and exposure seemed to be the main contributing factor. The complicated host—*Sirex*—fungus relationship is worth investigation as the factor or combination of factors which predispose the trees to attack.

The stock cultures of wood-rotting fungi were maintained and 27 new cultures added.

51. *Climate and Damage from Natural Causes.*—The weather during the period was marked by fewer extremes than in either of the two preceding periods. The only case of forest damage attributable to extreme weather violence occurred just at the end of the reporting period in the last week of March, 1948, when a sudden and unexpected windstorm about midnight vented the peak of its violence along the eastern boundary of Golden Downs State Forest, in Nelson. The new lookout cabin on the shoulder of Gordon's Knob (see para. 43 of 1947 report) at about 3,000 ft. altitude was completely destroyed and its occupant was severely injured. So sudden and so extreme was the blast that the boarding of the structure was splintered to matchwood as from an explosion. Although the occupant was at the time of the blow-away actually speaking on the telephone to the forest staff in the valley below, it was impossible to reach him until after daylight, although relief expeditions twice set out in the storm and the darkness. When relief did reach him he was found to have a broken leg and to have suffered considerably from exposure.

The forest itself suffered a certain amount of breakage and windfall along its eastern margin, which was from 700 ft. to 1,500 ft. below the cabin; but there was no instance of complete windthrow over any area, whilst in the forest interior at any distance over a mile from the affected margin no damage at all could be seen.

This incident is described at some length because the localized intensity of weather violence affords one of a chain of examples of extreme storms experienced in that particular area over the years. Gordon's Knob and the upper catchment of the Motueka River appear to be in a district particularly subject to extremes of concentrated atmosphere disturbance, though fortunately only at long intervals.

In other respects the season, although far from an average one, did not experience weather markedly unfavourable to forest well-being. The summer, though providing in most districts a long dry spell, showed neither extremely high temperatures nor long periods of low humidity, and in no case did the high temperature coincide with the low-humidity period. Although, therefore, there were, as always, times of fire anxiety, in no case did the actual hazard as measured by climatic factors only run as high as in some preceding years. Certain silvicultural phenomena noted, however, do merit formal record, though they are not interpretable quantitatively in terms of recorded climatological data. The records will serve, however, as silvicultural precautionary signposts:—

(i) *Seed Shedding from Insignis Pine.*—It has been customary to regard this species as completely serotinous throughout the Dominion, so that in any given year when a seed supply is needed in any district, seed can be obtained in any quantity from local trees. All trees, so to speak, store in the cone the seed of three preceding years, if not more, and it can be collected when and as required at any season of the year. When, however, in mid-1947, collection was begun in Rotorua, it was found that the weather of the two preceding summers (see relevant reports on climate and on fire hazard) had apparently sprung all the cones to shed the seed. Investigation showed that the same had occurred, although not to such a degree of completeness, with insignis pine in Canterbury and in Nelson. Ample seed was procurable from other districts, so that with some slight reorganization no dislocation of silvicultural routine resulted, but the incident serves to show how unsuspectedly close we run to a climatic margin with many of our customary silvicultural practices. It was found upon inquiry that such cone-opening and seed-shedding is a normal annual occurrence in South Australia, a small difference in the life-history of the tree species which must profoundly affect silvicultural practice.

(ii) *Sun-scald Following Heavy Thinning of Insignis Pine.*—Again in Rotorua there occurred another case of unforeseen damage probably attributable to the unusual summer climate of the two preceding seasons. A compartment of insignis pine in Waiotapu State Forest was felled some ten years ago and had regenerated naturally to a dense, though uneven, stand. In 1945, having formed full canopy in all the well-stocked patches it was heavily thinned to a density of between 600 and 700 trees per acre. An undue proportion of deaths in the stand in 1947 focussed the pathologist's attention on the stand, and it was found that there were numerous lesions on the north side of the dead stems, and cross-sections of these stems showed one-sided cambium-killing two years previously. It seems almost certain that the thin bark of trees naturally regenerated in dense stand had been unable to withstand the unusually hot summers of 1945, 1946, and 1947. Again this is a combination of what could be regarded as a locally safe forest practice with a climatic extreme which is rarely encountered. It may be that the sun-scald diagnosis, which at this late date is of necessity partly conjectural, is not the whole story of the incident, but there seems to be little doubt that it was a major contributing factor, and it is a type of injury which has never before been detected under local temperate climate conditions.

(iii) "*Lammas Flowering*" *of Beech Species.*—In February, 1948, there occurred a scanty second flowering of beech species, at least in the southern portion of the North Island. This is a phenomenon which is known to occur occasionally in forest trees everywhere, but its significance is not understood, save that it usually occurs in a summer of unusual climatic conditions, and that it is frequently followed by a poor seed year of the species that flower out of due season. It is set down here, because no such record has been made previously for the inconspicuously flowering native beeches. Whether it will be followed or not by a poor flower and seed year in 1948–49, it certainly occurred in a poor seed year, 1947–48. The beeches flowered quite profusely in September to October, 1947, but the seed did not mature in quantity, the seeding in places at least being replaced by the scanty second flowering in February already referred to, when the summer had been long and pleasant without undue heat but with less than average rain. These are the unpredictable and uncontrollable vicissitudes that regulate the efforts of the forester who is committed to a programme of natural regeneration.

52. *Forest Offences.*—The number of convictions for offences against the forest laws during the year was 45 (49) and the total fines, costs, and damages amounted to £598 1s. 7d. (£567 14s. 11d.), being made up as follows: fines imposed, £174 (£125); costs and damages, £424 1s. 7d. (£442 4s. 11d.). Particulars of these offences are given in Appendix IX.

Included in the costs and damages for lighting fires in a fire district contrary to the provisions of the Act was the sum of £44 1s. 4d. which was recovered in a single case as fire-suppression costs. For aiding and abetting in the unlawful lighting of fires an offender was fined £5 with 10s. costs. The heaviest fine imposed this year was £20, which was for failure to report a fire. Altogether 5 convictions were obtained for failure to report fires or take proper steps to suppress fires in State forest, whereas there were no convictions for this offence in the previous year.

There was an increase in the number of prosecutions for unlawful cutting and removal of forest produce, convictions being entered in 16 (9) cases; but, as in the previous year, there was no large amount of forest produce cut or removed before discovery.

CHAPTER VII.—FOREST ENGINEERING

53. *General.*—Labour continues to be quite inadequate for the amount of engineering work which is urgently needed in State forests, while the technical side is very much understaffed. Nevertheless, roads, bridges, buildings, and general engineering services have been maintained to a reasonable standard.

54. *Roads and Bridges.*—Approximately 55 miles of new State Forest Service roads have been formed and 40 miles metalled; maintenance work was carried out over more than 850 miles. Other works on the above roads included over 100 new culverts of various sizes and 6 new bridges, while 30 culverts and 26 bridges received maintenance. New tracks formed totalled 28 miles and old tracks maintained 40 miles.

55. *Transportation and Construction Equipment.*—This equipment comprises 301 trucks, 84 tractors, 5 carryall scrapers, and 300 items of miscellaneous plant; other vehicles are 30 cars and station wagons and 94 fire-engines. Much of the plant was purchased second hand from the Armed Forces and must before long be replaced, as maintenance under the present conditions of material and labour shortages is becoming increasingly difficult.

56. *Buildings.*—In spite of all efforts to provide further accommodation, particularly for married employees at State Forest Service projects, only 22 permanent residences were completed (although a further 51 have been commenced), and 19 temporary dwellings were completed and 9 more started. A hostel and several single men's camps complete with modern amenities have been established or enlarged, providing for the accommodation of some 180 men. Additional buildings under construction will be sufficient for a further 280 men. Sundry buildings completed comprise 3 fire lookouts, a sawmill building, 8 implement-sheds, &c., and pump-house and a small power-house. Work is proceeding on a number of others, including a large workshop to serve the Rotorua Conservancy. Two bores have been put down in Rotorua in order to utilize thermal heat for the heating of buildings.

57. *Water-supply and Drainage.*—The provision of water and drainage systems has been attended with the difficulties caused by current shortages, and as a result it has been necessary to employ temporary methods in a number of Forest Service communities; it is hoped, however, to replace these improvisations in the next twelve months with permanent installations. Additional bores for water-supply purposes have been put down at Kaingaroa, Minginui, and Glenbervie, while storage and/or additional reticulation have been provided at Rotoehu, Kaingaroa, Minginui, Pureora, Balmoral, and Eyrewell. For purely fire-fighting purposes, storage tanks have been installed at Balmoral Forest and small earth dams at Dusky Forest, while the opening-up of access roads to streams in the latter forest has been continued.

58. *Utilization Plant.*—The increase in kiln capacity at the Waipa Sawmill forecast in last year's report has been realized in part by the completion of one kiln unit; the second is nearing completion. Two additional boilers have now been installed, ensuring an adequate supply of steam to the new kilns and providing some relief to the original boilers which have been forced for many years.

A small experimental plant was built for the pressure treatment of timber with preservatives, and a log-splitting machine was designed and built. New plant, chiefly German reparations, has been installed in the fitters' shop.

A start has been made with the construction of a new export shed and the installation of an end-trimming and branding machine. Further extensions have been made to the sprinkler system, so that all buildings are now fairly well protected from fire.

The construction of the overhead travelling crane to expedite the unloading of logs has been delayed by the shortage of steel, but some progress is expected at an early date.

The first stage in the development of the Kaingaroa Sawmill has been reached and the mill is in production. Plant still to be installed comprises gang-saws, boiler and power-house and sorting-table equipment.

59. *Transportation.*—The need for additional vehicles for the cartage of logs and sawn timber is acute, owing to the increased production and the necessity for replacing worn-out machines. Although during the year 34 trucks were acquired for this work, the increase in fleet strength is small on account of the replacement factor. Among the number added were 10 heavy Mack trucks obtained from the United Kingdom Government surplus war stocks and now being utilized for log transportation. The allocation of the 34 vehicles received was: Auckland, 6; Rotorua, 23; Canterbury, 3; and Southland, 2.

60. *Communications.*—New telephone lines erected during the period comprised 21 miles of earth-working circuit and 30 miles of metallic circuit, and 4 miles of existing earth-working circuit were converted to metallic circuit and 4 miles of existing metallic circuit were converted to earth-working circuit. The total length at present is 526 miles, of which 138 miles are of metallic circuit. A total of 270 instruments is installed. The Benneydale–Pureroa line (14 miles), which was completed during the year to Post and Telegraph Department specifications, carries the Post and Telegraph Department's lines to the new post-office at Pureroa Village as well as the Forest Service lines. At Tairua, 6 miles of new line were erected on a co-operative basis with local settlers.

Radio-telephone installation has progressed in the Auckland Conservancy, where stations have been completed at Riverhead (control station), Waipoua, Te Kuiti, Pureroa, Great Barrier Island, and in a motor-launch. Work is proceeding on other stations in this conservancy and also in the Wellington, Nelson, and Canterbury Conservancies. A mobile headquarters vehicle for fire-fighting purposes was delivered to the Rotorua Conservancy and is being fitted with radio- and line-telephone equipment.

In order to avoid interference between radio networks, separate frequencies have been allocated to adjoining conservancies as follows: Auckland and Nelson, 2,780 kc./s.; Rotorua and Canterbury, 2,760 kc./s.; Wellington, Westland, and Southland, 2,770 kc./s. Two private afforestation companies in the Rotorua Conservancy will use 2,750 kc./s for internal communication, but will continue to form part of the Forest Service network on 2,760 kc./s.

Fire-weather reports were transmitted from the control stations in the Auckland and Rotorua Conservancies to Head Office, Wellington, via the Post and Telegraph Department's receiving-station at Makara using the frequency 5,990 kc./s., and arrangements are being made to extend this facility to other conservancies.

61. *Community Planning.*—The shortage of labour and materials has retarded the development of Forest Service communities. Some improvement, however, has been made in the living-conditions for employees in a number of localities, a further 20 houses having been completed at Kaingaroa and Waipa and a hostel at Rai Valley. Better progress is expected in the near future.

The assistance of officers of the Housing Department in developing forest communities has been of the greatest value.

CHAPTER VIII.—EXTRACTION AND COMMERCIAL DEVELOPMENT

62. *State Forest Block Sales and Permits.*—The quantities and values of indigenous timber sold from State forests during the year, exclusive of log sales, was as follows:—

Species.	1946–47.	1947–48.
	Bd. ft.	Bd. ft.
Rimu and miro	84,615,000	86,514,000
Matai	6,910,000	10,820,000
Totara	5,154,000	4,780,000
Kahikatea	8,461,000	7,728,000
Tawa	2,088,000	5,650,000
Beech spp.	1,910,000	10,973,000
Others	803,000	1,271,000
	109,941,000	127,736,000
	£	£
Value	190,153	194,909

The timber was sold as follows: by appraised quantities, 104,364,000 board feet; by log scaling, 5,606,000 board feet; and by mill output, 17,766,000 board feet.

Minor indigenous forest produce sold under permit was valued at £12,989; and exotic forest produce sold under licence and permit was valued at £1,711.

The production of indigenous timber under licence and permit from State forests totalled 122,975,000 board feet (112,216,000). Minor forest produce removed under permit comprised: poles, 9,641 (5,003); strainers, 21,042 (17,626); posts and stakes, 430,583 (357,605); stays, 8,117 (7,288); sleepers, 19,995 (17,049); house and pole blocks, 14,252 (5,881); mining timber, 61,352 (54,569) pieces; battens, 1,136,068 (982,775); bridge stringers, 9 (165); firewood, 575 (360) cords; shingles, 184,496; chopping-blocks, 1,177; tomato-stakes, 38,625.

The following exotic material was produced under sale by licence and permit: sawlogs, 82,877 (7,339) cubic feet; mining timber, 12,718 (3,700) pieces; battens, 9,300 (nil); posts, nil (16,000); sleepers, nil (8,400); firewood, 32 (260) cords; and chopping-blocks, 98 (nil).

In order to salvage timber blown down in Canterbury during the 1945 gale, two sales were made under licence in the year 1946–47, and in one case (Raincliff Forest) milling-operations are now complete. In the other case, however (Balmoral Forest), very little progress has been made by the licensee, only 250,000 board feet having been milled in the period under review. As a result of increasing deterioration, the proportion of timber now merchantable is very small.

Details of timber cruising are shown in paragraph 30.

63. *State Forest Log Sales.—Indigenous:* The State Forest Service continued its logging operations in indigenous State forests in the Auckland and Rotorua Conservancies and produced and sold to sawmillers 1,720,514 cubic feet (1,173,677) of logs of a total value of £90,341 (£57,349). Minor forest produce extracted at the same time comprised the following: poles, 59 (251); posts, 8,027 (7,474); strainers, 654 (569); stays, 828 (nil); battens, 17,168 (71,431); rails, nil (366); house blocks, 1,052 (4,450) lineal feet; mining timber, nil (3,100) pieces; firewood, 67 (11) cords.

Exotic: Logging operations conducted by the Forest Service in exotic State forests resulted in the production of 3,283,524 cubic feet (2,782,550) of sawlogs. Of this quantity, 216,047 cubic feet, having a value of £5,914, were sold to sawmillers, the

remainder being utilized at the Waipa and Kaingaroa Sawmills. Minor forest produce extracted by the Forest Service comprised: poles, 4,575 (1,905); posts, 81,092 (645); rails, 2,055 (1,430); battens, 9,300 (nil); firewood, 6,438 (5,238) cords; pulpwood, 40 (481) cords; mining timber, 133,142 (117,700) pieces.

64. *Indigenous Timber Disposal.*—As forecast in last year's report, a further increase has been achieved in the amount of cruising work carried out, an indication of the value of the training courses provided for timber measurers (see paras. 21 and 30). The quantity of timber cruised during the year—182,066,000 board feet (168,020,000)—is the greatest in any twelve months since this Service undertook such work. For the year 1948–49 an even greater quantity will require measurement, and arrangements are being made for accelerated training for suitable junior employees. It was not, as hoped, found possible to have appraisals completed well ahead of sawmillers' requirements, owing mainly to the increased demand for State and Maori-owned areas resulting from increased milling activities and the gradual cutting out of privately owned forests; nor is it anticipated that any great advance in forward cruising will be possible in the year 1948–49, but every effort is being made to provide sawmillers with areas having a cutting life of two to two and a half years. Appraisals of Maori-owned forest represented 29 per cent. of the total, an increase of 25 per cent. over the previous year, whereas for the State forests the proportion was 66 per cent. representing an increase of only 4 per cent.

The quantity of sawn timber produced from indigenous State forests, together with that from Forest Service indigenous logging operations, amounted to approximately 138,000,000 (120,000,000) board feet, which represents 49 (49) per cent. of the total quantity of indigenous timbers milled.

Registered sawmills obtaining supplies from indigenous State forests during the year totalled 144 (123), being 21 (23) per cent. of all registered sawmills and 37 (35) per cent. of those cutting principally indigenous timbers. In view of the inevitable decline in the future sale of indigenous State forest timber, the increase in the number of sawmills operating in State forest is noteworthy and is explained by the fact that most of the new units are working small isolated areas which hitherto have been considered too small or remote to warrant attention. The heavy demand for indigenous timber has now encouraged such utilization, either for log supply to existing sawmills and plywood-factories or for new small sawmills. In most cases these areas have been too remote or unattractive for exploitation by existing sawmills.

In other sections of this report reference has been made to artificial conditions which now exist in the timber industry on account of price-control policy. Because indigenous timbers are now often under-priced compared with the cost of substitutes, many consumers are willing to pay more than approved rates to secure supplies. As sawmillers and merchants are unprepared to adopt the illegal practice of selling at above approved prices, some users, in order to obtain what they want, have adopted the practice of buying logs and having them sawn. Poor-grade logs are often purchased from remote places, their delivered cost being generally abnormal, and the timber produced from them costing considerably more than if purchased at approved market rates. To discourage such practices the Forest Service has modified its timber and log sales policy, and most sales are now made conditional upon the conversion of all sawlogs being undertaken in the district where the timber is growing; and if approval is given to rail sawlogs away from the district, maximum log prices are prescribed. Furthermore, to assist equitable distribution of sawn timber, sales on occasions are made conditional upon the successful tenderer selling in prescribed markets; as, for example, to provide a reasonable supply of timber to the southern districts of the North Island, some Main Trunk forest sales are made contingent upon a southwards distribution of sawn timber. In the exercise of this policy, every endeavour is made to leave the sawmiller as wide a market as possible, and no attempt is made to influence him in his choice of customers. With demand for

indigenous timber continuing to exceed supply, there is naturally an increasing field of buyers eager to secure bush or log supplies. This is reflected in the higher tenders now frequently received for areas or logs advertised for sale.

65. *Rotorua Exotic Forest Log Production.*—To provide supplies for the new Kaingaroa Sawmill and for an increase in output at the Waipa Sawmill, the total output of the logging operations in the Rotorua exotic forests was expanded and totalled 3,067,477 cubic feet (2,582,138).

Details of the species produced are as follows :—

Species.	Whaka-rewarewa Forest.	Waiotapu Forest.	Kaingaroa Forest.	Totals.	Percentages.	
					1947–48.	1946–47.
	Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.		
Insignis pine	945,789	..	1,306,047	2,251,836	73	77
Corsican pine	125,686	13,474	6,856	146,016	5	16
Larch	545,820	68,138	..	613,958	20	5
Eucalyptus	50,656	611	..	51,267	2	1
Douglas fir	394	..	3,551	3,945	..	..
Other species	455	..	..	455	..	1
1947–48—						
Totals	1,668,800	82,223	1,316,454	3,067,477	..	..
Percentages ..	54	3	43	..	..	..
1946–47—						
Totals	1,503,000	255,000	855,000	2,613,000	..	..
Percentages ..	57	10	33	..	..	..

In accordance with the working plan for Whakarewarewa Forest, the output of larch was increased and that of Corsican pine reduced; the operations in these larch areas will be continued during the current year. Of the total sawlog production, 14 per cent. (19) came from thinning operations. Logs obtained from Whakarewarewa and Waiotapu Forests included 337,500 cubic feet (192,587) unsuitable for sawing, and this quantity was sold either as mine props or as firewood or was delivered to the creosoting plant for treatment as fencing-materials or poles.

The wage-incentive plan, which has proved successful in stimulating production, was continued during the year in both Kaingaroa and Whakarewarewa clear-felling and thinning operations. A total of £1,779 (£1,681) in bonuses was earned by the gangs, an average increase in wages of 5·4 per cent. (6·8).

66. *Milling Operations.—Waipa Sawmill:* During the year, the Waipa Sawmill continued to operate on a forty-eight-hour-week basis. The four log-frames operating on 258 days produced 12,649,000 board feet of sawn timber, and the circular rig, working both a day and a night shift on 258 days, produced 4,132,000 board feet. The total cut of the mill was 16,781,000 board feet (16,139,000), again a record for the plant. Logs received for sawing were insignis pine, 73 per cent. (76); Corsican pine, 5 per cent. (16); and larch, 22 per cent.

The circular rig was again utilized for the production of scantling from the larger and rougher logs for the building industry. The total production in widths 6 in. and under amounted to 88 per cent. (86) and in widths over 9 in. to 2 per cent. (4). In the log-frame mill, which supplies the box-factory with as much wide timber as possible, the proportion of widths up to 6 in. was 57 per cent. (55) and 8·5 per cent. (9) was sawn in widths exceeding 9 in. The increased amount of timber cut in the narrower widths was due to the smaller average diameter of the logs supplied.

Timber requirements of the box-factory increased to 9,593,000 board feet (7,468,000), with the result that timber available for sale to merchants and wood-users decreased to 6,341,000 board feet (7,814,000). Sales comprised: green timber, 4,010,000 board feet (5,398,000); kiln-dried timber, 2,053,000 board feet (2,208,000); and air-dried timber, 278,000 board feet (208,000). Most of this timber was sold in the Auckland Province, but increasing quantities are now being distributed to other parts of the North Island in order to demonstrate the quality of timber which can be supplied by careful adherence to good sawing, grading, and seasoning practices.

With increased shipping-space becoming available it was possible to export 1,535,000 board feet (911,000) of timber to Australia. Supply was confined to New South Wales and Victoria, as shipping could not be secured to other states.

Timber stocks held at the 31st March, 1948, amounted to 3,372,000 board feet (2,987,000). In common with other sawmills in the Rotorua area, great difficulty continues to be experienced in obtaining sufficient rail trucks to transport current increased production to the markets. In the early part of 1948 the position deteriorated to such an extent that it was again necessary to resort to the use of motor transport to relieve the congestion in the mill yard, 197,000 board feet being despatched to Auckland; and at times special trains were loaded during the week-ends. The State Forest Service fully appreciates, however, the endeavours made by the Railways Department to provide an adequate supply of trucks.

Timber filleted for kiln-drying totalled 9,577,000 board feet (7,126,000) and for air-drying 2,670,000 board feet (3,167,000); the balance of the year's cut, 4,534,000 board feet (5,846,000), was sold or used in a green condition. The kilns dried 9,773,000 board feet (8,246,000), of which 8,611,000 board feet (7,525,000) consisted of green timber and 1,162,000 board feet (721,000) was partly air-seasoned stock. It was possible to dry this increased quantity because of the installation of a new kiln during the year. 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 92·6 per cent. (91). The quantity of timber dried per kiln-hour was 292 (263) board feet.

The profit from the sawmill and dry kilns amounted to £22,770 (£14,000).

Kaingaroa Sawmill: The Kaingaroa Mill was partly completed, and commenced operating in November, 1947, on a forty-eight-hour-week basis, using a light twin circular breakdown rig and two breast benches for the sawing of the logs from the shelter-belts around Kaingaroa Headquarters. To permit the efficient utilization of small-diameter thinnings, two Bolinder gangsaw frames and an edger will be installed as soon as possible. A green-sorting chain for handling timber out of the sawmill and a steam power plant for the sawmill and for the supply of electric power to the adjacent village are also to be erected.

This mill was producing at the rate of 16,000 board feet per day by the end of the year, and production for the period amounted to 1,094,000 board feet of insignis pine, of which 776,000 board feet were sold in green condition, leaving stocks at 31st March of 318,000 board feet.

67. *Waipa Box-factory and Planing-mill.*—The demand for box-shooks continued to be very heavy throughout the year, and it was found necessary to operate the box-factory on a forty-eight-hour-week basis in an endeavour to satisfy essential case-users whose needs could not be met from other sources. Extra overtime also was found necessary in some sections of the factory. Fruit-cases and cheese-crates again figured largely in the output.

An exceptionally heavy demand for box-shooks still exists from Australia, but there was no possibility of exporting any shooks during the year owing to the overall unsatisfactory supply position in New Zealand.

The ample orders which have been available have enabled production to be maintained at a peak level, resulting in the use of an additional 2,000,000 board feet of timber over last year's quantity. The box-factory's output of case-shooks accounted for a gross total of 9,593,000 board feet (7,468,000) of rough-sawn timber. Sales of dressed timber during the year amounted to 414,000 board feet (862,000).

Profit from the box-factory operations amounted to £27,751 (£8,303), a satisfactory figure reflecting the full use made of the box-factory during the year. Had the box-factory, however, been charged market price for dimension grades, unavoidably used to secure the output recorded, the profit would have been significantly smaller and the sawmill profit correspondingly greater.

68. *Departmental Wood-preserving Activities.*—The quantity of produce creosoted at the departmental creosoting plants during the year was considerably below the total plant capacity, as was the case in the previous year. Operations at Waipa were again seriously retarded owing to lack of seasoned material for creosoting, but it has now been possible to resume cutting for seasoning in advance of creosoting, and a much greater output of creosoted produce can be expected in future. At Hanmer there was again insufficient labour to cut adequate supplies for seasoning and, although more produce was creosoted than in the previous year, this plant will continue to operate below capacity. Fencing-material for departmental use constituted the principal output of the Conical Hill plant.

69. *Exotic Forest Exploitation.*—At the 31st March, 1948, registered sawmills wholly or partly engaged in the cutting of exotic timber totalled 270, representing an increase of 11 per cent. on the number of mills so engaged at 31st March, 1947.

Many of the recently established sawmills are both primitive in construction and incapable of producing a high standard of sawn timber, and viewed from the angle of orderly development of markets for exotic softwoods these are most undesirable features. Although similar sawmills have cut an acceptable standard of product in indigenous timber, this provides no criterion for exotic timber, which, being produced only from low-grade logs, yields a product comparable only with lower grades of indigenous timber. As, however, indigenous timbers were much overproduced before the war, and will still continue to be produced in substantial quantities despite the anticipated decline, there would be little future for exotic timbers if their potential uses were confined to purposes for which the lower grades of indigenous timbers are employed. Although all grades of exotic timber must contain considerable defect, the limited and declining supply of upper grades of indigenous timber offers a wide though difficult market for the better grades obtainable in exotic timbers. It will be appreciated, therefore, that as the best exotic timber grades are fundamentally inferior to the higher grades of indigenous timber, the utmost care in sawing, grading, and seasoning will be a prerequisite to the successful development of a worth-while and stable market.

The State Forest Service continues to concentrate upon improving its seasoning and grading practices with a view to widening the market for exotic timbers, particularly as flooring, weatherboarding, and interior joinery, for natural or paint-finished furniture, and for the framing of factories, schools, and commercial buildings. Although the quality of the product obtained by the Forest Service is far higher than that of most other operators, the Service is convinced that only by adopting the best sawmilling technique can a permanent market be established.

CHAPTER IX.—TIMBER TRADE

70. *Production of Sawn Timber.*—The production of sawn timber of all species by registered sawmills for the year ended the 31st March, 1948, amounted to 429,000,000 board feet. Although production in immediate pre-war years fluctuated around 325,000,000 board feet, wartime demand used up practically all timber stocks, and in order that post-war needs might be met with reasonable promptitude it was

necessary to increase production considerably above 1937 to 1939 levels. Plans were accordingly made before hostilities ended with a view to attaining an annual production of 415,000,000 board feet as rapidly as possible. Owing, however, to man-power and equipment shortages, cutting did not increase as fast as desired, though a new record of 357,000,000 board feet was reached during 1946–47. In that year, however, the construction of many new sawmills in both indigenous and exotic areas was begun, and the large increase in production now recorded shows that many of these units were able to commence cutting simultaneously in the early part of 1947. A total of 608 (527) sawmills were registered for the year ended 31st March, 1948 (see paragraph 107).

It must not be thought that the high level of indigenous-timber production reached in 1947–48 will lead ultimately to the overcoming of the acute shortage of indigenous building timbers which has been an outstanding feature of building activity for nine years. Indigenous-timber production may be as good again this year or possibly a little better, but within a very short period a decline will be inevitable, many of the new sawmills having a life of a year or two only and production will fall as they cut out because further indigenous bush to maintain them in action does not exist in their vicinity.

North Island production amounted to the substantial total of 276,000,000 board feet, which is approximately 50 per cent. above immediate pre-war cutting.

In the South Island, however, the 153,000,000 board feet of timber produced showed an increase of only 9 per cent. above pre-war cutting.

In addition to the logs used as sawn timber, a new record was established in the quantity converted into veneers and plywood, a total of 8,000,000 board feet (7,000,000) being used for this purpose.

71. *Species Cut.*—The increase in annual production amounting to 72,000,000 board feet, or 20 per cent. over last year's total, was provided in both indigenous and exotic timbers.

The steady annual decline in indigenous-timber production over the last six years was reversed, and the 46,000,000 board feet increase over 1946–47 brought the cut up to the 1940–41 level. Many factors combined to make this position possible. The acute shortage of rimu, matai, and totara encouraged builders to finance the logging and milling of small sparsely timbered and even worked-over areas of indigenous forest, much of which had hitherto been considered incapable of economic extraction in the orthodox view of the sawmilling industry; and the Forest Service substantially expanded its logging activities to make possible the establishment of five new sawmills in two of the few remaining significant stands of indigenous timber in the North Island. It is interesting to note that, of these five sawmills, three are operated by timber-merchants who have engaged in saw-milling since the war solely to secure timber supplies and thus avoid the extinction of heavily capitalized retail businesses, and one is owned by a merchant who, although engaged in sawmilling to a small extent prior to the war, found it necessary to increase his investment for a similar reason. Of course, builders who financed logging or sawmilling operations do not have to operate within or show a profit on approved sawmillers' prices, assurance of timber supplies being often far more important to them than price.

Increases in production were recorded for all of the well-known indigenous timbers except kauri. The cutting of the latter has now fallen to the lowest amount yet recorded, being under 1,500,000 board feet. At this level many users who are accustomed to regard the timber as essential for their needs are unable to secure their full requirements, and intensification of control has become necessary in order to ensure allocation of supplies for the most essential uses. The increased supply of rimu and miro available, amounting to 24,000,000 board feet, eased the position somewhat in respect to timber for house-building, furniture, and fittings, &c. The additional 7,000,000 board feet of matai and 1,000,000 board feet of totara produced assisted in meeting the heavy demand for exterior joinery, weatherboarding, and flooring, this

increase being particularly important owing to the very small imports of redwood obtainable. The increased cutting of 2,000,000 board feet of tawa served to glut the market with this timber during the last quarter of the year, particularly in lower grades. The marketing of this timber was undoubtedly prejudiced by the greater timber supply available, but it is believed that, provided appropriate care is taken in marketing, preservation, and use, the recession in demand will be temporary. Demand for kahikatea and beech species still continued much ahead of supply, despite increases of 3,000,000 board feet and 4,000,000 board feet respectively in the cutting of these timbers.

The increase in exotic-timber production, amounting to 26,000,000 board feet, was double that of last year. North Island cutting amounted to 96,000,000 board feet, which is appreciably in excess of domestic demand, having regard to the concurrent supply of other timbers. To avoid hardship to sawmillers and to encourage further expansion in exotic-timber production, every effort is being made to improve the current level of export. Based on present indications, however, it will not be possible to secure loadings on trans-Tasman shipping from Auckland for more than 6,000,000 board feet of timber in 1949, and in order to export an estimated surplus of approximately three times this total, endeavours are being made to have ships loaded at Tauranga. The possibility of loading at ports in the southern part of the North Island is also being explored, but this will involve the difficulties of longer rail haulage and heavier freight charges.

72. *Man-power.*—More men are now employed in the North Island sawmilling industry than at any time previously. This position can be considered remarkable for a period when the general demand for labour has continued to exceed supply, and it is primarily the result of providing suitable living-accommodation for bush workers.

Sawmillers operating in indigenous areas where accommodation was inadequate have taken advantage of the Timber Workers' Housing Scheme (referred to in paragraph 100) to procure additional houses and improve existing dwellings, thus removing the major obstacle to securing their full labour complement. Other operators requiring new houses in indigenous bush are invariably using the Scheme to provide all the accommodation needed.

In the principal exotic timber areas, sawmillers whose mills have a potentially long life are providing permanent housing near their mills, but some timber-merchants, boxmakers, builders, and sawmillers are erecting sawmills in urban areas, usually adjacent to their existing retail or conversion plants. This latter group is generally influenced by one or other of two considerations in following this policy. In some cases their bush resources are too small or scattered to warrant the establishment of a rural sawmill, while in others the deciding factor has been the freedom from accommodation difficulties which urban sawmilling makes possible.

In the South Island, although man-power employed in sawmilling increased steadily throughout the year on the whole, little increase was recorded on the west coast, principally because of competition for available labour from the mining industry. The Westland sawmillers did not take immediate advantage of the facilities provided under the timber-workers' housing scheme, but now its value has been realized and houses are being erected, better progress in securing additional labour can be expected. Most of the additional labour secured for sawmilling in the South Island found employment in exotic sawmills in Canterbury, many of which were situated near or in centres of large population.

For the first time the industry in both Islands received assistance from the pool of selected workers engaged in Great Britain, a total of 92 men being allocated to country sawmills.

Other references to man-power are made in paragraph 101.

73. *Equipment for Timber and Allied Industries.*—The shortage of parts and replacements for sawmilling equipment is still very acute, especially in respect to tractors, many of which have been immobilized for this reason. A large number of new tractors is required to maintain timber production at its present level. A small number of portable sawmills which is expected to arrive towards the end of 1948 will be readily utilized by the industry. (See paragraph 104 in respect to saws.)

74. *Domestic Markets.*—The substantial increase in timber production secured during the year resulted from early forward planning to meet the post-war needs of the timber industry. Although, as expected, much of the improvement occurred in exotic species, the trend of declining production from indigenous species was temporarily arrested and wood-consumers had available a slightly better supply than formerly.

The all-time record created by the building of 12,734 houses made an extraordinary demand for many grades and sizes of timber, and the success attained was largely due to the adaptability shown by house-builders in the use of substitutes when normal timber specifications could not be met. In particular, the large-scale use of insignis pine for framing and the acceptance of treated non-heart rimu, matai, and tawa for flooring and weatherboarding contributed in making the record possible.

Nevertheless, it is doubtful if such house-building results could have been achieved had it not been for the limitations placed upon the construction of other types of buildings and the gradual easing in demand for timber for postponed maintenance work. Inability to undertake the latter work during the war years caused an accumulated demand which required urgent attention when hostilities ceased and created a heavy drain on supplies in 1946 and 1947. The combined effect of increased production, intensification of house-building, and reduced demand for timber for maintenance has resulted in some grades and sizes becoming surplus to current need. This, in turn, has caused reduced inquiries for subnormal produce such as shorts, face cuts, &c., which for some years have found a ready market, but which normally are difficult to sell.

While demand for timber considerably exceeded supply, buyers often found it necessary to accept specifications not entirely suitable or appropriate for their needs. This applied particularly to exotic timbers, with buyers frequently accepting multiple sizes requiring subsequent recutting, and dimension grades for boxmaking. The sawmiller thereby secured a better conversion rate and a higher average return, at the expense of the buyer, whose costs were correspondingly increased. These practices, although favouring the sawmiller, did not always result in more than a short-term advantage. Again, some operators used current income as the basis for their purchases of plantations or log supplies and paid prices based upon the continuation of artificial trading practices. Easier conditions between supply and demand make the position of such sawmillers unenviable. Sawmillers cutting exotic timbers in the North Island are now generally finding it necessary to meet buyers' specifications. Recognition of Mamaku as a basic-price point for North Island insignis-pine sales is still being sought. In the South Island, however, where exotic forest areas are smaller than in the North Island, it is expected that demand will continue to exceed supply, with market conditions favouring the sawmiller.

The position regarding the boxmaking industry which was referred to in last year's report has not improved, and to afford North Island box-users a reasonable opportunity of securing their supplies the State Forest Service found it necessary to increase the output of its box-factory at Waipa. The quantity of timber used at this factory rose to the high figure of almost 10,000,000 board feet and unfortunately exceeded the production of box grades, necessitating the use for boxes of some grades suitable for house-building and furniture. The failure of other producers to meet market demands was undoubtedly due to narrowed margins of profit.

75. *Timber Imports.*—As shown in Appendix IV, the importation of 33,200,000 board feet of timber in 1947 was over 50 per cent. more than in 1946.

The supply of Australian hardwoods increased only slightly and shipping was again the principal factor in limiting deliveries to about half their pre-war level. Demand for sawn hardwoods continues to far exceed supply and it is still necessary to continue strict control of ordering and use.

It was possible in 1947 to procure the largest quantity of Douglas fir imported since 1929 and for the first time since the war commenced satisfactory stocks were held throughout the Dominion. The Building Controller's policy of restricting the use of indigenous timbers for purposes other than house-construction created a good market for Douglas fir and was largely responsible for the heavy sales made.

Although redwood was still unobtainable and western red cedar was not easy to buy, New Zealand can consider itself fortunate in securing over 3,000,000 board feet of the latter species. This was imported almost entirely for exterior joinery and made possible the supply of window joinery for the record house-building programme undertaken.

The heavy increase in landed price was a disturbing feature associated with the importations of all timbers from Canada and the United States of America. Before the war these woods were retailed at prices reasonably close to those of the New Zealand timbers which they complemented; they are now generally double the price of local comparable timbers. In addition to creating difficult conditions for merchants, manufacturers, and users, these prices intensify the search for substitutes, not necessarily in timber. It is hoped that this problem is appreciated and that efforts will be made to secure a reduction in delivered price.

76 *Timber Exports.*—Exports in 1947, amounting to nearly 9,000,000 board feet, were nearly 2,500,000 board feet in excess of the amount which it was possible to export in 1946. This figure reflects the slight improvement in shipping available during the year, but a much greater improvement is required immediately if the Dominion is to find an outlet for its expanding production of insignis pine. It was again found impossible to obtain shipping from the port of Greymouth, but during 1948 loadings are expected for about 3,000,000 board feet from this port.

The export of insignis pine in the form of sawn timber and box-shooks totalled 5,834,000 board feet (4,117,000). With shipping available, annual export could be anticipated to increase to 50,000,000 board feet between 1950 and 1952. It is generally appreciated that the main avenue open to the Dominion in seeking to balance trade with Australia lies in the export of substantial quantities of softwoods and other forest products to the Commonwealth.

Throughout the year continual inquiries for box-shooks were received from Australian buyers. The unsatisfied demand which existed on the domestic market precluded the possibility of releasing shooks for export, except those for the Pacific islands banana trade. Details of quantities exported are shown in Appendix V.

CHAPTER X.—FOREST TECHNOLOGY

77. *Forest Experiment Station.*—As the co-ordinating and initiating authority for all research activities in the Service, the Forest Experiment Station at Rotorua has made commendable progress in the first year of its establishment, in spite of inadequacy of staff and laboratory facilities. Preliminary work at the Station has necessarily been directed towards the evolution of a research policy, staff organization, classification of current projects, development of a system of project documentation, assembling of research literature, and liaison with conservancies. The staff at the end of the year consisted of 8 professional officers, 5 forest rangers, and a fluctuating number of foremen and trainees; the majority of the non-professional staff were engaged on national forest survey work. The staff establishment of a fully equipped station provides for several

additional senior research officers. Some references to the year's work are given under "Forest Management" and "Silviculture" (paragraphs 28, 29, 30, 32, 49, and 50, and paragraphs 80 and 81 of this chapter).

78. *Forest Research.*—Interpretation of the ecological observations undertaken as a part of the national forest survey is beginning to throw a clearer light on the research problem involved in the management of indigenous forests. It has never been thought that the ecology of New Zealand forests (the study of the dependence of their component plant communities upon one another and upon their environment) was simple, and in particular the difficulties in managing podocarp stands have always been realized; the indications now are that the problems are more complex than had been expected, even for pure beech forests, and that the forest survey, rather than solving these problems, is merely for the first time stating them clearly.

The course of action, however, is equally clear. The primary survey is concerned with mapping and describing the many different forest associations and with indicating the ecological status of each. From a forest management point of view, two major ecological categories can be recognized: (1) those that reproduce themselves, and (2) those that do not. The latter category is characterized by light and infrequent seed crops; paucity of natural regeneration; complete absence or, at best, poor representation of sapling and pole stages; stagnant and overmature trees; and a general down-grading of the association (following destruction of its own micro-climate). Forests in this category cannot be considered truly adjusted to the present climate and soil. In the extreme cases forest management is impossible, since any interference will result in reversion to shrub, heath, or tussock. In all other cases management directed towards perpetuation of the original association is equally impossible, since the successional trends are towards hardwood or, on occasions, minor softwood forests. Management should be possible, although the composition of the second crop will inevitably be changed. The other major category (No. 1) shows less stagnation, a more normal distribution of age and size classes, and signs of definite regenerative vigour. All the evidence suggests that such forests are well adjusted to their climate and soil and are in fact true climatic or true edaphic climaxes. Management in this category is not only possible and desirable, but in some areas it is already taking place.

The steps to be taken are obvious. Firstly, the primary survey with its attendant interpretative work must be completed. Secondly, the forests most amenable to successful management (mainly in category (1)) must be segregated, and their reservation as permanent State forest assured. Thirdly, a programme of detailed and intensive research must be commenced in forests of both categories. Such a programme should lead to the evolution of silvicultural systems which will follow the natural and inevitable trends of forest succession and which will not, instead, attempt to "fly in the face of Nature." Fourthly, and to some extent concurrently, the silvicultural systems evolved will have to be translated into practical possibilities by large-scale management experiments designed to find out the most suitable and economical harvesting techniques.

The research programme will demand staff with intensive training in forest ecology and of the very highest calibre. The problems are so intricate that only by attacking them with teams of research workers investigating all the biological, practical, and economical considerations involved can any success be hoped for. With only flimsy historical records of the behaviour of these forests, and even then only over the past few decades, and with no literature on long-term investigations into similar forests overseas, many years of carefully designed experimental and observational work will be required. The programme, in fact, must be essentially long-term in nature and must, as pure research, look to not fifty but two or even five hundred years ahead. The growth-rate of indigenous species is so slow and, for some associations, the intermediate or "nurse" stages are likely to be so prolonged that the results will not be evident for many generations to come. This fact, however, must not act as a deterrent. The

soils involved are generally unsuited to any type of agriculture and the only productive use to which they can be put is in some form of high forest; the solution of New Zealand's indigenous-forest problems is a prerequisite to the success of any rational land-use policy.

Intrinsically less complex than the indigenous forests, the exotic forests nevertheless present many problems for research.

The numerous exotic-timber species introduced during the past century have provided accumulative evidence of silvicultural characteristics which, in many respects, differ from those found in their countries of origin. Sufficient time has elapsed since their introduction to determine, by process of elimination, the most important species for New Zealand conditions, but much research remains to be done in the silvicultural evaluation of such species, by qualitative observation and quantitative measurement, which will, for example, disclose for each species the optimum and limiting site factors, the effect of different spacing distances and different treatments, the effects of mixtures, and the conditions necessary for successful natural regeneration.

By their relative uniformity and rate of growth, the exotic forests are more adaptable to intensive management than indigenous forests, and the experience of past decades (largely, of necessity, the result of trial and error) is being drawn up as the basis of a number of co-ordinated research projects (paragraphs 78, 80, 81) the continuity of which has been provided for by the establishment of the Forest Experiment Station.

In the field of forest products research the immediate requirement is the provision of facilities for more intensive studies. New Zealand, as a timber-producing country, cannot divorce its problems of timber use from those of forest management and silviculture, and the centralization of *all* aspects of forest research at the Rotorua Forest Experiment Station will be an important step forward. Some of the most urgent forest products problems to be investigated are necessarily those concerned with the timber trees in the indigenous forests, which are most amenable to forest management, but which occupy a relatively insignificant place in the wood-use picture to-day. Very many problems relate to the timbers from planted forests the products of which depend so largely for quality upon silvicultural treatment; the nature and number of defects and density of the wood are the most important factors determining the value of the timber or round products, however those products may subsequently be improved to fit special use requirements. With both of these groups of problems is indissolubly linked the conservation of the major indigenous softwood timbers by their *intelligent* use—that use must inevitably become more restricted.

79. *National Forest Survey.*—In contrast to the long-term aspect of the national forest survey project already discussed, the more immediate task is the provision of reliable estimates of the Dominion's indigenous forest resources. Progress during the year has been steady and has brought the total area covered by ground sampling up to more than 1,000,000 acres. Much of this is merchantable forest, and although it represents a small part of the total forest area it is a significant proportion of all merchantable or potentially merchantable forests.

In the North Island, broadly speaking, about half the important podocarp stands have been dealt with, a small proportion of the mixed and hardwood forests, and very little of the (mainly) protection beech forests; in the South Island the podocarp and beech areas in western Southland are nearly completed, and a start has been made on the large tracts of rimu in South Westland, but the very extensive merchantable and protection beech forests of north-west Nelson have not been commenced. Work will be concentrated in the western Southland and Westland units in the coming summer, when it is hoped that both units will be completed.

Computations to the volume per acre stage have kept pace with the field-work, but map compilation has lagged behind. As a result it has been possible to submit final volume estimates for one small unit only. Such maps as have been completed show more detailed and more accurate information on topography, bush edges, and forest type boundaries than has been available hitherto in the Service. They will be a valuable addition to the map records.

80. *Forest Botany.*—Good progress has been made by the Forest Experiment Station in the establishment of a national forest herbarium at Rotorua, the total number of indigenous species now being 389; for the exotic section of the herbarium 146 species have been collected and mounted. The study and periodic description of tree-seedling characteristics have progressed and a number of line drawings are ready for publication. Past and current data on the seasonal growth cycles (phenology) of a range of exotic coniferous tree species are being collated by the Station; a new allied project initiated by the Station during the year was the collection of data on the first concurrence of cones and viable seed, evidence which will be of considerable interest in future genetical research. The old exotic arboretum at Rotorua has been taken over and improved by the Forest Experiment Station and a commencement made in the formation of an indigenous arboretum in the same vicinity.

A further 820 trees were planted in the northern arboretum at Waipoua and the few failures of the previous year were replaced. When completed, this arboretum will comprise all the existing species of the genera *Agathis*, *Araucaria*, and *Phyllocladus*. A small arboretum was opened in Canterbury Conservancy to include pine, poplar, and willow species.

81. *Silvicultural Investigations.*—The Forest Experiment Station has been engaged on collection of data on the periodicity of seed years in both indigenous- and exotic-tree species; seed germination testing of a wide range of exotic and indigenous species; raising of elite stands from special-quality seed lots; vegetative propagation of insignis pine, including treatment by hormone products; experimental low pruning of ponderosa pine, lodgepole pine, spreading-leaved pine, and strobus pine; and preliminary work on the significance of the podsolization of pumice soils (in co-operation with the Soil Survey Branch, Department of Scientific and Industrial Research). A review of systems of tree classification was undertaken and comparative field tests carried out with a view to the adoption of a suitable standard system. The response to thinning of insignis pine and Douglas fir respectively has been the subject of sample investigations, and a further series of spacing trials was instituted in a South Island forest. The Forest Experiment Station now has supervisory control of all sample plots and experimental areas, and is engaged in a review of the whole series and the concurrent formulation of standing instructions for sample plot procedure. Studies of the natural regeneration of indigenous species (including kauri at Waipoua) have been continued.

A contribution to the study of the principles on which forest ecological survey is based, with particular reference to Otago and Southland forest types, has been published in the *New Zealand Journal of Forestry.*

82. *Grading of Timber.*—With the substantial increase in production and the greater diversity in the use of forest-grown exotic timbers, there has been a demand for grading rules to cover flooring, weatherboarding, interior fitments, and furniture. For the last-mentioned purpose the emphasis has been upon a minimum acceptable length of "cutting" and a stated percentage of cutting to be yielded by each board; in some instances a 2 ft. length of clear timber—*i.e.*, a 2 ft. "clear cutting"—is an acceptable minimum length, but it is recognized that longer length cuttings up to 6 ft. containing dressable defects will also be yielded by this factory grade. Meanwhile the grade requirements are the subject of mutual agreement between buyer and seller, and the need for national grades is less urgent than is the case with the dressed building lines. From

experience gained in the use of flooring, weatherboarding, shelving, skirtings, and architraves of exotic forest timbers in Forest Service buildings and those erected by private companies, a satisfactory basis for grading has been established. In co-operation with representatives from some of the principal producers, mill studies have been carried out and grading rules submitted for consideration by the appropriate Standards Institute Committee. At the end of the year, rules for grading of rough-sawn timber of *Pinus* spp. in finishing and dressing grades, and also for the machined finishing timbers, flooring, weatherboarding, and other interior woodwork such as shelving, were in the final Committee stages.

Grades of insignis pine for light timber construction—*i.e.*, dimension grades—have been issued in printed form as an addendum to the National Grading Rules for New Zealand building timber. The need for strict adherence to those grades has not been recognized by all producers, and this factor, in conjunction with the unmerited publicity given to insect-borer hazards, has delayed the acceptance of the grades by some of the building authorities. Arrangements are in hand for the testing of insignis-pine timber conforming to the grades in several standard sizes over a number of spans; to be of greater practical value, these strength tests should be paralleled with similar tests of rimu building grades.

Some progress has been made in the definition of structural grades for insignis pine, and large-sized members conforming to those tentative grades (standard structural) have been used in roof trusses with spans of 45 ft., in smaller trusses, and in columns in large buildings at the Waipa Mill.

The approved profiles for weatherboarding, flooring, and matchlining have been amended slightly to permit the inclusion of the taper-tongue flooring profile. As an essential preliminary to the manufacture of templates, accurate drawings of the profiles have had to be made, and this work has been simplified by the receipt of Swedish standard profiles for flooring and matchlining giving the dimensions required. The completed Standard Institute specification for the above-mentioned profiles and also the specification for moulding and joinery profiles are now in the hands of the printer.

The establishment of grades for dressed flooring, weatherboarding, and other interior woodwork from forest-grown exotic timbers draws attention to the need for similar standards for the indigenous softwoods permitting prescribed defects and thus enabling additional supplies to be drawn from Building A Grade. Draft specifications are at present being formulated.

Other Standards Institute Committee work under this heading involving active participation by the Forest Service has concerned "Plywoods," "Glues," "Ladders," and "Household Furniture." The use of tawa has been the most important item for discussion in the last-mentioned specification, with special regard for the elimination of *Lyctus* borer attack. Tawa dowels are now acceptable in furniture conforming to this specification only if treated with preservatives. For other furniture parts this Service, in co-operation with private firms, has been studying the practical possibilities of a superficial treatment with an oil-soluble preservative. The material formulated has been shown to have no detrimental effect upon the finish or on glue bond. The potential value of such treatment for tawa, taraire, or other *Lyctus*-susceptible timbers is based upon the assumptions that the timbers have been kiln-dried and are free from infestation when the furniture is manufactured and that the preservative is applied to all surfaces of the furniture parts or assembled furniture.

83. *Utilization of Minor Timbers.*—The very good strength properties of locally grown Douglas fir and European larch, combined with their ability to yield high-grade framing timber and planks, have been recognized in their use for light timber framing and a limited use for scaffolding and scaffold planks. For sub-floor members, heartwood

timber from old trees is being used as an alternative to heart rimu in some of the lower-rainfall districts. On account of its good grade, larch should also be considered as an alternative to rimu for battens for some types of exterior wall sheathings, while heart larch may be considered for use as tile battens. It is of interest to note that locally grown *Eucalyptus viminalis* and *E. obliqua*, kiln-dried after preliminary air-seasoning, have been used as high-class hardwood flooring in several Forest Service houses.

Apart from the established uses of red beech and hard beech heartwood for sleepers, fence posts and rails, and bridge and mine timbers, increasing quantities are going into housing primarily for sub-floor framing, but to a limited extent for flooring. Timber containing sapwood is used for above-floor framing, furniture, handles, dowels, and similar uses. Other industrial inquiries affecting the minor species have been concerned with poplar for peeler logs, rata and maire as possible substitutes for persimmon, white manuka for handles, tawa for cooperage, redwood (imported) for fireproof doors, eucalypt logs for floating booms, and various indigenous and imported timbers to replace kauri. Numerous requests for information concerning timbers from Burma, Siam, Malaya, Borneo, and New Caledonia have been dealt with and the small supplies of these timbers which have been landed are finding a limited market.

84. *Timber Mechanics.*—Additional tests of air-dry insignis-pine material from the original Whakarewarewa test shipment, which has been in dry storage for six years, have been carried out, and the inclusion of the data from these tests with the previous results will enable a complete statistical analysis to be made and the final results prepared for publication.

Preliminary analysis has already shown that there is a definite correlation of rings per inch with strength and specific gravity with strength, but there is no correlation of rings per inch with specific gravity. This confirms the results obtained for material grown in South Africa and Australia. In the case of New Zealand material, the rings per inch and specific gravity account for 68 per cent. of variation in maximum crushing strength and for 63 per cent. of variation in modulus of rupture.

A report on the physical and mechanical properties of both green and air-dry material of thirty-year-old loblolly pine has been completed.

Air-dry values for some properties of insignis pine and loblolly pine are compared, as follows:—

—	Insignis Pine, C. and D. Bolts. (Five Trees).	Loblolly Pine. C. and D. Bolts (Three Trees).
Growth rings, per inch	$2\frac{3}{4}$	$3\frac{3}{4}$
Specific gravity (weight oven-dry, volume green)	0·385	0·314
Weight per cubic foot, air-dry, pounds	28	24
Modulus of rupture in bending (pounds per square inch)	11,230	7,820
Modulus of elasticity in bending (1,000 lb. per square inch)	1,338	827
Maximum compressive stress parallel to grain (pounds per square inch)	5,570	4,300

Static bending tests have been carried out on laminated packs, consisting of silver beech laminations and veneers of various species. As the assemblies were mainly for handles, the tests were carried out principally for the purpose of determining the work to maximum load and work to total load.

Routine testing was continued with the Denison toughness machine on both indigenous and exotic timbers. Miscellaneous investigations have included tests of various laminated packs, the laminates varying in species and thickness, for use as hammer handles.

85. *Wood Technology.*—In the study on New Zealand beech species, simple chemical tests for distinguishing durable species have been considerably extended. Ferric-chloride - potassium-dichromate solutions have been of some merit, but at present appear to be suitable as laboratory tests rather than field tests. Of all chemical tests so far investigated, the ferric-chloride - sodium-acetate gives the most positive result. Chemical work on the beeches has also been extended to identification of individual species, and of the tests so far examined the methanol-hydrochloric test and those on alcohol-solution extracts indicate possibilities. All this work, together with the investigations on the substantial variation of specific gravity, as well as anatomical features, has resulted in a considerable extension of the collecting of beech material from localities not covered by previous studies.

Routine microscopic identifications of 77 specimens were made during the year, and a microscopic study was made of the refractory nature of miro under pressure preservative treatment. Twenty-five proven samples were supplied for microscopic sectioning, and some 300 permanent microscopic slides were added to the reference collection, which now contains close on 5,000 slides.

Specific-gravity and shrinkage tests were carried out on several trees of different exotic species from the arboretum at Whakarewarewa. When compared with similar tests on timber from trees grown in adjacent areas under forest conditions, it was found that the specific gravity mean for arboretum and forest material is almost the same in two species, but in arboretum material the range for specific gravity shows greater extremes. In general, the higher specific gravities occur at the base with maxima in the central core, and the lower specific gravities near the top of the trees with minima at the central core. The occurrence of a specific-gravity mean and specific-gravity pattern which are similar in trees of approximately the same age grown under considerably different conditions of environment but similar climatic conditions further indicates that, in the species investigated, specific gravity is a function of age, rather than of rate of growth.

Specific-gravity figures (weight oven-dry, volume green) for the arboretum material are compared with those for the forest-grown material (in parentheses), as follows :—

Douglas fir : Mean values for trees tested	0·44 (0·45)
Loblolly pine : Mean values for trees tested	0·34 (0·33)
Spreading-leaved pine : Mean values for trees tested ..	0·36 (0·35)
Japanese cedar : Mean values for trees tested ..	0·30 (—)

The Douglas-fir figures are comparable, the trees being forty years old in each case, and loblolly-pine figures are also comparable, the ages being thirty years. The spreading-leaved pine tests are not directly comparable, owing to fewer tests in forest material and a difference in age of seven years.

For resin-content testing in connection with the pulping of insignis pine from Kaingaroa Forest (paragraph 90), 250 samples have been prepared since September for analysis by the Dominion Laboratory. For each sample prepared, a duplicate was cut and tested for density and shrinkage. The range of test samples covers material from dominant, co-dominant, and suppressed trees. The available specific-gravity results for this material, twenty-two to twenty-three years old, give a basic specific gravity mean of 0·351.

Following this work there has been a reinvestigation of the moisture content of insignis pine by zones from the pith to the bark. This has confirmed the results of a small study undertaken several years ago—namely, that the heartwood possesses a moisture content of 40 per cent. to 50 per cent., which extends usually one to two rings outside the visual heartwood boundary into a dry zone, and then rises sharply to a maximum moisture

content of about 200 per cent. and decreases only very slightly towards the bark. The moisture content by the Dean and Stark water-estimation spirit method has indicated that moisture-content determination by oven-drying method may, in the case of resinous heartwood, lead to significant errors.

Laboratory investigations were made on the condition of timber dried by the pyroligneous method.

A study of the effects of painting and priming on the equilibrium moisture content of various woods—*e.g.*, sap and heart rimu, sap and heart matai, totara, tawa, silver beech, and insignis pine—under different conditions of exposure—*e.g.*, outdoor exposed, outdoor under cover, and in a non-centrally-heated room—has been in progress for nearly twelve months. So far the study has shown that for samples outdoor under cover and outdoor exposed in Wellington the equilibrium moisture contents for heart and sap rimu, painted and unpainted, are as follows :—

Material : Rimu.	Moisture Content Per Cent. Based on Oven-dry Weight.	
	Winter Period : July to October, Inclusive.	Summer Period : January to April, Inclusive.
Outdoor under cover—		
Unpainted sap	20·5	17·0
Unpainted heart	11·5	10·5
Painted sap	18·25	16·5
Painted heart	9·5	9·0
Outdoor exposed—		
Unpainted sap	23·0	15·0
Unpainted heart	13·5	10·5
Painted sap	18·5	15·5
Painted heart	12·25	11·0

The transitions from winter-to-summer and summer-to-winter equilibrium moisture contents are quite marked and on each occasion occupy a period of two months—viz., May–June and November–December. The study has also shown that the effectiveness of a priming coat as a sealer on exposed rimu boards diminishes very rapidly and it is relatively ineffective after six weeks' continuous exposure.

86. *The Drying of Timber.*—Protracted discussions by the Standards Institute Committee have delayed the issue of the "Code of Practice for the Kiln Drying of Timber." The amended specification has now been recommended for publication. In specifying moisture contents for the various products it has been necessary to set down the figures most nearly approaching the average equilibrium moisture contents in the main centres of population. Current studies reported above are giving a more complete picture of the manner in which the several major building timbers, separately for heart and sap wood where necessary, vary from the generalized graph of wood moisture content as affected by relative humidity and temperature.

Attention has been drawn to the need for the specification of moisture contents in (*a*) technical notes compiled for the guidance of instructors who are preparing students for School Certificate Examinations, (*b*) a lecture to a representative gathering of engineers and architects, (*c*) lectures forming part of a timber technology course, (*d*) Standards Institute specifications governing finished products, and (*e*) an article published in *Building Progress*. The last-mentioned article, "Kiln Drying Notes for the Guidance of Kiln Operators," covers everyday aspects of kiln operation and recommended schedules.

In several instances assistance has been given to kiln operators, especially in the provision of drying schedules. Two kilns were operated for a short period, principally for drying tawa loads. One kiln charge of 1 in. red beech was kiln-dried, but degrade

was excessive. In this instance an edge-to-edge piled kiln stack was air-dried for over three months before kiln-drying; in future charges it must be recognized that reasonable air drying requires vertical flues—*i.e.*, spaces between the boards in each course—which will ensure that the centre of the stack will have been seasoned to the same extent as the outsides. This general principle should be followed in all preliminary air-seasoning, which, while desirable for native softwoods, is essential for native hardwoods, with the exception that tawa and other species prone to rapid discoloration should be kiln-dried as soon as possible after sawing. It has been found necessary in giving advice on the kiln-drying of rewarewa to point out that boards containing the refractory core cannot be dried without excessive warping and that excessive tangential shrinkage makes it necessary for this species to be accurately quarter-sawn or flat-sawn to avoid diamonding.

Further experience at the Waipa Mill has shown that automatic ventilation has considerable value, especially for the efficient drying of the fast-drying exotic pine timbers. It is clear that kiln units designed for the drying of indigenous softwoods have insufficient heating surface, ventilator provision, and fan capacity for these fast-drying exotic timbers.

87. *Wood Preservation.*—Testing of wood preservatives against marine borer infestation was continued in co-operation with the Auckland Harbour Board. Test specimens were again examined during the year. After five years exposure, creosoted specimens of exotic species were sound and showed nil to slightly increased incidence of attack as compared with the condition the previous year. Attack had occurred by teredo and was evident mainly on the unsheathed transverse sections. Untreated control specimens of the same species had been completely destroyed. Of the untreated indigenous species (all heart timber), tawa, taraire, kauri, and miro were totally destroyed. Totara continued to show marked resistance to teredo attack, while attack by *Limnoria* was minor to moderate and had spread over the entire surface. The additional indigenous species containing both heartwood and sapwood, installed untreated, were also examined. After three and a quarter years' exposure, kauri specimens have been totally destroyed, while totara specimens have been attacked by *Limnoria*, extensively in the sapwood and moderately in the heartwood. Round bolts of tawa, taraire, and miro have been extensively attacked from surfaces where the bark had become detached while submerged in the water and are now in an unserviceable condition. White and red manuka (both with and without bark) after two years' exposure are relatively free from attack. Redwood and larch specimens immersed with bark intact are comparatively free from attack, and the bark is holding well. Specimens of these two species immersed untreated and debarked have been attacked quite extensively.

Rimu poles creosoted by the State Forest Service and installed by the Post and Telegraph Department during 1931 in Greymouth and Canterbury have been maintained under close observation. After seventeen years' service, 65 creosoted poles are perfectly sound while 2 show signs of decay. Of the creosoted poles none has failed, but an average life of only three years was obtained from untreated controls. Similar service tests with creosoted larch poles and crossarms are now being organized in co-operation with that Department.

An experimental pressure cylinder 26 in. in diameter by 8 ft. in length has been installed at Rotorua, and will be utilized in determining the susceptibility to treatment of the principal indigenous and exotic species and in investigating suitable treatment schedules for application on a commercial scale.

Further investigations have been made of the dipping of kiln-dried insignis-pine timber in an oil solvent preservative immediately after withdrawal from the kiln and before appreciable cooling of the timber had occurred. These investigations were extended to include 8 ft. lengths of 4 in. by 2 in. insignis pine which were immersed while hot for periods varying from ten to thirty minutes. The results were comparable

with those obtained in previous tests using short lengths of timber, good absorptions and penetrations being secured. This method of preservation appears to have a practical application where it can be arranged for timber to be dipped immediately after withdrawal from the kiln, and, while the cost of preservative absorbed may be fairly high, handling costs could be kept to a minimum by mechanization of the dipping process.

88. *Painting of Wood.*—The Forest Service has co-operated with the Inter-departmental Paint Committee in its extended activities, which include erection of additional test fences at Westport and Alexandra, Central Otago (representing climatic extremes), inspection of panels on existing fences, and current problems relating to paints and painting technique.

No extension of Forest Service paint-testing on the Wallaceville fence will be made until a final report on the present panels is complete. Four years' exposure of the insignis-pine panels has shown that white lead in oils is still rated highest of the primers used. The resin knot-sealer developed by the Western Pine Association is being tested on sections of the insignis-pine weatherboarding used in recent additions to the State Forest Service Head Office buildings.

89. *Plywood Manufacture.*—A departmental report on a number of technical aspects is nearly complete. In a short paper, conversion of New Zealand logs into veneer and plywood is discussed and comparisons made with such scanty overseas figures as are available. It is concluded that, on an average, only one-third of the volume of the green log finds its way into the finished plywood; while this does not compare favourably with conversion by sawing, it must be recognized that plywood possesses the advantages of wide sheets, distributed strength, non-splitting qualities, and dimensional stability which make its use more economical. There is need, however, for closer utilization of small-sized sheets of veneer.

90. *Wood Chemistry.*—Resulting from research work by the Dominion Laboratory on the resins of white-pine, rimu, and minor *Dacrydium* species, a number of requests have been received from overseas for supplies of shake resin from white-pine and rimu and for wood or foliage of rimu. It has not been possible, however, to arrange for supply on a commercial scale, owing to lack of information on collection costs as related to the value of the finished products.

Tests of silica content of a number of specimens of beech species have been made by the Dominion Laboratory as part of an investigation by the Forest Service into the sawing difficulties associated with one or two species. The silica contents of black beech, mountain beech, and hard beech are high in many of the specimens examined. A brief note in the *New Zealand Journal of Forestry* has covered the initial tests.

A new series of tests of ether-soluble extractives from insignis pine is in progress, the actual extractions being made by the Dominion Laboratory. An earlier series of tests had shown considerable seasonal variation in resin content, and this was one aspect to be re-examined, together with zonal resin content from pith to bark at several height levels in trees from similar Kaingaroa Forest compartments; the trees are now five years older and show a higher proportion of heartwood. In the current series there has been considerable difficulty in defining accurately the outer limits of the true heartwood and it was necessary to use the benzidine method of differentiation. Outside the true heartwood, the resin content of which was recorded as high as 35 per cent. in one instance, but was usually 6 per cent. to 13 per cent. there is a dry zone, apparently intermediate in character and resin content, between the heartwood and sapwood. In the latter zone there is generally a consistent decrease in resin content towards the bark. Summer fellings show higher sapwood resin contents towards the tops of trees than do spring fellings, but in few instances do they exceed 2 per cent.

91. *Pulp and Paper Making.*—Forest assessment and industrial engineering surveys have demonstrated the practicability of developing an integrated sawmill and pulp and paper development of economic size at Murupara, on the Rangitaiki, to operate in perpetuity on the sustained yield of adjacent Kaingaroa exotic forest stands, principally of insignis pine. To check previous laboratory and mill scale tests made in North America from time to time, a comprehensive series of both pulp and paper making trials were carried out in co-operation with the three largest paper-manufacturers in Australia. All tests were so satisfactory that the Government engaged the services of a prominent North American engineering firm, the Rust Engineering Co. of Pittsburgh, Pennsylvania, which has built some of the most modern sulphate pulp and paper mills in the southern States of United States of America, using rapidly grown pine pulp-wood similar in character to New Zealand insignis pine, to report upon the economic and engineering features of a Murupara development. The company's report is due in October. Altogether 520 cords of insignis-pine pulp-wood were dealt with in Australia, most of it from twenty-five-year-old trees from Kaingaroa State Forest, and so selected as to be representative of the pulp-wood which will become available at the integrated Murupara scheme some five years hence. Highlights of the Australian tests are briefly as follows:—

(*a*) *Chemical Pulping Tests by Australian Paper Manufacturers, Ltd., at the Maryvale (Victoria) Sulphate Pulp Mill.*—After preliminary work in both laboratory and pilot mill, approximately 140 tons of sulphate pulp were successfully produced. In both yield and in bursting and tensile strength the pulp was found to be the equal of good Swedish pulp, but lower in tearing strength. Pulp-wood from older trees yielded better fibre, but nevertheless in tearing strength was not equal to the best Swedish pulp.

Ten tons of this pulp were subsequently shipped to the New Zealand Paper Mills, Ltd., at Mataura, Southland, which report that it had been possible to produce high-quality wrapping-papers comparable to those produced from imported kraft pulp.

Another 31 tons has been shipped to England for special beating trials in various types of equipment not available in either New Zealand or Australia.

(*b*) *Bleaching Tests of New Zealand Insignis-pine Sulphate Pulp by Australian Paper Manufacturers, Ltd., at Maryvale.*—One series of tests was devoted to the production of a semi-bleached pulp approximately equal in colour to a normal unbleached sulphite pulp and suitable for use in the manufacture of newsprint. The results showed that a satisfactory pulp with strength well above that of unbleached sulphite normally used for newsprint-manufacture could be readily produced without excessive consumption of bleaching agents, and 40 tons of semi-bleached pulp so manufactured were shipped to the Australian Newsprint Mills, Ltd., at Boyer, Tasmania, for the subsequent newsprint trials.

It was also established as a result of another series of tests that a fully bleached pulp suitable for the manufacture of writings and printings could be produced. Although the bleaching equipment available did not allow the manufacture of as highly bleached a product as that produced by the best American and Scandinavian mills, the conclusion was that an entirely satisfactory product could be produced with comparable bleaching facilities.

(*c*) *Kraft-paper-making Tests by Australian Paper Manufacturers, Ltd., at Its Fairfield (Melbourne) Paper-mill.*—As one of the largest, and certainly the most exacting, usage of kraft paper is for the manufacture of multi-wall bags, advantage was taken of the extensive experience of this firm of papermakers in endeavouring to produce a high grade of wrapping-paper to meet such a specification. The tests established the fact that, while less power is consumed in beating the pulp preparatory to papermaking and that the beaten pulp handles with ease on the paper machine, the resultant product, although developing a higher bursting and tensile strength than that made from wholly imported long fibred pulp, it is appreciably lower in tearing strength. Nevertheless, the firm reported that over-all the paper should be satisfactory for the manufacture of multi-wall bags, comparing favourably with that at present being produced in Australia. Its tear was not quite up to specification, but sufficiently approximate to conclude that with more experience and suitable control of manufacturing operations a satisfactory grade of paper could be produced.

(*d*) *Multi-wall-bag-making Tests by Bates (Australasia) Pty., Ltd., Using Kraft Paper Manufactured from New Zealand Insignis-pine Pulp.*—Almost one hundred thousand 94 lb. cement-bags were produced. They were of five-ply construction (two 52 lb. and three 39 lb. plies; substance, 480 sheets 24 in. by 36 in.). Tubing strength was up to standard, but sewing strength only 83 per cent. of standard. Filled bags withstood an average of 48 end drops each 12 in. high, as compared with a standard of 66, but the company reported that they would be capable of giving reasonably good performance in service, and a small service test by one of the New Zealand cement companies has indicated that they are at least as good as, if not better than, the Australian-manufactured bags normally available in New Zealand. The results of further tests are awaited with interest. It has been concluded that by improvements both in the quality of kraft pulp and paper and in the technique of bag-manufacture results closely approximating to the standard are within a reasonable degree of attainment.

(*e*) *Manufacture of Writings and Printings by Associated Pulp and Paper Mills, Ltd., at Burnie, Tasmania.*—Thirty tons of fully bleached sulphate pulp from the Maryvale Mill of Australian Paper Manufacturers, Ltd., was converted into satisfactory sheets of white bond, white bank, cream-wove writing, and machine-finished printing-papers using, in the case of bond and bank, 100 per cent. New Zealand pulp, and in the other papers approximately 50 per cent. of New Zealand pulp with 50 per cent. of soda-cooked eucalyptus pulp.

The strength developed in the finished sheets was greater than that of a eucalypt sheet of the same substance, particularly so in the case of folding endurance. In every case the caliper of the finished sheet was lower than that of the equivalent eucalypt sheet, presumably because the stuff carried water better, thus enabling the paper machine presses to do more efficient work in compacting the sheet. As a result of this compacting of the sheet the porosities and densities obtained were high. Beatibility of the New Zealand fibre was found to be comparable with that of imported bleached sulphite pulp. The brightness of the pulp and finished sheets was low, but could readily be raised by efficient bleaching. In the opinion of the paper machine crew, the stuff was easier to handle on the paper machine than is the normal eucalypt furnish.

These papers were subsequently distributed throughout the printing trade in New Zealand, the general consensus of opinion being that they were very satisfactory, although users of the bank and bond papers indicated the desirability of improving their colour.

(*f*) *Mechanical Pulping Tests by Australian Newsprint Mills Pty., Ltd., at Boyer, Tasmania.*—After preliminary grinding tests, a twenty-four-hour continuous trial was successfully concluded. Horse-power consumption was normal for pine pulp-wood, and although a yield of only 84 per cent. was obtained, the conclusion is that this figure could be effectively increased both by improved grinding processes and by a suitable conservation system in the paper-mill. The strength of the pulp was exceptionally high.

(*g*) *Newsprint-manufacturing Tests by Australian Newsprint Mills Pty., Ltd., at Boyer, Tasmania.*—From the ground-wood mill the mechanical pulp was taken in slush form and mixed with the semi-bleached sulphate pulp produced by Australian Paper Manufacturers, Ltd., at Maryvale (Victoria), and manufactured during a continuous twenty-four-hour trial into 77 tons of standard newsprint (32 lb. basis weight). Due to the excellent strength of both ground wood and semi-bleached pulp it was possible, even during the short period of the trial, to attain a machine speed of 1,070 ft. per minute with only 15 per cent. of the chemical pulp, and a still higher speed would have been attainable had more suitable screening equipment been available. The only adverse characteristics of the newsprint produced were low smoothness and low opacity, but from subsequent investigations at the Southland Paper-mills in Lufkin, Texas, it is concluded that their success in correcting these deficiencies with pine newsprint will be readily duplicated with insignis-pine newsprint.

The finished newsprint was subsequently used by a number of New Zealand and Australian newspapers with favourable comment on its strength and general performance. These tests confirmed the necessity for developing a better finish, but otherwise were satisfactory.

CHAPTER XI.—MISCELLANEOUS

92. *Legislation.*—The Forests Act, 1921–22, was amended during the year as follows:—

(*a*) Statutes Amendment Act, 1947: Sections 17, 18, 19, 20, and 21 are to be read together and deemed part of the Forests Act, 1921–22. Section 17 is a machinery clause. Section 18 amends section 10 of the principal Act and makes additional provisions regarding appointments of honorary forest rangers. Section 19 provides for the appointment of part-time honorary forest officers. Section 20 provides power for the making of regulations with a view to the prohibition of the importation of any tree-seed, timber, or timber product that may introduce into New Zealand any insect, fungus, bacterium, or virus that might be injurious to any tree, timber, or other forest product. Section 21 amends sections 7, 9, and 11 of the principal Act.

(*b*) Forest and Rural Fires Act, 1947, is an Act to make better provisions with respect to the prevention and suppression of forest and rural fires. It repeals all the provisions of other Acts relating to forest fire districts and other fire districts in rural areas. In particular it repeals section 27 of the Forests Act, 1921–22, sections 5 and 6 of the Forest Amendment Act, 1925, and section 28 of the Statutes Amendment Act, 1940 (an amendment of the Land Act, 1924), and makes other miscellaneous amendments.

(*c*) Section 26 of the Reserves and other Lands Disposal Act, 1947, cancels the reservation for permanent State forest purposes over an area in the Nelson Land District containing 2,940 acres situated in Blocks IV and VII, Maungatapu Survey District, and Block XII, Waimea Survey District, and sets the land apart as a reserve for water-supply purposes and vests the reserve in the Corporation of the City of Nelson in trust for these purposes.

(*d*) The Maori Purposes Act, 1947, affects the Forests Act, 1921–22, by altering the term " Native " to " Maori."

93. *Finance.*—Mention was made in the last annual report of the weaknesses inherent in the methods of financing forestry and allied activities in the past, and an indication was given in that report of the general lines which it was considered forest finance should follow. The old methods of finance continued through the year under review without alteration, but the matter has been studied in detail, and at the time of writing it is hoped to reach finality shortly regarding the institution of new methods as from 1st April, 1948, which will remedy past defects.

The proposed new system is based on three main points: firstly, that income from the sale of forest produce should be treated as " revenue " only to the extent that it is surplus to the requirements of forest rehabilitation or establishment; secondly, that the use of loan-moneys should be restricted to the building-up of assets representing reasonably sound commercial propositions; and thirdly, that General Government revenue should be utilized not only for financing both past and future activities which do not justify the use of loan-moneys, but also, to the extent that the general budgetary position will allow, for the financing of any deficit between forest income and forest expenditure.

In considering the impact of the points given in the last paragraph it must be appreciated that New Zealand must face up to meeting a considerable burden from the past in attempting to place succeeding generations as we *should* stand to-day, this burden arising partly from the unsound utilization of forest income and loan-moneys in the past and partly from the necessity for dealing with substantial accumulated arrears of forestry work. The extent of this burden will mean that the refinancing of the forests will be a long process and that it will be many years before forestry activities can be expected to produce a surplus of income over expenditure as a contribution to General Government revenue, especially as the earliest established exotic forests are only now coming into production, while some new exotic forests are still in the initial stages of establishment.

The time taken to reach the point where New Zealand can have all the necessary protection and commercial forests not only established and in managed production, but also free of debt, may be long, but the adoption of the system set out above will ensure that some real steps will be taken towards the rehabilitation of forest finance.

Receipts into and payments from the State Forests Account during the year are summarized in Appendix VI of this report, from which it will be seen that expenditure increased by £372,000 compared with last year and receipts by £173,000. The complete accounts for the State Forest Service are set out in parliamentary paper B–1 [Pt. IV].

Increased expenditure has again been necessary for the establishment and maintenance of new projects and to cope with postponed maintenance work on established forest projects.

The increase in total receipts from £590,000 last year to £763,000 this year is due to increased production from utilization projects and increased sales of standing timber. The largest increases in sales from utilization projects occurred as follows: box-shooks, £72,000; logs, £24,000; and sawn timber, £11,000. From sales of standing timber, revenue increased by £57,000.

The difference between expenditure and receipts has, in accordance with current practice, been made up principally from loan-moneys, which this year amounted to £900,000 (£750,000).

94. *Subventions to Local Authorities.*—Varying proportions of the revenue received from the sales of standing timber are required by Acts of Parliament to be paid to local authorities and to the Consolidated Fund. Details of these payments over the last three years are shown in the following table :—

Year.	Consolidated Fund (Under Section 39 of Forests Act, 1921–22).	Local Authorities (Under Section 17 of Finance Act, 1924).	Local Authorities (Under Sections 6 and 7 of Forests Amendment Act, 1926).	Total.
	£	£	£	£
1945–46	14,235	17,114	6,230	37,579
1946–47	16,023	25,750	6,033	47,806
1947–48	10,886	21,078	4,540	36,504
Totals	41,144	63,942	16,803	121,889
Percentage of indigenous forests receipts	4·42	8·57	1·845	14·837

95. *Recreation in State Forests.*—Considerable activity by tramping clubs and deer and pig hunters in State forests is reported throughout the Dominion and there were a greater number of visitors and campers in selected areas. The camping-ground maintained by the Service at Piano Flat, in Southland, was extremely popular and was supervised by an attendant during the Christmas holiday period. Parties of visitors were attracted to Waipoua, Colville, and Moehau Forests and Great Barrier Island. It is reported that no fires resulted from picknickers, campers, tourists, or other recreational users of the forests except in Eglinton Valley, Southland, where a number of small fires occurred with minor damage to beech forests in that locality, and it is intended to patrol this area during next fire season.

The favourable position reported is doubtless due largely to the co-operation of the thousands who visited the State forests in observing the simple rules regarding the use of fire in proper places and exercising reasonable care of forest growth.

96. *Forest Privileges.*—(*a*) At 31st March, 1948, the following forest privileges were held : grazing leases and licences, 221 ; sawmill-site leases, 15 ; tramway licences, 55 ; road-access licences, 5 ; and dwelling-site lease, 1.

(*b*) *Mining Privileges :* Ninety-seven applications for mining privileges in State forests under the Mining Act, 1926, and 9 applications for coal-mining rights under the Coal-mines Act, 1925, were granted by the Mining Warden. Although these rights and privileges are not granted under the Forests Act, 1921–22, the holders are subject to the same obligations as the holders of State forest privileges with respect to the protection of State forests, and in all cases the attention of applicants is directed to the provisions of the Forest (Fire-prevention) Regulations 1940 and amendments.

97. *Library.*—Recataloguing of the library is proceeding rapidly. Overseas book orders are now being filled without delay and supplies of literature for trainees are being forwarded to conservancies. Most of the countries from which no exchange publications were received during the war are again forwarding technical literature, and every effort is being made to complete those series which were interrupted.

98. *Post-war Development and Expansion.*—Basic reports on 55 managed State forests were revised for the Ministry of Works in connection with regional ten-year plans. Recruitment of labour again fell far short of the planned labour requirements, and in consequence commencement of forest operations on certain new projects has again been deferred and the programme of works on certain existing projects reduced.

The labour strength at the close of the year was 1,730 (1,630). The number has not yet reached one-half of the average number (3,500 men) provided for under the original plans, but a recruitment drive inaugurated about the close of the year has since yielded very encouraging results.

Acquisitions of land—for consolidation of existing forest areas or for provision of exotic forests in timberless districts—totalled 11,700 acres, and the total area acquired since 1940 is now 97,300 acres. The area under negotiation for acquisition totals 63,500 acres. In keeping with the policy of planting no land which is suitable for farming, two blocks purchased in timberless localities are to have the farming land demarcated and taken over by the Lands and Survey Department for farm settlement.

Progress in providing additional accommodation for employees, whether married or single, is described in paragraph 56. Appendix X lists the forests on which expansion is planned.

99. *Export Butter-box and Cheese-crate Pools.*—For the year ended 31st March, 1948, the deliveries of timber for butter-box manufacture to North Island boxmakers licensed under the Export Butter-box and Cheese-crate Pool Regulations 1941 again decreased, and totalled only 1,999,000 board feet (4,169,000). Shipments from the South Island comprised 648,000 board feet (1,574,000), made up of 97,000 board feet of white-pine and 551,000 board feet of rimu. The balance of the timber received, consisting of 1,202,000 board feet (2,446,000) of white-pine and 149,000 board feet (149,000) of rimu, was secured from North Island mills. The depletion of white-pine stands and shortage of shipping has again made it difficult to secure butter-box timber for the North Island from west coast South Island ports.

The following figures illustrate the decline in production of timber for butter-box manufacture :—

—	Year Ended 31st March, 1941.	Year Ended 31st March, 1948.
	Bd. ft.	Bd. ft.
White-pine received in North Island from west coast ..	9,500,000	97,000
Total timber delivered for butter-boxes in North Island ..	27,500,000	1,999,000

Details of boxes supplied to North Island dairy companies during the past year are as follows : standard wooden boxes, 552,000 (926,000) ; " Saranac " type (fibre-board mats and wooden ends), 923,000 (1,242,000) ; corrugated kraft fibre-board cartons made in New Zealand from Canadian liner, 261,000 (549,000) ; kraft fibre-board cartons from Scandinavia and United States of America, 4,430,000 (1,732,000) : total, 6,166,000 (4,449,000).

At 31st March, 1948, stocks of all types of export butter containers held by dairy companies totalled 1,519,000 (615,000), and ships in New Zealand waters or *en route* to the Dominion had an additional 1,300,000 on board. Dairy companies lack storage capacity to hold all of the containers as they arrive, and use is being made of central stores to hold the surplus. The forward supply position appears to be very favourable.

During the year the supply of export cheese-crates to dairy factories was recorded at 1,137,000 (1,168,000), of which 174,000 (181,000) crates were manufactured by South Island crate-makers.

No crates were shipped to North Island dairy companies from the South Island. Deliveries of timber to North Island cheese-crate manufacturers totalled 10,500,000 board feet (10,020,000).

CHAPTER XII.—TIMBER CONTROL

100. *Timber Production Advisory Committee.*—The Timber Production Advisory Committee, under the chairmanship of the Commissioner of State Forests, held three meetings during the past year. The membership of the Committee remained unchanged.

Many problems affecting the sawmilling industry, but mainly those connected with man-power, supply of equipment, and transport, were discussed and appropriate recommendations were made.

Timber Workers' Housing: Once again the main work of the Committee was in connection with the administration of the Timber Workers' Housing Scheme under Part III of the Finance Act (No. 2), 1946. The Scheme is under the control of the State Advances Corporation, but applications for houses are made in the first instance to the Committee, which acts in an advisory capacity to the Corporation. In order to expedite the progress of applications, two meetings of the special sub-committee were held during the year. Altogether 89 applications for 373 houses were considered during the past year.

Since the inception of the Scheme the Committee has received and dealt with 124 applications for 513 houses, as follows:—

Committee's Decision.	Applications.	Houses.
(1) Recommended to receive houses	87	388
(2) Deferred pending satisfaction of priority claims	2	3
(3) Declined	29	107
(4) Consequently withdrawn by applicants ..	6	15

A further 13 applications for 51 houses were under action at the 31st March.

Many difficulties in implementing this Scheme have now been overcome, and it is pleasing to note that as at 31st March, 44 houses had been erected, while a further 81 houses were in various stages of construction.

During the year the Timber Workers' Housing Regulations were gazetted. Under these regulations the Committee is responsible for the collection of annual returns of sawn timber from all sawmillers and for advising the State Advances Corporation of the individual and total amounts of levy due. The levy, which is payable to the State Advances Corporation, together with payments due from the houses, funds a pool which bears the cost of the Scheme.

In the practical application of this Scheme it is becoming increasingly apparent that the primary objectives of improving the standard of sawmill accommodation, fulfilling and assuring the industry's labour requirements, and increasing timber production will ultimately be attained.

101. *Industrial Man-power.*—Movements of man-power in the sawmilling industry during the year are referred to in paragraph 72. The following statistics collected by the Department of Labour and Employment show the actual increase that has taken place in the total man-power employed in sawmills and which accounts largely for the increased output in sawn timber for the year. These figures cover sawmilling in its widest sense and include persons engaged in resawing and dressing of timber:—

Labour Force in Bush and Town Sawmills

——	Town.	Bush.	Total.
April, 1947	2,003	5,812	7,816
November, 1947	2,093	6,094	8,187
April, 1948	2,171	6,561	8,732

The majority of sawmillers have continued to work extended hours up to forty-eight hours per week, the average being approximately forty-three hours per week; and the extra cost involved by the payment of overtime has again been subsidized from the Consolidated Fund, vote "Stabilization," on the same basis as before—*i.e.*, 80 per cent. of the extra cost of overtime at time and a half rates worked during the week and on Saturday mornings, and 100 per cent. of the extra cost of overtime at double rates worked on Saturday afternoons.

The Forest Service continued to check all claims for subsidies received from the industry, and during the year has passed for payment claims totalling £117,281 (£98,166). The estimated additional production achieved as the result of this subsidy is 28,500,000 board feet (25,000,000).

102. *Petrol and Tire Conservation.*—Owing to the sale of petrol again being governed by regulation, the State Forest Service is once more acting in an advisory capacity to the Commissioner of Transport and the Oil Fuel Controller in the allocation of supplies to the timber industry.

The control over tires was removed during the year and consequently the Forest Service is no longer required to give assistance in allocation.

103. *Essential Supplies.*—On account of the shortage of essential supplies as they affect the timber industry, the Timber Controller, by arrangement with the merchants, has instituted a control over the sale of circular saws, gang-saw blades, band saws, and two-man cross-cut saws. This action was deemed advisable to ensure that the small stocks coming to hand would be directed to operations where they would produce the maximum quantity of timber. The situation is being closely watched, and should supplies improve, the matter of continuing the control will be reviewed in the light of the existing and forward positions. The Forest Service has also served the industry usefully by arranging for the supply of other materials urgently needed.

104. *Timber Purchases for Defence Works.*—The reconciliation of the Timber Controller's records with those of the contractors is the only work remaining to be done under this heading, and details are complete except in respect of one contract.

105. *Timber Control Notices.*—Mr. A. R. Entrican, Director of Forestry, relinquished the appointment as Timber Controller during the year and was succeeded by Mr. W. C. Ward, Inspector in Charge, Marketing Division, State Forest Service, Wellington. There was no amendment to existing Timber Control Notices and no new notice was issued during the period under review. Timber Control Notices are subsidiary to and authorized by the Timber Emergency Regulations 1939, which are read together and deemed part of the Supply Control Emergency Regulations 1939.

Notices at present in force are as follows:—

Title.		Subject.
The Second-hand Fruit-case Control Notice 1946	Statutory Regulations, Serial Number 1946/159	Licensing of persons to deal in used fruit-cases.
Timber Control Notice No. 35	*Gazette*, 1942, p. 609 ..	Names under which beech timber may be sold.
Timber Control Notice No. 36	*Gazette*, 1942, p. 609 ..	Use and importation of Australian hardwoods.
Timber Control Notice No. 43	*Gazette*, 1942, p. 952 ..	Distribution of timber produced south of Te Kuiti.
Timber Control Notice No. 53	*Gazette*, 1943, p. 352 ..	Use and sale of white-pine timber.
Timber Control Notice No. 54	*Gazette*, 1943, p. 352 ..	Only clause 6 now in force. Operators of box-factories required to notify Timber Controller within a week after commencing.
Timber Control Notice No. 56	*Gazette*, 1944, p. 622 ..	Grading and classifying of rimu, miro, matai, and totara building timber.
Timber Control Notice No. 59	*Gazette*, 1946, p. 1004 ..	Use and sale of kauri timber.

106. *Registration of Sawmills.*—Under the provisions of the Sawmill Registration Regulations 1942 (Serial number 1942/330), any person commencing to operate a sawmill must within one week make application to register it; and operating sawmills must be re-registered annually. Notice must be given when a sawmill ceases to operate and when change of ownership occurs. At the 31st March, 1948, a total of 608 (527) sawmills were registered—see Appendix VIII. A list of sawmills registered as at 31st March, 1947, was published in the *Gazette*, 1947, at page 1355.

107. *Sale and Purchase of Forests.*—(*a*) *Privately Owned Forests:* During the year, 85 (198) consents to the sale and purchase of privately owned forests were granted under the provisions of Regulation 3 of the Timber Emergency Regulations 1939 (Serial number 1939/148). Consents in respect to indigenous forests totalled 61, including 19 for Maori-owned areas and 24 were for exotic forests. The reduced number of consents granted during the year is accounted for by the smaller number of transactions in small lots of standing timber.

(*b*) *Maori-owned Forests:* During the year one notice was issued pursuant to Regulation 3 of the Timber Emergency Regulations 1939, as amended by Regulation 2 of Amendment No. 1 (Serial number 1943/106), which authorizes the Timber Controller to require Maori owners of forests to sell their interests to such proprietors as he may nominate. No objection was received to the notice within the prescribed twenty-one days after notice was given, and a licence was subsequently issued and forwarded to the Maori Land Court for confirmation pursuant to the Maori Land Act, 1931.

Sales of Maori-owned timber require the consent of the Commissioner of State Forests pursuant to section 35 (2) of the Forests Act, 1921-22, and this was given in the case referred to above and also in the other instances where the sales were made in the normal manner through the Maori Land Board.

(*c*) *Exotic Forests (Commercial):* Four consents for sale and purchase of exotic forests owned by afforestation companies were granted during the year. All these consents were given subject to the usual conditions requiring the forest-owner to submit for approval a working plan setting out fully proposals for silvicultural management, progressive re-establishment of areas felled, and forest-fire prevention and control.

Two working plans and one five-yearly revision of an existing working plan were approved during the year. One working plan is at present under revision.

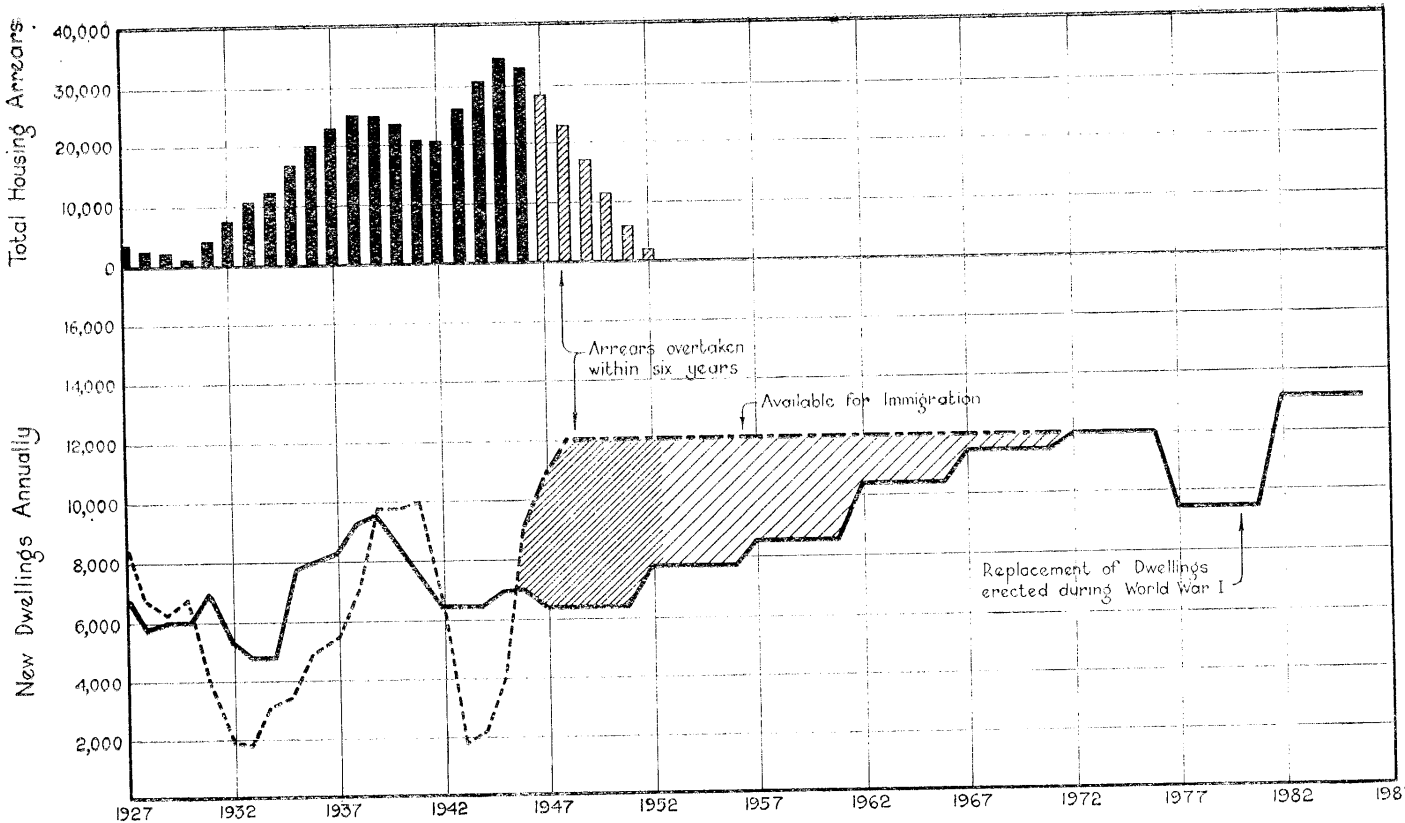
108. *The Timber Position: Present and Prospective.*—Timber is one of the world's vital raw materials, and because it is a crop which requires a relatively long period of years to reach maturity the future position can only be assured by adequate planning and preparation for forward requirements. For this reason the supply-demand position is constantly under review to ascertain the probable trend and magnitude of the future demand for sawn timber and other forest products, and to co-ordinate it with the anticipated forest yield. The post-war survey disclosed that an immediate annual production of 420,000,000 board feet was necessary to service all requirements, and every effort was strained to reach this target with the minimum delay. The introduction of the Timber Workers' Housing Scheme towards this end was a revolutionary measure, but this year's record output completely vindicates the policy pursued; last year's report anticipated reaching the production objective within two years, whereas actually it has been exceeded in one year.

Overall timber production in the North Island now exceeds consumption, and the steadily increasing surplus over current requirements is put into stock or exported. As timber stocks have been very low throughout the past seven years, wood-users and merchants will welcome the better service now possible from increased supplies. Rising production has also largely solved the problem of zone quotas. However, although the over-all production in the North Island is now more than sufficient for local needs, the demand for certain species and grades of timber continues to exceed the supply, but, as explained in paragraph 110, is unavoidable meantime.

The heavy expansion of timber production in the North Island during the past two years has not been paralleled in the South Island, where the forward position now needs careful consideration. For some decades production by South Island sawmillers consistently exceeded the local demand and substantial quantities of timber were shipped each year to the North Island and to Australia; now almost the whole of the output is required for local consumption.

The trend of timber consumption is greatly influenced by the momentum of population movements, and the stage has now been reached where an accelerated increase in population must be anticipated and provision made for its impact on the forward demand for timber. There is every indication that over the next twenty years there will be a very much greater increase in population than over the last twenty years. In particular, it appears that there must be a vigorous immigration movement as soon as the shipping situation improves, and, while forward estimates of population are apt to be highly speculative, it is believed that from the viewpoint of planning for future timber requirements allowance must be made for a minimum annual immigration movement equivalent to 2 per cent. of the population in addition to providing for a natural rate of increase of not less than 1 per cent. Assuming that this highly desirable figure of 2 per cent. immigration is reached by 1955, the total demand for sawn timber will soar to nearly 500,000,000 board feet, while if immigration continues at this level until 1965 the total demand will then be just over 600,000,000 board feet annually. These are levels of consumption never before reached in this country, and our ability to service such a demand is contingent on the large-scale development of the exotic-forest resources. Since the indigenous cut is to be deliberately curtailed (refer to paragraph 110) and only token quantities can be expected from overseas sources, it means that the exotic forests must supply about 300,000,000 board feet of sawn timber in 1955, or more than double the present output, and nearly 500,000,000 board feet by 1965. These appear phenomenal figures when it is remembered that only ten years ago the output of exotic timbers was less than 40,000,000 board feet, and while such a demand may not eventuate, it is nevertheless a distinct possibility, even a probability, and must therefore be anticipated and prepared for.

The largest single item of sawn-timber consumption is for building purposes, hence the significance attached to the forward housing programme. The accompanying graph (No. 1) was prepared in conjunction with a survey of the housing position at the close of the war to assist in determining timber requirements for the early post-war period; it shows, *inter alia*, that one of the fundamental reasons for the current abnormal demand for timber is the acute shortage of dwellings which is the direct outcome of the marked disparity, firstly during the depression years and later during the war period, between new construction and the number of dwellings which should have been erected to cover obsolescence and to cater for the increase in the population; so much so, that by 1945 there was an accumulated shortage of 35,000 houses. On the basis of a minimum serviceable life of sixty years per dwelling, and allowing for a 1 per cent. rate of natural increase in population, the graph shows the total number of new dwellings required annually for a considerable number of years. The pertinent fact which emerged from this graph was that, disregarding the question of immigration, the long-term housing position did not justify a rate of housing construction in excess of 12,000 annually, but that a rate of 12,000 nevertheless would allow the accumulated arrears to be overtaken by 1953. Thereafter, the continuance of this rate depended on a modest immigration movement of diminishing proportions, commencing with approximately 18,000 annually during the period 1953–57 and tapering off to nil over twenty years. Since this survey was completed the entire aspect of immigration has altered, so that in arriving at the timber requirements for 1965 allowance has been made for a suitable step-up in the housing programme to cater for 2 per cent. immigration annually. The most important point at this juncture as regards future timber supplies is to sound a



Graph No. 1 – The Housing Situation in Retrospect and Prospect

Number of New Dwellings Required Annually
Number of New Dwellings Actually Erected
Post-War Housing Programme
Accumulated Housing Arrears

warning against the danger of ever again permitting the rate of building construction to fall below current requirements as happened during the early "thirties"; postponement of the requisite number of new dwellings merely postpones a demand for timber which sooner or later must lead to an abnormal pressure on the timber supply and dislocate the production and distribution system. Therefore, one of the fundamental essentials in planning for the forward timber demand is an assurance that a steady rate of building activity will be maintained.

Despite the fact that the Dominion faces a demand for sawn timber in the near future which far exceeds all previous figures, and that in addition raw material must be provided for an entirely new industry in the shape of pulp and paper manufacture, the potential yield of the exotic forests, conservatively estimated, is nevertheless more than sufficient for domestic requirements. For this reason the utilization plants are being definitely planned with a view to export, with the emphasis, in the initial stages at least, on sawn timber and a tentative objective of approximately 140,000,000 board feet for overseas markets by 1955. This short-term objective is based on the yield from the short-rotation species alone; the surplus, of course, will decrease as the rising tide of population presses on the timber supply, but at that stage the longer-rotation species come into the picture; they can be managed on a rotation of from sixty to a hundred years and hence give a much greater elasticity of supply than in the case of the shorter-rotation insignis pine. Consequently, cutting can be adjusted to conform to the requirements of both domestic and export demand.

109. *Timber Prices.*—There has been relatively little movement in sawmillers' timber prices during the year. When rail freights were increased by 15 per cent. in September, 1947, an automatic increase in cost to buyers followed where sales were made on a price-point basis—that is, f.o.r. Mamaku, &c. Retail prices in all centres were increased to cover the extra rail freight involved.

Following the general order of the Arbitration Court in October, 1947, award rates of pay to timber workers throughout New Zealand were increased. To compensate for this the Price Tribunal gave authority for the prices of indigenous timber to be raised by 9d. per 100 board feet in all areas except Westland, Nelson, and Marlborough, where the increase approved was 6d. per 100 board feet. The prices of exotic timbers were increased by 6d. per 100 board feet throughout New Zealand. These increases are applied as surcharges in the meantime until the results are available from economic surveys of the industry which have been conducted by the Dominion Federated Sawmillers' Association throughout the North Island and Westland.

In order to encourage the production and orderly marketing of white-pine, the sale of this timber in the North Island has been placed upon a price-point basis, the price points being Ongarue and Mamaku. This arrangement does not, however, extend to North Auckland, where prices remain f.o.r. loading station.

Generally speaking, all sections of the trade are uneasy over the numerous price anomalies arising out of the long-continued control of timber prices. Many grades of indigenous and exotic timbers are being sold at unbalanced prices which appear to threaten the rational development of both sections of the industry, but nevertheless it must be stressed that stabilization of the country's economy is the paramount consideration meantime.

110. *Trend of Production and Utilization.*—The shifting of the focus in production and utilization from the indigenous to the exotic forests is increasingly obvious, and will be accelerated by important developments which are pending in the latter field. Briefly the position is that with a steadily expanding demand for timber New Zealand is now faced with a diminishing area of indigenous forest which cannot sustain for any length of time the present relatively high output. Beyond question the current output is much too high in relation to the remaining resources of indigenous timber, but the

present position continues by the sheer force of circumstances associated with an all-time peak demand at a time when the exotic forests are incapable of playing in full the part ultimately expected of them. However, the status of the exotic forests is changing so rapidly that a planned reduction in the indigenous cut can be faced with equanimity, with the object of ultimately reducing output to a figure which can be maintained in perpetuity. The desirability of this objective is beyond dispute, and it will be achieved by regulating the release of State indigenous-forest areas for milling purposes. Little or no effect can be expected for several years, but it is planned to reduce the indigenous cut to a maximum of 100,000,000 board feet to 130,000,000 board feet by 1965, and thereafter ultimately down to an annual quota of only 50,000,000 board feet, which is regarded at the present juncture as the maximum which can be maintained on a sustained yield basis. This figure may be revised when the results of the national forest survey are available, since at the moment the actual sustained yield capacity of the indigenous forests is not known accurately; it may be more or less than 50,000,000 board feet, but at best it can be only a fraction of the total annual requirement at that date.

It might be urged that the cut of indigenous timber should be reduced more rapidly in the interests of conserving our remaining supplies, but unfortunately this is impracticable. One of the principal reasons for the popularity enjoyed by the indigenous timbers is their inherent capacity to yield high-grade defect-free timber greatly in excess of what can be expected from the exotic forests for many years to come. The exotic forests were established at a time when planting on a large scale was the primary objective, and large areas were planted up over a relatively short period; so much so, that the finer considerations of silviculture were lost to sight, and the necessary attention to pruning and thinning, so fundamental to the production of high-grade logs necessary for clean, attractive timber, was neglected. The result is that to-day the product coming off the saw is, on the whole, rather knotty stock which compares very unfavourably with the indigenous softwoods for finish and appearance which are so essential for such purposes as weatherboarding, flooring, joinery, interior finish, furniture, &c. The errors of the past in this respect can be rectified only slowly; silvicultural attention is being concentrated on these forests, but years must elapse before the required results are achieved. In the meantime there is no alternative but to rely on the indigenous forests for the bulk of the high-grade defect-free timber demanded for certain critical purposes.

Nevertheless, despite the inherent limitations of exotic timbers at the present time, an early appreciation of their merits for many purposes will ease the problems of wood-users generally. The essential point to remember is that insignis pine cannot be selected at random and be expected to be a satisfactory substitute for indigenous timber, nor can it always be used under the same conditions as indigenous timber; but subject to certain precautions it will give very satisfactory service for a wide variety of purposes. The New Zealand Standards Institute has already issued grading rules for house framing and scantling in these species, and these can be used with confidence. During the current year similar specifications will be available for flooring, weatherboarding, and also for finishing and factory grades. This means that wood-users will shortly be offered a comprehensive choice of insignis-pine grades as substitutes for all common uses of rimu. However, owing to the susceptibility of insignis pine to sap-stain attack which ruins its appearance and increases its affinity for moisture, special emphasis is laid on the desirability of limiting this defect in timber intended for permanent usage.

Sap-stain is effectively eliminated by kiln-drying soon after sawing, and can also be controlled by dipping in approved chemicals promptly after cutting if this is followed by efficient air-seasoning, or preferably kiln-drying. Provided the above precautions are carefully observed, the Forest Service unhesitatingly advocates the use of insignis pine for framing purposes in house construction where B.A. rimu is normally used. In

its own extensive housing programme the Forest Service is using kiln-dried insignis pine for weatherboarding and flooring. Care is taken in the design of foundations to secure adequate sub-floor ventilation, and weatherboarding is always kept well painted; where these precautions are observed, kiln-dried but otherwise untreated insignis pine is confidently expected to give satisfactory service. However, even in the absence of these conditions insignis pine can be used with complete confidence for flooring and weatherboarding, provided it is treated by chemical processes approved by the New Zealand Standards Institute. For sub-floor timbers, insignis pine definitely requires such preservative treatment if a long life is to be secured.

Steady progress was made throughout the year in the substitution of insignis pine for rimu for furniture, interior joinery, and cabinetmaking. Of special interest was the production of insignis-pine bedroom suites, paint-finished in pastel shades. A rapidly increasing use of the timber for interior joinery is expected to follow the introduction of factory grades.

The Building Controller co-operated through the year in limiting the use of indigenous timber when approving the issue of building permits for purposes other than the erection or alterations of houses. The use of rimu, matai, and totara was generally forbidden in the erection of commercial buildings, factories, schools, &c., for structural parts in which imported Douglas fir (or Oregon pine) could be substituted. This policy was very effective in assuring the requisite supply of indigenous wood for home-building. It was left to builders' discretion, however, to substitute New Zealand grown exotic timbers for Douglas fir, and a number availed themselves of this dispensation. Both treated and untreated insignis pine were used, and as this timber, adequately treated with wood preservatives, costs less than half the current price of Douglas fir, the extended use of insignis pine in this field can be expected.

The preceding paragraphs, which show what can be done with the exotic species at the present time despite their obvious limitations, leave little doubt as to their future possibilities. The exotic forests are in the ascendency, and within the foreseeable future the indigenous forests will be relegated to a completely minor role quantitatively in the national timber economy. The potential yield of the exotic forests is very considerable; in the short-rotation species alone the sustained yield has been assessed at just over 100,000,000 cubic feet annually, which is equivalent to an annual cut of approximately 600,000,000 board feet; in addition, there are considerable areas of the slower-maturing species which from 1965 onwards will add materially to the above figure. For the economic utilization of this very substantial forest yield, conversion activities must be on a scale and to a standard far above anything previously attempted in this Dominion, and the solution can be found only in the integration of the principal forest industries. Fortunately the location of the bulk of both the State and private holdings in a relatively circumscribed area in the Taupo - Bay of Plenty district renders them highly amenable to development along these lines, and the establishment of the first major projects within the next five years will give a more balanced utilization than was ever possible in the case of the indigenous forests, and with the assurance that the exotic forests can be managed on this basis in perpetuity.

The changing incidence of timber production is clearly illustrated by the accompanying graph (No. 2), which is both historic and prophetic. Production has been projected to 1965, by which time the output of exotic timbers will completely overshadow the indigenous species and, in addition to dominating the domestic market, will figure prominently in the Dominion's export trade.

Graph No2—ROUGH SAWN TIMBER PRODUCTION IN RETROSPECT AND PROSPECT

The growing importance of the exotic forests.

APPENDIX I

Areas of State Forests as at 31st March, 1948

Conservancy.	Permanent State Forest.		Provisional State Forest.		Totals.	Percentages of Land Area Under State Forest Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	
Auckland	430,419	89,789	144,458	14,006	678,672	7·89
Rotorua	700,156	286,760	161,751	63,108	1,211,775	15·34
Wellington	1,029,964	41,135	34,895	3,808	1,109,802	9·17
Nelson	1,092,114	213,151	789,225	525,840	2,620,330	37·39
Westland	923,932	355,713	364,105	225,613	1,869,363	48·39
Canterbury	486,739	3,647	..	..	490,386	4·93
Southland	552,523	56,234	624,720	13,740	1,247,217	7·34
Totals ..	5,215,847	1,046,429	2,119,154	846,115	9,227,545	13·9
	6,262,276		2,965,269			

APPENDIX II

Summary of Planting and Silvicultural Operations in State Forests as at 31st March, 1948

Forest.	Year of Commencement.	Gross Area of Forest.	Total Net Area Planted.	New Area Planted, 1947.	Area Treated, 1947-48.			
					Low-pruned.	High-pruned.	Thinned.	Clear-felled.
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Mangonui ..	1944	8,927	3	..	..	..	..	..
Waipoua ..	1925	12,600	4,173	123	167	..	19	..
Puhipuhi ..	1904	1,565	1,209	..	19	..	..	..
Glenbervie ..	1945	5,075	286	280	..	..	..	..
Riverhead ..	1926	11,965	10,593	..	476	43	37	..
Tairua	1930	48,500	13,617	102	706	22	10	..
Kauaeranga ..	1940	4,009	681	72	120	..	..	..
Maramarua ..	1928	14,087	12,311	..	147	4	1	..
Rotoehu ..	1937	38,559	5,156	563	174	..	46	..
Whakarewarewa ..	1898	10,665	7,122	18	13	..	160	228
Waiotapu ..	1901	7,974	6,894	..	30	94	161	..
Kaingaroa ..	1913	346,529	259,791	249	1,159	38	55	117
Tongariro ..	1937	4,500	2,300	..	..	..	..	..
Erua	1930	6,648	4,390	..	383	..	..	..
Karioi	1927	25,869	16,922	..	50	106	2	..
Gwavas ..	1944	7,643	135	120	..	..	..	..
Ngaumu ..	1942	6,751	101	84	..	..	..	..
Golden Downs ..	1927	46,725	23,352	273	80	..	..	..
Rimu	1922	5,839	3,090	..	133	..	..	..
Hanmer ..	1901	10,661	7,684	..	196	..	119	..
Balmoral ..	1916	24,132	21,141	..	736	..	..	67
Eyrewell ..	1928	19,266	17,312	..	788	..	..	31
Ashley	1939	5,099	2,173	231	231	..	..	..
Naseby	1900	4,032	3,095	..	162	34	68	..
Herbert.. ..	*	3,269	..	..	..	..	..	..
Berwick ..	1946	7,506	156	133	..	..	..	..
Allanton ..	*	1,676	..	..	..	..	..	..
Akatore ..	*	3,908	..	..	..	..	..	..
Dusky	1898	6,866	4,466	..	197	878	216	6
Conical Hills ..	1903	4,923	4,328	117	127	96	103	2
Blue Mountains ..	1925	10,058	8,895	8	295	215	86	..
Pebbly Hills ..	1930	5,330	4,359	4	248	428	162	..
Minor areas ..	1875–1947	14,527	4,003	442	106	25	..	..
		735,074	449,738	2,819	6,743	1,983	1,245	451

* New projects.

APPENDIX III

Creosoted Forest Produce

—	Year Ended 31st March, 1947.				Year Ended 31st March, 1948.			
	Posts, Stays, and Strainers.	Poles.	Other Produce.	Total Quantity of Produce.	Posts, Stays, and Strainers.	Poles.	Other Produce.	Total Quantity of Produce.
	Number.	Number.	Cu. ft.	Cu. ft.	Number.	Number.	Cu. ft.	Cu. ft.
Produce creosoted ..	56,439	138	14,808	67,609	25,930	2,346	10,891	52,630
Sales	43,208	3,632	4,413	74,895	12,329	1,281	6,591	25,818
Creosoted produce used by State Forest Service	4,642	2,440	3,738	22,270	4,108	789	12,337	22,638
Creosoted stocks at end of year	55,584	1,993	12,736	70,125	65,077	2,269	4,699	74,299
Untreated stocks at end of year	322	892	1,015	8,103	57,973	2,563	636	70,550
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Creosote used ..	37,545	433	17,165	55,143	22,085	3,084	13,524	44,605

APPENDIX IV

Imports of Sawn Timber and Other Forest Produce

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1945, 1946, and 1947. Value represents value in country of export, plus 10 per cent., expressed in terms of New Zealand currency. All figures are subject to confirmation when final figures are published by the Customs Department.)

Item.	1945.		1946.		1947.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Hardwoods—	Bd. ft.	£	Bd. ft.	£	Bd. ft.	£
Sleepers	3,253,000	69,000	6,836,000	141,200	6,376,000	153,100
Australian hardwoods—						
Rough hewn ..	6,434,000	173,000	7,123,000	185,100	1,301,000	25,200
Rough sawn ..					1,790,000	53,700
Logs and poles ..	97,000	3,000			5,176,000	126,300
Total ..	9,784,000	245,000	13,959,000	326,300	14,643,000	358,300
Softwoods—						
Douglas fir ..	3,751,000	48,000	7,276,000	115,200	13,400,000	440,200
Redwood	2,552,000	75,100	274,000	8,000	88,000	4,400
Cedar	..	..	..	..	3,149,000	152,100
Total ..	6,303,000	123,100	7,550,000	123,200	16,637,000	596,700
Other	775,000	22,200	410,000	20,000	1,897,000	97,000
Grand total..	16,862,000	390,300	21,919,000	469,500	33,177,000	1,052,000
Shingles	..	..	..	65	..	3,312
	Tons.		Tons.		Tons.	
Tanning-bark and extracts	3,860	93,900	1,800	56,900	5,600	185,000
Wood-pulp	9,300	231,100	10,700	302,900	9,100	383,800

APPENDIX V

Export of Sawn Timber and Other Forest Produce

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1945, 1946, and 1947, and are subject to confirmation when final figures are published by the Customs Department.)

Item.	1945.		1946.		1947.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Bd. ft.	£	Bd. ft.	£	Bd. ft.	£
White-pine	38,000	530	50,000	600	3,000	80
Rimu	690,000	10,220	2,615,000	40,800	1,289,000	22,700
Beech	927,000	16,230	650,000	15,200	909,000	19,500
Matai	75,000	1,070	362,000	5,700	762,000	16,300
Kauri	19,000	870	24,000	1,100	26,000	1,400
Insignis pine—						
Sawn	575,000	8,920	1,535,000	26,500	4,575,000	86,000
Box-shooks	1,249,000*	32,990	2,582,000*	73,100	1,259,000*	33,900
Other	560,000	14,900	133,000	2,100	33,000	1,000
Total	4,133,000	85,730	7,951,000	165,100	8,856,000	180,880
	Tons.		Tons.		Tons.	
Kauri-gum	1,190	94,290	230	22,770	1,200	120,260

* Includes a small percentage of beech.

APPENDIX VI

Payments and Receipts for the Year Ended 31st March, 1948

Item.	1944–45.	1945–46.	1946–47.	1947–48.
Payments				
Allocation of revenue—	£	£	£	£
Consolidated Fund (portion of revenue from national-endowment forests)	16,196	14,235	..	16,023*
Working Railways Account (section 24 (1), Finance Act, 1936)	..	..	3,539	4,329
Local bodies	12,799	17,114	25,750	21,078
General management charges—				
Salaries	110,317	137,984	187,714	225,047
General expenses	56,019	102,275	130,770	144,973
Land purchase	38,957	30,098	18,296	11,640
Forestry projects under direct management—				
Exotic	346,743	377,910	710,376	811,495
Indigenous	41,912	58,808	79,023	135,698
Utilization: Sawmill, creosote plant, &c.	125,931	133,677	174,379	318,826
Pulp and paper making	..	..	12,369	25,023
Totals	748,874	872,101	1,342,216	1,714,132
Receipts				
Indigenous forests receipts—				
Timber sales	121,603	135,913	155,208	212,454
Timber royalties and trespass	9,250	13,451	11,481	14,585
Leases, grazing	1,611	2,865	2,229	2,083
Sawmill sites, industrial, &c.	308	672	359	378
Miscellaneous	9,124	8,960	16,419	16,523
Log sales from managed forests	54,716	67,053	62,432	84,867
Exotic forests: Poles, posts, firewood, &c.	45,938	38,643	39,975	52,523
Utilization projects—				
Sawn timber	22,529	63,451	98,703	109,716
Creosoted products	45,918	17,305	17,889	7,216
Box-shooks	129,126	182,187	134,839	207,192
Miscellaneous	9,875	9,532	12,840	23,072
Miscellaneous credits	10,802	48,292	37,953	32,665
Totals	460,800	588,324	590,327	763,276
Receipts from national-endowment indigenous forests (included in above)	47,426	47,157	37,366	52,911

* This amount was payable in 1946–47. The amount accrued in 1947–48—£10,886 has subsequently been paid.

APPENDIX VII

Sawmilling and Sash and Door Manufacturing, 1946–47

Provincial District.	Number of Mills or Establishments.	Character of Organization.						Persons engaged in connection with													
								Felling, Hauling, &c.						Production of Sawn Timber from Logs.							
		Individual.	Partnership.	Registered Company.		Co-operative and Miscellaneous.	Government.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.	Wage-earners.	Contract.	Total.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, &c.		Wage-earners.	Contract.	Total.	
				Public.	Private.			M.	M.	M.	M.	M.	M.	M.	M.	M.	F.	M.	M.	M.	F.
Auckland	173	31	31	30	78	1	2	15	39	10	715	166	945	62	110	64	31	1,319	36	1,591	31
Hawke's Bay ..	21	1	2	3	15	..	..	2	6	..	48	16	72	2	13	7	..	98	..	120	..
Taranaki	22	6	1	2	13	..	..	..	2	..	99	2	103	6	8	3	3	123	2	142	3
Wellington ..	59	8	2	6	43	..	..	2	15	1	240	24	282	9	33	18	9	319	4	383	9
Marlborough ..	10	4	3	..	3	..	..	6	1	..	8	..	15	7	1	..	..	21	..	29	..
Nelson	54	10	10	2	32	..	..	12	13	1	226	2	254	16	14	6	2	207	1	244	2
Westland	35	4	4	4	23	..	..	1	13	2	263	13	292	5	26	12	2	305	3	351	2
Canterbury ..	53	18	12	1	22	..	..	6	5	..	46	38	95	36	14	8	1	180	2	240	1
Otago—																					
Otago portion ..	27	5	5	4	12	1	..	1	5	..	53	2	61	11	8	3	..	86	..	108	..
Southland portion	33	2	8	..	23	..	..	6	10	..	178	..	194	8	18	11	5	235	..	272	5
Totals, 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
,, 1945–46	469	89	72	51	252	3	2	62	105	10	1,924	239	2,340	135	232	125	55	3,073	19	3,584	55
,, 1944–45	447	80	60	53	249	3	2	49	99	11	2,034	176	2,369	108	212	123	57	2,893	72	3,408	57

Provincial District.	Persons engaged in connection with																Salaries and Wages paid to Persons engaged in connection with						
	Resawing, Dressing, &c.									Total.										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.	M.	M.	F.	M.	F.	M.	F.
																				£	£	£	£	£	£
Auckland ..	4	51	55	23	696	21	..	806	44	81	200	129	54	2,730	21	202	3,342	75	422,530	629,993	6,509	316,434	10,155	1,368,957	16,664
Hawke's Bay ..	1	4	3	1	46	..	..	54	1	5	23	10	1	192	..	16	246	1	30,773	49,053	..	19,900	127	99,726	127
Taranaki ..	..	6	6	5	92	..	..	104	5	6	16	9	8	314	..	4	349	8	45,180	58,459	565	35,119	872	138,758	1,437
Wellington ..	..	21	17	12	259	..	..	297	12	11	69	36	21	818	..	28	962	21	129,143	162,459	1,389	103,943	2,326	395,545	3,715
Marlborough ..	..	..	..	..	..	..	..	..	..	13	2	..	..	29	..	..	44	..	6,307	11,352	..	..	..	17,659	..
Nelson	..	8	4	2	73	1	..	85	3	28	35	11	4	506	1	3	583	5	116,279	99,171	516	25,693	396	241,143	912
Westland ..	..	1	1	3	7	..	..	9	3	6	40	15	5	575	..	16	652	5	133,151	144,047	438	3,392	467	280,590	905
Canterbury ..	3	16	19	9	236	..	..	274	9	45	35	27	10	462	..	40	609	10	38,070	80,735	100	99,085	1,473	217,890	1,573
Otago—																									
Otago portion ..	1	10	13	6	151	..	..	175	6	13	23	16	6	290	..	2	344	6	26,032	40,566	15	60,535	1,303	127,133	1,318
Southland portion	1	7	3	2	42	..	..	53	2	15	35	14	7	455	..	..	519	7	79,067	105,727	822	20,901	422	205,695	1,244
Totals, 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
,, 1945–46	16	118	107	74	1,545	35	3	1,789	109	213	455	242	129	6,542	35	261	7,713	164	938,350	1,323,505	9,243	613,736	19,451	2,875,591	28,694
,, 1944–45	12	131	88	77	1,582	40	1	1,814	117	169	442	222	134	6,509	40	249	7,591	174	878,562	1,176,457	8,246	588,999	18,763	2,644,018	27,009

APPENDIX VII—*continued*

SAWMILLING AND SASH AND DOOR MANUFACTURING, 1946–47—*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 ..	484	54,161	15,207	57,208	112,163	23,659	262,882	4,395	29,075	35,624	49,109	121,352	85,927	325,482	5,512	13,782	19,500	34,494	40,302	50,538	164,128	210,290	419,895	1,397,691	2,027,876
Hawke's Bay ..	5	3,424	1,820	4,792	6,174	1,638	17,853	105	1,245	3,443	2,249	7,580	7,733	22,355	96	584	1,185	657	1,314	2,117	5,953	16,610	8,901	59,809	85,320
Taranaki ..	55	3,972	1,718	7,055	9,810	617	23,227	323	1,688	3,569	2,937	7,558	4,088	20,163	425	1,036	1,628	1,284	2,220	2,135	8,728	10,898	19,899	74,034	104,831
Wellington ..	347	9,639	5,672	10,539	30,443	10,460	67,100	775	7,571	8,101	8,089	27,999	19,678	72,213	1,225	3,507	6,219	5,519	9,286	11,202	36,958	57,614	36,862	379,898	474,374
Marlborough ..	..	2,268	467	634	1,047	261	4,677	29	845	523	466	815	158	2,836	..	..	..	..	..	..	..	1,641	6,813	..	8,454
Nelson	118	7,306	3,791	9,154	18,455	3,151	41,975	1,396	5,690	4,486	6,835	13,822	5,791	38,020	513	1,291	871	1,671	2,492	1,531	8,369	27,285	3,682	106,652	137,619
Westland ..	443	8,519	5,321	6,178	19,972	5,733	46,166	716	5,826	6,569	6,214	18,036	7,672	45,033	96	220	156	286	289	114	1,161	28,912	10,174	14,435	53,521
Canterbury ..	..	7,606	1,467	1,230	4,050	1,948	16,301	715	8,119	4,697	4,063	9,958	6,627	34,179	899	3,180	5,617	6,272	11,955	4,893	32,816	30,924	79,285	246,268	356,477
Otago—																									
Otago portion ..	12	2,778	1,330	1,375	5,550	1,146	12,191	650	1,575	2,801	1,983	9,874	3,853	20,736	2,038	2,224	2,825	3,301	4,969	5,964	21,321	6,896	16,116	155,818	178,830
Southland portion	17	5,264	3,542	5,931	17,283	4,380	36,417	781	2,014	4,467	6,363	13,356	5,261	32,242	178	991	1,686	2,073	2,266	1,695	8,889	28,561	867	86,805	116,233
Totals 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
,, 1945–46	2,604	104355	44,294	85,580	230,370	62,560	529,763	9,921	49,070	70,223	80,163	193,856	115,370	518,603	11,000	28,186	36,077	44,676	69,696	59,924	249,559	404,828	488,578	2,194,437	3,087,843
,, 1944–45	2,549	85,601	39,093	85,410	191,841	98,625	503,119	8,892	40,637	60,700	70,269	171,928	92,592	444,018	11,243	26,937	31,712	35,907	64,546	54,548	224,893	384,838	366,500	2,021,378	2,772,716

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.	£	£	£	Ft. B.M.	£	£	£	£	£	£	£	£	£	£
Auckland	1,014,331	1,263,250	1,888,408	4,165,989	158,776,082	2,362,451	102,914	2,465,365	36,391,023	1,164,026	165,437	182,093	53,391	71,131	81,608	288,289	2,005,975	4,471,340
Hawke's Bay	67,615	77,930	85,789	231,334	13,006,994	176,596	1,128	177,724	1,726,179	43,515	4,853	2,392	..	3,391	15,202	12,552	81,905	259,629
Taranaki	82,007	96,384	118,753	297,144	14,532,823	201,057	692	201,749	1,648,648	44,724	12,079	40,526	..	18,429	868	3,915	120,541	322,290
Wellington	262,983	263,797	523,125	1,049,905	35,180,480	525,854	29,760	555,614	11,117,358	308,949	41,407	63,760	22,088	40,934	8	92,125	569,271	1,124,885
Marlborough	12,625	21,001	..	33,626	1,970,200	27,843	2,432	30,275	..	..	..	..	..	..	..	..	..	30,275
Nelson	186,893	140,035	141,110	468,038	29,128,406	349,699	1,654	351,353	865,299	21,296	869	15,581	4,698	2,075	83,574	28,655	156,748	508,101
Westland	210,045	197,876	19,455	427,376	41,671,372	476,435	1,683	478,118	858,557	14,694	..	..	3,171	95	..	853	18,813	496,931
Canterbury	90,626	188,968	379,642	659,236	26,662,346	341,139	4,453	345,592	8,126,855	219,437	3,701	79,242	634	4,459	23,737	83,459	414,669	760,261
Otago—																		
Otago portion ..	45,119	77,433	238,977	361,529	10,310,378	144,862	253	145,115	5,259,051	158,864	22,692	33,039	..	4,937	15,541	17,980	253,053	398,168
Southland portion ..	144,045	139,658	117,017	400,720	22,715,659	313,888	445	314,333	1,638,586	58,936	..	..	1,921	13,353	2,061	53,356	129,627	443,960
Totals, 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
,, 1945–46 ..	1,999,329	2,213,861	3,076,863	7,290,053	344,723,089	4,389,074	157,967	4,547,041	59,752,119	1,610,297	224,597	333,542	119,834	178,661	233,422	614,322	3,314,675	7,861,716
,, 1944–45 ..	1,841,592	1,921,291	2,853,890	6,616,773	340,133,099	3,801,199	163,503	3,964,702	56,267,036	1,375,505	174,607	307,189	154,494	147,506	206,372	663,119	3,028,792	6,993,494

* Butter-boxes made numbered 783,293; cheese-crates, 982,106; fruit-cases, 4,116,566. † Laths, posts, waste products, &c.

APPENDIX VII—*continued*

SAWMILLING AND SASH AND DOOR MANUFACTURING, 1946–47—*continued*

Provincial District.	Motive Power used for																					Approximate Value.									
	Hauling and Delivering.							Production of Sawn Timber from Logs.								Resawing, Dressing, and Manufacturing from Sawn Timber.								Sawmill.					Planing and Resawing Mill.				
	Kind of Engine.							Kind of Engine.								Kind of Engine.																	
	Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Land and Buildings.	Tram-ways and Tram Plant.	Logging and Hauling Equip-ment.	Other Machinery	Total.	Land and Buildings.	Tram-ways.	Other Machinery	Total.	Total Value.
																								£	£	£	£	£	£	£	£	£	£
Auckland ..	55	..	171	84	1	..	311	11,445	86	..	58	22	297	..	463	13,959	9	..	2	2	659	..	672	7,405	353,737	79,580	315,091	406,540	1,154,948	262,960	4,904	228,599	496,463	1,651,411
Hawke's Bay	6	..	14	12	..	..	32	1,301	11	..	2	..	20	..	33	870	5	..	1	5	54	..	65	635	21,601	1,460	25,570	19,347	67,978	16,260	860	10,796	27,916	95,894
Taranaki ..	13	..	13	8	..	..	34	953	14	..	1	4	33	..	52	1,300	2	..	..	..	104	..	106	847	23,672	25,811	11,399	16,417	77,299	27,170	..	16,840	44,010	121,309
Wellington ..	28	..	59	21	..	..	108	3,278	23	..	14	8	49	..	94	2,507	8	..	4	..	260	..	272	2,775	43,234	25,931	69,912	60,923	200,000	58,520	39	56,516	115,075	315,075
Marlborough	1	..	8	4	..	..	13	377	4	..	4	2	4	..	14	334	..	..	..	..	..	..	..	..	2,802	..	2,966	7,553	13,321	..	..	..	..	13,321
Nelson ..	35	..	66	12	3	1	117	3,674	30	..	5	7	57	1	100	3,120	3	..	..	..	57	1	61	532	37,912	32,002	54,388	55,256	179,558	12,550	..	9,639	22,189	201,747
Westland ..	55	..	52	3	5	..	115	2,877	29	..	13	8	20	..	70	2,483	..	..	..	1	4	..	5	94	48,125	55,043	31,910	43,316	178,394	1,120	..	1,338	2,458	180,852
Canterbury ..	9	..	26	2	..	..	37	795	13	..	5	3	81	..	102	2,302	1	..	..	..	270	..	271	2,214	23,868	..	11,402	31,920	67,190	42,170	..	41,706	83,876	151,066
Otago—																																		
Otago portion	13	..	13	..	..	..	26	495	18	..	..	..	14	..	32	643	3	..	..	..	105	..	108	1,161	10,447	6,727	9,354	14,598	41,126	27,153	..	21,803	48,956	90,082
Southland portion	34	..	29	3	..	..	66	1,412	31	..	2	1	15	..	49	915	5	..	..	1	42	..	48	522	23,963	22,629	29,086	34,693	110,371	8,438	962	12,937	22,337	132,708
Totals—																																		
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
1945–46	270	..	423	137	17	2	849	25,408	267	1	85	55	524	6	938	25,243	37	..	5	5	1486	1	1534	15,717	541,928	264,403	474,590	610,630	1,891,551	457,859	1,588	400,501	859,948	2,751,499
1944–45	283	..	392	119	11	3	808	24,026	257	1	77	59	432	5	831	23,578	42	..	13	3	1404	1	1463	15,354	465,564	333,282	432,173	613,235	1,844,254	428,054	1,566	386,097	815,717	2,659,971

Provincial District.	Number of Log-sawmills.	Approximate Sawn Output of various Kinds of Timber at Log-sawmills during the Year 1946–47.											Average Mill Output.	Maximum Daily Capacity of Mills (8 Hours).	Area Cut.
		Kauri.	Rimu.	Kahikatea.	Matai.	Totara.	Beech.	Tawa.	Miro.	Insignis Pine.	Other and Unspecified.	Total.			
		Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Acres.
Auckland	142	2,282,796	63,857,655	6,682,378	11,750,822	6,614,648	162,474	7,414,980	974,663	56,980,003	2,055,663	158,776,082	1,118,141	998,820	12,173
Hawke's Bay	15	..	6,442,520	774,981	1,113,262	57,581	914,839	2,731	5,246	2,658,296	1,037,538	13,006,994	867,133	86,500	712
Taranaki	15	..	7,609,734	811,233	1,351,051	1,134,740	56,997	183,449	32,112	3,333,819	19,688	14,532,823	968,855	81,700	1,128
Wellington	43	..	19,513,877	1,472,144	5,050,136	1,660,092	320,632	13,808	511,587	6,028,390	609,814	35,180,480	818,151	213,300	3,405
Marlborough	10	..	493,600	118,100	45,200	13,900	9,500	..	..	1,206,800	83,100	1,970,200	197,020	18,700	65
Nelson	52	..	18,177,911	684,099	138,890	10,930	2,582,492	..	8,890	7,499,141	26,053	29,128,406	560,162	242,747	2,321
Westland	34	..	37,149,355	4,030,092	86,328	21,268	384,329	..	..	..	..	41,671,372	1,225,629	243,200	3,351
Canterbury	38	..	44,700	..	..	..	..	..	18,110	26,206,147	393,389	26,662,346	701,641	124,200	360
Otago—															
Otago portion	19	..	5,494,653	3,103	21,946	13,089	732,480	..	2,149	3,937,951	105,007	10,310,378	542,651	69,718	576
Southland portion ..	32	..	11,744,593	540,229	115,890	100,448	6,443,230	..	12,767	3,740,302	18,200	22,715,659	709,864	140,890	1,556
Totals, 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	4,348,452	353,954,740	884,887	2,219,775	25,647
1945–46 ..	379	2,801,391	175,125,071	17,043,060	18,834,568	10,561,310	12,122,863	5,327,046	839,489	96,819,028	5,249,263*	344,723,089	909,560	2,191,568	24,224
„ 1944–45 ..	357	2,877,669	181,931,369	17,990,073	19,180,641	11,252,614	11,074,170	4,135,508	849,511	85,713,439	5,128,105	340,133,099	952,754	2,037,602	29,498

* Details for 1946–47 include eucalypts, 1,239,699 ft. b.m.; poplar, 939,731 ft. b.m.; taraire, 308,034 ft. b.m.; rata, 179,192 ft. b.m.; macrocarpa, 241,378 ft. b.m.; maugeao, 202,801 ft. b.m.; pukatea, 150,738 ft. b.m.; rewarewa 174,961 ft. b.m. puriri, 133,969 ft. b.m.; tanekaha, 130,481 ft. b.m.; hinau, 89,003 ft. b.m.; other and unspecified, 558,465 ft. b.m.

APPENDIX VIII

Sawmills Registered Under the Sawmill Registration Regulations 1942

Conservancy.	Number of Sawmills Registered as at 31st March, 1948.	Sawmills Cutting Mainly Indigenous Timber.	Sawmills Cutting Mainly Exotic Timber.
Auckland	148	94	54
Rotorua	82	59	23
Wellington	101	53	48
Nelson	83	58	25
Westland	66	66	..
Canterbury	59	2	57
Southland	69	51	18
Totals	608	383	225

APPENDIX IX

Forest Offences, 1947–48

Offence.	Law Under Which Proceedings were Taken.	Number of Convictions.	Fines.	Costs and Damages.
			£ s. d.	£ s. d.
Lighting fire in a fire district, contrary to the provisions of the Act	Section 44 (1) (*c*), Forests Act, 1921–22	10	27 10 0	77 9 3
Aiding and abetting an offence	Section 51 (1), Forests Act, 1921–22	1	5 0 0	0 10 0
Operating engine without efficient spark-arrester	Regulation 6 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	4	22 0 0	22 18 4
Failure to take proper steps to suppress a fire in State forest or in a fire district or privately owned forest	Regulation 15 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	5	22 0 0	14 16 6
Unlawful cutting and removal of forest produce	Section 43, Forests Act, 1921–22	16	81 0 0	277 11 10
Lighting fire without lawful authority in a State forest	Section 44 (1) (*a*), (*b*), (*c*) ..	6		
Unlawfully entering State forest	Regulation 12 (1), Forest (Fire-prevention) Regulations 1940, as amended by Amendment No. 1	1	16 10 0	39 15 8
Unlawfully hunting in State forest	Section 47 (*a*), Forests Act, 1921–22	2		
Totals	..	45	174 0 0	424 1 7

APPENDIX X

Localities of Managed Forests

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

APPENDIX XI

Training and Recruitment 1947–48

Course. Name.	Serial No.	Period.	Number Attended.
Rotorua Forest Training Centre			
Timber measurers*	6	3 weeks	14
Junior field officers	1	8 weeks	14
Senior trainees	1	8 weeks	14
Forest-survey-party leaders	2	2 weeks	10
Senior officers' refresher	2	2 weeks	16
Timber sales	1	2 weeks	19
Junior trainees	1	3 weeks	20
Tapanui Forest Vocational School			
Forest foremen	2	8 weeks	17
Leading hands	9	6 weeks	17
Intermediate trainees	3	6 weeks	22
Leading hands	10	6 weeks	15
Leading hands	11	7 weeks	19
Auckland Conservancy Course			
Entomology	..	2 weeks	8

* An eight-weeks' course, five weeks of which were held in the year 1946–47.

APPENDIX XII

Report of the Committee on Education

(1) The Committee believes that the foundation of proper forestry lies in correct forest education and that care should be taken not only to maintain, but to raise, the standard of that education. It draws attention to the fact that the profession itself must be judged in large measure by the level at which this standard is set. The Committee emphasizes that forestry is an art requiring observation and judgment, relying upon the sciences to no small degree, but not exclusively upon them.

(2) The Committee therefore recommends that the field of recruiting shall be made as wide as possible and that Governments, where this field has proved to be unduly narrow, shall expand arrangements for the selection of students by intrinsic merit in advance of their qualification in technical forestry. It further recommends that the essential post-selection technical training shall be on a probationer or scholarship basis in the case of men who are so qualified at the time of selection as to be eligible in all respects for professional employment other than in forestry, where this is necessary to attract men of the required calibre. It would add, however, that in such cases a period of cadet service in the field is an invaluable guide to first selection and an essential preliminary to the final stage of technical training.

(3) The Committee considers that provision should be made for the promotion of outstanding men from the sub-professional to the professional or officer grade, but stresses that this should only be possible by passage through the professional qualifying course, necessarily on a scholarship basis.

(4) The Committee considers that the activities of the forest exploiting agencies, whether they be private companies or State concern separate from the Forest Services, must be as much regarded as a part of the planned management of forests as are the activities of the Forest Services themselves. If these agencies are to carry out their work to the prescriptions of planned management it is essential that they shall employ and be able to obtain executive or sub-professional staff with a technical forestry training. It therefore recommends that Governments shall expand, if necessary, the existing facilities for the training of men for sub-professional posts in the State Forest Services or with private owners of forests, to accommodate the additional men required by the exploiting agencies on terms which must be decided by local circumstances.

(5) The Committee stresses the principle that no professional officers' school should be created or maintained unless it can be thoroughly well equipped and has the full-time services of an adequate instructing staff with field experience. The ever-widening scope of forestry training necessitates consideration as to whether the present staff of the Forestry Schools and the duration of the courses given by them are adequate.

(6) It strongly recommends that research by the teaching staff and post-graduate students should be encouraged and provided for. It does not consider, however, that post-graduate students should be allowed to instruct, except in specialist subjects, until they have had practical experience in the field as successful working forest officers.

(7) The Committee emphasizes that while sub-professional schools, with a definitely regional character, must teach technique for direct application, the professional schools must concentrate upon the basic principles of forestry as a foundation on which the forest officer may build by practical experience.

(8) The Committee considers that more stress could profitably be laid in professional schools upon the principles of land acquisition and management and upon matters of tenure, tenancy, and especially the social consequences of forest conservation or afforestation. A forest officer's work is the administration of a large and complex estate, and in some countries informed attention to these matters is as important as the practice of silviculture.

(9) The Committee expresses the view that refresher courses for officers and subordinates have fully proved their value, but finds that conditions within the Commonwealth are so varied that it must be left to local decision whether they are best used as routine courses to be taken by all, or as advance courses for selected men only, who will fully profit by them.

(10) It is added that, ideally, a school should have training access to the whole region it is designed to serve. It is suggested that at some future time it may become possible to adjust, within the British Commonwealth, the regions served by particular schools, without regard to purely administrative spheres.

Signed :

F. S. Collier (Chairman).
I. J. Craib.
J. L. d'Espeissis.
A. R. Entrican.
T. I. Rees.
T. N. Stoate.
W. L. Taylor.
S. A. Vahid.
J. Q. Williamson.

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*).
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*).
Insignis pine (*Pinus radiata*).
Japanese cedar (*Cryptomeria japonica*).
Larch (*Larix decidua*).
Loblolly pine (*Pinus taeda*).
Lodgepole pine (*Pinus murrayana*).
Macrocarpa (*Cupressus macrocarpa*).
Ponderosa pine (*Pinus ponderosa*).
Prickly-cone pine (*Pinus muricata*).
Redwood (*Sequoia sempervirens*).
Spreading-leaved pine (*Pinus patula*).
Strobus pine (*Pinus strobus*).
Western red cedar (*Thuya plicata*).

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

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