

1943
NEW ZEALAND

STATE FOREST SERVICE

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1943

*Presented to both Houses of the General Assembly pursuant to Section 64 of the
Forests Act, 1921-22*

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

SIR,—

Wellington, 27th May, 1943.

I have the honour to present herewith, pursuant to section 64 of the Forests Act, 1921-22, the annual report of all operations of the State Forest Service for the year ended 31st March, 1943.

In the interests of paper economy, much of the report is presented in precis form, with comparative figures for corresponding dates or periods for the previous year shown in parentheses.

I have, &c.,

ALEX. R. ENTRICAN,
Director of Forestry.

The Hon. the Commissioner of State Forests.

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REPORT

CHAPTER I.—FOREST POLICY

1. *General Administration.*—All normal departmental work with the exception of fire protection has been sacrificed to the maintenance of forest supplies to the timber and allied industries for defence purposes, and to post-war and rehabilitation planning. Extended hours have been worked by all sections of the staff, and virtually a twenty-four-hours' service seven days a week has been provided for the war effort.

2. *Recruitment and Training.*—The policy of recruiting trainees from secondary schools and giving them even only a year or two of training before taking up military service has been continued with good results. Plans are in hand for Department participation in the Army educational scheme, which it is now proposed should be dovetailed with the early establishment of a departmental training centre at Rotorua where both short refresher and long residential courses will be available for various classes of officers and employees as well as for timber graders and saw doctors, &c.

3. *Indigenous-forest Resources.*—A national forest inventory is planned as a post-war development essential to the conservation of the remaining indigenous resource and the early transfer of production from indigenous to exotic forests. The necessary technique is being studied for early application at the conclusion of hostilities. One thing is certain. So depleted are the indigenous resources that their cutting, whether in State or other forests, must be limited as soon as practicable to the minimum consistent with the Dominion's requirements for high-grade finishing timbers, leaving the exotic forests to supply the bulk of the demand.

4. *Indigenous-forest Management.*—Within the limitations imposed by staff shortage and concentration on defence work, extensive reconnaissance is being made of major forest areas with a view to expediting the establishment of new milling units with a length of life sufficient to warrant the installation of modern milling-equipment, including dry kiln, and the provision of well-designed villages with all modern amenities, and to allow the growth of a continuing subsequent supply of exotic logs. Such units will operate under formal working plans as provided for under the Forests Act, 1921–22.

5. *Indigenous Silviculture.*—Regeneration and tending operations, whilst naturally restricted, are being persevered with incidental to forest-protection activities. This is for the purpose of developing a technique which can be applied to large-scale rehabilitation activities in the post-war period, more especially for the improvement of extensive areas of kauri and beech stands, which appear to be most susceptible to silvicultural treatment. For similar reasons, fundamental research into the behaviour of tree seeds and the phenology of significant tree and shrub species is being continued.

6. *Exotic-forest Resources.*—Assessment surveys in the older State forests are being steadily persevered with as the basis of post-war management and utilization. The results continue to emphasize the difficulties of both silviculture and exploitation, but indicate that it should be quite practicable to meet the whole of the Dominion's increased demand for timber as a result of rehabilitation and post-war activities by an expansion of exotic-timber production in both State and private commercial forests.

7. *Exotic Silviculture.*—Continued experience in departmental logging and milling operations in exotic stands suffering from lack of silvicultural treatments over appropriate periods demonstrates the imperative necessity for both technical staff and adequate funds to supervise and finance tending operations as required by current growth. The indications now are that only on a limited scale will it be practicable to apply ideal silvicultural treatments, that on not inconsiderable areas virtual abandonment of poor sites and species must be faced, that still other areas must be converted from poor to good species, and that very large areas must be clear cut. It is against a continuation or repetition of such an experience that the establishment of a staff training centre and the inauguration of working plans are being proceeded with. A very necessary protection to the development of new exotic forests is the provision of public control over the importation and collection of tree seed, the results of assessment surveys indicating that many mistakes have been due to the supply or collection of poor or wrongly named seed. For this reason seed crops, tree types, and the phenology of the more important exotics are being carefully investigated.

8. *Communal and Farm Forestry.*—Constant reference has been made in recent reports to the recently accepted policy of establishing small State exotic forests in poorly timbered districts remote from major forest areas, and as part of the departmental rehabilitation effort, areas totalling 47,000 acres have been selected in various parts of the Dominion for this purpose, the actual purchases finalized during the year amounting to 15,000 acres. Whilst an area of 8,000 acres is regarded as a desirable minimum in order that fire-protection, overhead, and administrative charges may be kept within reasonable limits, consideration has been given in some districts to units as low as 5,000 acres without, however, any success in locating suitable blocks, and it is an inescapable conclusion that in some localities where only very small areas are available communal forests should be established and maintained by local bodies. Recommendations are accordingly being drafted whereby such a policy can be implemented. Means likewise of encouraging farm forestry by the establishment of woodlots also continue to be studied as a possible post-war development.

9. *Forest Protection.*—Apart from the ever-present threat of epidemic insect and fungal attack, which is largely a technical matter and under appropriate scientific scrutiny and policing, forest protection involves three major problems—those of animal, wind, and fire damage. Animal damage in the indigenous forests is only too well known, and the rise in the deer population as a result of war conditions is serious and will require prompt correction in the post-war period. The danger of wind damage, and incidentally also of

snow damage, is little appreciated, largely because damage of recent years has been localized and confined to non-forested areas. Against this there is strong evidence that in past centuries New Zealand has been subjected to serious forest devastation by abnormal winds, probably when preceded by soaking rains or accompanied by heavy snowfalls. On the gravelly plains of Canterbury in particular extensive windthrow would be the inevitable result, and the planning of emergency salvage operations has therefore been commenced. Fire, however, continues to be the outstanding menace to the Dominion's forests, and whilst radio and poster publicity aided by a strict departmental policy of law enforcement is making the public more fire conscious, the legislative provisions are altogether too limited to give effective protection throughout the Dominion. The experience in North Auckland this year of gorse, fern, and scrub fires extending from small farm burning operations over miles of country and endangering or destroying fences, buildings, forests, and even human lives is an effective demonstration of the necessity for urgent correction, and immediate consideration is being given to the framing of appropriate recommendations whereby Dominion-wide control of burning operations may be inaugurated.

10. *Forest Utilization.*—The basic problem of New Zealand forest utilization is the replacement of indigenous by exotic timber wherever practicable. Of the current annual cut of all sawn timber amounting to about 350,000,000 board feet, about 50,000,000 board feet is exotic softwood, but if the post-war demand should reach 450,000,000 board feet, as appears not unlikely, then the whole of the extra 100,000,000 board feet should be supplied in exotic softwood. Assuming, however, that the annual cut is sustained at the 450,000,000 board feet level for a decade, the indigenous timber content should decrease to 200,000,000 board feet and the exotic rise correspondingly to 250,000,000 board feet, but such a development will depend primarily upon the almost universal adoption of log gang or modern bandsawing equipment for conversion of logs into sawn timber, of kiln drying even for scantling and framing timber, and of preservation by pentachlorophenol or similar chemicals of the kiln-dried timber. By these means waste will be reduced to a minimum, costs likewise reduced, while an infinitely superior article to the indigenous timber now marketed will be supplied. No longer will timber shrink and crack, no longer will framework distort, and no more will homes suffer from insect and fungal attack if properly maintained.

A still further outlet for the exotic resources is the local pulp and paper industry, the normal pre-war consumption of which was about 90,000 tons per annum. A combined pulp and paper mill with an annual production of almost 40,000 tons is advocated in the Lower Waikato as the most economical unit to establish meantime.

11. *Forest Finance.*—Following the representations made in last year's report, discussions have taken place with the Public Accounts Committee and the Treasury regarding the payment in connection with forestation operations of compound interest at $4\frac{1}{2}$ per cent., but further investigations have been ordered before any relief can be secured. An investigation into the incidence of taxation on forestation companies has also been commenced.

12. *Soil Erosion.*—Co-operation has been afforded the Soil Conservation Council, but lack of direct representation precludes an optimum effort by the Forest authority, which is universally recognized elsewhere as responsible for the most effective contribution to the broader problem of soil and stream control.

CHAPTER II.—ADMINISTRATION

13. *Permanent and Temporary Staff.*—Permanent, 210 (198); temporary, 131 (130). Increase wholly due to appointment of cadets and timber control temporary staff.

14. *Military Service.*—Second N.Z.E.F., 58 (39); R.N.Z.A.F., 25 (14); Territorial, 40 (48); Navy, 1; Home Guard and E.P.S., 130 (148); W.W.S.A., 11 (3).

15. *Casual Staff.*—Average for year, 920 (922)

16. *Honorary Staff.*—Honorary Forest Rangers, 233 (237).

17. *Health of Staff.*—The general health of the staff continues to be satisfactory, but overtime work on timber-control activities has become dangerously excessive.

18. *Safety of Employees.*—Total accidents, 169 (188). Details are as follows: Cuts, 52 (60); strains, 39 (43); fractures, 8 (0); crushes and bruises, 37 (39); septic wounds, 9 (13); eye injuries, 9 (16); miscellaneous, 15 (17). No fatal accidents occurred, although two were of a serious nature. Once again the greater proportion (112) occurred in Rotorua Conservancy, but next year's figures should show a substantial drop as a result of a safety campaign which has been vigorously pursued by the display at danger points of printed warnings and posters illustrating the common causes of accident.

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

Year.	Total Payments.	Total Wages.	Per Cent. (Approx.).
	£	£	£ s. d.
1941-42	3,057	245,600	1 4 11
1942-43	4,426	261,000	1 13 11

For the past year the estimated premium payable for a comprehensive accident policy would have been £8,000; a saving of over £3,500 has thus been effected.

20. *Recruitment.*—Nineteen cadets were appointed.

21. *University Training.*—Nine cadets attended University lectures.

22. *Examinations.*—Three 1941 candidates completed their practical departmental examinations.

23. *Allocation of Duties.*—Timber-control duties expanded very considerably with the continuation of the war and absorbed the full working-time of many senior officers.

24. *Field and Office Inspections.*—Staff shortage placed added responsibilities on inspecting officers, with the result that fewer inspections were possible than formerly.

25. *Regional Organization.*—A continuing policy of decentralization of timber control was followed, and a study commenced of regional reorganization in order to meet the requirements of post-war and rehabilitation developments.

26. *Inter-departmental Co-operation.*—Acknowledgment is made of the co-operation received from other Departments during a very difficult and exacting year.

CHAPTER III.—CONSTITUTION OF STATE FORESTS

27. *Changes in Area.*—During the year 188,243 acres were set apart as permanent and provisional State forest and 37,617 acres were withdrawn from reservation, a net increase of 150,626 acres. The area under State forest reservation now totals 8,952,794 acres, equivalent to 13.5 per cent. of the land area of the Dominion (see Appendix I). Of this total, 5,873,262 acres are permanently reserved, being 65.6 per cent. of the total State forest area.

28. *Changes in Status.*—Of the area withdrawn from reservation, 21,900 acres were included in the Abel Tasman National Park, 7,820 acres were taken for defence purposes, the remainder being for settlement purposes. Nine hundred and seventy acres of provisional State forest were permanently reserved.

CHAPTER IV.—FOREST MANAGEMENT

29. *Surveys.*—Topographical surveys covering 1,583 acres and compartment subdivision surveys covering 650 acres were carried out on exotic forests. Timber-appraisal surveys covered 130 acres totalling 14,577 acres, and forest reconnaissance 7 areas covering 15,706 acres, while roads totalling 11 miles were also surveyed.

30. *Mapping.*—Additions to the permanent forest atlas included 2 topographical maps (Puketi State Forest), 4 stock maps, 8 operational maps, and 4 privilege maps. Three stock maps were renewed and additions made to 54 stock and operational maps; while 16 copies of these maps were prepared for general use.

31. *Forest-management Staff.*—Late in the year two trained assistant foresters returned to duty, one from the Army and the other from protracted sick-leave. Frequent calls have necessarily been made on some of the trained management staff in connection with timber-control activities, and while steady progress has been made with technical forest-management projects, the latter have again suffered by reason of staffing shortages.

32. *Forest Working Plans.*—The war provisions of the kauri working plan, the first departmental working plan to be formally approved in accordance with the Forests Act, 1921–22, were operated for the supply of timber for various categories of naval vessels.

Assessment of growing stock of Waiotapu and Conical Hill exotic forests has progressed to within sight of completion. These assessments as the basis of working-plans management are qualitative as well as quantitative, and have brought to light in the older exotic forests numerous interesting silvicultural features not disclosed by the recorded histories, such as unusual species mixtures, almost complete disappearance of one species in a mixture, results of various planting spacings, inaccurately recorded species, and so on. One outstanding instance is the newly discovered existence of many flourishing Corsican pines in stands previously recorded as Austrian pine, which in comparison is a low-value species. The assessment strip plots on which volume measurements are made are being permanently pegged and recorded, so that a five-yearly investigation of stand development and increment becomes a simple matter.

Assessment of Golden Downs exotic forest was commenced. In this and similar younger exotic forests, assessment is being confined meanwhile to stands of the fast-growing *Pinus radiata*. This species will probably be managed under a working circle quite distinct from that for the slower-growing species, which will not be ready for cutting until some years later.

CHAPTER V.—SILVICULTURE

33. *General.*—Silvicultural operations are now restricted to what can be done by the bare maintenance personnel that is necessary for fire protection. Extension of planted forest area dropped to 1,540 acres, the smallest annual area for over twenty years past. Only 1 per cent. of the total area received improvement treatment, but the most urgent operations were accorded priority, and, of these, medium to heavy thinning was increased by 30 per cent. Statistics of establishment and silviculture are presented in Appendix II.

34. *Natural Regeneration.*—In Omahuta Kauri Forest high mortality in recently germinated kauri seedlings has resulted from the dry, hot summer and autumn, particularly amongst seedlings precariously established in heavy litter. Nevertheless the remaining stocking appears adequate for re-establishment. The acquirement of a large area of forest on Great Barrier Island comprising hundreds of acres of kauri sapling and pole forest was finalized. Progress was made towards the acquirement of an even more attractive block of privately owned young kauri forest on the mainland. Podocarp regeneration on Whirinaki Forest made satisfactory progress and was assisted by the planting of 7,000 indigenous seedlings, chiefly kahikatea. No special beech-regeneration measures were practicable during the year.

Natural regeneration of *Pinus radiata* in Whakarewarewa Forest compartments clear-felled in 1940–42 is very promising. The bark-beetle (*Hylastes ater*) and honey-fungus (*Armillaria mellea*) have caused a certain number of deaths, but the beetle damage now appears to be abating (see clauses 41 and 49 below). A considerable number of internal firebreaks of the State exotic forests are becoming heavily covered by natural regeneration, necessitating the opening-up of access rides for the maintenance of efficient fire-prevention communications.

35. *Interplanting Indigenous Forests*.—In pursuance of the policy mentioned in recent reports under which this operation is being tapered off pending a complete investigation of results, only 115 acres of cut-over podocarp forest were interplanted to shade-tolerating exotics. Partly failed areas were blanked up on 26 acres. In addition, 17 acres were interplanted to kahikatea, totara, rimu, and matai.

36. *Afforestation*.—Only 1,408 acres of new area were planted to exotics, mixed species being used on 78 acres, but serious failures of recent years were replanted over 1,828 acres and partial failures blanked over 1,975 acres. Planting and silvicultural statistics are presented in Appendix II. Thirty-four pounds of indigenous seed and 425 lb. of exotic-tree seed were collected and extracted.

37. *Nursery Operations*.—A total of 450 lb. of tree seed was sown, yielding 887,000 seedlings as at 15th March, 1943; 6½ lb. of indigenous seed are included. Trees lifted for planting, transfer, &c., totalled 3,898,000, while 234,000 were lined out. Tree stocks in all nurseries at the close of the year amounted to 10,700,000.

38. *Tending of Indigenous Forests*.—In Warawara Kauri Forest some of the time of the caretaking personnel was occupied in releasing kauri saplings from overtopping shrubs. Extensive work of this nature is urgent, but must be postponed until after the war. Release cutting of exotics interplanted in podocarp stands comprised 31 acres, and pruning of double leaders 35 acres.

39. *Tending of Exotic Forests*.—On 1,440 acres tree plants were released from fern, &c. Low pruning of stems to 8 ft. from ground-level was done on 2,265 acres, while high pruning of final-crop trees comprised 729 acres. Thinning treatment covered 444 acres of first or light thinning and 1,024 acres medium to heavy thinning. One hundred and thirty-four acres were clear-felled; and damage clearances of stands harmed by gales, snow, or fire accounted for 329 acres partial clearance (virtually an uncontrolled thinning) and 92 acres total clearance—necessitating re-establishment.

40. *Silvicultural Investigations*.—In Rotorua Conservancy 36 acres of cultivated ground were planted to Californian redwood spaced at 16 ft. by 16 ft., to ascertain the relation between costs of pre-cultivation, wide spacing, and successive green prunings, as against costs of normal close spacing on uncultivated ground, normal low and high pruning of dead branches, and several thinnings; and, of course, a comparison between the stem form and timber value under each method. In Wellington Conservancy small trial plantings in the National Park district (altitude, 2,900 ft.) were made with several tree species, but a severe January frost destroyed most of these, thus limiting future plantings to the hardy pine species previously used for planting at that inhospitable altitude. On a block newly acquired for an afforestation project in connection with post-war rehabilitation 3 acres were planted to six tree species in order to observe, prior to commencement of large-scale planting, their early growth in the locality concerned. Good progress was made with the collection of data for a set of bulletins on the silvicultural characteristics, requirements and treatment, and the utilization value of the fifteen principal exotic conifers planted in New Zealand.

41. *Experimental Plots and Statistical*.—Five new sets of plots were established in connection with the study of natural regeneration of exotics, more particularly the conditions under which natural regeneration takes place, the relative density, rate of growth, and species distribution. A set of replication plots was established in 1942 plantings on Rotoehu Forest to study the effect of various planting spacings upon height development, stem form and pruning requirements, and thinning periods of *Pinus radiata*. Eight different spacings were adopted, ranging from 3 ft. to 15 ft., the total area involved being 64 acres. In a Canterbury forest subject to occasional windthrow a new plot was established to study the effect of thinning upon subsequent windthrow.

Four sets of plots were re-examined. *Pinus radiata* propagated from cuttings showed at thirteen years of age no differences in dimensions or form from normal stands. Thirty-six kahikatea representative of 5,000 planted in 1937 to restock a windthrown stand showed a mean annual height growth of 5 in. (soil—a rich river-flat loam). In a Canterbury forest natural regeneration from a twelve-year-old *Pinus muricata* stand completely destroyed by fire in February, 1939, tallied as follows in winter 1940, 1941, and 1942: 126,000, 105,000, and 85,000 plants per acre respectively.

Re-examinations of plots in a clear-felled *Pinus radiata* compartment in Whakarewarewa Forest revealed an average net increase in naturally regenerated seedlings of from 1,860 per acre in late spring, 1941, to 2,630 in autumn, 1942, and 3,360 in late spring, 1942 (range, 210 to 6,210). During the year the average number per acre killed by the bark-beetle, *Hylastes ater*, was 170 (range, nil to 260). Only one of the six plots is still understocked, with 210 plants per acre. Six newly established plots in felling coupes which have had a full year to regenerate average 3,590 plants per acre (range, 80 to 9,400) after allowing for 90 plants per acre killed by the bark-beetle. Three of these plots are not yet satisfactorily stocked. Three plots were established in portions that were experimentally burned to a fierce, moderate, and light degree respectively, and no regeneration has so far appeared on any of these. To date, the season of clear-felling appears to be of no significance, while understocking is characteristic of ground heavily consolidated by logging activity, some portions of which will require to be regenerated artificially by planting once the stumps and tops have dried out sufficiently to reduce the local *Hylastes* population to insignificant levels.

42. *Forest Botany*.—The following projects, relating to the main exotic and indigenous tree species, were continued under control plan: organized collection and testing of seeds; effect of storage on the viability of seeds; recording of seed crops according to an arbitrary scale denoting degree of abundance (on the whole, 1942 was a poor seed year); variation in quality of insignis-pine seed collected from cones of different ages (seed from sixteen-year-old cones was found to be still viable); and collection of phenological records on the main exotic tree species. From two years' observations on juvenile stages of some of the native podocarps, a tentative method of recording their growth has been devised. Seed of species of *Araucaria* has been received from Australia and South America and seedlings raised for planting out in an arboretum in North Auckland.

CHAPTER VI.—FOREST PROTECTION

43. *Fire Protection.*—The season on the whole was wet, though a dry spell in January caused concern in North Auckland, where forest fires proved difficult to handle—troops and settlers being called upon before they could be brought under control. For the whole Dominion only 39 fires were recorded in State forests covering a total of 6,555 acres, mainly scrub and fern lands. There were only 3 serious fires—1 burning-off fire at Tairua which destroyed 206 acres of exotic plantation, mainly *P. radiata*, and 2 in North Auckland which destroyed 400 acres of indigenous forest, all of which timber, however, it will be practicable to salvage.

Continued intensive recording by lookouts of fires adjacent to exotic State forests show that 720 were detected, these being mainly land-clearing and rubbish fires. Included in these were 39 previously mentioned in the first paragraph and 41 others outside State forest which were reported upon and shown to have burned off an area of 5,336 acres, mainly tussock and fern country. Assistance was rendered various land and forest owners in combating fires, notably one private forestation company which is estimated to have lost 410 acres of exotic forest, due to the fact that the fire was left unattacked for twenty-four hours and allowed to advance right up to the edge of the forest before any serious attempt was made to check it.

Also included in the above were six sawmills—owned by Kauri Timber Co. (Auckland), Randall Creek Sawmilling Co. (Westland), A. Sharpe, Ltd. (Tawauui), Dominion Timber Co. (Owhango), C. Aitken and Son, Ltd. (Gisborne), and Hopkins, Speirs, and Winger (Pukawa)—and one timber-yard—owned by W. W. Keighley (Christchurch).

44. *Fire-hazard Stations.*—Meteorological and fire-hazard stations have proved more invaluable than ever before in giving warning of dangerous fire conditions and in economizing the use of man-power on fire-protection activities. The danger in certain indigenous forest areas of high winds, accompanied by comparatively high relative humidity conditions, has been shown by recent fires. Normal moist climatic conditions are conducive, especially on the west coast (both Islands), in Southland, and in North Auckland, to the growth on the forest floor and trees of mosses and liverworts, which become a distinct fire hazard after a brief drying period. Indices of this light fuel type have yet to be devised. Of the woods used for the recording of fire hazards, locally grown *Pinus strobus* has proved the most suitable.

45. *Fire Districts.*—A new fire district covering an area of 103,400 acres was constituted for the protection of State forests in the Monowai-Lillburn district of the Southland Conservancy, and one local-body fire district for the protection of a water-supply forest area in the Nelson Conservancy, bringing the grand total to date to 63 fire districts covering 3,558,008 acres.

46. *Forest (Fire-prevention) Regulations 1940, Amendment No. 1 (Serial number 1943/31).*—This amendment rectified certain defects in the principal regulations revealed by administration and legal proceedings since the regulations were introduced in November, 1940, and introduces several new provisions to strengthen fire control and prevention. The principal features of the new regulations are:—

- (a) Logging operators are made responsible to see that engines of any kind are not operated in State forests or fire districts from 1st August in any year to 30th April in the following year unless such engines are equipped with efficient devices for arresting dangerous sparks or flame and for preventing the escape of live coals or fire:
- (b) A steam locomotive engine may not be operated along a tramway adjoining or within an exotic forest in a fire district during the period mentioned unless the operator provides a patrol with adequate fire-extinguishing equipment to patrol the route followed by the engine not earlier than ten minutes nor later than thirty minutes after the passing of the engine and to promptly extinguish any fires:
- (c) The owner of a tramway which adjoins or is within an exotic forest in a fire district may be issued with a notice requiring him to clear his land of inflammable material likely to cause the spread of fire, providing similar steps have been taken by the adjoining forest owner, whether the Crown or not. If he fails to do so, a Forest Officer may have the work done:
- (d) A motor-vehicle using a gas-producer may not be operated in a fire district during the fire season unless the producer is fitted, mounted, and maintained to prevent the escape of fire, sparks, cinders, &c., while material taken from the producer must be emptied into a receptacle containing water to eliminate all fire danger. By *Gazette* notice the Minister may prohibit the use of roads in or adjoining State forests within fire districts by gas-propelled motor-vehicles during any period specified in the notice:
- (e) While a fire is burning in a fire district, the permittee must remain in attendance with the necessary assistance and equipment to control the fire, and may not leave until the fire is extinguished or been made safe from spreading beyond the area specified in the permit to burn. This provision has become necessary because permittees had placed too much reliance on what is termed a "safe" fire, which after being well lighted has been left to its own devices. Sudden weather changes combined with over-confidence, thoughtlessness, or indifference on the part of the fire-lighter have too often been responsible for a "safe" fire getting beyond control and seriously damaging timber stands or protection forests where Forest Officers were not available to render speedy and skilful fire-fighting assistance.

47. *Animal Damage*.—No reports have been received of serious damage from deer or pigs to planted areas, though goats are stated to be damaging Douglas fir in Nelson Conservancy. Nevertheless, the increase in the animal population in both indigenous and exotic forests is alarming. Animals killed in State forests were: Rabbits and hares, 14,604 (16,317); deer, 627 (904); pigs, 502 (1,062); goats, 0 (77); rats, stoats, ferrets, &c., 955 (2,534). Opossum damage has been reported from planted areas in Southland, Westland, and Wellington, and those destroyed under special Ministerial warrant totalled 1,803 (1,210).

48. *General Ecology*.—The collection of data and the investigation of all insects and diseases of potential silvicultural importance have been continued as essential to the protection of our forest resources. The recorded geographical occurrence of the pine-bark beetle, *Hylastes ater*, was extended southward, from mid-Canterbury to the Waitaki River.

49. *Insects*.—The negotiations with the Australian Commonwealth (referred to in last year's report) for preventing the export of insect-infested timber to the Dominion were brought to a satisfactory conclusion by the enactment of regulations by the Commonwealth authorities prohibiting the export of timber unless, *inter alia*, it has been examined by an officer of the Forestry Commission or other State authority and marked or branded as being free from termite or other insect infestation. The regulations became operative on the 1st December, 1942, and continue for one year, after which they will be reviewed and any disclosed deficiencies remedied. This Service gratefully acknowledges the co-operation it received from the Australian Trade Commissioner, the Commonwealth Department of Trade, and the State Forestry authorities in a matter which so greatly concerns hardwood-timber importers and consumers. Check inspections of hardwood shipments show the timber to have been exported in conformity with the regulations.

Recently reports were received from the Rotorua Conservancy that freshly-felled larch and Douglas fir poles were being attacked by borer. The beetle was identified as *Pachycotes ventralis* Sharp, a common native bark-beetle living normally in dead forest trees and had also been reported as attacking freshly sawn timber. The adult is particularly abundant from November to February, and to minimize and control attacks, all freshly cut timber during these months was sprayed with Diesel oil and creosote. This treatment appeared to be fully effective.

The *Hylastes* attack of *Pinus radiata* appears to have decreased in intensity in Whakarewarewa Exotic Forest. The plots established in clear-felled areas show that though this pine-bark beetle is still present, the number of plants killed is not significant, the stocking of seedlings per acre having increased from 4,810 in March, 1942, to 9,400 in October, 1942.

50. *Plant Pathology*.—No serious outbreaks of disease have occurred in indigenous or exotic State forests through the year. Diseases reported have been investigated and are being kept under observation. Among those which have received attention are: Discoloured heart of poplar thinnings from Dusky and Conical Hill Forests, from which was isolated a fungus resembling *Stereum purpureum*; a rot of *Pinus taeda*, Waipoua, together with attack by *Sirex noctilio*, though the pathogen does not appear to be *Stereum sanguinolentum*, which is most commonly associated with the steel-blue sawfly; dying seedlings from Ashley State Forest (damping-off by *Fusarium* sp.), &c., and heart rots of larch and totara ("kaikaka" yielding a fungus other than the previously isolated *Fomes robustus*). Two saprophytic species of *Dasyscypha* have been identified from larch in Southland, one being *D. calycina*, the well-known saprophyte which sometimes occurs with the larch-canker fungus, and can only be distinguished from it microscopically. The larch-canker fungus, *D. wilkommii*, has not been found in New Zealand.

51. *Damage from Natural Causes*.—Only minor wind damage of localized occurrence was recorded during the year, including, however, one cold saline southerly in June which severely damaged and in some cases killed ngaio, lacebarks, and other indigenous shrubs in the South Wellington area. Heavy snow in October damaged larch in three Naseby forest compartments (Otago Central) and also indigenous beech forests growing on sidelining slopes in Glenorchy district, where large numbers of trees in the pole stage were bent over, broken, or actually uprooted. The damaged poles are being converted into mine-props for local use. A severe January frost at Tongariro Forest, on the plateau of Central North Island (altitude, 2,900 ft.), destroyed experimental plantings of Douglas fir and *Pinus radiata*, and very seriously damaged *P. laricio* planted in 1940 and 1941. Larch and macrocarpa were but slightly affected, and the hardiest species at that high altitude are *Pinus ponderosa* and *P. murrayana*. At Longwood Forest (Southland) unusually heavy frosts occurring in May and June following a mild autumn killed and damaged large numbers of newly planted exotic trees and actually killed numbers of indigenous silver beeches up to 8 ft. in height, a rare occurrence worthy of record.

During an electrical storm in December over Kaingaroa Forest 15 pine trees were destroyed and 3 others damaged. One acre of *Pinus jeffreyi* in Waitapu Forest, planted in mixture with *Cupressus lawsoniana* in 1918, became thermally active and the pines had to be felled, yielding sawlogs and mine-props. The Lawson cypress, which predominated in the mixture, is so far unaffected. The soil temperature 2 ft. down is 80° F.

52. *Forest Offences*.—Offences against the Forests Act were considerably fewer than in the previous year, but convictions were secured in 18 cases (29), made up as follows: Theft of timber, 1 (0); attempted bribery, 1 (0); fires, 6 (6); timber trespass, 5 (2); trespass and hunting, 5 (21). In one flagrant case of timber trespass a company and its manager were each fined the maximum sums (£100 and £50 respectively).

CHAPTER VII.—FOREST ENGINEERING

53. *General.*—War conditions have again delayed the carrying-out of any major construction works, and even maintenance of existing services was achieved only with extreme difficulty.

54. *Roads and Bridges.*—Road construction and maintenance were necessarily limited by the labour and equipment available; nevertheless thirty miles of new roads for access and fire protection were made and thirty-seven miles of existing roads regraded.

55. *Other Transport Facilities.*—The Forest Service siding at Rotorua Railway-station again proved invaluable in expediting the despatch of the urgent defence and other essential timbers produced in that conservancy.

56. *Buildings.*—The only new buildings erected were in Rotorua Conservancy and comprised two small houses built of exotic softwood in Waipa Village and extensions to fuel-bins, power-house, workshop, and dry-storage sheds at Waipa Mill. New premises were acquired in Rotorua Borough to accommodate the conservancy staff, as after some forty years of occupation the old headquarters building at Whakarewarewa was quite inadequate for present-day needs. Certain structural alterations were necessary to make the new building suitable for office use.

57. *Water-supply and Drainage.*—With the increase in growth and area of the exotic forests, the fire risk, particularly at outlying stations, becomes progressively higher, and every effort has been made to supplement existing water-supplies by sinking wells, although so far with little success owing to scarcity of labour, piping, &c. At Kaingaroa, Hammer Springs, and Conical Hills State exotic forests, trailer pumps have been installed, and the Waipa mill trailer pump has been mounted on a truck for greater mobility and utility. In Rotorua abnormally heavy rain fell on four occasions—in one period of four hours 7 in. were recorded, the heaviest within living memory—and some damage was done in the vicinity of the logging area and the mill by flood-waters. Steps have been put in train to minimize damage in the future should another cloud-burst occur at any time.

58. *Utilization Plants.*—With its second full year of operation, the Waipa log-frame mill has demonstrated beyond all possible doubt the pre-eminence of this type of equipment for the conversion of exotic softwood logs. With an annual production of 7,750,000 board feet, its output is as follows:—

- (a) The largest of any single mill cutting either indigenous or exotic timber:
- (b) Almost equal to the output of the next three largest mills cutting exotic timber:
- (c) Equal to over ten times the average output of all other mills cutting exotic timber:
- (d) Equal to over one-eighth of the entire Dominion output of exotic timber.

So successful has been the mechanization of operations in relieving workers of undue physical exertion that on the sawmill floor the output per man is—according to the size of the logs sawn—from 2,000 board feet to 5,000 board feet per day, as compared with a usual figure in the century-old circular-saw mills of only 500 board feet per day. Coupled with this achievement is the fact that the timber is so accurately sawn that it may be used directly for many purposes for which the ordinary circular-sawn timber would have to be further dimensioned by planing, &c., which is also reflected by the fact that the loss in sawdust, slabs, and shavings at Waipa is only two-thirds of that in the circular-saw mills, whose only usefulness in the future will be in the working-up of the few rough logs yielded by shelter-belts and marginal trees from farms, &c.

The reliability of the Waipa plant is demonstrated by the fact that during the year there were only seven days on which it operated less than seven effective working-hours and not one day on which it did not operate at least six effective working-hours. This record is a tribute both to equipment and to maintenance staff.

The only major improvement disclosed by the year's working was the necessity for expanding fuel storage in order to carry sufficient stocks of sawdust and hogged slabs over week-ends for the generation of steam required for the continuous working of the dry kilns. The installation of the necessary bins is well on its way to completion. Minor improvements to the log crosscut saw and the outfeed equipment to the log frames have been effected by the installation of heavy feed rolls, those originally supplied having proved somewhat light to withstand the heavy green logs and excessive wear due to pumice.

In the dry kilns, box-factory, and creosote plants the equipment has performed satisfactorily, but experience in the box-factory indicates that, with the large amount of salvage material which must be reworked in order to minimize wastage, an extensive system of subfloor conveyors is essential if a high standard of production management is to be attained. The superiority of sliding-type cut-off saws and metal cut-off tables has also been well proven. The kilns, which include three 66 ft. long chambers and one 20 ft. chamber, are the largest of their kind in the Dominion, and have effectively demonstrated the practicability of large-scale commercial drying of exotic softwoods for box-making even in stock up to 2 in. in thickness.

59. *Transportation.*—The only additions to the departmental motor fleet has been a pneumatic-tired straddle truck for the handling of unit timber packages at the Waipa mill. It has been found infinitely superior to the solid-tired equipment owing to its ability to operate on even the softest pumice. As was the case last year, vehicles due for replacement have of necessity been kept on the road, but only with extreme difficulty. Close supervision to ensure only essential running has again been exercised by controlling officers. The transportation of increasing quantities of manufactured produce from the Waipa mill to the railway-station has been effected by the use of detachable semi-trailers, four of which together with only one truck have succeeded in moving the whole output of the mill and creosoting plant a distance of four miles to the Rotorua Railway-station. Gas-producer units fitted to the departmental trucks last year have operated satisfactorily although their operation has been curtailed through the fire season.

60. *Communications*.—Four miles of new telephone-line were erected, bringing the total to 389 miles. Revolutionary developments in the use of radio are being evolved for fire-protection work, and extensive applications are being planned as a post-war activity.

61. *Village Planning*.—Employee demand for rental housing following the successful development of the Waipa Village settlement has increased to an extent not previously contemplated, and the improved results from this experiment in added efficiency, protective availability, and other indirect benefits are such as to encourage further developments elsewhere for forest workers. Such possibilities are now the subject of a comprehensive survey at Whakarewarewa and Waiotapu, having as its objective the grouping and extension of our forest-worker communities and the improvement of existing settlements. These communities will be served with water-supply, sewerage, and artificial light, as well as all modern village amenities not hitherto available. It is hoped that such schemes will be self-supporting, but the indirect benefit is considered to amply outweigh any considerations of profit.

Waipa Village has added two house units during the period, and the use of a large number of one-man hutments to supplement the wholly inadequate hostel accommodation has been also necessary. At Reporoa detailed surveys have been made of sites suitable for communities associated with the proposed sawmill and other projects, and plans are now in preparation for this work. A noteworthy, if not unexpected, feature has been the fine public spirit shown by staff and employee tenants in the development of communal amenities.

CHAPTER VIII.—EXTRACTION AND COMMERCIAL DEVELOPMENT

62. *State Forest Block Sales and Permits*.—Timber appraisals numbered 130 (123) covering 101,460,000 board feet (102,062,000 board feet); 42 (22) appraisals were for other Departments and comprised 23,009,000 board feet (13,062,000 board feet). One Head Office check appraisal was made and several by regional senior officers. Reconnaissance was carried out over 15,700 acres affecting 67,000,000 board feet of timber.

The wartime demand for forest supplies has been sustained. The volume sold in board feet was 74,710,000 (80,637,000), the principal species being rimu and miro 56,035,000, kahikatea 6,914,000, matai 5,723,000, totara 2,478,000, beech 2,423,000, and others 1,137,000, with a value of £103,413 (£111,040).

The quantity of sawn timber produced from State forest and warden areas was 111,190,000 board feet (108,858,000 board feet). Miscellaneous indigenous forest produce cut under permit comprised 161,789 posts and stakes, 3,862 stays, 9,695 strainers, 116,803 battens, 6,234 poles, 16,267 rail sleepers, 20,775 house and pole blocks, 97,526 pieces of mining timber, and 215 cords of firewood. The produce cut under permit from exotic forests include 13,960 pieces of mining timber and 23 cords of firewood.

63. *State Forest Log Sales*.—Indigenous forest log sales aggregated in volume 1,451,247 cubic feet (1,038,768 cubic feet) with a sale value of £51,053 (£29,156). Of this quantity, 21,288 cubic feet were sold for peeling purposes. Sales of logs were confined to Auckland and Rotorua Conservancies; and in the latter conservancy also sales of produce from cut-over forests covered 14,394 posts, 9,530 battens, 49½ cords firewood, 3 butchers' blocks, &c. Log sales were made from exotic State forests in Rotorua and Southland, the total quantity being 1,293,638 cubic feet, the major quantity of which was converted at Waipa mill.

A vast quantity of miscellaneous produce was also extracted and sold from the exotic forests—viz., 82,570 mine-props, 44,470 posts, 12,456 telephone-poles, 357 radio masts, 93,000 stakes, 6,040 tent-poles, 3,740 cords firewood, 32,400 tent-pegs, &c.

Round timber made available for creosoting aggregated 118,007 cubic feet.

64. *Commercial Policy*.—The major departmental logging, milling, and boxmaking and wood-preservation activities at Waipa are managed as ordinary commercial industrial units and required to conform to both peace and war time control affecting all other units in the timber industry. A strictly commercial system of accounts is maintained, while rates of depreciation as determined by expert engineers for all items of equipment are subject to periodical scrutiny.

65. *Whakarewarewa State Forest Production*.—The production of round forest produce in the form of eucalypt logs for bridge-strengthening, harbour-works, &c., and of larch and Douglas fir logs and spars for posts, poles, and masts and for cutting into tunnelling and mining timbers, &c., reached extraordinarily high levels as a result of defence demands and occupied the bulk of the forest staff at Whakarewarewa.

The production of sawlogs attained a new record, as evidenced by the output of the Waipa State mill reviewed below, but due to the logging of poorer timber on much higher country than was logged last year, the cost of sawlogs delivered from the principal area being clear-felled increased somewhat. Including the payment to the Whakarewarewa Forest Account of a stumpage of 2s. 6d. per 100 board feet to cover the cost of growing, the clear-felled logs delivered to the mill cost 9s. 10d. per 100 board feet, or 10d. more than last year, but of this 5d. is accounted for by extra wage costs resulting from the award agreement to pay for Xmas-New Year holidays and the Arbitration Court granting of a cost-of-living bonus.

Much misapprehension exists regarding the nature of the wastage of round material in the Whakarewarewa State Forest, which is an excellent demonstration of what occurs when silvicultural improvement measures are not carried out over appropriate periods of the forest's growth. Had funds been available for thinning purposes many years ago, the pine stands now being clear-felled would have contained virtually no dead trees or useless stems, whereas to-day, for every 250 green trees felled per acre for sawlogs, an average of 416 dead and decayed trees are knocked down, constituting what appears as avoidable waste, but in reality is useless. In larch stands, too, there is a measure of similar waste, but in addition it is a virtual impossibility always to balance exactly

orders for such classes of produce as stakes, pickets, posts, poles, &c., with the result that, although salvaging is going on constantly, some waste is inevitable, though naturally every effort is made to reduce this to an absolute minimum. The moral is to reinstate silvicultural improvement measures as soon as the man-power can be made available.

66. *Waipa Milling Operations*.—The production of sawn timber at the Waipa log-frame mill reached a new record of 7,696,000 board feet (6,346,000 board feet). Owing to previous commitments and to directions of the Timber Controller, it was still necessary to sell some of the output on the open market—viz., 2,182,000 board feet (4,092,000 board feet). At 31st March, 1943, the Waipa stocks were 1,853,490 board feet (1,565,504 board feet).

67. *Waipa Box-factory and Planing-mill*.—The year's operations represent the first full year in production, but although 4,380,000 board feet were converted (2,627,000 board feet), the mill is capable of dealing with at least the whole of the Waipa sawmill output, amounting to the 7,696,000 board feet already recorded. The production consisted principally of export containers, including 133,000 cheese-cases, 127,000 meat-cases, 102,000 biscuit-cases, 14,000 boot-cases, 56,000 vegetable-cases, and 200,000 barb-wire reels. In addition, 86,000 fruit-cases and 14,000 miscellaneous cases were made.

Owing to the date of this report, final financial accounts are not available, but preliminary accounts for the combined sawmill and box-factory operations show a profit of £13,000 (£5,508).

68. *Departmental Wood-preserving Activities*.—The creosoting plants at Rotorua and Conical Hills have maintained their production of creosoted poles and fencing-posts. The third plant, at Hanmer, however, has been inactive for a period owing to all available labour being engaged on the production of poles, stakes, &c., to be used untreated on various defence projects. Poles for creosoting were also prepared, but it has not been possible to treat the majority of these, owing to their being insufficiently seasoned. Defence requirements of untreated poles, stakes, &c., from the forests normally supplying the requirements of the Rotorua plant have made it impossible to maintain seasoning-yard stocks, particularly of posts, at a satisfactory level, and the impact of this will be felt next year, when it will be necessary to cease creosoting operations for about four months. Appendix III summarizes the year's activities in this field.

69. *Departmental Objective in Commercial Development*.—The furnishing of high-quality timber products at the lowest possible price is the ultimate objective of departmental participation in commercial development. In sponsoring the national grading rules and the development of kiln drying, the Forest Service has made outstanding contributions to the indigenous-timber trade. In the exotic-timber trade much more was required. Only small logs were available, as compared with the large logs so characteristic of the indigenous forests, and with infinitely higher costs in both logging and milling. Neither could the sawn exotic timber be abused as in the case of the indigenous timbers, but had to be protected against sap stain or kiln dried. What was worse, many users were prejudiced against the timber on account both of poor sawing and bad sap staining. The only corrective was to develop the use of new types of logging and sawing equipment and of treating methods for protection against sap stain. After considerable investigation, a satisfactory solution to these various problems was evolved and is typified in the Waipa log-frame sawmill.

Insignis-pine prices throughout New Zealand range from as low as 16s. 9d. to as high as 22s. 9d. per 100 board feet on an ex-mill basis, but with only one or two exceptions these apply to sawn timber produced from relatively large logs much cheaper to log and mill than the small logs (average diameter is 10 in.) sawn by the Waipa State mill. Yet the average price realized by the Waipa mill is only 20s. 4d. per 100 board feet for green sales ex-mill, and considering that the mill is only in the second year of full production the operations are showing a reasonable profit and paying for the growing of the timber; the venture is a valuable contribution to the solution of the Dominion exotic utilization problem.

CHAPTER IX.—TIMBER TRADE

70. *Production of Sawn Timber*.—Full details are presented in Appendix VII. The annual cut for the year ended 31st March, 1942, was 324,000,000 board feet (342,000,000 board feet), this reduction of 5 per cent. being due to the accumulated loss of experienced workers to the armed Services. Although a number of mills have cut out meantime, the released employees have assisted to more fully man other operations, and this concentration of production, coupled with the release of skilled and key personnel from the armed Services and the working of extended hours, is estimated to yield an annual cut for the year ended 31st March, 1943, of 350,000,000 board feet.

71. *Species cut*.—With an extraordinary demand for boxing and crating timber for the packing of export produce both for Great Britain and other theatres of war, the cut of insignis pine for the year ended 31st March, 1942, increased to 56,000,000 board feet (53,500,000 board feet), whereas with the exception of beech, which remained at the previous year's level (9,326,000 board feet), all other important species registered a decrease of between 6 per cent. and 20 per cent. For the past year, however, it is anticipated that the indigenous species will show, as a result of the working of more extended hours, a greater recovery in production than insignis pine.

72. *Man-power*.—In spite of determined attack upon the man-power problem, many mills have been inadequately staffed, if not in numbers, then in experienced and young fit men. Few, if any, other industries are believed to require the same high standard of physique as the logging and milling sections of the timber trade, and high tribute is due to those who keep the logs moving and the saws cutting, often under most difficult conditions. Credit is also due to those older and experienced workers who have returned

to assume hazardous and arduous duties in both forest and mill. The total strength of the industry is estimated to be about 10 per cent. below normal. Further reference to the staff problem will be found in clause 102.

73. *Equipment for Timber and Allied Industries.*—The delivery of new equipment for use in the sawmilling and boxmaking industries has not improved greatly and the difficulties of maintaining production have increased accordingly. The position has been relieved to a certain extent by improvisation within the industry, but the problems in replacing worn equipment or repairing the rapidly ageing plant is straining the resources to the utmost. This is particularly so in regard to tractors and motor-trucks, as the demand for parts exceeds the supplies arriving in the country, and only by the closest co-operation between units has it been practicable to keep such equipment operating.

Extensions in the equipment installed in the new plywood-factory operated by Messrs. N.Z. Plywoods, Ltd., have increased this company's output, which, together with that of fibre board by Messrs. N.Z. Forest Products, Ltd., has afforded considerable relief from the acute shortage caused by reduced imports of these products, as well as conserving supplies of sawn timber for essential purposes.

74. *Domestic Markets.*—Demand for timber for defence works both in the Dominion and in the South Pacific war theatre continued to be maintained at a high level throughout the year. At the 31st March, 1943, stocks of building timbers were estimated to be not more than 20 per cent. of normal and of seasoned lines not more than 10 per cent. In order to assure supplies for work for which only dry timber was suitable, sufficient deliveries were maintained to keep all approved dry kilns in full operation, and their output rationed. Due to the necessity of employing building personnel largely on defence works, the number of building permits issued for dwellings in the larger centres was recorded as only 600, while the total value of permits for all buildings in the same centres was only £2,245,000.

The demand for timber for containers for both potatoes and other vegetables, which have hitherto been carried in sacks, resulted in insignis pine, although produced in greater quantities, being insufficient to meet demand. It has been necessary to meet the deficiency with matai and rimu, but owing to the sudden demand, boxmakers' stocks have been reduced temporarily to unsatisfactory levels. The butter-box and cheese-crate position is dealt with later in clause 106.

Strict control over timber-prices continues to be maintained by the Price Tribunal, to which all applications should be addressed. The only general price increases approved during the year were relatively insignificant, being of the order of 3 per cent. to cover the increased costs of production resulting from the new award and its provision for the payment of non-statutory holidays between Xmas and New Year.

According to the latest figures published by the Government Statistician, the average values per 100 board feet of all species of timber ex mill for the last four years for which figures are available are as follows: 1938-39, 18s. 6d.; 1939-40, 19s.; 1940-41, 19s. 3d.; and 1941-42, 20s. 1d.

75. *Timber Imports.*—With timber and shipping in short supply in both Australia and North America, the reduction of imports as shown in Appendix IV to only 8,447,000 board feet (21,814,000 board feet) is not unexpected. The export from Australia of sawn hardwood is under strict control by permit, and at the suggestion of the Commonwealth Timber Controller all Government and local-body orders for poles, &c., are placed at ruling rates by the New Zealand Supply Liaison Officer in Sydney after consultation with the Deputy Controller there, this being regarded as the only alternative to more irksome control and to a steep spiral of rising prices. The Douglas fir stock position has improved in respect to large structural sizes of merchantable grade, but efforts are still being made to secure better stocks of No. 2 Clear and Better for specialist uses.

76. *Timber Exports.*—Though it could ill be afforded, a release of 13,000,000 board feet to Australia was scheduled for 1942 in exchange for essential supplies of sleepers, poles, &c., but, as indicated by Appendix V, a shortage of shipping made it impracticable to export more than 7,548,000 board feet (16,709,000 board feet). The silver beech exported was released only to purchasers nominated by the Commonwealth Timber Controller.

CHAPTER X.—UTILIZATION

77. *General.*—The trend towards substitution of minor local woods for imported special-purpose timbers has been limited by the incidental availability of supplies: sawmills in general have had to give precedence to maintaining output of the important building timbers for defence construction, and emphasis on the adaptation of these rather than of the more suitable but relatively scarce woods has been necessary in order to avoid excessive sacrifice of total production by extensive scouting and logging of such timbers.

78. *Grades and Specifications.*—Timber-control inspections have shown the national grading rules for building timbers to be invaluable in policing the supply of timber to Government defence contracts. There is almost as much timber supplied over-grade as under-grade. Only in one instance have substantial quantities below grade and quality been detected, and action appropriate to the seriousness of the case is in progress.

The preparation of standard hardwood grading rules has been further advanced by the development, as a result of various mill studies, of what is believed to be an entirely practicable set of grading rules for silver beech. From subsequent mill-cutting studies of tawa, it would appear that the underlying provisions of the beech rules are applicable to this timber, and a composite rule for all New Zealand hardwoods is now being drafted on the basis of the size and percentage of usable cuttings yielded by the various species and as required by the different wood-using industries.

Other than to relate the results of specific-gravity studies to existing information on working stresses, no further progress has been achieved in the derivation of structural grading rules, although a study of defects developing as a result of the use of patent connectors with green timber has been commenced as the result of a request by the Australian Forest Products authorities.

79. *Specification for Finished Products.*—The enormous expenditure of Government funds on defence construction has effectively demonstrated the necessity for reducing the multiplicity of designs in finished and manufactured wooden building products, and as a commencement a special Committee representative of all interests concerned produced during the year a wartime standard specification for doors, which is being enforced under appropriate Emergency Regulations. The Forest Service is reporting to the same Committee on standard profiles for flooring, weatherboarding, and match lining, which, together with window-sash, will be standardized immediately as an emergency measure.

80. *Structural Utilization of Timber.*—As a result of timber-control activities, constant liaison has been maintained with both the Public Works Department and the Housing Department in the development of new systems of timber construction for defence and other purposes. The most permanent and significant development is that of prefabrication for dwelling construction, and the modified system evolved by the Housing Department is believed to represent a valuable contribution to the solution of the housing problem. Favouring as it does economy in the use of timber, the Forest Service leans away from the general trend in New Zealand and towards the use of large panels or sections as well as the placement after erection of wall linings in one piece free of all joints. The elimination of laundry tubs and coppers by completely self-contained washing-machines suitable for placement in roomy kitchens, and the substitution of combined gas-electric central heating-equipment for open fires and radiators, are advocated as the most practical solution of the large-family problem.

81. *Mill Studies.*—Owing to the pressure of timber-control work, no mill conversion studies other than at the Waipa State mill proved practicable during the year, although numerous grading studies were made, as reported elsewhere, at beech and tawa mills.

82. *Utilization of Minor Species.*—Tawa is assuming ever-increasing importance for furniture in place of Japanese oak and for the expanding turnery industries—*e.g.*, as a substitute for ash for non-shock handles, and for mahogany for instrument tripods—but in all cases the finished parts before assembly should be treated against lyctus, or powder post beetle attack, particulars of which can be obtained on application. *Inter alia*, pukatea has been used for wedge-heels and clog-soles; rewarewa for turned products; mangao for handles and jack stocks; tanekaha for ladders, printers' blocks, and sweep-teeth; and alder for clog-soles.

83. *Timber Mechanics.*—Standard tests have been inclusive of material representing the full commercial bore of forest-grown insignis pine in the green condition and European larch green and air-dry. The superiority of slow over fast grown or of narrow over wide ringed insignis pine is very marked. During the year 560 standard tests have been made on various species.

Standard dry and wet shear tests of plywoods have been carried out in order to determine the efficiency of the glue bonding under conditions where the plywood is subjected to hydrolysis, severe mechanical stress, and attack by micro-organisms. The efficacy of water-repellant solutions is also under investigation. The results will be used as a basis for manufacturing specifications.

84. *Box-testing.*—Boxes for both the domestic and overseas shipment of bacon, beer, soap, nails, and various munitions have been tested in the box-tumbling tester, also barbed-wire reels and fibre board butter-boxes. Collected technical data has been of immense value in the design of numerous other containers and preparation of specifications for their manufacture.

85. *Microscopic Anatomy of Woods.*—Routine identifications have been made of forty specimens of New Zealand and foreign woods. Expert evidence has been prepared in connection with two Criminal Court cases and other related investigations. Reference collections of exotic-forest timbers have been further built up.

86. *Specific gravity Studies.*—Material from crop-thinning and suppressed trees of larch, Corsican pine, Douglas fir, and lesser species has been examined in addition to that provided by the timber-mechanics programme. Unexpectedly, the locally-grown Douglas fir has been found to possess a specific gravity closely approximating that of virgin-growth wood in North America, due probably to a relatively high percentage of springwood, indicating a long period of spring growth.

87. *Moisture-content Control.*—Lack of moisture-content control is still characteristic of many woodworking operations, and plans are under consideration for a Dominion-wide educational and propaganda campaign designed to improve the position.

Further experiments with the use of electrical moisture meters of various types show that none are yet sufficiently rugged, inexpensive, and reliable to warrant general endorsement for everyday use or as a substitute for the oven-drying method of moisture-content determination.

88. *Kiln Drying.*—An inventory of drying-facilities revealed a deficiency which is being met by the immediate installation of sufficient units to increase the output of dry timber by approximately 30 per cent.; these are concentrated principally in the main centres of utilization for defence building. Recently completed installations show considerable improvement in layout. The Service continues to give assistance to operators and advice in connection with new units. Research work has included the development of satisfactory schedules for fast-grown exotic building-grade timber. With sixteen-hour operation daily in the drying of indigenous building timbers the continued operation of

the fans during the off period appears to be desirable if severe conditions engendered by the radiation from the heated walls is to be avoided; the use of lower temperature schedules will also eliminate to a large degree this possible danger.

89. *Wood-preservation.*—Commercial treating companies have been urged to use locally-produced creosote wherever possible and restrict the use of pentachlorophenol and other imported chemicals to applications where a clean treatment is necessary. The results of laboratory examinations of other chemicals studied in conjunction with such Service records as are available have not revealed substitutes which can be recommended in place of the chlorinated phenol group of preservatives.

Likewise, owing to the non-availability of the best of the sapstain-preventive chemicals as a result of war restrictions, as much as possible of the departmental output of exotic softwoods is being kiln dried in order that dermatitis trouble with the use of the poorer chemicals may be reduced to an absolute minimum.

Owing to staff limitations, little progress has been made with the preparation of painted panels for exposure on the paint-test fence maintained at Wallaceville in collaboration with the inter-departmental Paint Committee. The exposure of panels to test will, however, be completed in the near future.

90. *Chemical Utilization of Wood.*—With so much war publicity given to the plastic industry, it is necessary to re-emphasize that the sawlog is by far the major product of the world's forest resources. Even including the large amount of wood employed for papermaking, the total quantity used for chemical utilization by destructive and solvent distillation, by hydrolysis, by pulping, by synthetic-fibre manufacture, by the production of plasticized woods, &c., is only about one-tenth of that used for mechanical purposes such as the production of round and hewn products, sawn timber, &c. An officer of the Department visited Australia during the year for the purpose of examining the latest developments in respect to plasticized wood, and opportunities for local application are being carefully examined.

Following the fundamental studies into the practical problems of pulp and paper manufacture from locally-grown exotics, seasonal variations in resin content were studied, the ether-soluble determinations showing a rise during spring months, falling away again in November.

Of minor problems studied, the most interesting was the development of a wooden stopper as a substitute for rubber corks for water-bottles. Of the various woods tried—insignis pine, North American white-pine, pukatea, and New Zealand white-pine—the first gave best results after softening by a boiling treatment in caustic soda, followed by immersion in glycerine and paraffin. Wide-ringed low-density wood proved to be the most suitable.

91. *Charcoal and Gas-producers.*—Charcoal-burning has continued at Rotorua, but owing to the easing of the petrol position has ceased at other centres. The demand for charcoal has remained small but steady, the cheaper Waikato "char" still being available in sufficient quantity to meet gas-producer requirements. During the year 164 tons were produced; sales amounted to 107 tons, with stocks at the end of the period standing at 65 tons.

Investigations are continuing into the use of motor-vehicle gas-producers using wood blocks or sawdust in place of "char," charcoal, or coal.

CHAPTER XI.—MISCELLANEOUS

92. *Legislation.*—No amendments to the Forests Act, 1921–22, were enacted during the year, but section 9 of the Reserves and other Lands Disposal Act, 1942, cancelled the reservation for the purpose of a public domain over Section 2, Block II, Waitahu Survey District (5 acres 0 roods 10 perches), Nelson Land District, and reserved the land as provisional State forest.

Sawmill Registration Regulations 1942 (Serial number 1942/330).—These regulations, which were required for the dual purpose of timber-control and post-war planning, came into force on 31st December, 1942, and require the owner of every operating sawmill to apply for registration within six weeks from that date; commencing in 1944, application for registration must thereafter be made not later than the 17th March in each year. Any sawmill commencing operations after the passing of the regulation is required to apply for registration within seven days from the date of commencement. (At the close of the year 413 mills had been registered.)

93. *Finance.*—A summary showing receipts and payments from State Forests Account for the past year, together with comparative figures for the previous three years, is presented in Appendix VI. Complete departmental accounts appear in parliamentary paper B.-1 [Pt. IV].

Expenditure increased by approximately £10,000, due mainly to land purchases in preparation for rehabilitation schemes, and to expenditure on the production of round timber from the exotic forests for all types for defence works. A moderate increase, which, however, is recoverable, has occurred in general management charges, due to additional timber-control duties undertaken by specially appointed staff. All other items of expenditure have been reduced.

Revenue increased by over £90,000, due almost entirely to the heavy demand for round timber for air-raid shelters and defence works generally, and to the rapid advance in sales from the Waipa Box-factory. Only at the conclusion of hostilities will it be possible to disclose fully the unprecedented extent to which the war effort has been assisted by the supply of timber from State forests and the manner in which the country's early exotic-forest policy has been vindicated.

The rapidly closing gap between revenue and expenditure augurs well for the future of the departmental accounts.

94. *Subventions to Local Bodies, &c.*—Attention has been drawn in previous years to the subventions of State-forest revenue to local bodies and to the Consolidated Fund. The extent of this tax on forest finance will be seen from the figures for the past three years quoted below:—

Year.	Consolidated Fund (under Section 39 of Forests Act, 1921–22).	Local Authorities (under Section 17 of Finance Act, 1924).	Local Authorities (under Sections 6–7 of Forests Amendment Act, 1926–27).	Total.
	£	£	£	£
1940–41 ..	16,151	15,593	7,075	39,819
1941–42 ..	20,443	17,080	8,261	45,784
1942–43 ..	16,721	14,767	7,065	38,553
Totals ..	86,443	75,833	36,504	198,780

95. *Recreation in State Forests.*—With so many young men serving in the armed forces and the limited transport available, visitors to the State forests for recreational purposes were very few when compared with past years, and some one-time popular camping-grounds were entirely unoccupied during the holiday season. On the other hand, certain indigenous forests in both Islands were used by the Army authorities during manœuvres for the advanced training of troops in bushcraft and modern methods of warfare.

96. *Mining Privileges.*—Applications for mining privileges were fewer than for several years; in all, only 72 (174) were dealt with. Consent was given to 2 applications to prospect for oil in State forests pursuant to the Petroleum Act, 1937.

97. *Grazing Licenses.*—The number of licenses and leases—201—was virtually the same as last year (202); 9 licenses were terminated and 8 granted.

98. *Rehabilitation.*—Good progress has been made with the acquisition of land for new afforestation projects, and, although negotiations are still proceeding, it can be stated that the areas already secured or approved by Government for purchase comprise units in North Auckland, Hawke's Bay, and Wairarapa in the North Island, and Nelson, Westland, and Otago in the South. The policy has been continued of selecting areas in timberless districts and conveniently located with respect to centres of population and road or rail transport. The total area already acquired for post-war afforestation amounts to approximately 15,000 acres, whilst those approved but still to be purchased amount to 32,000 acres. In addition, the total estimated acreage available for the same purpose in the exotic State forests is 77,300. The search is continuing for still further areas, and proposals for assisting local bodies in the establishment of communal forests are now well advanced and will be submitted at an early date for consideration by the Government—i.e., where areas prove of uneconomic size for creation as State exotic forests, it is proposed to recommend that they may, by subsidy and suitable safeguards, be established as communal forests by local bodies.

Other rehabilitation projects include silvicultural operations, thinning, pruning, &c., in existing forest, cultural work in the kauri and beech forests to assist regeneration, and the planting of extensive areas adjoining the exotic forests at Kaingaroa and Rotoehu (Rotorua Conservancy) and Tairua (Auckland Conservancy).

As an expansion in timber-production will be required in order to meet post-war and rehabilitation demands, extensive reconnaissance of suitable forest areas has also been undertaken.

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

- (a) Notice No. 44 (*Gazette*, 1942, page 1121) required every sawmiller to deliver to the Timber Controller not later than 30th April, 1942, a return giving particulars of wire ropes discarded, disposed of, or acquired after the 15th December, 1941, while every sawmiller is required to furnish within seven days particulars of all wire ropes discarded, disposed of, or acquired by him:
- (b) Notice No. 45, dated 21st April, 1942 (not published), was given to an individual sawmilling company directing the reopening of a sawmill:
- (c) Notice No. 46, dated 23rd April, 1942, was not published, but was given to certain sawmillers tributary to the North Island Main Trunk Railway requiring a return of workmen necessary for maximum production:
- (d) Notices Nos. 47 and 48, dated 9th June, 1942, were not published, but directed the owners of two adjoining blocks of forest to sell to a sawmiller:
- (e) A notice published in *Gazette*, 1942, page 1975, revoked Notice No. 34 (*Gazette*, 1942, page 371), which required Building A and Dressing A matai to be supplied for the manufacture of cheese-crate battens:

- (f) Notice No. 49 (*Gazette*, 1942, page 1975) revoked No. 38 (*Gazette*, 1942, page 610), and in effect removed the restriction on the sawing or disposal of insignis-pine timber except for the manufacture of wooden containers in so far as it applied to the North Island, but retained the restriction in the South Island:
- (g) Notice No. 50 (*Gazette*, 1942, page 2561) requires that no Oregon or Douglas fir timber be sawn, used, disposed of, or purchased except with the precedent consent of the Timber Controller. It also requires owners to furnish monthly statements of stocks. The notice revoked the affected passages in the notice relating to Oregon or Douglas fir and redwood timbers (*Gazette*, 1940, page 705) and Notice No. 37 (*Gazette*, 1942, page 610):
- (h) Notice No. 51 (*Gazette*, 1942, page 2825) requires that insignis-pine timber should not be used, disposed of, or purchased except for the manufacture of wooden containers without the precedent consent of the Timber Controller. This requirement applies throughout New Zealand; and Notice No. 49 (*Gazette*, 1942, page 1975), applying that requirement to the South Island only was revoked:
- (i) Notice No. 52 (*Gazette*, 1942, page 2844) requires that no proprietor in the timber industry may dispose of certain timber materials—viz., tractors, motor-trucks, log-haulers, boilers, railway-rails, or wire ropes—and no person may purchase such timber materials from any proprietor except with precedent consent of the Timber Controller:
- (j) The Second-hand Fruit-case Notice 1943, published as a statutory regulation (Serial number 1943/1), consolidates and extends the provisions of the original notice and amendment (Serial numbers 1942/120 and 1942/121 respectively). This notice is now administered by the Director, Horticulture Division, Department of Agriculture, who is empowered to license persons to acquire or deal in used fruit-cases, while the use of such cases is permitted for the packing or repacking of pip-fruit, stone-fruit, citrus fruit other than lemons, tomatoes, or vegetables:
- (k) Notice No. 53 (*Gazette*, 1943, page 352) requires that kahikatea or white-pine timber be used only for the manufacture of tallow-casks or butter-boxes or for ships' dunnage except with the consent of the Timber Controller:
- (l) Notice No. 54 (*Gazette*, 1943, page 352) requires every boxmaker to furnish particulars of his plant and output, while similar particulars are required from any person who commences to use any boxmaking plant within seven days of such commencement.

101. *Declaration of Timber Industry as Essential.*—Declarations of essentiality affecting the timber industry issued during the year in pursuance of the Industrial Man-power Emergency Regulations 1942 (formerly National Service Emergency Regulations 1940) are as follows:—

- (a) Declaration of Essential Industry No. 7 (the industry of sawmilling): Amendment dated 17th April, 1942 (*Gazette*, 1942, page 1160), includes operations engaged in the supply of logs to sawmills or in the delivery of timber materials as required by the Timber Controller:
- (b) Declaration of Essential Undertakings No. 22 (manufacture of wooden boxes, containers, and parts thereof). Amendments—Undertakings included in the declaration: Dated 9th April, 1942 (*Gazette*, 1942, page 1120); dated 4th May, 1942 (*Gazette*, 1942, page 1395); dated 4th December, 1942 (*Gazette*, 1942, page 3180); dated 8th January, 1943 (*Gazette*, 1943, page 18); dated 10th March, 1943 (*Gazette*, 1943, page 351). Undertakings deleted from the declaration: Dated 4th May, 1942 (*Gazette*, 1942, page 1395); dated 20th May, 1942 (*Gazette*, 1942, page 1481); dated 7th October, 1942 (*Gazette*, 1942, page 2486); dated 4th December, 1942 (*Gazette*, 1942, page 3180).
- (c) Declaration of Essential Undertakings No. 71 (*Gazette*, 1942, page 1394) applies to certain specified undertakings in respect only of their timber-yards, joinery-factories, and planing-mills. Undertakings included in the declaration: Dated 5th May, 1942 (*Gazette*, 1942, page 1394); dated 27th May, 1942 (*Gazette*, 1942, page 1637); Dated 4th June, 1942 (*Gazette*, 1942, page 1637); dated 17th June, 1942 (*Gazette*, 1942, page 1843); dated 2nd July, 1942 (*Gazette*, 1942, page 1926); dated 15th July, 1942 (*Gazette*, 1942, page 1947); dated 4th December, 1942 (*Gazette*, 1942, page 3180); dated 17th December, 1942 (*Gazette*, 1942, page 3180); dated 25th February, 1943 (*Gazette*, 1943, page 283). Undertakings deleted from the declaration: Dated 17th June, 1942 (*Gazette*, 1942, page 1843); dated 4th December, 1942 (*Gazette*, 1942, page 3180); dated 25th February, 1943 (*Gazette*, 1943, page 283).
- (d) Declaration of Essential Undertaking No. 78. Addition: State Forest Service. Dated 7th July, 1942 (*Gazette*, 1942, page 1947).
- (e) Declaration of Essential Undertaking No. 105 (civilian services). Addition: An afforestation company. Dated 23rd December, 1942 (*Gazette*, 1943, page 18).
- (f) Declaration of Essential Undertaking No. 106 (civilian services not specified). Addition: An afforestation company. Dated 7th October, 1942 (*Gazette*, 1942, page 2486).

102. *Industrial Man-power*.—The expansion of timber requirements for defence works and for the manufacture of containers for the export of foodstuffs and other commodities to the war zone necessitated the maximum possible production from all operating sawmills, and to achieve this objective the notices set out hereunder were issued in pursuance of the Industrial Man-power Emergency Regulations 1942, while to assist in dealing with the difficult man-power position in the timber industry the Timber-workers Registration Order 1942 (Serial number 1942/130) was issued. This order required every male person eighteen years of age and over in civil employment who had twelve months' experience in some branch of timber-work to register within seven days. Notices issued during the year in respect of hours of operation of sawmills are:—

- (a) In accordance with a War Cabinet decision that increased timber-supplies were essential, sawmillers were notified that the existing requirements to operate on the basis of a forty-eight-hour week must be observed during the weeks in which Easter and Anzac Day (1942) occurred, while this requirement was extended to sawmillers in the South Island who were not at that time otherwise affected:
- (b) Commencing on 4th May, 1942, sawmillers in Southland Conservancy whose production of beech timber was not less than 50 per cent. of sawmill output, all insignis-pine sawmillers in Southland, Canterbury, and Nelson Conservancies, and all sawmillers on the west coast and Westport-Karamea district were directed to maintain maximum rate of production for at least forty-eight hours each week until further notice:
- (c) An existing notice requiring insignis-pine sawmillers in the North Island to operate forty-eight hours each week was withdrawn as from 25th July, 1942. This step followed the change of production from cheese to butter because of the unsuitability of insignis pine for butter-boxes:
- (d) Commencing on 23rd November, 1942, certain insignis-pine sawmillers in the North Island whose man-power and log-supply position enabled them to do so were directed to maintain maximum rate of production for at least forty-eight hours each week. This was necessary to satisfy a greatly increased demand for boxes and crates for the export of foodstuffs to the fighting Services:
- (e) All sawmillers were directed to observe normal working-hours in all sections of their operations on the King's Birthday:
- (f) Certain selected sawmillers in the North Island were directed to operate all sections of their operations on Sundays, 7th and 21st June, 1942:

NOTE.—Notices in respect of the directions referred to in the foregoing paragraphs (a) to (f) were not published, but were served on the individual sawmillers affected.

- (g) A notice published in *Gazette*, 1942, page 2517, required undertakings in the sawmilling industry to observe Labour Day as a holiday, and permitted the undertakings to operate forty hours during the week affected:
- (h) Sawmilling Industry (Christmas Holiday) Notice 1942 (*Gazette*, 1942, page 2825) required every sawmilling undertaking to continue operations until the normal closing-hour on Wednesday, 23rd December, 1942, and to resume not later than the usual time on 5th January, 1943. In effect this notice varied existing requirements regarding weekly operation of forty-eight hours during the two weeks affected.

All the aforementioned notices provided for relaxation or variation of requirements in individual cases by consent of the Timber Controller.

The deterioration in the general man-power position in the industry which set in from the outbreak of hostilities and culminated in the reduced production of 1941–42 continued through the early months of 1942. Temporarily it was then arrested by a decision that no more men were to be taken and as many as possible released by the armed Services as rendering a more productive contribution to the general Allied war effort than in the fighting forces. Due, however, to the unavoidable turnover, particularly in the older age groups, the position became so serious towards the end of last year that as a result of strong representations War Cabinet decided in January, 1943, that up to 120 Grade A skilled bushmen and key mill personnel should be withdrawn from the Army, and if necessary from overseas training units. The position will be further relieved by the release of men as a result of the recent Army industrial census and local defence reorganization.

Unfortunately, the shortage of skilled bushmen and other key logging operatives has been so acute that the reduced bush staffs available to many mills have been unable, even when working forty-eight hours and longer, to supply sufficient logs to maintain sawing operations at the mills for fully extended hours—viz., forty-eight per week—and it is for this reason that emphasis has been placed upon the release of bushmen. The Minimum Weekly Wage Order has also assisted to maintain mills at maximum productive capacity.

103. *Vehicle and Tractor Impressment and Petrol and Tire Conservation*.—The arrangement, as outlined in the last report to conserve petrol and tires was continued throughout the timber industry with good results, and arrangements were concluded during the year whereby most of the timber produced in the Taupo district will be hauled in railway wagons over nineteen miles of the Taupo Totara Timber Co.'s line with marked savings of both petrol and tires. The extent to which railway has replaced motor haulage is indicated by the fact that for the first time since the peak timber production year of 1926 one four-weekly period of timber loadings has amounted to 60,000 tons. As a further means of assisting the industry, a complete survey was made

of all tractors operating therein, and, with the object of keeping all machines essential to timber production in good operating-condition, considerable assistance has been rendered by way of arranging loans, exchanges, and supply of spare parts and machines. The close co-operation of the Public Works Department in this particular matter is acknowledged with appreciation.

104. *Essential Supplies.*—The national reserve of wire rope, saws, and other supplies essential to the timber and boxmaking industries was extended to cover binding-wire and hoop steel; largely owing to the reserve stocks, the industries suffered no hold up or interruptions through lack of supplies. Arrangements have now been concluded whereby releases from national reserves will go through usual merchant channels.

105. *Forest Resources.*—The maintenance of log-supplies to sawmills dependent upon privately owned indigenous and exotic forests has given much concern, but appeals to owners for the release of trees not essential for shelter purposes as a very definite contribution to the war effort have so far proved successful and it has not yet proved necessary to force any sales by invoking the powers authorized by the Timber Emergency Regulations 1939, although it is anticipated that with the ever-increasing demand for essential supplies some such action may become necessary. The difficulty of securing shipping space for timber to the North Island is reflected in the reduced manufacture of white-pine butter-boxes, and to obtain an adequate supply for next dairy season it will be necessary to secure supplies from many privately owned clumps of white-pine in the North Island, and negotiations have accordingly been instituted. Not, however, until every possibility of voluntary release has been explored will legal enforcement be resorted to. In all cases owners are guarded against the removal of essential shelter-trees by arranging for Field Inspectors of the Department of Agriculture to reserve such trees from release to millers.

106. *Export Butter-box and Cheese-crate Pools.*—Due to the emphasis in dairy production reverting from cheese to butter manufacture, crate requirements for the current season as compared with last have receded by about 30 per cent. and butter-box demand increased by about 10 per cent., with serious repercussions in respect to timber-supplies. While the surplus stocks of cheese-crate timber such as insignis pine, &c., built up over the previous year were easily disposed of for the manufacture of other produce containers, it proved impossible to expand sufficiently the North Island production of butter-box timber or to move adequate supplies from the South Island for seasoning owing to the shipping shortage. The result was that over the peak of the season it was necessary to supply some boxes manufactured from insufficiently seasoned timber.

Naturally, with the ever-present danger of mould damage to butter, such a development was viewed with apprehension both by the Government and by the dairy industry, and when, therefore, the British Government advised that it had made tentative arrangements with America for the supply of one million fibre-board butter-boxes made of pure kraft pulp so that these could be reused by the British paper-mills, it was decided not only to take advantage of this arrangement, but to secure as a reserve against a possible shortage of seasoned timber at the peak of next season a further million of these boxes. By this arrangement it is anticipated that timber stocks will be built up to such a level that from 1944 onwards a fairly uniform rate of monthly manufacture may be assured in the butter-box factories and the whole of the 1944-45 butter production packed in wooden boxes.

For the first ten months of the current pool season, butter-boxes manufactured totalled 3,716,237 (4,035,430) and cheese-crates 1,115,296 (1,868,196). Deliveries to box-factories of butter-box timber for the same period totalled 16,885,000 board feet (15,656,000 board feet), but included 7,102,000 board feet (809,000 board feet) of rimu.

107. *Commercial Afforestation Companies.*—The latest available figures for the planted area controlled by private companies are those supplied by the Government Statistician for last year's annual report—viz., 310,542 acres.

APPENDIX I

AREAS OF STATE FOREST AS AT 31ST MARCH, 1943

Conservancy.	Permanent State Forest.		Provisional State Forest.		Totals.	Percentage of Land Area under State Forest Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	
Auckland ..	393,013	89,789	132,281	14,006	629,089	7.32
Rotorua ..	631,850	289,939	138,794	63,108	1,123,691	14.23
Wellington ..	974,118	37,308	36,231	7,634	1,055,291	8.72
Nelson ..	924,592	179,945	888,449	562,139	2,555,125	36.46
Westland ..	916,905	354,109	360,693	228,973	1,860,680	48.16
Canterbury ..	486,401	3,647	..	..	490,048	4.92
Southland ..	535,412	56,234	633,484	13,740	1,238,870	7.3
Totals as at 31st March, 1943	4,862,291	1,010,971	2,189,932	889,600	8,952,794	13.5
	5,873,262		3,079,532			

APPENDIX II

SUMMARY OF PLANTING AND SILVICULTURAL OPERATIONS IN STATE FORESTS AS AT 31ST MARCH, 1943

Project.	Year of Commence-ment.	Gross Area of Forest.	Total Net Area planted.	New Area planted, 1942.	Area treated, 1942-43.				
					Low-pruned.	High-pruned.	Lightly Thinned.	Heavily Thinned.	Clear-felled.
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Mangonui ..	*	8,927	..	..	..	..	..	..	..
Waipoua ..	1925	12,600	3,687	328	72	42	31	..	..
Pubipuhi ..	1904	1,565	1,209	..	17	71	..	..	..
Riverhead ..	1926	11,965	10,593	..	56	42	..	..	..
Tairua ..	1930	48,510	13,349	130	35	..	..	..	..
Kauaeranga ..	1940	4,000	454	8	..	..	..	..	..
Maramarua ..	1928	14,087	12,311	..	175	..	..	..	..
Rotoehu ..	1937	31,235	4,398	101	..	..	..	..	..
Whakarewarewa ..	1898	10,065	7,753	38	..	104	..	393	123
Waiotapu ..	1901	7,974	6,976	..	14	96	..	266	7
Kaingaroa ..	1913	328,667	258,998	30	681	1	12	9	..
Tongariro ..	1937	4,500	2,297	55	..	..	..	..	..
Erua ..	1930	6,648	4,350	45	..	..	..	..	..
Karioi ..	1927	25,869	17,195	..	371	..	..	..	..
Masterton ..	1942	4,695	3	3	..	..	..	..	..
Golden Downs ..	1927	28,799	22,415	287	31	..	..	..	..
Westland ..	1922	5,839	3,090	..	47	..	..	..	..
Hanmer ..	1901	10,412	7,684	..	2	..	..	121	..
Balmoral ..	1916	24,141	21,268	..	309	..	109	102	..
Eyrewell ..	1928	19,266	17,220	..	27	..	..	..	..
Ashley ..	1939	5,001	1,444	226	..	..	..	..	..
Naseby ..	1900	4,032	3,098	..	14	..	..	7	..
Dusky ..	1898	6,866	4,456	..	2	..	244	70	..
Conical Hill†..	1903	4,534	4,170	..	..	60	4	37	4
Blue Mountains ..	1925	10,058	8,872	..	37	313	11	19	..
Pebbly Hills ..	1930	5,330	4,342	1	303	..	..	..	..
Minor areas ..	1875-1939	9,381	3,109	288	72	..	33	..	..
Totals ..	..	654,966	444,441	1,540†	2,265	729	444	1,024	134

* New projects. † Now includes Pukerau. ‡ Includes 132 acres interplanted in indigenous forest.

APPENDIX III
CREOSOTED FOREST PRODUCE

	Year ended 31st March, 1942.				Year ended 31st March, 1943.			
	Posts and Strainers.	Poles.	Other Creosoted Produce.	Total Quantity of Creosoted Produce.	Posts and Strainers.	Poles.	Other Creosoted Produce.	Total Quantity of Creosoted Produce.
	Number.	Number.	Cu. ft.	Cu. ft.	Number.	Number.	Cu. ft.	Cu. ft.
Produce creosoted ..	107,906	4,366	30,040	156,559	115,718	4,481	6,809	137,252
Sales	135,903	2,594	4,441	146,051	105,698	4,025	1,754	127,376
Creosoted produce used by Forest Service	5,583	918	11,163	20,369	1,602	593	3,139	7,730
Creosoted stocks at end of year	11,172	2,598	9,481	42,803	29,754	2,725	1,917	38,605
Untreated stocks at end of year	124,517	8,087	13,352	182,935	58,845	11,628	43,482	163,690
	Gals.	Gals.	Gals.	Gals.	Gals.	Gals.	Gals.	Gals.
Creosote used	125,336	15,759	16,112	157,207	93,593	22,870	7,021	123,484

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, 1940-42. Value represents value in country of export, plus 10 per cent. expressed in terms of New Zealand currency.)

Item.	1940.		1941.		1942.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Hardwoods—	Ft. Bm.	£	Ft. Bm.	£	Ft. Bm.	£
Australian hardwoods ..	9,113,000	143,000	9,815,000	160,800	6,637,000	136,200
Oak	2,217,000	63,000	788,000	21,300	Nil	Nil
Total	11,330,000	206,000	10,603,000	182,100	6,637,000	136,200
Softwoods—						
Douglas fir	1,867,000	23,800	2,122,000	24,200	1,151,000	18,700
Redwood	961,000	21,600	1,528,000	35,500	Nil	Nil
Total	2,828,000	45,400	3,650,000	59,700	1,151,000	18,700
Other	313,000	17,600	246,000	13,300	659,000	40,800
Grand total ..	14,471,000	269,000	14,499,000	255,100	8,447,000	195,700
Shingles	..	166	..	91	Nil	Nil
	Tons.		Tons.		Tons.	
Tanning-bark	651	7,314	867	13,006	15	219
Wood-pulp	7,090	142,729	7,780	169,301	2,040	48,072

APPENDIX V

EXPORTS OF SAWN TIMBER AND OTHER FOREST PRODUCE

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1940-42.)

Item.	1940.		1941.		1942.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ft. Bm.	£	Ft. Bm.	£	Ft. Bm.	£
White-pine	732,000	8,000	835,000	8,200	334,000	3,768
Rimu	11,808,000	100,100	13,960,000	143,800	5,484,000	61,579
Beech	1,575,000	20,600	1,273,000	18,700	142,000	2,341
Matai	747,000	7,700	213,000	2,400	31,000	370
Kauri	174,000	6,900	55,000	2,500	50,000	2,295
Insignis pine	1,889,000	33,100	2,680,000	43,900	1,469,000	24,326
Other New Zealand	397,000	8,000	12,000	500	2,000	132
Foreign	84,000	1,000	38,000	600	36,000	1,221
Total	17,406,000	185,400	19,066,000	220,600	7,548,000	96,032
	Tons.		Tons.		Tons.	
Kauri-gum	1,683	87,450	1,421	88,643	1,061	74,737
Tanning-bark	..	..	..	..	..	..
Fungus	22	2,382	24	2,911	..	..

APPENDIX VI

PAYMENTS AND RECEIPTS FOR THE YEAR ENDED 31ST MARCH, 1943

Item.	1942-43.	1941-42.	1940-41.	1939-40.
<i>Payments</i>				
Allocation of revenue—	£	£	£	£
Consolidated Fund (portion of revenue from national-endowment forests)	16,721	20,442	16,151	14,416
Working Railways Account (section 24 (1), Finance Act, 1936)	898	1,151	1,567	1,923
Local bodies	14,767	17,080	16,593	15,612
General management charges—				
Salaries	79,793	81,662	77,834	70,858
General expenses	34,370	28,463	31,070	27,168
Land purchase	25,307	1,996	6,788	1,884
Forestry projects under direct management—				
Exotic	220,598	183,561	234,704	293,884
Indigenous	22,945	35,376	32,724	29,578
Utilization: Sawmill, creosote plant, &c. ..	100,720	136,090	148,545	120,344
Miscellaneous: Expenses of raising loans and interest on temporary advances	..	978	911	..
Totals	516,119	506,799	566,887	575,667
<i>Receipts</i>				
Indigenous forests receipts—				
Timber sales	134,396	127,926	120,753	102,957
Timber royalties and trespass	9,467	9,532	8,539	12,130
Leases, grazing	1,492	1,523	1,558	1,618
Sawmill-sites, industrial, &c.	239	329	402	401
Miscellaneous	8,017	8,274	6,937	10,414
Log sales from managed forests	30,596	31,296	26,153	21,662
Exotic forests: Poles, posts, firewood, &c. . .	54,234	15,341	13,207	10,518
Utilization projects—				
Sawn timber	40,607	45,815	28,948	342
Creosoted products	23,637	19,262	7,996	314
Box shooks	79,109	32,883	..	..
Miscellaneous	4,767	3,642	2,470	282
Totals	386,561	295,823	216,963	160,638
Receipts from national-endowment indigenous forests (included in above)	48,289	45,374	27,408	22,114

STATISTICS OF SAWMILLING AND SASH AND DOOR MANUFACTURING

(Reprinted by arrangement with the Government Statistician from the Statistical Report on Factory and Building Production for the Year 1941-42.)

SAWMILLING AND SASH AND DOOR MANUFACTURING, 1941-42

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SAWMILLING AND SASH AND DOOR MANUFACTURING, 1941-42—continued.

C.—3

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Expenses of Operation, other than Salaries and Wages and Cost of Materials.																			Cost of Materials used or operated upon.									
Provincial District.	Production of Logs at Mill.					Production of Sawn Timber from Logs.					Resawing, Dressing, and Manufacturing from Sawn Timber.					Cost of Materials used or operated upon.												
	Rent.	Total.	Repairs.	Other Expenses.	Total.	Cost of Power.	Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Rent.	Cost of Power.	Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Stumpage.	Logs purchased.	Rough-sawn Timber purchased and other Materials.	Total.						
Auckland	590	16,500	10,043	37,175	47,179	34,334	145,821	4,380	10,231	19,411	24,306	50,035	54,329	162,892	6,590	7,745	12,636	11,103	18,373	31,053	87,500	154,782	112,331	1,059,923	1,327,036			
Hawke's Bay	36	1,534	1,006	2,043	2,736	2,125	9,480	86	1,218	1,732	2,065	3,566	4,839	13,506	157	644	1,034	926	1,152	2,282	6,195	11,674	8,921	56,294	76,889			
Taranaki	78	1,925	2,569	15,302	16,725	1,571	38,170	1,014	1,715	3,280	4,610	9,860	3,592	24,071	787	1,279	1,802	1,573	3,385	3,482	12,308	31,406	3,445	71,043	105,894			
Wellington	177	2,636	3,080	7,742	12,917	9,441	35,993	576	1,820	5,041	5,666	10,665	14,413	38,181	4,516	3,662	5,364	4,623	5,433	9,628	33,226	36,923	18,801	341,872	397,596			
Marlborough	5	663	282	625	807	917	3,299	46	348	329	336	427	1,487	2,973	39	23	62	60	214	214	214	214	214	214	3,611			
Nelson	85	8,118	3,586	7,450	15,448	10,293	44,980	1,192	4,275	4,079	4,542	9,538	11,428	35,054	785	888	785	844	606	3,715	7,623	31,455	1,635	70,848	103,938			
Westland	1,130	6,090	7,313	9,274	16,485	11,939	52,231	1,517	5,455	7,394	6,389	14,650	15,539	50,944	66	155	192	47	111	364	935	45,697	906	15,323	61,926			
Canterbury	..	1,702	682	496	1,138	423	4,441	392	2,416	2,202	1,023	3,175	13,378	1,177	4,010	4,745	3,948	5,335	5,319	24,734	11,991	31,560	200,371	243,922	..			
Otago—	..	1,170	1,017	1,086	4,753	708	8,734	262	493	1,390	751	2,194	1,288	6,378	1,832	1,730	2,290	3,181	5,944	16,770	6,288	83	82,444	88,815	..			
Otago portion ..	470	3,533	3,445	4,553	10,416	4,673	27,090	936	1,969	4,328	3,845	7,307	7,752	26,187	223	1,295	1,389	1,441	2,013	2,241	8,602	18,416	2,696	77,074	98,186			
Southland portion ..	2,571	43,871	33,023	85,746	128,604	76,424	370,239	10,461	30,340	49,186	53,533	112,012	118,042	373,564	16,133	21,447	29,770	26,818	39,831	64,088	198,107	350,689	180,378	1,976,746	2,507,813			
Totals, 1941-42	3,449	43,427	32,731	77,675	107,420	95,817	369,519	7,939	24,584	49,886	57,032	115,398	129,117	383,956	16,799	20,480	27,528	27,747	38,987	59,663	191,204	325,129	228,501	1,775,156	2,328,786			
1940-41	3,068	36,095	30,490	63,089	111,367	86,149	330,258	8,851	22,982	50,117	55,629	110,286	130,935	378,800	16,448	18,942	25,130	24,335	32,911	55,825	173,591	301,976	244,688	1,705,806	2,252,470			
1939-40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			
Total Costs of Operation (including Salaries and Wages).																												
Provincial District.	Felling, Hauling, and Delivering Logs at Mill.	Resawing, Dressing, and Manufacturing from Sawn Timber.	Total.	Log Sawmill Products.					Products.					Resawing and Planing-mill Products.					Total Value of all Products.									
				Rough-sawn Timber.	Laths, Posts, Waste Products, &c.		Total.		Planed Flooring, Skirting, Moulding, &c.	Sashes and Doors.		Joinery.		Butter-boxes.		Cheese-crates.		Fruit-cases.		Other Products.								
Auckland	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£				
Hawke's Bay	535,240	699,612	1,392,626	2,627,478	119,550	100	1,303,612	4,301	1,307,913	32,803	100	690,554	214,227	203,128	220,886	24,787	32,417	103,737	1,489,736	2,797,649	£	£	£	£				
Taranaki	45,567	65,117	81,382	192,066	12,280	200	128,682	645	129,327	1,956	100	34,176	5,115	1,849	18	8,736	22,686	7,847	80,427	209,755	£	£	£	£				
Wellington	142,792	108,901	114,741	366,434	28,244	700	284,365	3,905	288,270	3,134	800	54,362	20,465	21,048	..	14,373	..	5,307	115,755	404,022	£	£	£	£				
Marlborough	141,928	164,615	476,259	782,802	29,425	300	326,661	3,867	330,528	12,271	200	280,483	36,645	86,424	8,179	21,282	..	50,361	483,382	813,911	£	£	£	£				
Nelson	10,230	9,794	2,198	22,222	1,851	600	20,784	784	21,568	12,000	262	144	144	58	..	1,996	16	16	2,476	24,044	£	£	£	£				
Westland	148,279	126,989	99,992	375,260	32,205	100	286,702	3,676	290,378	1,469	600	24,372	2,272	2,609	3,771	6,470	50,793	16,731	397,399	516,487	£	£	£	£				
Canterbury	229,288	187,506	20,892	437,686	55,892	800	493,908	1,462	495,370	1,751	700	18,387	..	..	2,518	..	..	212	21,117	316,487	£	£	£	£				
Otago—	26,703	78,473	298,371	403,547	12,155	600	110,327	2,243	112,570	7,735	700	155,823	9,211	41,465	1,248	4,259	21,854	73,393	307,253	419,822	£	£	£	£				
Otago portion ..	33,229	29,208	135,650	198,087	7,374	200	64,158	827	64,985	3,704	700	78,665	13,838	21,467	..	3,862	2,690	20,860	141,382	206,367	£	£	£	£				
Southland portion ..	110,907	112,867	105,781	329,555	25,434	000	295,141	389	235,530	2,603	900	45,270	..	..	742	18,881	12,037	36,626	113,556	349,086	£	£	£	£				
Totals, 1941-42	1,424,163	1,583,082	2,727,892	5,735,137	324,473	600	3,254,340	22,099	3,276,439	67,502	800	1,382,354	301,917	378,048	237,362	102,850	144,481	315,090	2,862,102	6,138,544	£	£	£	£				
1940-41	1,386,957	1,643,219	2,509,298	5,539,474	342,207	844	3,289,332	19,823	3,309,155	70,023	296	1,352,682	220,323	297,861	232,399	90,325	149,741	297,474	2,640,785	5,949,949	£	£	£	£				
1939-40	1,331,651	1,586,119	2,392,068	5,309,838	335,991	282	3,198,552	24,159	3,222,711	68,862	492	1,293,344	230,839	366,920	186,488	61,782	138,738	229,772	2,507,883	5,730,599	£	£	£	£				

Total Costs of Operation (including Salaries and Wages).

Provincial District.	Kelling, Hauling, and Delivering Logs at Mill.				Resawing, Dressing, and Manufacturing from Sawm Timber.		Log Sawmill Products.				Resawing and Planing-mill Products.								Total Value of all Products.								
	Total.				Production of Sawn Timber from Logs.		Rough-sawn Timber.		Laths, Posts, Waste Pro- &c.		Planed Flooring, Skirting, Moulding, &c.				Sashes and Doors.		Joinery.		Butter-boxes.		Cheese-crates.		Fruit-cases.		Total.		
							Value.		£ &c.		Quantity.		Value.		Quantity.		Value.		Quantity.		Value.		Quantity.				
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Auckland	535,240	699,612	392,626	2,627,478	119,550	1,303,612	4,301	1,307,913	32,803	1,000	690,554	214,227	203,128	220,886	24,787	32,417	103,737	1,489,736	2,797,649	80,427	7,847	7,847	7,847	80,427	209,754	115,755	404,025
Hawke's Bay	45,567	65,117	81,382	192,066	12,280	128,682	645	129,327	1,956	1,000	34,176	5,115	1,849	18	8,736	22,686	7,847	8,736	209,754	115,755	404,025	404,025	404,025	404,025	404,025	404,025	404,025
Taranaki	142,792	108,901	114,711	366,434	28,244	284,365	3,905	288,270	3,134	800	54,362	20,465	21,048	..	14,573	..	5,307	14,573	115,755	404,025	404,025	404,025	404,025	404,025	404,025	404,025	404,025
Wellington	141,928	164,615	476,259	782,802	29,425	300	326,661	3,867	330,528	12,271	200	280,483	36,645	86,424	8,179	21,282	50,361	483,382	813,910	813,910	813,910	813,910	813,910	813,910	813,910	813,910	813,910
Marlborough	10,230	9,794	2,198	22,292	1,851	600	20,784	784	21,568	12,000	262	144	58	..	..	..	16	2,476	24,044	24,044	24,044	24,044	24,044	24,044	24,044	24,044	24,044
Nelson	148,279	126,989	99,992	375,260	32,265	100	286,702	3,676	290,378	1,469	600	24,372	2,609	3,771	6,470	50,793	16,731	107,018	397,396	397,396	397,396	397,396	397,396	397,396	397,396	397,396	397,396
Westland	229,288	187,506	20,892	437,686	55,892	800	493,908	1,462	495,370	1,751	700	18,387	..	2,518	..	212	212	516,487	516,487	516,487	516,487	516,487	516,487	516,487	516,487	516,487	516,487
Canterbury	26,703	78,473	298,371	403,547	12,155	600	110,327	2,243	112,570	7,735	700	155,823	9,211	41,465	4,259	21,854	73,393	307,253	419,823	419,823	419,823	419,823	419,823	419,823	419,823	419,823	419,823
Otago—	33,229	29,208	135,650	198,987	7,374	200	64,158	827	64,985	3,764	700	78,665	13,838	21,467	..	2,690	20,860	141,382	206,367	206,367	206,367	206,367	206,367	206,367	206,367	206,367	206,367
Otago portion	110,907	112,867	105,781	329,555	25,434	000	235,141	389	235,530	2,603	900	45,270	..	..	742	12,037	36,626	113,556	349,086	349,086	349,086	349,086	349,086	349,086	349,086	349,086	349,086
Southland portion	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals, 1941-42	1,424,163	1,583,082	2,727,892	5,735,137	324,473	600	3,254,340	22,099	3,276,439	67,502	800	1,382,354	301,917	378,048	237,362	102,850	315,090	2,862,102	6,138,541	6,138,541	6,138,541	6,138,541	6,138,541	6,138,541	6,138,541	6,138,541	6,138,541
1940-41	1,386,957	1,643,219	2,509,298	5,539,474	342,207	844	3,289,332	19,823	3,309,155	70,023	296	1,352,662	220,323	297,861	232,399	90,325	149,741	297,474	2,640,785	5,949,940	5,949,940	5,949,940	5,949,940	5,949,940	5,949,940	5,949,940	5,949,940
1939-40	1,331,651	1,586,119	2,392,068	5,309,838	335,991	282	3,198,552	24,159	3,222,711	68,862	492	1,293,344	230,839	366,920	186,488	61,782	138,738	229,772	2,507,883	5,730,594	5,730,594	5,730,594	5,730,594	5,730,594	5,730,594	5,730,594	5,730,594

* Butter-boxes made numbered 2,550,815; cheese-crates, 821,983; fruit-cases, 3,482,828.

GLOSSARY

1. INDIGENOUS

(a) *Softwoods*:—

- Kauri (*Agathis australis*).
- Matai (*Podocarpus spicatus*).
- Miro (*Podocarpus ferrugineus*).
- Rimu (*Dacrydium cupressinum*).
- Silver-pine (*Dacrydium colensoi*).
- Tanekaha (*Phyllocladus trichomanoides*).
- Totara (*Podocarpus totara*).
- White-pine (*Podocarpus dacrydioides*).

(b) *Hardwoods*:—

- Beech (*Nothofagus* spp.).
- Mangeao (*Litsaea calicaris*).
- Pukatea (*Laurelia nova-zelandiae*).
- Rewarewa (*Knightia excelsa*).
- Silver-beech (*Nothofagus menziesii*).
- Tawa (*Beilschmiedia tawa*).

2. EXOTIC

(a) *Softwoods*:—

- Araucaria (*Araucaria* spp.).
- Austrian pine (*Pinus austriaca*).
- Bishop's pine (*Pinus muricata*).
- Corsican pine (*Pinus laricio*).
- Douglas fir (*Pseudotsuga taxifolia*).
- Insignis pine (*Pinus radiata*).
- Jeffrey's pine (*Pinus jeffreyi*).
- Larch (European) (*Larix decidua*).
- Lawson's cypress (*Cupressus lawsoniana*).
- Loblolly pine (*Pinus taeda*).
- Lodgepole pine (*Pinus murrayana*).
- Monterey cypress (*Cupressus macrocarpa*).
- North American white-pine (*Pinus strobus*).
- Ponderosa pine (*Pinus ponderosa*).

(b) *Hardwoods*:—

- Alder (*Alnus glutinosa*).
- Ash (*Fraxinus excelsior*).
- Australian hardwoods, principally *Eucalyptus* spp.
- Mahogany (*Swietenia mahagoni*).
- Oak (*Quercus* spp.).

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