1913.

NEW ZEALAND.

DEPARTMENT OF LANDS AND SURVEY:

STATE NURSERIES AND PLANTATIONS

(REPORT ON).

Presented to both Houses of the General Assembly by Command of His Excellency.

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PLANS.

SIR,— Department of Lands and Survey, Wellington, 2nd June, 1913.

During the past year over ten million trees were successfully raised in the four State nurseries, a little more than half being in the North Island nursery at Rotorua, whilst the remainder were grown in the three South Island nurseries. Over five million trees were sent out to the State plantations in the same period, and at the 31st March last there were estimated to be nineteen million tree-plants remaining in the nurseries available for planting out during the current and successive seasons. Since the formation of the nurseries in 1896 over sixty million trees have been sent to the plantations and three million trees to outside places, the total cost of the seven nurseries (three of which have now been closed) to date being £117,743, of which, however, £25,323 is represented by permanent works.

In the nine plantations in which operations are at present being carried on an area of 1,604 acres was planted during the year, making a total of 20,634 acres planted since 1896. The cost per acre planted during the year ranged from £3 to £6 15s. 8d. per acre, which is a reduction on former figures. The total expenditure, inclusive of the estimated value of prison labour, since 1896 amounts to £170,347, of which £26,517 was on permanent works such as formation, buildings, roads, and fencing.

In the North Island as well as in the South Island abnormal weather-conditions were experienced, as will be seen by a perusal of the detailed report of the Superintending Nurseryman. The employment of prison labour on planting operations has continued to be a success, the gross value of work performed by those employed during the year being estimated at £2,130, or, deducting cost of buildings and supervision, at £1,370, but averaging about £70 per man per annum since the establishment of the system, as work to the value of over £32,000 is estimated to have been performed since 1900.

The ravages of larvæ and beetles on the young larch still continue, but, owing to the precautions taken in the nursery, are much diminished, and it is hoped they may eventually be suppressed. The danger from fires is increasingly realized on the large plantations now established in the Waiotapu and Whakarewarewa district, but every care has been taken to avert the threatened danger, and the officer in charge is now organizing his forces to combat any unexpected outbreak, and has made several valuable suggestions to this end. It is, however, regretted that a spreading fire severely damaged the Puhipuhi *Eucalyptus* plantation.

In the South Island an unusually wet season was experienced, consequently no serious fire took place in any plantation.

In Central Otago the raising of seedlings was an unprecedented success. Prison labour to the value of £1,127 was expended during the year on planting operations, the work done by each prisoner averaging £74. At the Dusky Hill plantation a certain amount of damage was done by the incursion of red deer. The departmental arboretum, containing a collection of the world's timbers and tree-seeds, is steadily being increased, and has already proved very useful.

I personally visited most of the nurseries and plantations during the year, and satisfied myself that the operations were being conducted in an efficient and economical manner. The staff under the immediate direction of Messrs. R. G. Robinson (Superintending Nurseryman for South Island) and H. A. Goudie (Superintending Nurseryman for the North Island) has worked well and zealously, and has shown every desire to advance the interests of the State in its afforestation operations.

The Royal Commission set up during the year to investigate and report upon forestry matters visited and inspected several of the nurseries and plantations during February and March. Its report is being laid before Parliament as a separate paper, and its recommendations will no doubt largely affect the future working of the Forestry Branch of the Lands and Survey Department.

The reports of the Superintending Nurserymen are attached, together with detailed reports from the officers in charge of the individual nurseries and plantations, whilst the usual summaries of operations in the nurseries and plantations follow my remarks.

I have, &c.,

JOHN STRAUCHON,

Under-Secretary for Lands.

The Hon. W. F. Massey, Commissioner of State Forests.

SUMMARIES.

Summary of Operations in Nurseries during Year ended the 31st March, 1913.

Name of Nursery.	Total Expenditure.				Trees in Nurseries.			
	Supervision and Clerical.	Permanent Works.	Tree-growing.	Totals.	Estimated Trees raised during Year.	Average Cost per Thousand Seedlings.	Output of Trees.	Estimated Number in Nurseries at 31st March, 1913.
							Trees sent to Plantations during Year.	Trees sent to outside Places during Year.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.		£ s. d.			
Rotorua	315 0 0	338 10 5	3,629 16 1	4,283 6 6	5,660,675	0 6 8	3,048,600	406	9,731,925
Tapanui	297 12 0	315 1 2	1,607 10 6	2,220 3 8	2,122,100	0 2 5	1,100,220	5,570	4,069,590
Eweburn	202 0 0	56 7 4	823 10 9	1,081 18 1	1,435,750	0 1 9	608,250	7,360	2,364,850
Hanmer Springs	160 0 6	106 15 4	971 11 7	1,238 7 5	1,587,100	0 1 10	712,240	28,850	3,187,100
Totals	974 12 6	816 14 3	7,032 8 11	8,823 15 8	10,805,625	..	5,469,310	42,186	19,353,465

Summary of Operations in Nurseries from 1896 to 1913.

Name of Nursery.	Total Expenditure.				Estimated Number of Trees raised.	Cost per Thousand.	Output of Trees.	
	Supervision and Clerical.	Permanent Works.	Tree-growing.	Totals.			To Plantations.	To outside Places.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.		£ s. d.		
Rotorua	2,946 16 8	8,959 12 5	34,698 0 7	46,604 9 8	46,500,236	0 17 10	35,974,829	793,482
Ruatangata*	797 2 8	1,278 19 4	6,632 6 3	8,708 8 3	2,187,732	2 15 2	2,133,520	54,212
Tapanui	2,296 4 11	4,621 16 8	18,359 16 6	25,277 18 1	15,905,880	1 11 9	11,091,060	745,230
Eweburn	1,421 19 6	2,993 14 7	9,631 0 7	14,046 14 8	5,606,972	2 10 2	3,166,045	76,077
Hanmer Springs	1,055 1 10	2,707 9 6	7,017 2 10	10,779 14 2	9,760,975	1 2 1	6,463,025	110,850
Starborough*	423 13 3	2,756 17 3	6,075 16 7	9,256 7 1	3,059,610	3 0 6	1,965,095	1,094,515
Kurow*	205 0 0	2,004 18 5	860 4 2	3,070 2 7	172,460	..	..	172,460
Totals	9,145 18 10	25,323 8 2	83,274 7 6	117,743 14 6	83,193,865	..	60,793,574	3,046,826

* Nursery now closed.

Summary of Operations in Plantations during Year ended 31st March, 1913.

Name of Plantation.	Trees.			Expenditure (including Estimated Value of Prison Labour).				New Area planted.	Cost per Thousand Trees planted.	Cost per Acre planted.	General Upkeep per Acre planted.
	Number received from Nursery.	Number used to replace Losses.	Number planted on New Area.	Supervision and Clerical.	Formation, Buildings, Roads, Fencing.	Planting Operations.	General Upkeep.	Totals.				
				£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Acres.	£ s. d.	£ s. d.	£ s. d.
Whakarewarewa ..	1,236,350	557,775	678,575	664 4 6	400 13 11	1,204 2 0	1,997 11 3	4,266 11 8	299	2 19 9	6 15 8	0 7 4
Waiotapu	1,812,250	449,125	1,363,125	790 0 0	993 18 8	1,074 15 5	977 3 4	3,835 17 5	477	1 11 4	4 9 6	0 3 4
Puhipuhi	..	..	..	25 0 0	..	..	210 5 0	235 5 0	..	..	..	0 4 0
Conical Hills ..	1,088,720	58,085	1,030,635	260 0 0	89 0 8	1,489 15 10	1,136 19 3	2,975 15 9	379	1 8 10	3 18 7	0 8 6
Dusky Hill	11,500	11,500	..	180 0 0	30 1 8	..	136 9 2	346 10 10	..	..	..	0 3 3
Gimmerburn ..	..	..	..	5 0 0	..	..	..	5 0 0	..	..	..	..
Naseby	608,250	49,600	558,650	144 4 0	19 1 9	613 15 3	299 18 7	1,076 19 7	205	1 1 10	2 19 11	0 8 8
Hanmer Springs ..	712,240	52,825	664,415*	307 0 6	370 11 2	1,147 1 5	501 13 4	2,326 6 5	244	1 14 6	4 14 0	0 5 1
Dumgree	..	..	..	2 0 0	..	..	3 3 0	5 3 0	..	..	..	..
Totals ..	5,469,310	1,178,910	4,295,400	2,377 9 0	1,903 7 10	5,529 9 11	5,263 2 11	15,073 9 8	1,604	..	...	..

* Including 5,000 willow-cuttings.

Summary of Operations in Plantations from 1896 to 1913.

Name of Plantation.	Trees.				Expenditure (including Estimated Value of Prison Labour).					Total Area planted.	Cost per Thousand Trees planted.	Cost per Acre planted.	General Upkeep per Acre planted.
	Number received from Nursery.	Number raised from Seed sown *in situ*.	Number used to replace Losses.	Total Number in Plantation.	Supervision and Clerical.	Formation, Buildings, Roads, Fencing.	Planting Operations.	General Upkeep.	Totals.				
					£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Acres.	£ s. d.	£ s. d.	£ s. d.
Whakarewarewa ..	15,309,469	109,725	2,732,168	12,687,026	3,727 3 4	5,121 16 5	22,288 3 7	9,673 8 10	40,810 12 2	5,749	2 3 11	4 16 9	1 16 8
Waiotapu	20,612,315	83,121	3,011,657	17,683,779	4,640 10 9	7,386 5 7	24,270 1 10	5,969 10 10	42,266 9 0	6,748	1 14 1	4 9 0	0 19 3
Puhipuhi	2,133,520	..	1,133,520	1,000,000	982 9 7	1,195 3 10	3,983 8 1	3,339 3 9	9,500 5 3	1,200	*	5 2 8	2 15 8
Conical Hills ..	8,471,603	..	745,256	7,726,347	2,168 9 4	2,109 19 10	13,212 17 7	6,257 5 4	23,748 12 1	2,838	3 1 5	8 7 4	2 4 1
Dusky Hill ..	2,990,537	..	809,700	2,180,837	1,679 4 2	1,181 13 5	7,426 17 4	2,897 13 1	13,185 8 0	845	6 10 1	15 12 0	3 8 6
Waitahuna ..	42,025	..	11,500	30,525	27 9 0	61 1 1	74 0 9	40 9 9	203 0 7	11	6 13 0	18 9 0	3 13 6
Gimmerburn ..	936,235	..	783,339	152,896	312 16 8	514 13 11	984 4 0	809 5 10	2,621 0 5	173	17 2 8	15 3 0	4 13 6
Naseby	2,102,035	..	245,676	1,856,359	641 3 2	1,004 9 9	3,142 5 6	1,644 12 10	6,432 11 3	691	3 9 4	9 6 2	2 7 7
Hanmer Springs ..	6,463,025	..	1,121,154	5,346,871	1,888 18 6	3,743 5 1	9,449 11 7	2,972 6 2	18,054 1 4	1,964	3 7 6	9 3 10	1 10 3
Dumgree	1,679,765	..	1,110,125	569,640	926 5 0	4,198 9 3	5,762 17 2	1,533 0 0	12,420 11 5	209	*	*	*
Raincliff	..	..	..	50,000	..	..	..	..	1,104 12 5	206	*	*	*
Totals ..	60,740,529	192,846	11,704,095	49,284,280	16,994 9 6	26,516 18 2	90,594 7 5	35,136 16 5	170,347 3 11	20,634	..	..	..

* Data not available.

REPORT ON THE AFFORESTATION OPERATIONS IN THE NORTH ISLAND, 1912–13.

[By the Superintending Nurseryman, Rotorua.]

In reviewing the results of the past season's work it is not possible to generalize because of the somewhat abnormal weather-conditions at certain periods of the year. The winter months were unusually severe, frost being recorded on eighty-one nights during the year, and in every month except March and December. November was a most trying month; strong drying winds were almost continuous, and in consequence all young growth suffered. From this month on to the end of March the weather was very dry, and except where the atmospheric conditions were modified by overhead shade the growth made by the trees is unusually small. In the plantations the death-rate is higher, and the growth made by the trees lower, than usual. Trees in the nursery made poorer growth, but the crop of seedlings is a plentiful one.

Prison Labour.

The following tables summarize the work done by prisoners at Whakarewarewa and Waiotapu Plantations:—

Year.	Waiotapu Plantation.			Whakarewarewa Plantation.		
	Average employed.	Total Value of Work.	Average per Man.	Average employed.	Total Value of Work.	Average per Man.
		£ s. d.	£ s. d.		£ s. d.	£ s. d.
1900–1	*20·00	170 0 0	8 10 0	..	..	..
1901–2	18·00	437 18 6	24 6 7	..	..	..
1902–3	22·59	904 12 11	40 0 11	..	..	..
1903–4	30·00	902 3 0	30 1 5	..	..	..
1904–5	43·00	1,562 0 0	36 6 0	†11·00	332 13 7	30 4 10
1905–6	42·56	2,440 8 5	57 6 9	14·19	771 8 4	54 7 3
1906–7	35·62	2,978 0 0	83 12 1	11·50	762 11 0	66 6 2
1907–8	38·64	3,878 7 6	100 7 5	15·05	1,103 5 2	73 6 1
1908–9	32·83	3,496 19 2	106 10 4	13·16	971 10 0	73 16 5
1909–10	27·81	3,164 19 2	113 16 0	10·89	789 7 6	72 10 10
1910–11	23·45	2,390 7 1	101 18 7	10·44	957 0 3	91 13 4
1911–12	17·04	1,750 5 0	102 14 3	11·16	934 19 9	83 15 7
1912–13	15·20	1,198 16 9	78 17 5	9·51	931 3 2	97 18 3
Totals ..	..	25,274 17 6	..	..	7,553 18 9	..
Averages ..	‡30·35	..	68 18 4	§12·21	..	70 13 3

* One month's work. † Nine months' work. ‡ 12·08 years. § 8·75 years.

Year.	Average Number employed.	Value of Work.	Deduct		Net Value of Prison Labour.	Value per Man per Day.
			Cost of Buildings.	Supervision.		
		Waiotapu Plantation.				
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.
1912–13	15·20	1,198 16 9	519 13 0	70 0 0	609 3 8	2 7
1900–13	30·35	25,274 17 6	2,360 13 1	70 0 0	22,844 4 5	4 0
		Whakarewarewa Plantation.				
1912–13	9·51	931 3 2	..	170 0 0	761 3 2	5 1
1905–13	12·21	7,553 18 9	763 0 0	696 14 8	6,094 4 1	3 8

The employment of prisoners upon afforestation-work has undoubtedly been a success, and it is to be regretted that the number of men thus employed has gradually declined, as shown by the above tables.

Insect Pests.

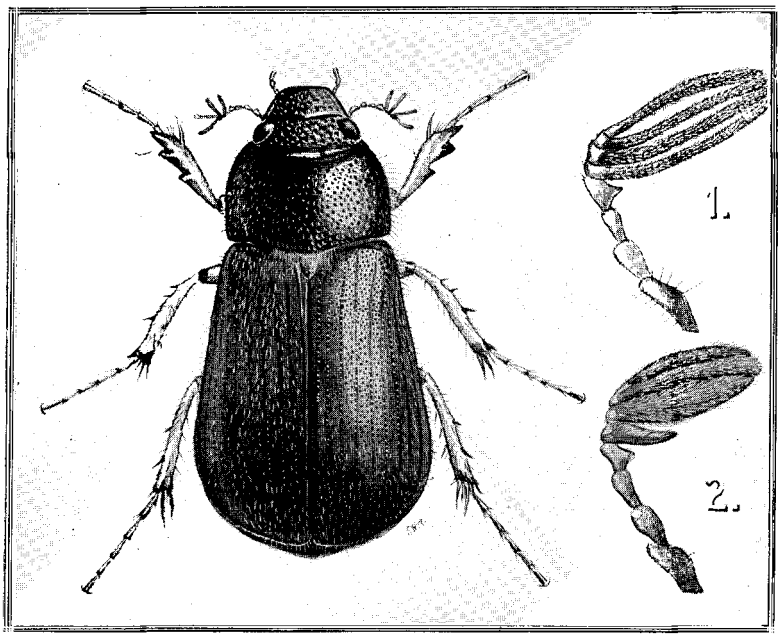
For some years past the seedling larch have been attacked by a native brown beetle, the larvæ of which feed upon the succulent roots of the plants. The destruction of trees caused by this pest was slight at first, but during the last two seasons it has been very severe. It was observed that the damage first commenced in the autumn, when the seedlings were about five months old. At this period the leaves of many of the plants become yellow, and upon investigation it is always found that such plants have been ring-barked just below the surface of the ground. In the spring the seedlings start away into growth, and to all outward appearance they give promise of doing well, but as the weather becomes dryer and warmer it is soon apparent that something is wrong; the leaves lose their healthy green appearance, many drop off, and the remaining ones are only about half the usual size. Plants can be pulled from the ground with the one finger and thumb, and it is found that all the soft roots have been eaten off, leaving only the bare tap-root and the stump ends of the secondary roots. Continued dry weather always results in the trees which are attacked dying out in patches. The beetles, which first make their appearance about the beginning of February, feed upon the leaves of the trees, but the damage done in this way is not as great in comparison as is that wrought by the larvæ upon the roots.

During the year much information has been gleaned about the life-history of this beetle, which has been fully described in the *Journal of Agriculture* of March, 1913, by Mr. A. H. Cockayne, Government Biologist, under the name of *Odontria puncticollis*. Several methods of control have been adopted, and from the knowledge thus acquired there appears no reason to fear any serious losses in the future. Spraying the trees with arsenate of lead and other insecticides at the period when the beetles were on the wing was not productive of any appreciable good results, and fires at night were similarly ineffective. There seems reason to believe that the wind has an influence upon the direction taken by the beetles on the wing in search of a suitable feeding and breeding ground, and in view of this the present year's crop of larch was sown as far as possible from the last year's crop, and in a direction at a right angle to the prevailing winds. This crop of larch has been protected, too, with a covering of thin hessian, and so far only one beetle has been found amongst the trees. The results of these precautionary measures are being eagerly awaited, and it is confidently expected that they will reduce the destruction of trees to a minimum. The losses amongst the two-year-old seedling larch amounted to about 400,000—the result of the damage by grubs combined with an unusually dry season. This insect seems to prefer larch before any other tree, but it has been got in considerable numbers in white-pine (*Pinus strobus*) and Douglas fir. Beds of Corsican pine and *Pinus ponderosa* growing alongside of infected larch-beds seem to be perfectly immune from attack.

Protecting the Plantations against Fire.

The dry period of the year, which usually commences about the beginning of November and continues to the end of April, necessitates definite measures being taken to protect the plantations from fire, and as it is desirable that the present system of protection should be extended, it is proposed to discuss at some length this important branch of forest-management. Hitherto the protective measures which have been adopted have consisted in the upkeep of fire-breaks, and in having at all times, during the dry season, an officer on duty to watch for outbreaks. Fortunately the damage done by fire to the plantations in the Rotorua district has been slight, but on several occasions this has been averted by only a hair's breadth, and it is upon such occasions that the shortcomings of the present system are realized. It must, however, be borne in mind that in the early stages of the work here it would have been unprofitable to have inaugurated an elaborate system of protection. The fire-breaks and the system of watching were then sufficient, but the area under plantation has gradually increased, until at the present time 5,748 acres are planted at Whakarewarewa, and 6,747 acres at Waiotapu, thus making it justifiable to increase the protective measures to some extent. It has been the rule to have all the internal fire-breaks 1½ chains wide, and in laying them off a ploughable course has been followed as far as was possible or desirable. On the boundaries, half a chain has mostly been left unplanted inside the fence; but where the line passes over heavy bracken country, or on the slopes of a hill, the width has been increased to three-quarters of a chain and sometimes to 1 chain. Owing to the broken nature of the country it has not been possible to adopt any regular size for each block, but it is now the rule to try and make 300 acres the minimum and 600 acres the maximum area. Road reserves and tracks are also left through the large blocks, and these would probably be of assistance in stopping the spread of fire. The outside boundary fire-breaks are kept cultivated, and never allowed to have sufficient growth upon them to carry a fire from outside into the plantations. Where these adjoin a public road they are made more effective by periodically burning off the growth upon the roadside. All fire-breaks which, owing to the rough or steep nature of the land, are unploughable are kept bare by burning. The continuous expense of ploughing an increasing area of fire-breaks led to an experiment being made three years ago of sowing them in grass and grazing them. This system is satisfactory, provided the grass is regularly eaten off, but neglect to do so might prove disastrous in case of a ground fire. It can be recommended only for the internal fire-breaks, because the danger from fire from without makes it expedient to keep the boundary ones cultivated. There are many sources from which fires may originate, but the most frequent one is the burning-off by occupiers of land adjacent to the plantation reserves. Very few settlers will go to the trouble to take measures to prevent the fire extending beyond their own boundary, and they usually regard the burning-off of the bracken country as a desirable thing, forgetting that a fire once started in such country may travel miles, and probably do considerable damage before it is extinguished. The fire which caused so much concern for the safety of the Whakarewarewa Plantation last December was, as far as can be ascertained, caused by a passenger on one of the coaches coming from Wairoa to Rotorua throwing down a burning match, cigar end, or something of a similar nature. Extensive areas of land covered with bracken and dwarf scrub growth adjoin all of the plantations. During the summer this growth is highly inflammable, and if once a fire is started it may last for a long time and burn over thousands of acres. Much depends upon the state of the wind as to how wide a fire-break a fire will carry over. Sparks will often carry fire for a distance of 10 or more chains. Hot cinders may be blown across a much-used road, and unless they are arrested by a bank of earth, by fresh plough furrows, or a non-flammable hedge they will extend the fire in an inconceivably short time. At Puhipuhi Plantation the land throughout the reserve and adjoining country carries a heavy growth of bracken, and in addition is strewn with decaying logs and dead standing trees. Once a fire starts it is not long before a dead stump or log becomes ignited, and the sparks from this, assisted by the wind, will carry destruction forward by stages, igniting other logs, and these in turn carrying the fire still further forward.

The present system of fire-breaks is, on the whole, satisfactory, but as it entails an annual expenditure of 10d. for every acre planted it appears desirable to sow them in grass and graze them with sheep in order to reduce this annual charge. Placing the grazing-value at £1 per acre per annum, the cost of sowing down at £3 per acre, and the permanency of the pasture at eight years, profit at the rate of about 7½ per cent. on the outlay would be reaped. Supposing, however, the grazing returned no profit, but simply paid expenses, it would still be a paying proposition, because the cost of ploughing, &c., at 10d. per acre per annum is, when reckoned at



ODONTRIA PUNCTICOLLIS, MAGNIFIED FIVE TIMES.

1, Antennæ of male, magnified thirty-five times; 2, antennæ of female, magnified thirty-five times.

The following is Major Broun's description of *Odontria puncticollis*:—

GROUP MELOLONTHIDÆ.

ODONTRIA, White, Man. N.Z. Coleopt., p. 265.

Odontria puncticollis, sp. nov.

Subovate, broadest near the hind thighs, moderately convex, somewhat nitid; head and thorax reddish-chestnut, elytra and legs rather paler, the latter often testaceous; sparingly covered with distinct, decumbent, moderately short, yellowish hairs, but also with longer erect ones along the sides, the base of elytra thickly clothed, in the middle, with elongate pubescence.

Head coarsely and moderately closely punctured, except at its extreme base, the forehead with reflexed, well-developed margins, broadly rounded in front, upper surface nearly nude. *Eyes* large, only slightly convex, hyaline. *Thoraæ* almost twice as broad as long, its sides finely margined, nearly straight, and only slightly narrowed behind the middle, gently curvedly narrowed towards the front; anterior angles acute, the posterior somewhat rounded; base widely sinuate towards the sides, rounded in the middle, the apex widely emarginate; its surface very distinctly, moderately closely and evenly punctured, frequently with a smooth linear space along the middle. *Scutellum* punctate, cordate or suboblong. *Elytra* thrice the length of the thorax, of the same width as it is at the base, gradually dilated posteriorly, the apices rounded at the sides, much less so, sometimes subtruncate, towards the suture; on each elytron there are nine fine striæ, the outer ones indistinct, the central ones obsolete near the shoulder; interstices plane, their punctation distinct, slightly finer that that of the thorax. *Pygidium* broad, with distant subgranular sculpture.

Under-side more or less finely punctate, fusco-testaceous, the abdomen a little shining and often fuscous in mature individuals; the sternum with numerous elongate, slender, fulvescent setæ, those on the femora erect.

Male.—Antennæ rather short, basal joint elongate, oblique and thickened at the extremity, the second as stout but only half as long, third more slender, fourth stout, angulate, and generally slightly produced in front; club minutely and densely pubescent, composed of four nearly equal leaflets.

Female.—Fifth antennal joint short, usually somewhat prolonged in front, but only a third, or less, of the length of the club, which is triarticulate and shorter than that of the male.

Length, 12–14; breadth, 7–8 mm.

This species can be distinguished from almost all the others by the very distinct, though not coarse, thoracic punctation, which is quite perceptible to the unaided eye, whereas in many other cases the punctures, either very fine or obsolete, can only be detected by means of a powerful lens. As a further aid to identification, it may be stated that, with the exception of White's *Rhizotrogus zealandicus*, 474, and one or two others, the surface is opaque and often maculate, and the elytra in some instances broadly sulcate. In the more closely allied, but larger, much paler, and rather more glossy, *O. nitidula*, 3223, the hind angles of the thorax, though obtuse, are more rectangular, and only those striæ that are near the suture are well marked.

Specimens collected by H. A. Goudie, in larch nursery-beds, Whakarewarewa, 6th February, 1913. The illustration is drawn from nature by Mr. E. H. Atkinson.

[Extract from the *Journal of the Department of Agriculture*, 15th March, 1913.]

To face p. 6.]

compound interest over a rotation of, say, sixty years, a heavy charge upon the plantation (10d. per annum at 4½ per cent. amounts in sixty years to £12). If this system is adopted it would be necessary to purchase sheep because of the difficulty in letting the grazing rights at a season of the year when grass is plentiful, and when it would be dangerous to allow the fire-breaks to become overgrown. An incipient fire may be easily suppressed by one man, whereas with a delay of half an hour there may develop a conflagration against which an army of men are helpless. It is absolutely necessary that fires should be dealt with promptly, and to carry this into effect a responsible officer must, during dry weather, always be on the lookout for outbreaks. A few workmen should live upon the reserve so that no delay will occur in getting help should fire start on a Sunday or a holiday. There should also be means of getting the men quickly to the scene of the fire, and a supply of fire-fighting tools should always be kept handy. It is advisable that all workmen when fire-fighting should be clothed entirely in woollen garments. Cotton fabrics catch fire more readily than woollen ones, and allow more heat through. Water for drinking should be carried to the men. If this is neglected their tongues become swollen and they cannot endure the same amount of heat, nor can they continue to work for any long period. To sum up, the problem may be stated as follows:—

(1.) There are 12,495 acres of plantation in the Rotorua district, the outside boundary of which is about twenty-five miles in length. Owing to the hilly nature of the reserves it is impossible to see much of the boundary from any one point.

(2.) The forester in charge has numerous duties to attend to which make it impossible for him to constantly patrol the boundaries.

(3.) In the event of a fire occurring on a Sunday or on a holiday time is lost in getting workmen to extinguish it.

In view of the foregoing the following proposals for improving the protective measures are put forward:—

(1.) The appointment of officers, to be designated Rangers, and given similar authority, whose main duty would consist in patrolling the boundaries during the dry season and keeping a watch for incipient fires; they to be accommodated in cottages built in positions commanding a good view of the plantation, and connected by telephone with the forester's house. During the wet months of the year they could be employed in keeping the fences in order and other work of a similar nature, and generally deal with trespass.

(2.) The erection of living-quarters for, and the selection of, six or eight workmen at each station who would take it in turns to be on the place on Sundays or holidays.

(3.) The equipment of a strong vehicle having a tank for carrying water, and a hand-pump and suction-hose for filling same. Also bucket-pumps and tools for fire-fighting. This vehicle to have seating-accommodation for six or eight men.

(4.) The establishing of depots where water can easily be got.

(5.) The planting of belts of deciduous trees, such as poplars, around the more inflammable blocks of pines.

(6.) Amending the laws in regard to the lighting and spread of fire and trespass.

The main idea in regard to the vehicle above mentioned was got from "Forestry in New England," by Hawley and Hawes. In this work much information is given about the protective measures adopted in the Connecticut, Massachusetts, and other of the eastern States. A special forest fire-wagon, which is described, is equipped with chemical extinguishers, galvanized cans containing extra charges of water and chemicals, also tools, &c.

The laws in respect to lighting fires and allowing these to spread into a State forest reserve might with advantage be amended to make it a punishable offence to light fires on Crown land, or to allow a fire to spread on to Crown land. Apart from the damage that may possibly result should such a fire get into one of the plantations, it seems remarkable that no thought has apparently been given to the damage done to the soil by fire. It is a common thing to see a fire smouldering for months in partly drained swamps, with the result that the humus is destroyed. Many acres of cut-out forest have deteriorated by similar means, yet the fires continue, and if the origin of some of them were sought out it would probably be found that the individual who was responsible was quite unconcerned and ignorant of the damage he had been the means of accomplishing.

The law in respect to trespass upon Crown lands and State forests reserves is probably sufficient, but the regulation in which the months from November to March, inclusive, are especially prohibited is not applicable to the plantation reserves, where trespass at any time of the year is undesirable. In the foregoing proposals for increasing the measures of protection the framework only of the proposed system is given. It will probably be necessary to establish something in the nature of fire-fighting corps and conduct regular practice work. This will ensure the services of probably sufficient men to cope with an average outbreak. When fire has threatened the plantations in the Rotorua district any appeal for help made to the workmen or the local Maori population has been cheerfully responded to, and if this spirit is fostered the sympathy of these people will go a long way towards making a success of any general scheme which is adopted.

Proposals for 1913–14.

Some five million trees are available in Rotorua Nursery, and these will be planted during the year at the plantations in this district. It is hoped that the area under plantation will be increased by 1,500 acres during the year.

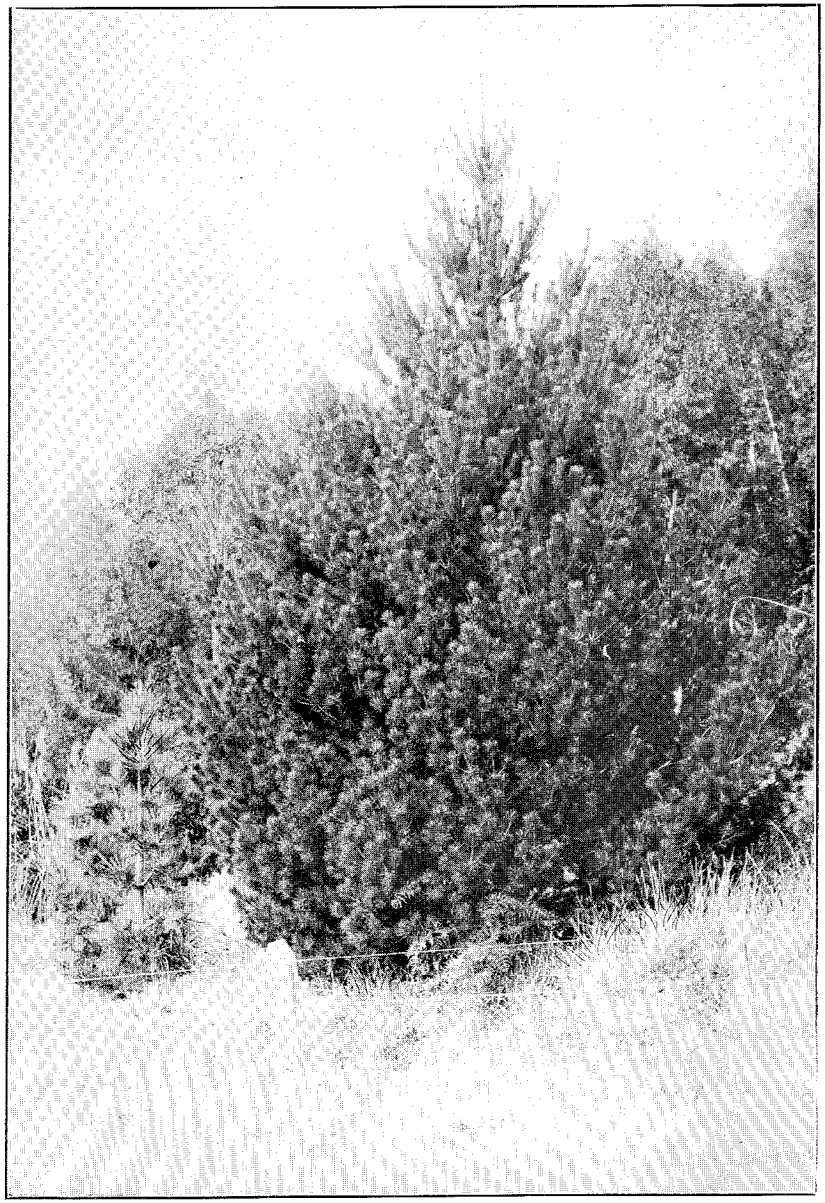
Conclusion.

The thanks of the Department are due to the Prisons Department for their co-operation in the tree-planting work. I have also to thank our own officers generally for their assiduity during a somewhat trying year.

H. A. Goudie,
Superintending Nurseryman, North Island.

NUMBER AND SPECIES OF TREES GROWING IN THE NORTH ISLAND.

Name of Trees.		Whaka-rewarewa Plantation.	Waiotapu Plantation.	Puhipuhi Plantation.	Totals.
Botanical Name.	Common Name.				
Acacia melanoxylon	Blackwood ..	123,174	1,296	..	124,470
Acer saccharum	Sugar-maple ..	..	..	..	..
,, pseudo-platanus ..	Sycamore ..	32,536	..	..	32,536
Aesculus hippocastanum ..	Horse-chestnut ..	..	..	..	..
Alnus glutinosa	Alder	26,393	..	..	26,393
Betula alba	Silver-birch ..	6,585	39,230	..	45,815
Castanea sativa	Sweet-chestunt ..	..	..	..	..
Catalpa speciosa	Hardy catalpa ..	..	..	..	..
Corylus avellana	Filbert	..	..	..	..
Cupressus Lawsoniana ..	Lawson's cypress ..	..	11,367	..	11,367
,, thurifera	Mexican cypress ..	420	400	..	820
Eucalyptus—species	Gums	2,103,767	72,000	981,500	3,157,267
Fraxinus americana	American ash ..	..	..	..	..
Hikora ovata	Hickory	..	..	..	..
Juglans cinerea	Butter-nut ..	..	..	..	..
,, nigra	Black-walnut ..	..	..	..	..
,, regia	Walnut	13,800	..	..	13,800
Juniperus virginiana ..	Red-cedar ..	670	..	..	670
Larix europaea	European larch ..	6,082,810	8,942,630	..	15,025,440
,, occidentalis ..	Western larch ..	50	..	..	50
Liquidambar styraciflua ..	Sweet-gum ..	1,700	..	..	1,700
Picea canadensis	White-spruce ..	..	..	..	..
,, excelsa	Norway spruce ..	195,025	..	..	195,025
,, grandis	Silver-fir (Cal.) ..	..	..	..	..
,, nobilis	Red-fir	..	..	..	..
,, pungens	Blue-spruce ..	..	..	..	..
,, sitchensis	Tideland spruce ..	91,175	..	..	91,175
Pinus austriaca	Austrian pine ..	283,655	1,108,025	..	1,391,680
,, Benthamiana	Bentham's pine ..	19,600	238,275	..	257,875
,, canariensis	Canary Island pine	6,300	..	..	6,300
,, contorta	Twisted pine ..	..	3,700	..	3,700
,, Coulterii	Coulter's pine ..	375	905	..	1,280
,, densiflora	Japanese red-pine	2,325	..	..	2,325
,, excelsa	Blue-pine ..	..	300	..	300
,, halepensis	Aleppo pine ..	..	..	..	..
,, Jeffreyii	Jeffrey's pine ..	2,200	6,643	..	8,843
,, Lambertiana	Sugar-pine ..	170	3,925	..	4,095
,, Laricio	Corsican pine ..	2,711,400	5,478,135	..	8,189,535
,, muricata	Bishop pine ..	6,320	43,800	18,500	68,620
,, Murrayana	Lodgepole pine ..	10,225	4,100	..	14,325
,, ponderosa	Heavy pine ..	505,650	1,153,700	..	1,659,350
,, ,, var. scopulorum	Rock-pine ..	575	1,475	..	2,050
,, radiata	Remarkable pine ..	147,800	248,875	..	396,675
,, resinosa	American red-pine..	375	2,150	..	2,525
,, rigida	Pitch-pine ..	..	12,200	..	12,200
,, Sabiniana	Nut or grey pine ..	25	..	..	25
,, sylvestris	Scotch fir ..	..	200	..	200
,, strobus	Weymouth pine ..	..	159,950	..	159,950
,, teocote	American torch-pine	2,250	3,000	..	5,250
,, Thunbergii	Japanese black-pine	700	..	..	700
,, Torreyana	Torrey's pine ..	1,320	..	..	1,320
,, taeda	Torch-pine ..	1,100	..	..	1,100
Platanus orientalis	Oriental pine ..	1,900	..	..	1,900
Podocarpus dacryoides ..	White-pine (N.Z.)	..	..	..	..
,, totara	Totara	..	..	..	..
,, Hallii	,, ...	..	..	..	..
Populus (varieties)	Poplar	600	..	..	600
Pseudo-tsuga Douglasii ..	Douglas fir ..	209,583	89,712	..	299,295
Pyrus aucuparia	Mountain-ash ..	..	..	..	..
Quercus pedunculata	English oak ..	..	..	..	..
Robinia pseudo-acacia ..	Locust tree ..	..	..	..	..
Sequoia gigantea	Big tree (Cal,) ..	..	..	..	..
,, sempervirens ..	Redwood ..	90,673	..	..	90,673
Thuja plicata	White-cedar ..	3,275	14,200	..	17,475
Ornamental shrubs and leguminous plants ..	..	475	36,936	..	37,411
Totals	..	12,686,976	17,677,129	1,000,000	31,364,105



ROTORUA.—PINUS MURRAYANA, AGE NINE YEARS, HEIGHT 21 FEET.

ROTORUA.—PINUS JEFFREYII, AGE NINE YEARS, HEIGHT 9 FEET.

ROTORUA.—PSEUDO-TSUGA DOUGLASII (DOUGLAS FIR), AGE FOURTEEN YEARS, HEIGHT 35 FEET.

ROTORUA.—PICEA SITCHENSIS (SITKA SPRUCE), AGE FOURTEEN YEARS. HEIGHT 21 FEET.

ROTORUA NURSERY.

(Area of enclosure, 163 acres; altitude (approximate), 1,000 ft.)

The rainfall for the twelve months ended 31st March amounted to 53·56 in., recorded on 161 days, the heaviest monthly fall being in September, when 8·02 in., falling on twenty-five days, was recorded. The maximum shade temperature for the year was 92° F. on the 30th December and the minimum 21° F. on the 5th August. Frost was recorded on sixty-nine nights. Generally, the weather throughout the year has been abnormal; the winter was unusually wet and cold, and the summer—from the beginning of December to the middle of March—hot and dry.

Seedling Trees.

The crop of trees, which number 5,660,675, and are detailed on Schedule V attached, are, on the whole, satisfactory, although the dry weather had the effect of retarding the growth until well into March. Heavy winds during November delayed the seed-sowing considerably, and the larch crop was fully a month later than usual in being sown.

Larch (Larix europaea).—From 4 cwt. of seed 2,500,000 trees were raised, germination being at the rate of about 8 per cent. The seedlings are a fine healthy lot, but the growth is not so good as usual, owing to the delay in sowing. From the same quantity of seed sown the previous year only half as many trees were raised.

Corsican Pine (Pinus Laricio).—2,000,000 trees were raised from 4 cwt. of seed, the rate of germination being unusually low—14 per cent These are a splendid lot of seedlings, and have made good growth since the dry weather ceased. They have been less affected by the dry weather than any of the other pines grown this year.

Heavy Pine (Pinus ponderosa).—The seed of this species germinated at the rate of 50 per cent., there being 500,000 trees raised from 100 lb. of seed. Owing to the dry weather the growth has been slow, and the leaves of the plants became pale and yellow in patches.

Weymouth Pine (Pinus strobus).—This is a very poor crop. From 20 lb. of seed 12,000 plants resulted, germination being at the rate of about 2 per cent.

Monterey Pine (Pinus radiata).—20,000 plants were got from 3 lb. of seed, germination being at the rate of 42 per cent. The growth of the seedlings has been slow, owing to the dry weather.

Douglas Fir (Pseudo-tsuga Douglasii).—From 40 lb. of seed 500,000 seedlings were produced, the rate of germination being 31 per cent. This is the most abundant crop of Douglas fir which has ever been raised here, the best previous rate of germination being 19 per cent. in 1911. The seedlings have felt the dry weather very much, and the growth has been rather poor.

Amongst the other small lots of seedlings mentioned in the schedule of one-year-old trees are several well-known valuable timber-trees.

The alder were grown for planting small areas of wet land. The crop is a very poor one as regards the germination, but the young plants have made excellent growth

Sycamore is also a thin crop, but the plants are very vigorous. It is proposed to use these in planting up open places where the bracken has killed out the larch.

Picea excelsa and *Picea sitchensis*—the Norway and Sitka spruces—are to be used for underplanting larch; the latter-mentioned species is an excellent timber-tree, and has thriven well here when sheltered by more accommodating species.

Abies pectinata (the silver-fir of Europe) will be experimented with in a manner similar to that outlined for the spruce.

Cryptomeria japonica has been grown here to a small extent previously, and does well under certain conditions. The number raised this year will make it possible to put the value of this tree for afforestation purposes beyond a doubt.

Chamaecyparis Lawsoniana will be tried for underplanting larch. It does well where protected by other trees, but is susceptible to damage by unseasonable frosts.

Two-year-old Trees.

European Larch.—This crop has suffered very much from the depredations of the larvæ of the native brown beetle (*Odontria puncticollis*), and also to some extent by the strong drying winds which were prevalent in the spring. The crop is a disappointing one.

Japanese Larch (Larix leptolepsis).—Suffered greatly from the same cause as the European one, but the trees were transplanted into nursery rows, and made a quick recovery. The growth has been strong and healthy. This larch appears to be a better drought-resister than the common one, but on this point further investigations require to be made, because the opinion is expressed upon observations made from trees planted in different parts of the nursery and without actually testing the species side by side.

Corsican Pine.—Both the trees in the seed-beds and the lined-out ones have made splendid growth.

Heavy Pine (Pinus ponderosa).—The growth is satisfactory, but not as good as usual. Judging from the appearance of the seedlings, this lot is one of the numerous types of heavy pine, and not the one which has been grown here for many years past. An endeavour will be made to ascertain which variety this is.

Weymouth Pine (Pinus strobus).—These were transferred from the seed-beds to nursery rows last spring, because the larvæ of the brown beetle was destroying them. Owing to the damaged condition of the roots, about 50 per cent. of the plants succumbed, and those which survived made very poor progress.

Pinus montezumae and *Pinus patula*, both Mexican species, have made very quick growth. The former makes a very strong tap-root, and will probably be difficult to transplant successfully.

Lining-out Trees.

This work was completed early in September, the labour-cost being 2s. 6d. per thousand averaged over the 1,200,000 trees dealt with. The number of deaths caused by transplanting is lower than usual, which is probably due to the wet weather which followed in September and October. During the early part of December strong drying winds were prevalent, and caused a lot of damage to the larch crop; sandy soil was driven against the young plants, with the result that most of the foliage was stripped off them. From this setback they never recovered, because of the hot dry weather, which was prevalent until the end of February.

Manuring.—All the nursery which was unoccupied by crops of trees was given a dressing of carbonate of lime. The bulk of such land was sown down with ryecorn as a green-manuring crop, which was ploughed in and followed by a crop of rape. Rye has the advantage of being a very hardy plant, and therefore is admirably adapted for spring sowing here. It throws considerably more leaves than oats, but still as a green-manuring crop it leaves much to be desired. Small experimental plots were sown with other seeds, with varying results. Soja beans were not a great success, and are apparently not quite hardy enough; cow-peas made good growth, but the seed germinated badly. This would probably be a valuable crop for the purpose if good seed could be procured. Mustard ran to flower very quickly without throwing much leaf. Red clover made splendid growth, and but that it was very slow in starting, would be an excellent crop. Prairie-grass made good quick growth, but is too prone to run to flower. Rape throws a lot of leafage, and is very suitable.

As usual, artificial manures were largely used with the crops of trees.

General.—The output of trees during the year was 3,049,006, and the total output since the nursery was started is 36,768,311. At the 31st March the stock of trees numbered 9,731,925 of which number 4,500,000 will be sent to the plantations during the coming winter.

The average daily number of workmen employed was 24·95.

Details of expenditure and other tabulated information are appended hereto.

Following is a record of rainfall and temperature for the year :—

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	In.		Deg. F.	Deg. F.	
April	5·56	22	72	33	..
May	3·56	9	69	26	11
June	6·11	18	63	27	11
July	6·86	11	63	23	18
August	5·35	12	62	21	23
September	8·02	25	65	33	..
October	5·23	16	74	30	4
November	3·03	14	78	32	1
December	0·75	6	92	31·5	1
1913.					
January	4·75	11	86	35	..
February	0·82	8	87	33	..
March	3·52	9	88	33	..
Totals	53·56	161	..	..	69

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Tree-planting and maintenance—		
Tree-growing	2,519 2 0	24,830 19 9
General maintenance and repairs ...	419 3 7	3,938 0 7
Tree-seeds	293 16 8	2,699 7 8
Manures	85 5 2	1,006 15 3
Horse-feed	277 7 4	1,862 9 10
Miscellaneous works	35 1 4	360 7 6
Stock and material—Tools and implements	153 17 11	1,172 11 9
Permanent works—		
Buildings	7 0 0	2,782 12 0
Seed-frames	149 17 4	1,799 2 1
Nursery-formation	27 15 2	2,322 15 1
Fencing	...	221 12 8
Water-supply	...	660 18 10
Supervision and clerical—		
Proportion of Superintending Nurseryman's salary	75 0 0	...
Proportion of Nurseryman's salary ...	200 0 0	2,946 16 8
Clerical assistance	40 0 0	...
	£4,283 6 6	£46,604 9 8

Schedule III.—Trees Account.

	During the Year.		Since 1896 to Date.		Estimated Value, as Schedule V.
	Number.	Cost of Growing, per Thousand.	Number.	Cost of Raising and Maintenance, per Thousand.	
		£ s. d.		£ s. d.	£ s. d.
Trees grown	12,780,931	0 6 8	46,500,236	0 17 10	85,625 17 2
Trees sent out	3,049,006	..	36,768,311	..	73,456 9 2
Balance in stock			9,731,925	..	12,169 8 0
Value of land, improvements, and stock (Property Account)					6,478 14 0
Total value					18,648 2 0

Schedule IV.—Property Account.

	£ s. d.
Land (160 acres): Crown land not charged to Forestry Account	
Buildings	1,749 9 9
Improvements	1,693 16 5
Fencing	125 3 9
Stores in hand	2,910 4 1
	£6,478 14 0

Schedule V.—Details of One-year-old Trees, sown 1912–13.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Amount of Seed sown.	Value per Thousand.	Total Value.	Remarks.
			Lb. oz.	£ s. d.	£ s. d.	
Acer pseudo-platanus	10,000	15	22 0	0 10 0	5 0 0	Strong.
Alnus glutinosa	2,500	9	5 0	0 15 0	1 17 6	"
Abies pectinata	500	1	1 0	1 0 0	0 10 0	For trial.
Cryptomeria japonica	2,000	2	1 0	2 0 0	4 0 0	"
Chamaecyparis Lawsoniana ..	2,000	1	0 8	1 10 0	3 0 0	..
" aurea ..	150	1	0 4	1 10 0	0 4 6	..
Eucalyptus Stuartiana	80,000	6	1 0	0 10 0	40 0 0	Strong.
" Smithii	200	6	0 1	0 10 0	0 2 0	Experimental.
" umbra	200	6	0 1	0 10 0	0 2 0	"
Larix europaea	2,500,000	1½	448 0	1 0 0	2,500 0 0	Good.
Picea excelsa	10,000	1	1 0	1 0 0	10 0 0	Experimental.
" sitchensis	20,000	1	1 0	1 5 0	25 0 0	"
Pinus densiflora	800	3	0 4	1 0 0	0 16 0	"
" Laricio	2,000,000	1	448 0	1 0 0	2,000 0 0	Good.
" ponderosa	500,000	1	100 0	1 0 0	500 0 0	"
" pinea	25	3	0 1	1 0 0	0 0 6	"
" radiata	20,000	3	3 0	1 0 0	20 0 0	"
" strobus	12,000	1	20 0	1 0 0	12 0 0	Poor.
" Thunbergii	300	3	0 4	1 0 0	0 6 0	Good.
Pseudo-tsuga Douglasii	500,000	1	40 0	1 5 0	625 0 0	Very good.
Totals	5,660,675	..	..	..	5,747 18 6	

Details of Two-year-old Trees, sown 1911–12.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Betula alba	..	1,500	12	2 5 0	3 7 6	Strong growth.
Larix europaea	500,000	200,000	12	1 5 0	625 0 0	Weak.
				2 5 0	450 0 0	
" leptolepis	..	25,000	12	3 0 0	75 0 0	Strong and sturdy.
Pinus Laricio	2,000,000	..	5	1 5 0	2,500 0 0	"
	..	800,000	5	2 5 0	1,800 0 0	"
" montezumae	..	500	5	2 10 0	1 5 0	Very strong.
" patula	..	1,000	6	2 10 0	2 10 0	"
" ponderosa	400,000	..	4	1 5 0	500 0 0	Good.
" strobus	..	30,000	3	2 5 0	67 10 0	Poor growth.
Totals	2,900,000	1,058,000	..	..	6,024 12 6	
	3,958,000					

Details of Three-year-old Trees, sown 1910–11.

Name of Tree.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Fraxinus americana	300	6	3 0 0	0 18 0	Fair.
„ quadrangulata	300	4	3 0 0	0 18 0	„
Liquidambar styraciflua	1,000	12	3 0 0	3 0 0	„
Picea canadensis	400	3	3 5 0	1 6 0	„
Pinus austriaca	400	5	3 0 0	1 4 0	Good.
„ Benthamiana	500	5	3 5 0	1 12 6	„
„ densiflora	25	6	3 0 0	0 1 6	„
„ Lambertiana	500	5	3 5 0	1 12 6	„
„ Laricio	80,000	5	3 0 0	240 0 0	„
„ Massoniana	50	5	3 0 0	0 3 0	„
„ monticola	100	3	3 0 0	0 6 0	Fair.
„ ponderosa	4,000	5	3 0 0	12 0 0	Good.
„ resinosa	250	5	3 0 0	0 15 0	„
„ teocote	25	6	3 0 0	0 1 6	Very good.
Pseudo-tsuga Douglasii	20,000	9	3 5 0	65 0 0	Good.
Sequoia sempervirens	1,000	6	8 0 0	8 0 0	„
Thuja occidentalis	1,000	3	3 10 0	3 10 0	Fair.
Tsuga canadensis	300	3	3 10 0	1 1 0	„
„ Mertensiana	400	3	3 10 0	1 8 0	„
Native trees and shrubs	2,700	8	20 0 0	54 0 0	„
Totals	113,250	..	..	396 17 0	

Details of Trees transferred to Plantations, &c., 1912–13.

Where sent.	Name of Tree.	Number.	Height, in Inches	Value per Thousand.	Total Value.
				£ s. d.	£ s. d.
Whakarewarewa Plantation ..	Cupressus thurifera ..	150	9	3 0 0	0 9 0
	Eucalyptus Stuartiana ..	174,650	6	0 10 0	87 6 6
	Larix europaea ..	243,675	12	1 5 0	304 11 10
	Pinus Laricio	677,325	6	1 5 0	846 13 1
	„ „	15,000	6	2 5 0	33 15 0
	„ Massoniana ..	50	8	1 10 0	0 1 6
	„ ponderosa ..	23,425	6	2 5 0	52 14 1
	„ radiata	43,050	6	1 0 0	43 1 0
	„ resinosa ..	325	6	3 0 0	0 19 6
	„ teocote	275	8	3 0 0	0 16 6
	Pseudo-tsuga Douglasii ..	13,150	9	1 10 0	19 14 6
	„ ..	45,125	12	2 10 0	112 16 3
	Sequoia sempervirens ..	150	8	8 0 0	1 4 0
		1,236,350	..	..	1,504 2 9
Waiotapu Plantation	Larix europaea ..	93,300	6	1 0 0	93 6 0
	„ ..	553,650	12	1 5 0	692 1 3
	„ ..	191,750	12	2 5 0	431 8 9
	Pinus austriaca ..	23,050	6	1 5 0	28 16 3
	„ Benthamiana ..	10,100	6	1 10 0	15 3 0
	„ Lambertiana ..	2,500	5	1 10 0	3 15 0
	„ Laricio	680,700	6	1 5 0	850 17 6
	„ „	1,000	6	2 5 0	2 5 0
	„ ponderosa ..	56,075	6	1 5 0	70 1 10
	„ „ ..	17,375	6	2 5 0	39 1 10
	„ radiata	182,575	6	1 0 0	182 11 6
	„ strobus	175	5	2 5 0	0 7 10
Totals	..	1,812,250	..	..	2,409 15 9

Details of Trees transferred to Plantations, &c., 1912–13.

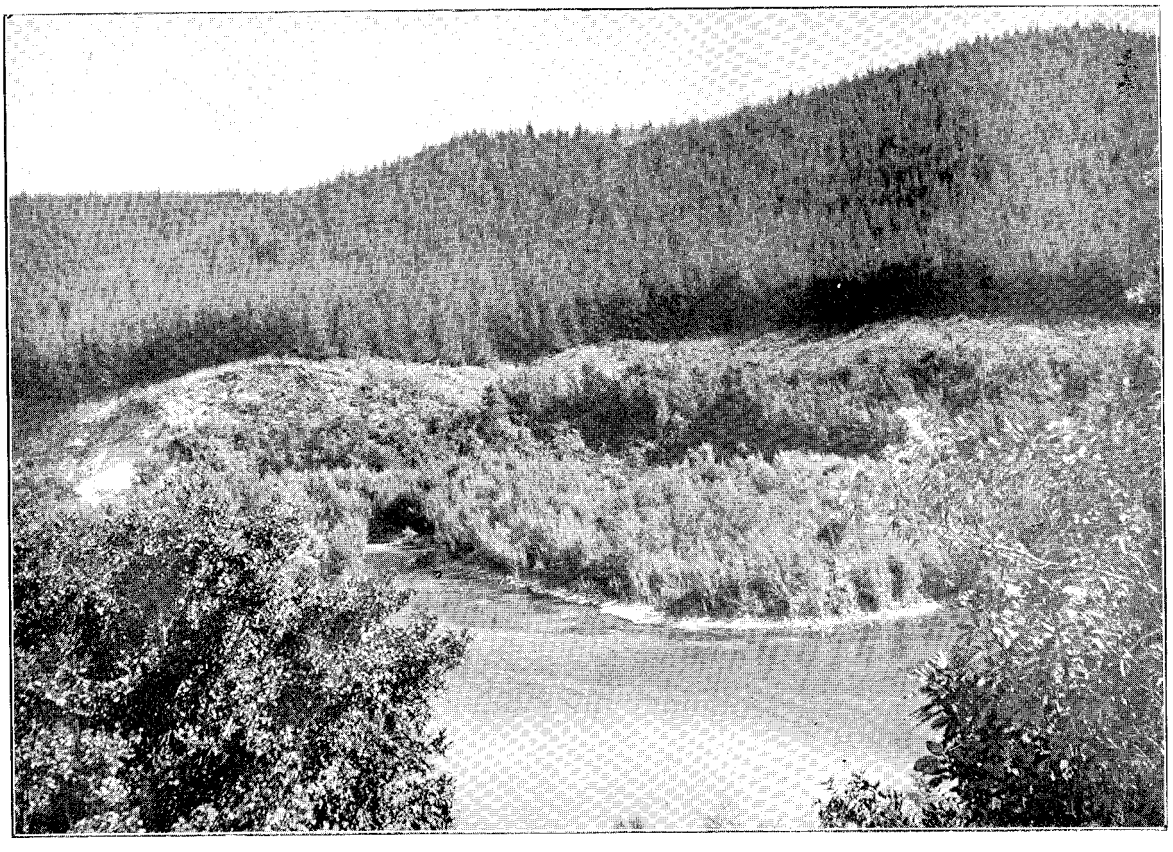
Where sent.	Name of Tree.	Number.	Value per Thousand.	Total Value.
			£ s. d.	£ s. d.
Whakarewarewa Plantation ..	As per details above	1,236,350	..	1,504 2 9
Waiotapu Plantation	„	1,812,250	..	2,409 15 9
Waikiekie School	Shelter-trees	75	..	0 7 6
Wanganui Education Board ..	Shelter-trees for Arbor-day planting	105	..	0 10 6
Native School, Waiotapu ..	Ditto	50	..	0 5 0
Matata Cemetery	Shelter-trees	36	..	0 3 7
Hauraki Plains Settlement ..	Trees for Public Domain	140	..	0 14 0
Totals	..	3,049,006	..	3,915 19 1

H. A. GOUDIE,
Superintending Nurseryman, North Island.

ROTORUA.—CALIFORNIAN REDWOOD, SWEET CHESTNUT, AND DOUGLAS FIR, AGE THIRTEEN YEARS, HEIGHT RESPECTIVELY 30 FEET, 25 FEET, AND 27 FEET.

ROTORUA.—EUCALYPTUS VIMINALIS, AGE THIRTEEN YEARS, HEIGHT 65 FEET.

Rotorua.—Plantation of Eucalyptus sieberiana, Age Thirteen Years, Height 15 Feet.



Larch Plantation at Waiotapu.

WHAKAREWAREWA PLANTATION.

(Area, 9,547 acres; altitude (approximate), 1,200 ft.)

A fair measure of success has attended the past season's operations, although the adverse climatic conditions experienced have resulted in the growth made by the majority of the trees throughout the plantation being slightly less vigorous than on an average year. During the spring and early summer months there was little warmth, and frequent frosts which assisted in keeping the ground cold; the result was that growth was sluggish, and the trees did not start away as freely as usual. As the season advanced an unusually protracted spell of dry weather set in, the small amount of rain which fell during a period of three months being barely sufficient to moisten the surface of the soil.

The effects of the dry weather were most noticeable amongst the larch, whose foliage became of an unhealthy colour, and resulted in a certain amount of premature leaf-shedding.

A particularly severe frost at the latter end of spring also checked the larch considerably, and on several small low-lying areas, where they had for several seasons been affected by late frosts, the trees were so severely damaged that there was no hope of recovery, and it was therefore decided to cut them out, and to prepare the ground for planting with pines during the autumn.

The dry weather has had little or no effect on the older pines, *Pinus Laricio*, *P. ponderosa*, and *P. Murrayana* in particular continuing to show their entire suitability to the district. On the whole, the trees planted during the past season have done remarkably well, the larch and Douglas fir having practically no failures amongst them, and with the exception that a few of the latter species are beginning to look sickly as the result of insufficient moisture, they are a very healthy lot. As usual, *Pinus Laricio* show the greatest percentage of failures, although the death-rate is a good deal lower than in the previous year; and although up to the present time they have made little headway, the weather is now very favourable for a vigorous autumn growth.

The comparatively small number of *Pinus Laricio* handled enabled the planting on new area to be completed during the autumn, and the young plants thus having the advantage of being partly established before the severe frosts set in no doubt contributed largely towards the success obtained.

Eucalyptus Stuartiana, which were planted during moist weather when the spring was well advanced, have also done better than in the previous year. In the experimental lots *Pinus resinosa* has done very well, but the same cannot be said of *Pinus Massoniana* and *Cupressus thurifera*, the former being almost a total failure, whilst amongst the latter there was fully 50 per cent. of deaths.

During the season trees to the number of 1,236,350 were received from the Rotorua Nursery. Of this number, 678,575 were planted in new area amounting to 299 acres, and the remainder —557,775—were used to replace failures in former years' plantings. The failures were principally amongst the *Pinus Laricio*, an extraordinary number of which were planted out during the previous season. Both free and prison labour were employed in planting operations, the former planting 88,625 on new area, and 408,450 to replace failures; while the prisoners planted 589,950 on new area, and 149,325 to replace failures. The number of trees now in the plantation is 12,686,551, occupying an area of 5,749 acres.

Prison Labour.—The daily average number of men employed was 9·51, and their work is valued at £931 3s. 2d., or an average per man of £97 18s. 2d., showing an increase of £14 2s. 7d. on the average earnings per man for the previous year. The work was performed in a very satisfactory manner, but the number of men available is generally insufficient, and varies so much that it is a difficult matter to lay out a season's work with any certainty of having it completed within a reasonable time.

Free Labour.—An average daily number of 19·25 men was employed, and the average cost of the various works undertaken was as follows: Clearing for tree-planting, £2 0s. 5d. per acre; pitting, 11s. 3½d. per thousand; planting, 6s. per thousand; and planting blanks, 17s. 1d. per thousand. 116 chains of fire-break were prepared for ploughing by clearing, stumping, and burning off, at a cost of 5s. 3d. per chain; and 83 chains of fencing were erected, at a cost of 4s. 2d. per chain.

The cost of clearing was considerably above that of the previous year, but the work was confined to some small areas of very steep rough land, on which the native growth was particularly heavy. On these blocks pitting was also more costly, but the greatest expense in this work was incurred in pitting the places where the frosted larch were cut out, and on which a dense growth of grass and small scrub had sprung up during the seven years which had elapsed since the areas were first planted. Owing to the risk of burning off this growth it was found preferable to chip it while preparing the pits.

Under the heading of "General Upkeep" the chief work included was the clearing of fern amongst the young trees, several of the blocks having to be gone over twice during the season. Considerable expense was also incurred in the planting of blanks and in the maintenance of fire-breaks.

Part of the oldest block of larch was cleared of all undergrowth, and the branches of the trees were trimmed up to a height of about 7 ft., and at the same time any completely suppressed trees which were either dead or dying were cut out. On any sufficiently open spaces which occurred the undergrowth was heaped and burned, the whole work of treating 30¼ acres costing, on an average, £3 14s. 6d. per acre.

This is a preliminary work connected with underplanting, and on the area prepared exhaustive trials of some of the best-known shade-enduring species of trees will be made.

A mixed block of Douglas fir and larch was gone through during the spring time, the growth being cleared around the former, and the branches of the larch trimmed up where necessary, in order to stimulate the growth of the Douglas fir by giving them the full enjoyment of light. A block of larch and redwood were also treated in the same manner.

In mixed blocks of these species this work is always necessary, as the larch grows so rapidly from the start that without assistance the other trees would be speedily suppressed.

During the first four years after planting the above-mentioned redwood made little or no growth, but with the shelter from frost and cold winds provided by the larch they have recently improved wonderfully, and judging from present appearances a great percentage of them will ultimately become fine trees.

During clearing operations any double leaders found amongst the redwood and Douglas fir were taken out. This was also done on part of a block of Corsican pine where severe frosts had destroyed the original leader, and caused the trees to throw up a number of shoots.

A new block of land of some 500 acres was fenced in, part of the materials of the old boundary-fence being used for this purpose, and part of it was also used in subdividing the horse-paddock. The total length of the fencing erected was 83 chains, costing 4s. 2d. per chain, including the carting of material, and the old fence, 220 chains in length, was dismantled and packed out to handy situations for carting, at a cost of 2s. 9d. per chain.

Little damage was done to the young trees by rabbits and hares, and beyond laying poison throughout the plantation no further work to keep down these pests was necessary.

No fires occurred in the plantation during the year, but a fire carelessly started during Christmas week on the Wairoa Road—which runs for several miles close to the boundary—caused a great deal of anxiety. For the greater part of a week men were required night and day to watch and check the fire, which on several occasions was carried by change of wind directly towards the plantation, and as all fern growth was exceedingly dry at the time the danger of sparks starting a fire amongst the trees was very great. Although the fire several times obtained a hold on the plantation side of the road it was successfully beaten out, and its progress was eventually stayed at the native bush at Tikitapu. The expenditure in wages in connection with the fire was £11 14s. 6d.

Work at which men could earn better wages has been plentiful in the district, and great difficulty has been experienced during the greater part of the year in getting suitable men for the plantation. As the work is in consequence all somewhat backward, and the scarcity of labour still continues, it is quite probable that some trouble in getting through the coming season's work may be experienced.

D. J. BUCHANAN,
Assistant Forester.

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
General utilization	...	68 17 7
Tree-planting	34 16 0	4,199 0 8
Pitting	80 6 0	5,418 4 9
Clearing	258 11 0	6,182 11 5
Cartage of trees	14 18 6	326 15 10
General upkeep of plantation ...	1,629 3 7	7,918 12 5
General repairs	107 16 8	506 0 5
Horse-feed	165 10 0	1,006 8 11
Permanent works—		
Fencing	49 13 0	1,127 14 10
Road-formation	...	368 15 2
General formation	204 19 6	701 8 10
Buildings	109 6 0	972 19 7
Water-service	...	95 5 6
Stock, implements, &c.—Tools and implements	16 3 9	636 14 2
Supervision and clerical—		
Supervision of free labour	419 4 6	
,, prison labour ...	205 0 0	3,727 3 4
Clerical assistance	40 0 0	
	£3,335 8 6	£33,256 13 5

Statement of Value of Prison Labour.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	221 4 10	1,779 13 1
Pitting	212 2 9	728 4 3
Clearing	84 10 0	1,641 14 8
General upkeep of plantation	368 7 8	1,754 16 5
General repairs	6 3 9	316 10 2
Miscellaneous work	1 18 9	97 18 1
Permanent works—		
Fencing	...	7 13 0
Formation	36 10 5	1,021 8 1
Buildings	0 5 0	206 1 0
	£931 3 2	£7,553 18 9
Average daily number of prisoners employed during year ...		... 9·51
,, ,, since camp started		... 12·21

Schedule III.—Trees Account.

	Number.
Trees received during year	1,236,350
Less to replace blanks	557,775
Planted on new area	678,575
Previously planted	12,008,451
Total number planted on 5,749 acres (average age, five years and a half)	12,687,026

Schedule IV.—Property Account.

	£ s. d.
Land (9,580 acres): Crown land not charged to Forestry Account	
Buildings	919 2 5
Improvements	1,588 4 9
Fencing	756 1 6
Stores in hand	319 15 3
	£3,583 3 11

Balance-sheet.

	£ s. d.
Total expenditure	40,810 12 2
Less Property Account	3,583 3 11
Cost of operations	£37,227 8 3
5,749 acres planted (average age, five years and a half).	
Estimated value of plantation per acre	£9 0 0

Schedule V.—Statement showing Cost of Operations.

	For Year. £ s. d.	To Date. £. s. d.
Total expenditure	3,335 8 6	33,256 13 5
Deduct cost of buildings, fencing, &c.	380 2 3	3,902 18 1
	2,955 6 3	29,353 15 4
Add proportion total cost buildings, &c.	226 19 8	1,299 0 9
	3,182 5 11	30,652 16 1
Deduct cost of maintenance	1,737 0 3	8,424 15 10
Cost of planting 299 acres	£1,445 5 8	
Cost of planting 5,749 acres		£22,228 0 3
Average cost per acre for planting	£4 16 8	£3 17 4
Average cost per acre per annum for maintenance	0 6 0	0 2 0

Statement showing Cost of Operations (with Value of Work done by Prison Labour treated as an Expenditure).

	For Year. £ s. d.	To Date. £ s.
Total expenditure	3,335 8 6	33,256 13 5
Prison labour, value of	931 3 2	7,553 18 9
	4,266 11 8	40,810 12 2
Deduct cost of buildings, fencing, &c.	416 17 8	4,138 0 2
	3,849 14 0	36,672 12 0
Add proportion of cost of buildings, &c.	288 15 11	1,637 5 11
	4,138 9 11	38,309 17 11
Deduct cost of maintenance	2,111 11 8	10,496 2 5
Cost of planting 299 acres	£2,026 18 3	
Cost of planting 5,749 acres		£27,813 15 6
Average cost per acre for planting	£6 15 8	£4 16 9
Average cost per acre per annum for maintenance	0 7 4	0 2 6

Summary of Trees planted.

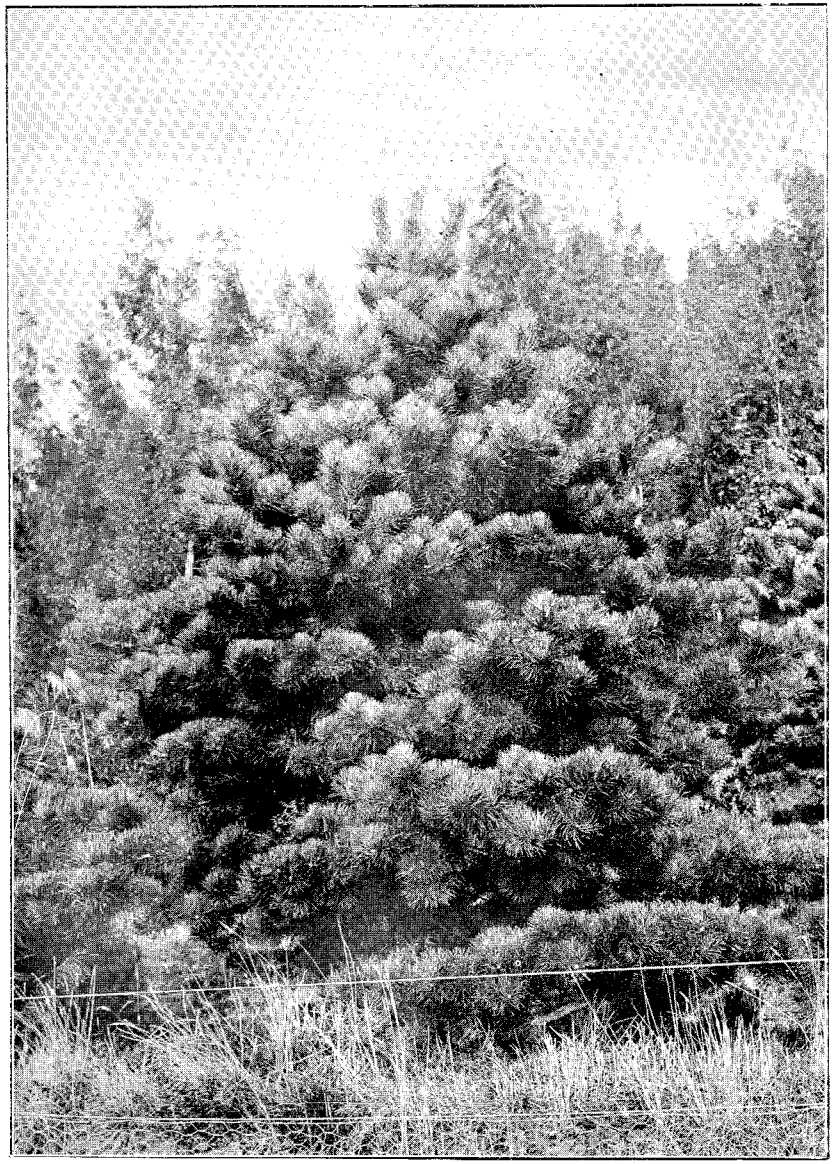
How used.	Number.
Number on plantation at present day—	
Contents of various blocks	12,686,551
Ornamental and shelter trees at prison camps, &c. ...	475
Total trees now living	12,687,026
Number used to replace failures, &c.—	
Experimental trees not suited to district	266,305
Used to replace failures	2,465,863
Total	15,419,194
Less trees raised from seed sown *in situ*	109,725
Trees received from nursery	15,309,469

Summary showing Area of Whakarewarewa Plantation (5,748·94 Acres in Trees).

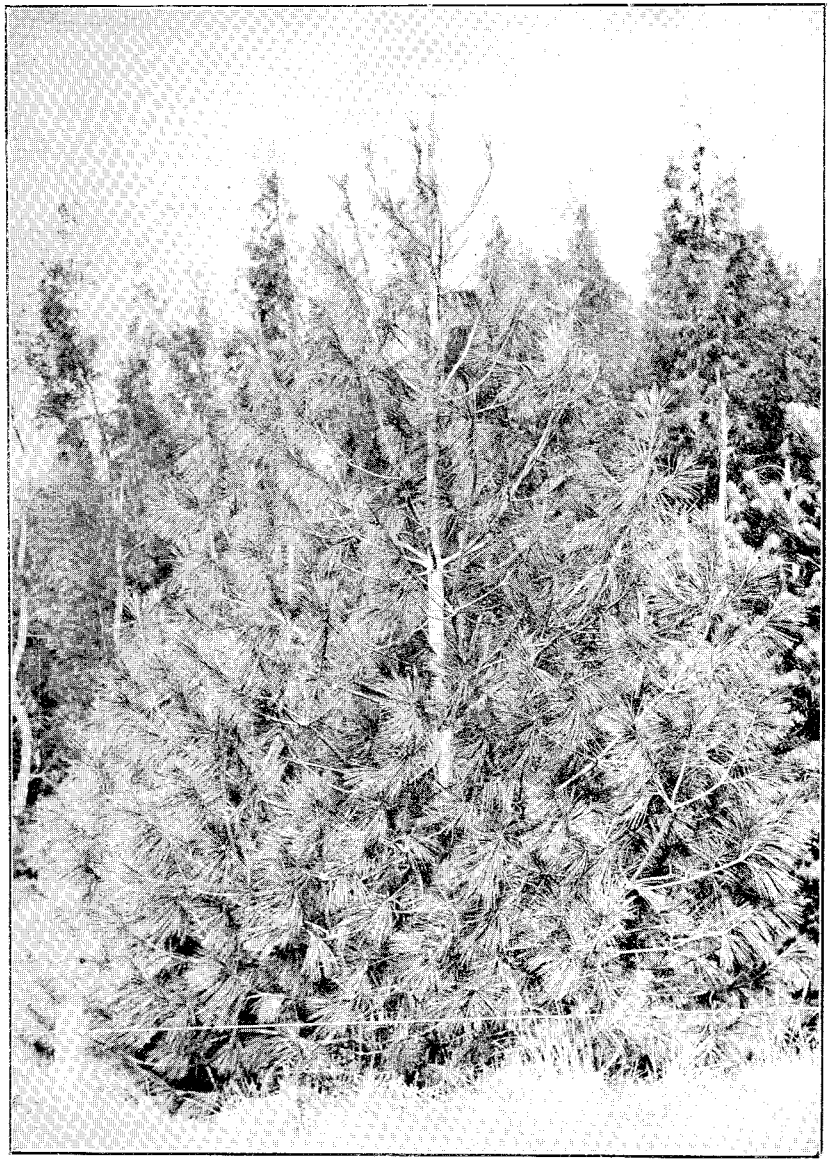
How occupied.	Acres.
Larch	2,449·80
Pines	1,541·20
Blackwood	79·00
Eucalypti	1,534·30
Walnut	9·70
Spruce, *Picea, Pseudo-tsuga*	119·00
Birch	5·80
Alder	8·94
Poplar	1·20
Roads, tracks, and fire-breaks	450·85
Land unsuitable for planting, including swamps, creeks, horse-paddocks, residence reserves, water-main reserve	458·71
Unplanted land	2,922·30
	9,580·80

Summary of Trees growing on Whakarewarewa Plantation.	Number.
Acacia melanoxylon	123,174
Acer pseudo-platanus	32,536
Alnus glutinosa	26,393
Betula alba	6,585
Cupressus thurifera	420
Eucalypti	2,103,767
Juglans regia	13,800
Junipérus virginiana	670
Larix europaea	6,082,810
,, occidentalis	50
Liquidambar styraciflua	1,700
Picea excelsa	195,025
,, sitchensis	91,175
Pinus austriaca	283,655
,, Benthamiana	19,600
,, canariensis	6,300
,, Coulterii	375
,, densiflora	2,325
,, Jeffreyii	2,200
,, Lambertiana	170
,, Laricio	2,711,400
,, Massoniana	50
,, muricata	6,320
,, Murrayana	10,225
,, ponderosa	505,650
,, ponderosa, var. scopulorum	575
,, radiata	147,800
,, resinosa	375
,, Sabiniana	25
,, teocote	2,250
,, Thunbergii	700
,, Torreyana	1,320
,, taeda	1,100
Platanus orientalis	1,900
Populus monilifera	600
Pseudo-tsuga Douglasii	209,583
Sequoia sempervirens	90,673
Thuja plicata	3,275
Total	12,686,551

D. J. Buchanan,
Assistant Forester.



ROTORUA.—PINUS RIGIDA, AGE NINE YEARS, HEIGHT 12 FEET.



ROTORUA.—PINUS EXCELSA, AGE NINE YEARS, HEIGHT 14 FEET.

Rotorua.—Seed-beds of Corsican Pine, with Larch and Eucalypti Plantation in Background.

Narrow Silver-birch Avenue leading to Hanmer Springs Nursery. Also serves as a Fire-barrier.

Waiotapu Plantation.

(Area, 7,777 acres; altitude (approximate), 1,200 ft. to 2,000 ft.)

Rain was registered on 150 days during the year, the total fall being 43·32 in. The maximum shade temperature of 89° F., recorded on the 30th December, was the highest reading at this station during the past five years. The minimum temperature was 18° F., on the 1st August. Frost occurred on eighty-one nights.

The month of September being exceptionally mild brought on splendid new growth, but unfortunately this was followed by severe late frosts which cut back some of the more tender species.

Trees to the number of 1,812,250 were received from the Rotorua Nursery. Of this total, 1,356,475 were planted out over a new area of 498 acres, 449,125 were used in replacing the deaths in previous years' plantings, and the remainder (6,650) were used for shelter-belts around the paddocks on the Kaingaroa Plains. As in former years, the bulk of the planting was done by prison labour, which accounted for 1,126,825 trees on new area and 266,075 in the replacing of deaths. Planting by free labour was mostly on outlying parts of the plantation, 229,650 trees being on new area and 183,050 in replacing failures. 2,760 poplar cuttings were planted, principally on land unsuitable to other trees.

Of the season's planting *Pinus radiata* seedlings were unable to withstand the severe winter frosts, and quite 50 per cent. will have to be replaced. Late frosts accounted for a good many losses in the Corsican pine, especially where this species had been planted on tussock country. With these exceptions, the remainder of the trees have made good headway, the tall seedling larch doing remarkably well. Taken right through, the season has been a good average one. The damage in the larger trees, due to late frosts, is confined to Douglas fir, and to small areas of larch planted on low-lying land, the trees being repeatedly cut back. Former plantings still continue to make strong healthy growth.

The formation of the new prison camp on the Kaingaroa Plains was completed in November last, and by the middle of January all the prison huts had been shifted on to the new site. It is now intended to work the area in the Waiotapu Valley with free labour, while the prison labour will be used on extension work on the Kaingaroa Plains.

The buildings formerly used by the Prisons Department as kitchen, dining-room, and store have been altered to provide accommodation for some of the men; this is greatly appreciated, as a cook can now be employed, and will probably be the means of the men stopping longer at the work than has been the rule in the past. Increased storage-room was obtained in the implement-shed by some slight alterations. At No. 1 camp the old raupo tool-shed was pulled down, and to replace it a wooden shed 20 ft. by 8 ft. was erected. All the necessary labour in connection with the building and alterations was carried out by one of the workmen employed on the plantation.

So far as can be ascertained, the plantation is practically free of disease. It is impossible at this stage to make a systematic examination of the different blocks, owing to the difficulty in moving about amongst the trees; and until the lower branches have been trimmed the amount of disease, if any, cannot be accurately stated, but so far as is possible the different blocks are kept under constant observation.

Boundary fire-breaks were widened an extra half-chain in several places by cutting and burning the manuka outside the fence, thus making an efficient fire-break for the present. 440 chains long by about 1 chain wide were reploughed, the remainder of the breaks being kept clear of all inflammable growth.

The horse-paddock near the No. 1 camp was thoroughly tile-drained, worked, and sown with a mixture of permanent grasses, resulting in an excellent sward. An easily drained swamp adjoins this paddock, and will be gradually brought under cultivation to enlarge the present paddock.

Rabbits and hares being on the increase, and doing a good deal of damage to the young trees, a man was constantly employed during the winter and spring months in trapping and poisoning, with good results.

The average daily number of men employed during the year was 10·02. A record of the rainfall and temperature for the year is attached.

J. Mason,
Assistant Forester.

Kaingaroa Plains.

(Area, 33,355 acres; altitude (approximate), 1,800 ft.)

The prisoners were transferred here from the Waiotapu Valley on the 15th November, since which time those men who were not required upon work in connection with the establishment of the camp have been employed clearing land and digging pits for tree-planting. It is expected that by the time the tree-planting season arrives 700,000 pits will have been dug, which number, added to those dug previously by free labour, will make about 2,000,000 available for tree-planting. The land which has been pitted is suitable for pines only, and it is intended to confine this year's planting to Corsican pine. Owing to the exposed nature of the plains generally, wherever possible the native vegetation is being left untouched, in order to provide shelter for the trees when they are planted. Unfortunately fires have gone over portions of it, and in such places only the hardiest trees will thrive. An experiment was made in sowing seeds of a number of trees in order to ascertain if there was any chance of stocking the land in this manner instead of planting. The seed was sown broadcast upon a strip of land which had been ploughed, left to fallow, and then harrowed. Birch, *Pinus radiata*, *Pinus ponderosa*, *Pinus Laricio*, Douglas fir, and *Eucalyptus Stuartiana* were all tried, but in each case the result was failure. The seed germinated badly, and any seedlings which came through soon succumbed, owing probably to the unfavourable climatic conditions. Further trials on a small scale will be made, but land on which there is a growth of fern or manuka will be chosen, because it is apparent that the seedlings must have protection from the sun and wind in their young state.

The establishment of the prison camp necessitated a considerable amount of labour in finishing the buildings and the water-service system, in laying drains, carting huts, &c. Most of this work was satisfactorily performed by prison labour. The water-supply has so far proved adequate and otherwise satisfactory. In addition to the supply from the spring, a concrete cistern, with a capacity of 14,000 gallons, was built to collect the rain-water off the roofs of the buildings, and this supply goes a long way towards satisfying the requirements of the camp.

An average daily number of 15·20 prisoners was employed throughout the year.

R. MACRAE,
Assistant Forester.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	In.		Deg. F.	Deg. F.	
April	3·92	18	68	32	1
May	2·48	7	68	20	15
June	5·88	18	60	21	10
July	4·66	12	62	20	16
August	3·59	9	61	18	23
September	5·61	26	62	37	..
October	4·91	15	71	25	8
November	2·14	13	75	24	4
December	0·50	4	89	36	..
1913.					
January	5·22	13	84	32	1
February	0·97	6	85	32	1
March	3·44	9	83	28	2
Totals	43·32	150	..	..	81

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	61 3 1	706 19 3
Pitting	64 15 6	700 11 6
Clearing	33 8 3	694 4 9
Cartage of trees	25 5 6	606 10 8
General upkeep of plantation ...	523 19 2	2,064 10 2
General repairs	134 9 4	340 6 5
Horse-feed	189 13 0	1,019 6 9
Permanent works—		
Fencing	14 12 9	1,761 10 0
Formation	299 18 2	1,081 2 4
Buildings	242 10 11	2,087 6 4
Water-service	208 18 10	378 2 7
Stock, implements, &c.—Tools and implements	48 6 2	910 10 0
Supervision and clerical—		
Supervision of free labour	420 0 0	4,640 10 9
,, prison labour	290 0 0	
Clerical assistance	80 0 0	
	£2,637 0 8	£16,991 11 6

Statement of Value of Prison Labour.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	287 16 7	6,520 4 11
Pitting	139 15 0	6,857 2 4
Clearing	74 3 0	5,724 7 3
General upkeep of plantation	453 4 2	3,905 0 8
General repairs	13 5 0	180 0 0
Horse-feed	2 15 0	9 18 0
Permanent works—		
Fencing	1 12 6	400 15 2
Formation	48 14 0	482 14 0
Roadmaking	...	542 3 4
Buildings	85 16 0	554 3 4
Water-service	91 15 6	98 8 6
	£1,198 16 9	£25,274 17 6
Average daily number of prisoners employed during year ...		15·20
,, ,, since camp started ...		30·35

Schedule III.—Trees Account.

	Number.
Trees received during year	1,812,250
Less to replace blanks	449,125
Planted on new area	1,363,125
Previously planted	16,320,654
Total number planted on 6,747 acres (average age, five years)	17,683,779

Schedule IV.—Property Account.

	£ s. d.
Land (41,132 acres): Crown land not charged to Forestry Account	...
Buildings	2,142 8 2
Improvements	2,014 10 11
Fencing	1,287 10 8
Stores in hand	470 11 0
	£5,915 0 9

Balance-sheet.

	£ s. d.
Total expenditure	42,266 9 0
Less Property Account	5,915 0 9
Cost of operations	£36,351 8 3
6,747 acres planted (average age, five years).	
Estimated value of plantation per acre	£8 16 0

Schedule V.—Statement showing Cost of Operations.

	For Year. £ s. d.	To Date. £ s. d.
Total expenditure	2,637 0 8	16,991 11 6
Deduct cost of buildings, fencing, &c.	814 6 10	6,218 11 3
	1,822 13 10	10,773 0 3
Add proportion total cost of buildings, &c.	356 8 1	1,868 19 7
	2,179 1 11	12,641 19 10
Deduct cost of maintenance	658 8 6	2,404 16 7
Cost of planting 477 acres	£1,520 13 5	
Cost of planting 6,748 acres	...	£10,237 3 3
Average cost per acre for planting	£3 3 9	£1 10 4
Average cost per acre per annum for maintenance	0 2 0	0 0 7

Statement showing Cost of Operations (with Value of Work done by Prison Labour treated as an Expenditure).

	For Year. £ s. d.	To Date. £ s. d.
Total expenditure	2,637 0 8	16,991 11 6
Value of prison labour	1,198 16 9	25,274 17 6
	3,835 17 5	42,266 9 0
Deduct cost of buildings, fencing, &c.	1,042 4 10	8,296 15 7
	2,793 12 7	33,969 13 5
Add proportion total cost of buildings, &c.	464 6 2	2,515 9 10
	3,257 18 9	36,485 3 3
Deduct cost of maintenance	1,124 17 8	6,489 17 3
Cost of planting 477 acres	£2,133 1 1	
Cost of planting 6,748 acres	...	£29,995 6 0
Average cost per acre for planting	£4 9 6	£4 9 0
Average cost per acre per annum for maintenance	0 3 4	0 1 6

Summary of Trees planted.

How used.	Number.
Number on plantation at present day—	
Contents of various blocks	17,627,338
On fire-breaks	11,367
Ornamental and shelter trees at prison camps, &c.	43,586
Experimental trees	1,488
Total trees now living	17,683,779
Number used to replace failures, &c.—	
Leguminous plants used as bait for rabbits and hares ...	1,425
Ornamental trees destroyed by rabbits and hares	16,000
Experimental trees not suitable for district	757,214
Used to replace deaths	2,237,018
	20,695,436
Less trees raised from seed sown *in situ*	83,121
Trees received from nursery	20,612,315

Summary showing Area of Waiotapu Plantation (6,747·70 Acres in Trees).

How occupied.	Acres.
Larch	3,255·45
Pines	3,299·80
Eucalypti	180·50
Birch	11·95
Roads, tracks, and fire-breaks	312·30
Land unsuitable for planting, including swamps, creeks, horse-paddocks, and residence reserves	260·25
Unplanted land	457·05
,, (Kaingaroa Reserve)	33,355·00
	41,132·30

Summary showing Number of Trees growing on Waiotapu Plantation.

Acacia melanoxylon	1,256
Betula alba	39,230
Cupressus thurifera	400
Eucalypti	72,000
Larix europaea	8,942,630
Pinus austriaca	1,108,025
,, contorta	3,000
,, Coulterii	475
,, excelsa	200
,, Jeffreyii	6,625
,, Lambertiana	3,925
,, Laricio	5,478,135
,, muricata	43,800
,, Murrayana	4,100
,, ponderosa	1,153,700
,, ponderosa, var. scopulorum	1,475
,, ponderosa, var. Benthamiana	238,275
,, radiata	248,875
,, resinosa	2,150
,, rigida	12,200
,, strobus	159,950
,, teocote	3,000
Pseudo-tsuga Douglassi	89,712
Thuja plicata	14,200
	17,627,338

H. A. Goudie,
Superintending Nurseryman, North Island.

Puhipuhi Plantation.

(Area (approximate), 1,200 acres; altitude, 1,000 ft.)

The rainfall for the year amounted to 39·13 in., falling on 145 days, the heaviest monthly fall being in July, when a fall of 9·95 in. was recorded. The greatest shade temperature was 90° F., recorded in March, and the minimum temperature was 31° F., in August. Frost occurred on four occasions.

The rainfall for this year is exceptionally low. Since 1906, when records were first kept, to the end of this year the average annual precipitation was 81·72 in. on 171 days. In 1907, 110 in. were recorded, which is the maximum fall in the period under review, and the lowest fall prior to this year was 71·45 in., in 1908.

The Puhipuhi State Forest Reserve consists of some 10,000 acres, which at one time was covered with a splendid kauri forest. Since this has disappeared the land has gradually become covered with bracken and dead logs, both fallen and standing, as is usual upon cut-out forest areas which have been burnt out. Practically nothing has been done by way of farming the land, owing probably to the fact that only short leases can be granted so long as it remains State forest reserve. It is true that a little grazing has been done, but this has simply been the using of the growth which usually comes after a fire without any attempt being made to grass the land in a proper manner. In its present condition this large area is a real menace to the plantation areas, and this fact was amply illustrated last January when a fire burnt over some 500 acres of *Eucalypti* plantations. The fire started on unoccupied land about a mile from a 100-acre block of *Eucalypti* which is detached from the main area planted. It spread with great rapidity, and before the caretaker could procure assistance the whole of this area had been burnt. The next difficulty was to keep it from spreading into the main area of plantation, but owing to the strong wind carrying sparks from burning stumps and logs it eventually broke out here, and soon swept over the best portion of the plantation. For some months prior to the outbreak no appreciable quantity of rain had fallen. The whole of the district was parched, the grass paddocks were as bare as a ploughed field, and consequently fire was readily spread by means of sparks. With regard to the damage done, this is not so great as might be supposed. The fire must have burnt very quickly, and, except where rotten logs or stumps became ignited, it did not last long. This conclusion is inferred from the fact that the foliage, which, of course, is scorched and lifeless, is still adhering to the trees, and that the topmost leaves on many of the trees of 14 ft. to 16 ft. in height are untouched by the fire. Since the fire most of the trees have made numerous shoots from the base of the trunk, and if the old wood is lopped off it will soon be replaced by a new stem. This work is now proceeding. Prior to the fire good growth was being made by *Eucalyptus resinifera*, but most of the other species of *Eucalyptus* planted were doing very indifferently.

The expenditure for the year amounted to £235 5s., which includes the wages of the caretaker and the employment of extra labour for fire-fighting.

The daily average number employed during the year was 2·11.

A record of the temperature and rainfall follows.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	In.		Deg. F.	Deg. F.	
April	5·40	19	74	38	..
May	3·57	10	66	34	..
June	3·31	16	62	36	..
July	9·95	20	62	33	..
August	5·15	16	61	31	4
September	4·77	20	66	38	..
October	2·24	16	71	36	..
November	1·30	11	75	39	..
December	0·47	5	86	42	..
1913.					
January	1·64	3	89	42	..
February	0·27	3	86	42	..
March	1·06	6	90	40	..
Totals	39·13	145	..	..	4

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	...	1,106 1 11
Pitting	...	1,552 14 0
Clearing	...	963 17 0
Cartage of trees	...	179 13 3
General upkeep of plantation	201 10 11	3,339 3 9
General repairs	4 6 5	142 18 0
Horse-feed	...	33 16 3
Permanent works—		
Fencing	...	471 0 3
Purchase of land	...	10 4 3
Formation	...	36 13 0
Buildings	...	355 4 9
Stock, implements, &c.—Tools and implements	4 7 8	326 9 3
Supervision and clerical—		
Supervision of free labour	15 0 0	982 9 7
Clerical assistance	10 0 0	
	£235 5 0	£9,500 5 3

H. A. Goudie,
Superintending Nurseryman, North Island.

REPORT ON AFFORESTATION OPERATIONS IN THE SOUTH ISLAND.

[By the Superintending Nurseryman, Tapanui.]

In adherence to the usual custom, I beg to make brief allusions to the special features of the year's forestry operations, details of which are given in local reports by officers in charge. A glance at the meteorological chart appended will convince one of the abnormally wet season we have just experienced; but, fortunately, this fact has not, on the whole, prevented the attainment of a very fair measure of success. Although at our Canterbury station the rainfall (50·73 in. on 139 days) was greatest, a precipitation of 43·45 in. occurred over an additional seventy-four days at Tapanui Nursery. At Central Otago the striking feature of the year's work is the unprecedented success in the raising of seedlings, whose rapid development points conclusively to the increased benefits arising from the combined natural application of water and earlier sowing. On 122 days the rainfall aggregated 22·67 in., which creates a greater fall than over any similar period during the fifteen years of weather observations at Ranfurly. Unfortunately, several late frosts were experienced at each station, injuring, more or less, the tender terminal shoots of the more sensitive trees; but generally the damage was not irreparable. Snowfalls were rare; but on one occasion at Hanmer Springs a stoppage of all operations for some weeks was brought about by an unusually heavy fall, which, although creating great discomfort, did not cause much damage to either seedlings or trees.

Nursery-work and Associated Expenditure.

The result of the season's tree-raising work in the three nurseries certainly supports the theory advanced by many persons that there is less likelihood of general failure arising in this phase of the work from various causes when trees are grown in several localities differing in climatic influences. An increased amount of moisture, for instance, in Central Otago is conducive to an improvement in results, whilst the heavy nature of the surface soil in the Tapanui district makes the growing of trees difficult in seasons (such as the past) when spring rains are not only heavy but persistent. Under the circumstances, the raising of some 5,144,950 seedlings (which is over a million in advance of last season's figures) may be looked upon as the outcome of careful management by the officers conducting the work. The actual cost of seed-sowing, covering with frames, scrimming, and other labour necessary during the first season amounted to £538 7s., which is a much better return than that shown in the previous reports. The development of these yearlings to the transference size, however, is generally so affected by the grubs, damping off, and other inherent pests that it is a wise policy to make provision for a 20-per-cent. death-rate when arranging for their transplantation. Each nursery is well stocked with trees ranging in ages from one to four years. The combined total, as shown in Schedule III, reaches 9,621,540, representing a value of £14,034 13s. 10d.; and omitting the records of the defunct Starborough Nursery, the average cost per thousand of growing the trees up to a sufficiently strong state for permanent planting, and bundling same in readiness for transportation, amounts to £1 8s. As by far the largest proportion of the output from the South Island nurseries are three-year-old trees, this rate of production is consistent with the best efforts recorded elsewhere, although we must always take into consideration the low rate of wages paid to employees engaged on similar work on the Continent when framing comparisons of results attained.

Since the year 1896 some 22,685,225 trees of various ages have been distributed from the four nurseries to State plantations, and, in addition, domains and public institutions have benefited similarly to the extent of 2,199,132, making a total output to date of 24,884,357.

Special Remarks concerning Principal Trees grown.

Although details of the development of trees at each plantation is presented in the following pages, a supplementary reference enlarging on the merits and demerits of certain trees may assist in substantiating facts that call for greater prominency. Since the initiation of the southern nurseries the energies of the Department have in great measure been directed upon the creation of *Larix europaea* plantations, nor have we until the past two years had any cause to regret specializing with this tree, of which some 6,591,299 are now growing in the eight State forests. Although in certain parts of Canterbury larch have always been regarded in an unfavourable light by arboriculturists, nevertheless the exceedingly rapid headway and healthy appearance until recently of the species tended to prove the wisdom of their inclusion in the varieties operated with even at Hanmer Springs, where, however, the altitude reaches 1,225 ft.

To the dryness experienced two years ago was attributed a mysterious discoloration of larch needles and on enlisting the services of Mr. A. H. Cockayne, Biologist to the Agricultural Departmtent, a diagnosis of the trouble revealed only climatic interference with the foliage. Realizing that pure larch forests are difficult to raise, owing to their sensitiveness to the contraction of disease, officers make frequent examinations for traces of fungus troubles. In conjunction with the Biologist, information is also being secured relative to the development of perithecia in the fallen needles, so that the determination of the presence of the previously suspected *Sphaerella laricina* will be possible at an early date. The question now arises, is it advisable to continue planting larch with the present uncertainty of success? Well-drained partially sheltered hillsides in a moist locality of about 1,000 ft. or more above sea-level are generally recognized as ideal conditions for larch-growing, and these conditions exist at most of our plantation areas.

On the other hand, a consistent progress is being maintained by both *Pinus Laricio* and *Pinus ponderosa*, probably two of the most valuable species of the genera now being operated with. Plant either of these pines in a fairly sheltered, warm position, and a growth of from 18 in. to 2 ft. annually might be expected; but the same healthy tone prevails, even if somewhat slower headway is made, if the most exposed or rocky situations are allocated to them. It

is satisfactory to note that a total of 5,697,582 of the mentioned pines are now accounted for on the plantations, and the future extension of these blocks will receive the greatest attention of the Department. The commercial value of *Pinus radiata* timber for rough indoor purposes will not be lost sight of, although so far we have given preference to the yellow and Corsican species. In the fertile gullies *Fraxinus excelsior* and *Pseudo-tsuga taxifolia* are flourishing, and no more profitable trees could be introduced into such positions.

Much consideration was given to the growing of the various piceas at the beginning of forestry operations, probably on account of the simplicity in propagating and cheapness of the seed and a minimum loss in establishing the spruces on the plantation areas. For some years past, however, the Department has almost ignored the supplementing of the 1,267,825 *Picea excelsa, Picea sitchensis,* and *Picea alba* trees now in various stages, principally in the South Otago forests, and present indications pointing to only partial success, our early decision to discontinue planting any of the mentioned species may be regarded with favour. The spruces, however, behave most inconsistently, for while at Dusky Hill Plantation their height on the sidlings has only been increased by from 18 in. to 4 ft. in twelve years, a much greater vigour has been displayed by those occupying almost similar situations at Conical Hills in about half that time.

Plantation-work, and Acquirement of Land.

Taking into consideration the adverse conditions under which we have had to labour, the output of 2,420,710 trees (as per Schedule V) may be regarded with approval. Of this number, 172,010 were utilized in replanting failures in previous plantings. The area under trees being augmented by 828 acres (against which an expenditure of £6,735 15s. 7d., including the value of prison labour performed, must be written) has now increased to 6,937 acres, containing 17,913,475 trees, as summarized in the associated table.

It will doubtless be pleasing to persons interested in the proposition of afforesting certain areas in Central Otago to learn that by establishing 608,250 trees at Naseby Plantation this season the total planted here over the past three years is advanced to a million and a half, which number greatly exceeds that similarly dealt with during the previous nine years of operations in the locality.

The comprehensive system of tabulating the cost of carrying on the various works prefacing these remarks will permit of instant comparison of one station with another, and the differences and annual fluctuations in costs may generally be attributed to the varying conditions under which the work is performed. For instance, the expense attached to the preliminary clearing, preparation of ground, and tree-planting at Hanmer Springs amounted to £1 14s. 6d., whereas the same operation was undertaken for £1 1s. 10d. at Naseby; but the very hard state of the surface at the former station prohibited good progress being made, and, in fact, contractors were loth to attempt the digging-work at times even at a greatly increased rate. It is satisfactory to refer to the general curtailment of expenditure in the item "General upkeep per acre," notwithstanding an almost equivalent amount of work being conducted. Tree-pruning, clearance of interfering vegetation, fire-break, and other maintenance works were carried on most economically at Dusky Hill and Hanmer Springs Plantations; but the fact of only a comparatively small number of trees requiring attention at the former station should not be overlooked.

The importance of almost immediately acquiring suitable ground for plantation-extension purposes is apparent. At neither of the chief stations is there a sufficient area to contain at the present rate more than two seasons' output of trees from the distributing nursery. In selecting future areas for tree-planting, not only should the altitude, character of soil, proximity to railway-communication, and rainfall statistics be considered, but the wind factor should also greatly influence the acquisition, as the retarding effect on tree-growth of strong prevailing south-westerly and north-westerly winds in certain districts, and particularly on the higher levels, makes the success in creating artificial plantations more problematical.

Fire-preventive Measures.

With an efficient protection against fires the problem of establishing forests becomes less difficult, and as more local experience is acquired annually, it is possible to effect improvements in this direction upon the more recent areas afforested. Although we might advantageously make greater use of the deciduous poplar and birch by increasing the width of the external fringe of these trees, and including strips on either side of the existing internal fire-lines, it is questionable if we could safely dispense with the custom of suppressing vegetation either near our boundary-lines or over the main areas now set apart as "fire-barriers." Two years ago it was resolved to include in future a few external lines of the partially fire-resisting poplars; but in this connection perhaps it would have been better, in view of the rapid depletion of the kahikatea forests and consequent necessity for substituting a suitable timber for converting into fruit and packing-cases, &c., to have decided upon the Canadian species (*Populus deltoides*) in place of the smaller-growing *Populus pyramidalis*, which, however, is recognized as an excellent shelter-tree throughout Central Otago. It is gratifying, however, to be able again to place on record the complete absence of any conflagration over our young forests. Perhaps in no previous year has less uneasiness been felt by responsible officers for the safeguarding of their plantations, and this fact must be ascribed to the moist conditions prevailing almost throughout that period when fires are most likely to occur. As referred to in the detailed report of Conical Hills Plantation, a grass fire was started near the planted reserve, and at one time became threatening; but after directing our full gang upon the outbreak, it was quickly subdued. Although generally varied experience is gained by employees in the

mode of successfully extinguishing such surface fires as are necessary in the preliminary clearance of tussocks, fern, gorse, &c., the suggestion advanced by an enthusiast to have special periodical tests of fire-fighting by employees when convenient is worthy of adoption. The projected extension of our private telephonic system will also permit of the speedy assembling of the staff in any case of emergency.

An expenditure of £155 was devoted to the general cultivation of fire-lines, and in our endeavours to lessen this annual-recurring outlay an experiment was conducted with sheep that promises to fulfil expectations. We have entered into the practical results achieved by, and financial aspects of, grazing enclosed fire-lines with sheep; but before effecting any extreme alteration to the present system the further experiment of giving the animals free access to all parts of the more established plantations is desirable, and will likely be undertaken during the current season.

Selwyn Plantations, Canterbury.

In adherence to the planting scheme decided upon some two years ago by the Selwyn Plantation Board a fair amount of successful work was carried out under the supervision of Overseer McIlwraith. At Hororata some 26,650 trees—17,000 *Pinus Laricio*, 9,000 *Pinus ponderosa*, and 650 *Pinus radiata*—were utilized in extending the plantation; whilst at Chaney's, efforts were directed solely in creating a barrier to the body of drifting sand, which is steadily encroaching upon the adjoining property, and reducing the efficiency of the existing fences. Some 17,800 marram-grass plants were thus used to fix the sand particles, and 2,000 pines (700 *Pinus maritima*, 250 *Pinus muricata*, and 1,000 *Pinus radiata*) in effecting a seaward break-wind. The proposals for the coming year include the planting of some 100,000 *Pinus Laricio* and *Pinus ponderosa* at Hororata, for which purpose three trained planters have already been temporarily transferred from Conical Hills Plantation. Notwithstanding an unexpected curtailed output of trees this year, the Board's desire to receive State-grown trees at cost price has been acceded to, and the mentioned pines will be duly transported from the nurseries in Canterbury and South Otago.

Abandonment of Prison Labour at Hanmer Springs.

The decision of the Justice Department to discontinue the utilization of prison labour for tree-planting at Hanmer Springs is regrettable in many ways; but with the gradual extension of reclamation-work and the enlargement of reformative farms the early cessation of tree-planting in Canterbury by prison labour did not come as a surprise. In briefly reviewing the work accomplished, too much stress cannot be laid upon the cordial relations existing between the officers of the co-operating departments and the extreme interest displayed by the Justice Department and its representatives in carrying on the work so successfully. Although prison labour has played a very important part in the plantation-extension work here more than one-half of the operations must be credited to free labour. During the year work to the value of £1,127 0s. 10d. was performed by the prisoners, which increases the credit of the Justice Department to date to £6,381 4s. 8d., as per details hereunder:—

Estimated Value of Prison Labour.

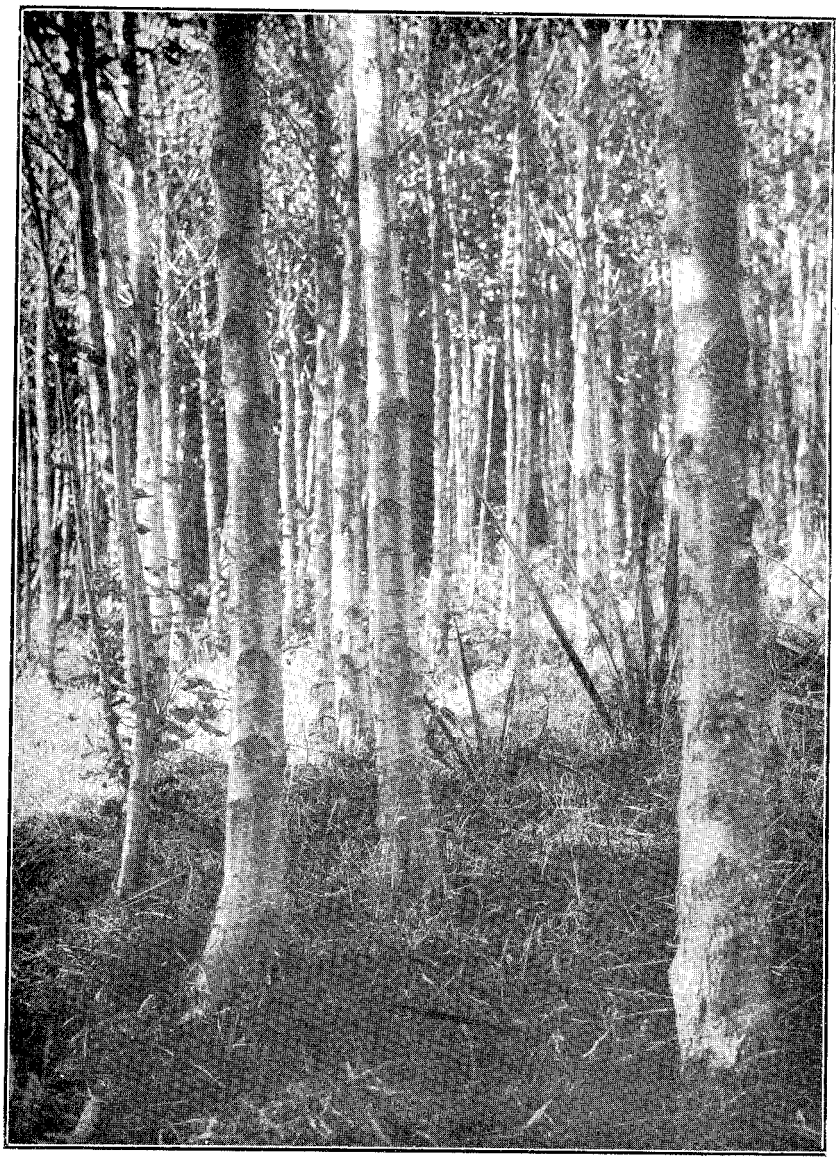
	During the Year. £ s. d.	Since 1903 to date. £ s. d.
Planting 643,865 trees	334 14 5	2,510 18 10
Preparing 433,033 pits	362 5 6	1,930 3 4
Clearing 290 acres	290 19 5	887 10 0
General upkeep of plantation	41 16 0	410 0 9
General repairs	...	153 1 9
Horse-feed	5 1 3	15 10 0
Fencing	13 10 0	80 1 6
Formation	78 14 3	268 6 6
Buildings	...	125 12 0
Totals	£1,127 0 10	£6,381 4 8

It is gratifying to be able to state that by each prisoner accomplishing work to the value of £74 2s. 10d. during the year the individual efforts recorded in any past year have been exceeded, the average individual annual working value since the commencement of the camp being set down at £47 19s. 6d. Not being conversant with the running-expenses of the institution, it is not possible to furnish here the debit side of the question, to which, however, must be added the reformative value of the undertaking. After making due allowance for the maintenance of the camp and lost time through inclement weather, a daily average of some 15·22 prisoners were engaged at forestry work throughout the year, and this discloses a slight numerical strengthening of the camp since the initiation.

With regard to the continuation of the tree-planting work, the employment of an additional ten free workers, or by increasing the number of contractors from seven to seventeen, the present output of trees from the local nursery may be handled satisfactorily, although a small outlay in providing accommodation for workers must be reckoned upon.

Damage by Red Deer.

Very perceptible damage has been done to hundreds of our youthful trees during the past season by the red deer, which, having gained access by jumping into the enclosures, now habitually frequent the plantations. Although at Tapanui Nursery provision was made for the



Alder (35 Feet) planted in Swampy Ground at Hanmer Springs in 1963.

Norway Spruce planted 8 Feet apart at Hororata Plantation, Canterbury.

A Fast-growing Plantation of Eucalyptus Stuartiana, near Darfield, Canterbury.

Oregon Pine and Norway Spruce growing under Ideal Conditions at Raincliff Plantation, Canterbury.

prevention of their ingress from the adjacent Blue Mountains by erecting special fences 6 ft. in height, this precaution was deemed unnecessary at other stations, where the ordinary 3 ft. 9 in. structures were provided. Should the animals persist in their destructive habits notwithstanding repeated stalking, our only safeguard will be in heightening the boundary-fences by the attachment of additional barb wires, and persevering with the shooting of the animals within the enclosure. The damage created by the red deer is confined chiefly to the ash and oak compartments at Dusky Hill, and in a smaller measure to larch at Hanmer Springs. The idea advanced by sportsmen that deer gradually acquire a taste for the foliage of certain species after previously ignoring such trees is borne out by the fact that a few years ago only trivial damage was reported; but now not only is the same foliage eaten readily, but leaders and laterals alike are chewed, and bark occasionally peeled. Undoubtedly the presence of stags gives greater cause for alarm, as they rub and strike their antlers against the trees at certain periods, necessitating the cutting-back to ground surface of certain deciduous trees. Needless to enlarge upon the volume of work inseparable from raising new "leaders," although at times we are compensated by being able to substitute perfectly straight boles for originally ill-formed ones. Officers in charge of the affected stations, although greatly handicapped by the density of the young plantations, were nevertheless successful in destroying four of the intruders during the year.

Destructive Influence of Grass-grubs on Nurseries.

It has been generally recognized that our greatest hindrance to successful tree-raising in the most southern nursery is the presence of the larvæ of *Odontria zealandica*, the beetles of which invade in large numbers the areas under young trees and green manurial crops. So far, by the application of certain combative measures, we have been able to greatly counteract the ill effects of the grub; but it is evident that more rigid preventive measures will require to be undertaken if the usual standard of success is to be maintained. The interest taken in the matter by Mr. A. H. Cockayne, Government Biologist, is commendable, and his valuable co-operation will surely lead to the determining of the local life-history of the insect and other information as will permit the formulating of practical control-methods. On forwarding a collection of beetles to the Biologist, it was ascertained that two species of *Odontria* were included —*O xanthosticta* and *O. zealandica*—so that the main flights of each species may not occur simultaneously. In the meantime all possible data is being collected, and present experiments with apterite, kainit, sulphate of copper, vapourite, permanganate of potash, and arsenate of lead will disclose to what extent these soil-fumigants and poisonous sprays may be put, in freeing the ground from the pest. Grass grows luxuriantly around the nursery enclosure, and it is certain that the beetles are attracted to our highly cultivated ground from the adjoining pastures. It is evident that although the seed-beds at the sowing period (October or November) may be comparatively free from the adult beetles or larvæ, the results from the main flight may prove quite disastrous to a seedling crop which in the earlier stages gave much promise of success. It would appear, then, that our efforts must be directed—Firstly, in blocking the ingress of the beetle to the seed-beds during the flying period; secondly, by spraying the surface with a chemical that will prove distasteful to the insect, and thus restrict its selection of the ground for egg-laying; thirdly, by inoculating the ground generally with a soil-fumigant of sufficient strength to make the situation uninhabitable to both the beetle and larva, whilst creating no interference to tree-growth.

Experimental and Educational.

It is imperative for the successful control of any growing institution to provide facilities for conducting worthy experiments connected with the work, and, although the soundness of suggestions emanating from officers of the staff are, when time permits, fully inquired into, the vast amount of detail matters calling for personal attention forbids many experiments being given sufficient application or study.

Soil-fertilization.

Any new methods of restoring the fertility of the soil and replacing the required humus are carefully tested. For the second season an interesting development has taken place on the area relieved of *Fraxinus excelsior*. On lifting the two-year-old crop of English ash one is impressed with the woody nature of the tap and issuing fibrous roots. By carrying out the usual cultivation-work, and sowing the relieved area with carrot-seed, an exceedingly fine crop of carrots evenuated, whilst the yield from a specially prepared block adjoining did not compare at all favourably. The opinion previously formed that the hardwoods so speedily reduce the fertility of the soil that a temporary relief from either tree or root-growing is essential after every crop of ash-trees must now be discarded, although further tests in this direction will be carried out. We have hitherto refrained from using extensively leguminuous crops for manurial purposes on account of the supposed refuge thus provided for grass-grubs, and have, as a substitute, kept the necessary areas in fallow, and applied bonedust and superphosphate. Consequent upon the two successive wet seasons, the growing and subsequent ploughing in of such crops as peas, crimson clover, cow-grass, and oats has been imperative, and it will be possible to accurately determine next year which, if any, of the mentioned cereals or grasses provides a breeding-haunt for *Odontria* beetles. The application of kainit at the rate of about 8 cwt. to the acre has been attended with much success, although the chloric salts not being absorbed by

the soil for some time the dressing is applied with most advantage some months before the transplantation of seedlings begins. Kainit has also proved of immense value in imparting a quality to the soil obnoxious to the beetles and larvæ. Periodically those portions of our nursery-areas where the predominance of clay is apparent receive a dressing of agricultural lime; but it may be interesting to state that the results are more satisfactory if ground so treated is permitted to remain "rested" until the ensuing season, as pines rarely fail to show their aversion to the presence of newly spread lime in any form.

Arboretum.

The small areas available have perhaps been the cause of postponing from time to time the laying-off on approved principles of an aboretum at each nursery to demonstrate the growth of the various timbers operated with, and disclose the possible success of those which are now considered undesirable from a sylvicultural point of view. Arrangements are now well in hand, however, to carry this laudable idea into effect, and, as we already possess a somewhat varied collection of trees and shrubs at each station, their rearrangement, labelling, and supplementing will be a simple matter.

Under-planting at Dusky Hill Plantation.

The experiment of under-planting with *Thuja plicata* is being conducted in a very moderate way, but nevertheless of sufficient magnitude to disclose the possibilities of using the Pacific red-cedar for creating ground-cover. In our more advanced larch compartments the canopy is less complete than it was two or three years ago, and consequently the action of the penetrating sun on the floor of the young forest has influenced, here and there, the regrowth of vegetation. The time for thinning and under-planting is therefore quickly approaching, and the experimental labour in this direction during the ensuing two years will verify or disprove the methods recommended for supposed similar conditions by Continental writers. In perfect shade the young *Thuja* have made 6 in. of healthy growth, and give every indication of being useful for the purpose in view. It is interesting to note that both spruce fir and Oregon pine have already shown their growing inconsistency when allocated positions under the larch shade. Certain specimens are observed making excellent progress, whilst others again refuse to respond to the conditions; but, by keeping a watchful eye upon the future behaviour of these shade-enduring trees, it should be an easy matter to ascertain the cause of their irregularity under what was hitherto considered to be ideal surroundings. Embodied in this report is a photograph showing the nature of a flourishing specimen of *Pseudo-tsuga taxifolia* planted simultaneously with *Larix europaea* in a specially mixed stand. Notwithstanding the proximity (4 ft.) of surrounding larch and the general evenness of height-growth, strong lateral branches have issued from the evergreen almost throughout the length of the bole, demonstrating clearly the presence of too much light and insufficient density of planting for the creation of ideal Oregon pine forests.

Timber and Seed Specimens.

The collecting of the world's timbers is proceeding slowly. Included in the 370 specimens of woods secured (which, however, are by no means representative of any country) are samples from India, Malay, East Africa, Australia, &c., and although in the past the limited time at the disposal of officers forbade entering minutely into the studies of wood-structure, this phase is now receiving attention, and for such comparative purposes even the present collection of timbers is exceedingly useful. It has been possible to also greatly supplement the collection of tree-seeds for reference purposes, whilst the preserving of entomological specimens associated with tree-culture has not been overlooked.

Publication of Forestry Journal.

Each officer is steadily accumulating much valuable knowledge, which, by its diffusion amongst fellow-officers and the public generally, would prove both highly interesting and instructive. The inclusion of many experiences in the annual report of afforestation operations is perhaps undesirable, inasmuch as the salient features are apt to be overshadowed by lengthy articles, although excellent in themselves, having little bearing on the actual season's work accomplished. To my mind, the publication annually (or, if circumstances warranted, at less periods) of a small illustrated journal devoted purely to forestry matters from a scientific and practical aspect would undoubtedly stimulate the desire for further research generally, and it is more than likely that solicitations for articles on kindred subjects would be responded to readily by enthusiasts willing to place on record the results of their observations and experiments.

Experimenting with certain Trees.

Probably the trial sowing of *Pinus taeda* was the most interesting experiment conducted with newly introduced varieties to the southern stations, and the 8,000 healthy seedlings issuing from 2 lb. of seed will be ample to test the adaptability of this species of pine for high altitudes and the more rigorous conditions obtaining in Central Otago. A previous test of *Picea pinsapo* and *P. Nordmanniana* not eventuating satisfactorily, a further attempt to secure better results with these species ended in only a slightly increased germinating percentage. Some 3,000 *Pinus Banksiana, P. patula, P. Montezumae, P. Murrayana, P. picea,* and *P. sylvestris* have reached the two-year-old stage without disclosing any ill effects from local climatic conditions. In next report, however, more complete data on the youthful characteristics of each species will be available, and accordingly influence our future operations with these members of the pine genera.

Divisional Plans.

In presenting explanatory plans of Conical Hills and Naseby Survey Plantations every effort has been made to combine accuracy with simplicity. The trial surveys have been carried out by the officers connected with each station, and the tabulation of statistics is sufficiently reliable for the basis of any future working-plan.

Outline of Proposals for 1913–14.

Dusky Hill Plantation.—Only a small expenditure is anticipated here during the coming year. At the present stage but two employees are required to carry out the general maintenance work, which embraces the replanting of sycamore compartments with more suitable trees, removing larch slash, pruning, and other maintenance works.

Conical Hills Plantation.—Preparations are in hand for dealing with an approximate 800,000 trees at this station. Probably the whole area enclosed will also be pitted in readiness for planting in the following season. In consequence of vegetation assuming such a rank state, a greater outlay than usual will eventuate under the heading of "General Upkeep."

Waitahuna Plantation.—The suppression of rank gorse and broom on this experimental plantation is necessary, although no further replanting measures are advisable at the present stage.

Naseby Plantation.—Some 300,000 trees are now sufficiently advanced in the Ranfurly Nursery for permanent planting there. As the portion of the run originally resumed for afforestation purposes will be fully taxed with this number, the further resumption of land and an almost immediate start at enclosing the property would be beneficial.

Gimmerburn Plantation.—The labour here will include the producing of horse-feed for other South Island stations not possessing such adaptability for grain-growing; general pruning and fire-preventive measures will also occupy some little time of an employee who will be temporarily transferred from the district nursery.

Hanmer Springs Plantation.—By combining free and prison labour no difficulty should be experienced in utilizing about 750,000 trees in extending this young forest. In addition, some 100,000 pines (for Hororata Plantation) have been placed at the disposal of the Selwyn Plantation Board. The dismantling and subsequent re-erection of divisional fences is also included in the year's projected extension scheme.

General.

No changes have occurred in the official staff, to whom my best thanks for cordial and able assistance is due.

Special visits of inspection were made by the members of the Forestry Commission, and at a later date by Mr. J. Strauchon, Under-Secretary for Lands.

Rainfall and Temperature recorded at the South Island State Nurseries.

Year.	Tapanui Nursery.				Eweburn Nursery.				Hanmer Springs Nursery.			
	Rainfall.		Temperature.		Rainfall.		Temperature.		Rainfall.		Temperature.	
	Inches.	Days.	Max.	Min.	Inches.	Days.	Max.	Min.	Inches.	Days.	Max.	Min.
1898–99 ..	36·32	170	90	22	13·42	93	88	14	..	..	..	..
1899–1900 ..	37·49	169	98	14	19·21	83	87	5	..	..	..	..
1900–1 ..	35·21	150	92	19	18·76	90	91	10	..	..	..	..
1901–2 ..	36·09	144	94	16	17·04	82	86	9	..	..	..	..
1902–3 ..	48·32	173	96	22	19·58	85	78	16	..	..	..	..
1903–4 ..	42·15	127	94	16	19·00	73	90	8	..	..	..	..
1904–5 ..	40·60	141	92	24	15·68	87	86	6	..	..	..	..
1905–6 ..	43·95	119	90	21	17·41	113	81	14	62·18	164	91	13
1906–7 ..	30·37	134	88	21	13·38	94	89	6	34·71	117	94	18
1907–8 ..	25·91	127	92	24	13·93	95	96	15	48·44	116	98	18
1908–9 ..	39·92	157	88	24	21·78	111	84	2	44·77	151	83	17
1909–10 ..	31·67	141	95	21	13·98	86	95	11	43·74	139	90	20
1910–11 ..	28·29	159	90	25	15·61	92	84	10	44·68	110	85	20
1911–12 ..	38·53	201	90	22	16·26	122	93	15	51·38	131	94	17
1912–13 ..	43·45	213	87	22	22·67	122	84	11	50·73	139	90	15
Averages ..	37·21 (Over period of 15 years).	155·0	..	..	17·18 (Over period of 15 years).	95·2	..	..	47·58 (Over period of 8 years).	134·6	..	..

NUMBERS AND SPECIES OF TREES GROWING IN THE SOUTH ISLAND (31ST MARCH, 1913).

Name of Tree.	Dusky Hill Plantation.	Conical Hills Plantation.	Waitahuna Plantation.	Gimmerburn Plantation.	Survey Paddock Plantation.	Naseby Plantation.	Hanmer Springs Plantation.	Dumgree Plantation.	Raincliff Plantation.	Total.
Acer pseudo-platanus ..	105,000	164,671	400	..	..	..	400	..	..	270,471
„ saccharum	350	2,575	125	..	..	..	..	..	..	3,050
Aesculus hippocastanum ..	1,800	..	..	..	..	..	..	..	..	1,800
Alnus glutinosa	8,750	42,750	1,200	..	..	..	67,460	..	..	120,160
Betula alba	25,000	108,125	4,300	..	5,960	..	26,215	9,000	..	178,600
Castanea vesca	2,050	..	..	..	..	..	..	..	..	2,050
„ (*in situ*) ..	6,200	..	..	..	..	..	..	..	..	6,200
Catalpa speciosa ..	27	..	..	..	..	..	..	..	..	27
Corylus avellana ..	480	..	..	..	..	..	..	..	..	480
Cotoneaster Simmondsii ..	1,800	..	..	..	..	..	..	..	..	1,800
Cupressus Lawsoniana ..	..	..	..	..	..	..	300	..	..	300
„ macrocarpa ..	..	360	..	..	..	..	..	..	..	360
Cytisus laburnum ..	2,500	10,175	..	..	..	..	..	..	..	12,675
Fagus sylvatica	..	4,250	..	..	..	..	..	..	..	4,250
Fraxinus americana ..	7,800	4,025	..	..	..	..	..	..	..	11,825
„ excelsior ..	201,000	371,300	700	..	..	..	..	..	..	573,000
Grisellinia littoralis ..	2,100	..	..	..	..	..	..	..	..	2,100
Juglans regia	13,000	20,080	..	..	..	..	..	..	..	33,080
Larix europaea	470,000	3,090,300	10,010	34,905	16,000	187,254	2,577,830	205,000	..	6,591,299
„ leptolepis ..	2,600	..	..	..	..	..	..	..	..	2,600
Picea alba	1,350	..	..	..	..	..	..	..	..	1,350
„ excelsa	202,000	815,525	3,300	..	..	..	63,395	..	..	1,084,220
„ sitchensis	85,000	63,375	..	..	..	..	33,880	..	..	182,255
Pinus austriaca	275,000	453,125	3,200	112,821	232,514	30,360	786,295	105,000	..	1,998,315
„ Benthamiana ..	25,000	59,770	..	..	9,180	75,764	56,400	12,000	..	238,114
„ canariensis ..	..	..	..	..	..	..	..	200	..	200
„ contorta	..	..	..	..	..	..	1,000	330	..	1,330
„ halepensis ..	..	325	..	..	..	..	..	1,600	..	1,925
„ insignis	500	25,458	..	..	200	..	10,800	600	..	37,558
„ Jeffreyii	100	25	..	..	..	..	150	..	..	275
„ Laricio	380,000	1,719,188	1,800	..	40,000	965,055	1,192,720	160,000	..	4,458,763
„ maritima	9,800	1,250	..	..	..	..	..	..	..	11,050
„ muricata	3,200	12,050	1,500	..	..	..	35,200	11,000	..	62,950
„ ponderosa ..	40,000	474,475	750	..	74,020	195,037	432,540	22,000	..	1,238,822
„ rigida	..	825	..	..	..	..	..	800	..	1,625
„ strobus	1,200	5,125	40	..	..	..	..	6,000	..	12,365
„ Torreyana ..	200	..	..	..	..	..	..	110	..	310
Pittosporum tenuifolium ..	1,600	..	..	..	..	..	..	..	..	1,600
Populus (vars.)	6,000	14,700	..	..	..	10,027	250	..	..	30,977
Pseudo-tsuga taxifolia ..	56,000	87,325	2,500	..	100	..	56,750	16,000	..	218,675
Pyrus aucuparia ..	1,800	3,195	..	..	11,580	..	..	..	..	16,575
Quercus pedunculata ..	205,000	133,825	700	..	..	..	..	..	..	339,525
Quercus pedunculata (acorns *in situ*	30,000	..	..	..	..	..	..	..	..	30,000
Robinia pseudo-acacia ..	1,100	8,350	..	..	..	..	..	20,000	..	29,450
Salix (vars.)	1,600	4,675	..	5,170	..	3,308	5,000	..	..	19,753
Sequoia sempervirens ..	..	200	..	..	..	..	..	..	..	200
Sophora tetraptera ..	2,500	225	..	..	..	..	..	..	..	2,725
Thuja plicata	800	24,325	..	..	..	..	286	..	..	25,411
Ulmus campestris ..	630	..	..	..	..	..	..	..	..	630
Various trees and shrubs ..	..	400	..	..	..	..	..	..	50,000	50,400
Totals	2,180,837	7,726,347	30,525	152,896	389,554	1,466,805	5,346,871	569,640	50,000	17,913,475

R. G. ROBINSON,
Superintending Nurseryman, South Island.

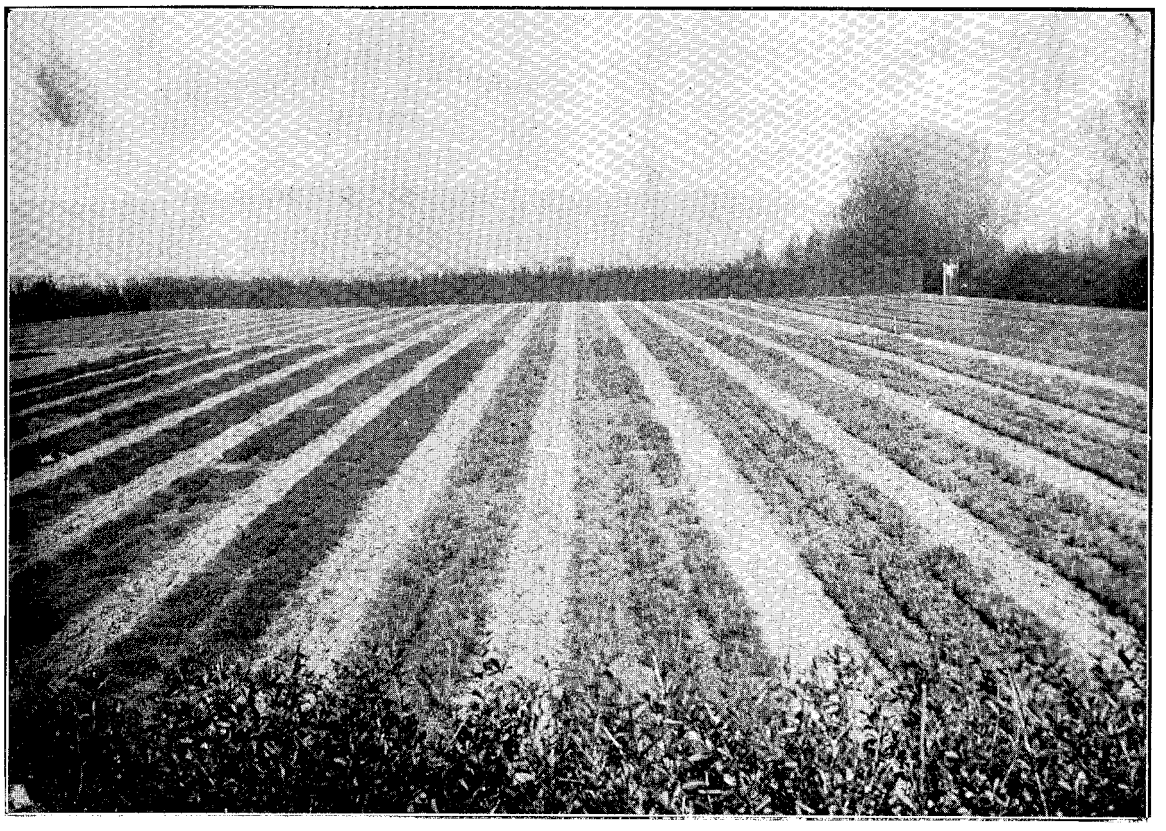
TAPANUI NURSERY, OTAGO.

(Area, 132 acres; altitude, 500 ft.; established, 1897.)

It is questionable if local tree-raising operations have had to be conducted under more adverse conditions since the establishment of this nursery than during the past season, and following immediately upon an unusually sunless year it is only reasonable to anticipate in the attainment in tree-growing work generally a decreased measure of success.

The annual rainfall (43·45 in. occurring over 213 days) is the heaviest yearly precipitation since 1905, and undoubtedly the wet weather has been more persistent than in any previous recording year. In most localities a similar rainfall to that experienced here would be looked upon with approbation; but the argillaceous composition of the surface soil and substrata on this station forbids systematic tillage unless a fair proportion of sunshine and drying winds are distributed throughout the season.

Raising of Seedlings.—Special attention was directed upon the seed-bed area by manuring and frequent tillage, and during the last two weeks of October some 476 lb. of tree-seed—as shown on Schedule V—were operated with under fair conditions. To the subsequent coldness must be attributed the slowness in germination throughout, although gradually an even though somewhat thin crop of seedlings resulted. It will be noticed that some 2,122,100 yearlings were



General View of Seed-beds containing 2,228,000 Young Plants at Ranfurly Nursery.

A Cultivated Fire-break at Naseby Plantation. Poplars will be planted on each side of Ploughed Land.

General View of Young Pinus Laricio and Pinus Ponderosa thriving at Nasery Reservoir Plantation.

Small Reservoir at Tapanui Nursery.

raised; but should the destructive work of the grass-grub continue unchecked by the series of experiments now in progress, it is doubtful if anything like this number will be realized ere the transplanting stage is reached. From 116 lb. of *Pinus Laricio* seed some 840,000 young plants were raised, and although this result cannot be termed disappointing, it was evident on applying the usual testing that the seed did not come up to the usual standard. Both *Pinus ponderosa* and *Pinus Benthamiana* came through somewhat sparsely, but evidently to their advantage, as some 183,000 plants are now sturdy enough for removal to lines. Having in view the more extensive use of *Pinus radiata*, it is gratifying to find that some 100,000 pines of this species are now available for transplantation. Experience here shows that the Monterey pine may be raised with less trouble than any other tree being operated with. A trial sowing of 2 lb. of *Pinus taeda* disclosed not only the excellent germinative capacity of the seed, but the partiality of the plant for local conditions. The usual amount of success was attained with *Pinus muricata*, *Pinus maritima*, and *Pinus Torreyana*. Perhaps the most interesting feature of the season's tree-raising, however, is the fine germinating record of *Pseudo-tsuga taxifolia*, of which 230,000 plants eventuated from 20 lb. of seed—a 300-per-cent. increase on the average issue from the Oregon pine seed since initiation. Small sowings of *Picea pinsapo* and *Picea Nordmanniana* were not attended with pronounced success, although the number raised will permit the furtherance of experimental work with the species. Contrary to expectations, the grass-grubs have shown a distinct partiality for the youthful *Cupressus macrocarpa*, *Sequoia sempervirens*, and *Sequoia gigantea*. The young plants were fairly numerous in the beds until the advent of the pest, when almost a total clearance was effected in the course of a few days. The continuation of a series of tests with the gums was undertaken. Exceedingly fine results were attained two years ago, but a partial failure must be attributed this year to the raising of *Eucalyptus Stuartiana*, *E. Gunnii*, *E. crebra*, *E. coriacea*, *E. amygdalina*, and this fact will tend to discount opinions freely expressed locally that the eucalypti may be raised quite successfully under the conditions prevailing here. As might be expected during a season when grass-grubs are numerous, the *Larix europaea* seedlings, after giving promise of great success, provided nourishment for the pest, which has probably reduced our crop by 50 per cent.

Transplanting Trees.—Notwithstanding every effort being previously made to have the area for lining-out in a free state, the heavy and prolonged rainfalls absolutely forbade the undertaking of the transplanting work on the prepared ground, which is naturally of a very heavy nature, and quickly becomes sodden. It was thus necessary as a last resource to convert one of our most suitable adjoining horse-paddocks (where the soil is of a more friable composition) into a temporary nursery, and erect a scrub breakwind for partial protection to seedlings. Although the tree-growth amongst the 1,303,576 one- and two-year-old seedlings handled is much below the usual standard, the present position of affairs justifies the temporary abandonment of the old nursery area in favour of the drier horse-paddock. It is fortunate that the greatest measure of success is associated with the *Pinus Laricio*, which are fairly well rooted both in lines and seed-beds. The 80,000 *Pinus ponderosa* were chiefly one-year-old plants when transferred to lines, and have progressed so well that a large proportion are sufficiently robust for permanent planting. Both *Pinus radiata* and *Pinus muricata* have been disappointing, and, in fact, have not developed enough to merit their shifting to any exposed situation. Experimental work with *Pinus Banksiana*, *Pinus patula*, *Pinus picea*, *Pinus Montezumae*, *Pinus Murrayana*, and *Pinus sylvestris* was persevered with, and it will be possible next year to more accurately determine the prospects of each species as a suitable addition to our present list of satisfactory growers. Very fair headway has been made with the Japanese larch—*Larix leptolepis*—which is scarcely as rapid in growth, but is apparently as alluring to the grass-grub as the European species. Some 4,000 fine three-year-old Pacific red-cedar (*Thuja plicata*) have demonstrated their suitability to the district. Although this shade-enduring tree will probably be included in the list of varieties for underplanting, its tapering habit reduces its value commercially to such an extent that extensive plantations of this cedar are not aimed at by Continental foresters, nor is it likely to attain the prominence in New Zealand of such trees as Oregon pine, redwood, &c., for the mentioned purpose. Throughout the transplanting area several "breaks" of fairly well-developed *Cupressus Lawsoniana*, *Picea sitchensis*, and *Alnus glutinosa* are evident, but in each case it will only be possible to remove to plantations about 60 to 80 per cent. of the number growing.

Soil-restoration Measures.—Special provision was made during the year to restore soil-fertility to the areas which have been cropped annually with hardly sufficient intermission during the past fifteen years. The position became more acute when an increased output was aimed at, and, as our nursery-area was not proportionately extended, much perplexity has from time to time arisen in keeping apace with the requirements without causing direct injury to the surface soil. It is pleasing, however, to refer to the recent acquirement of an additional 12 acres of land, part of which will relieve any "breaks" in future when bordering on poverty through over-cultivation.

Crops of peas, oats, clover, and sainfoin were grown, and on reaching a height of from 2 ft. to 3 ft. were ploughed under for manurial purposes. In this district, where the grass-grub abounds, experiments extending over some years have revealed the ill effects of attempting to raise trees on areas relieved of a rye and clover crop of two years standing. Such areas on being ploughed usually receive a dressing of lime, and are permitted to remain in fallow for at least twelve months, during which time frequent tillage is resorted to.

The application over certain spare "breaks" of kainit at the rate of 8 cwt. per acre having been previously found beneficial as a soil-fertilizer and also distasteful to the larvæ of *Odontria zealandica*, some 4 tons have been used during the year, from which good results are expected.

Horse-feed and Live-stock.—Scarcely sufficient horse-feed for our stock was grown during the season, as by so doing the nursery-area would have been unduly taxed. Fortunately the associated pastures were in a better condition than formerly, and the consumption of chaff by our thirteen horses was accordingly curtailed. Some 5 tons of oaten sheaf and 10 tons of rye and clover were harvested under favourable conditions, and this quantity will be supplemented by produce specially grown for the southern stations at Gimmerburn Plantation. The number of live-stock was increased to fourteen head by the arrival of a filly of the desired stamp.

Miscellaneous Works.—An expenditure of £200 was incurred in the acquirement of the adjoining leasehold property of 12 acres, together with a small dwellinghouse and minor improvements.

To overcome the disadvantage arising from the presence of horses grazing amongst the native bush adjacent to the nursery about 40 chains of fencing was erected and gates hung at convenient positions. Several semi-decayed gates on the main boundaries were also replaced with those of a more durable character.

All buildings and implements received the usual annual overhaul, and are in excellent order throughout.

The annual expenditure amounted to £2,220 3s. 8d., providing employment to 10·9 men, and the total expenditure to date reaches £25,277 18s. 1d.

The year's output to plantations, public bodies, &c., is 1,105,790, which are valued at £3,325 0s. 11d. as per Schedule V, but in all probability this number will not be reached during the ensuing season.

Some 4,069,590 trees in various stages are now in stock, against which the value of £5,852 18s. 7d. has been shown.

Statement of expenditure, Property Account, Trees Account, and meteorological records are appended.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	In.		Deg. Fahr.	Deg. Fahr.	
April	2·80	19	73	29	3
May	3·33	20	61	27	11
June	7·98	24	55	22	12
July	2·06	14	58	22	14
August	2·84	12	64	22	11
September	3·10	19	64	31	4
October	4·93	17	71	28	3
November	3·23	23	81	32	1
December	1·29	12	86	37	..
1913.					
January	3·11	19	85	33	..
February	3·60	16	87	33	..
March	5·18	18	81	30	1
Totals	43·45	213	..	..	60

Schedule II.—Statement of Expenditure.

	For Year.			To Date.		
	£	s.	d.	£	s.	d.
Tree-planting and maintenance—						
Tree-growing	887	0	0	12,666	15	11
General maintenance and repairs ...	402	15	2	2,680	1	2
Tree-seeds	138	1	11	1,205	0	7
Manures	23	19	9	245	8	1
Horse-feed, purchased and grown ...	94	0	2	1,279	17	11
Miscellaneous works	61	13	6	282	12	10
Stock and material—Tools and implements	23	13	11	1,005	13	11
Permanent works—						
Buildings	272	4	0	2,271	7	4
Nursery-formation	5	5	6	502	10	3
Fencing	13	8	9	617	10	8
Water-supply	0	9	0	224	14	6
Supervision and clerical—						
Proportion of Superintending Nurseryman's salary	125	0	0	1,885	14	11
Proportion of Nursery Foreman's salary	67	12	0	67	12	0
Clerical assistance	105	0	0	342	18	0
	2,220	3	8	£25,277	18	1

Schedule III.—Trees Account.

	During the Year.		Since 1896 to Date.		Estimated Value, as Schedule V.
	Number.	Cost of Raising.	Number.	Cost of Raising and Maintenance.	
		£ s. d.		£ s. d.	£ s. d.
Trees raised	2,122,100	254 10 0	15,905,880	25,277 18 1	..
Trees sent out	1,105,290	..	11,836,290	..	..
Balance in stock			4,069,590	..	5,852 18 7
Value of land, improvements, and stock (Property Account)				..	4,582 7 1
Total value				..	10,435 5 8

Schedule IV.—Property Account.

	£ s. d.
Land (132 acres): Crown land not charged to Forestry Account...	...
Buildings	2,271 7 4
Live-stock	274 0 0
Improvements	727 4 9
Fencing	617 10 8
Stores in hand	692 4 4
	£4,582 7 1

Schedule V.—Details of One-year-old Trees, sown 1912–13.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Seed sown.	Value per Thousand.	Total Value.	Remarks.
			lb.	£ s. d.	£ s. d.	
Larix europaea	700,000	2	199	1 0 0	700 0 0	Germinated well. Damaged by grub.
Pinus Laricio	840,000	1½	116	1 0 0	840 0 0	Fair crop.
„ ponderosa	170,000	2	90	1 0 0	170 0 0	Strong plants.
„ Benthamiana	13,000	2	12	1 5 0	16 5 0	„
„ radiata	100,000	4	16	1 0 0	100 0 0	Satisfactory results.
„ muricata	48,000	2½	7	1 0 0	48 0 0	Sturdy plants.
„ maritima	8,000	2	2	1 0 0	8 0 0	„
„ taeda	8,000	2½	2	1 0 0	8 0 0	Strong plants.
„ Torreyana	1,000	3	3	1 5 0	1 5 0	„
Pseudo-tsuga taxifolia	230,000	1	20	1 5 0	287 10 0	Germinated excellently.
			oz.			
Picea pinsapo	50	1	3	1 0 0	0 1 0	Experimental.
			lb.			
„ Nordmanniana	300	1	4	1 0 0	0 6 0	„
Cupressus macrocarpa	200	3	3	1 0 0	0 4 0	Crop destroyed by grub.
Sequoia gigantea	400	1½	0¾	4 0 0	1 12 0	Fair crop.
„ sempervirens	300	1½	1½	4 0 0	1 4 0	„
			oz.			
Eucalyptus Stuartiana	1,000	5	1	0 10 0	0 10 0	Strong plants.
„ Gunnii	800	5	1	0 10 0	0 8 0	„
„ crebra	800	5	1	0 10 0	0 8 0	„
„ coriacea	150	3	1	0 10 0	0 1 6	„
„ amygdalina ..	100	3	1	0 10 0	0 1 0	„
Totals	2,122,100	..	..	..	2,183 15 6	

Two-year-old Trees, sown 1911–12.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Pinus Laricio	1,015,000	..	2	1 5 0	1,268 15 0	Fair growth.
„ ponderosa	..	80,000	3	2 5 0	180 0 0	Well-grown trees.
„ Benthamiana	..	2,500	3	2 10 0	6 5 0	„
„ muricata	..	18,000	3	2 5 0	40 10 0	Not very robust.
„ radiata	..	9,000	7	2 5 0	20 5 0	„
„ strobus	..	2,000	1½	2 5 0	4 10 0	„
„ Banksiana	1,100	..	2	1 5 0	1 7 6	Sturdy plants.
„ patula	900	..	3	1 5 0	1 2 6	„
„ picea	200	..	1	1 5 0	0 5 0	„
„ Montezumae	300	..	2	1 5 0	0 7 6	„
„ Murrayana	200	..	2	1 5 0	0 5 0	„
„ sylvestris	150	..	1½	1 5 0	0 3 9	„
Larix leptolepis	..	25,000	4	2 5 0	56 5 0	Fair growth.
Picea excelsa	400	..	2½	1 5 0	0 10 0	„
„ sitchensis	1,500	..	2	1 10 0	2 5 0	„
Cupressus macrocarpa	..	13,000	7	2 5 0 1 5 0	29 5 0	„
Various trees	1,500	700	..	2 5 0	3 9 0	
Totals	1,021,250	150,200	..	..	1,615 10 3	
	1,171,450					

Three-year-old Trees, sown 1910–11.

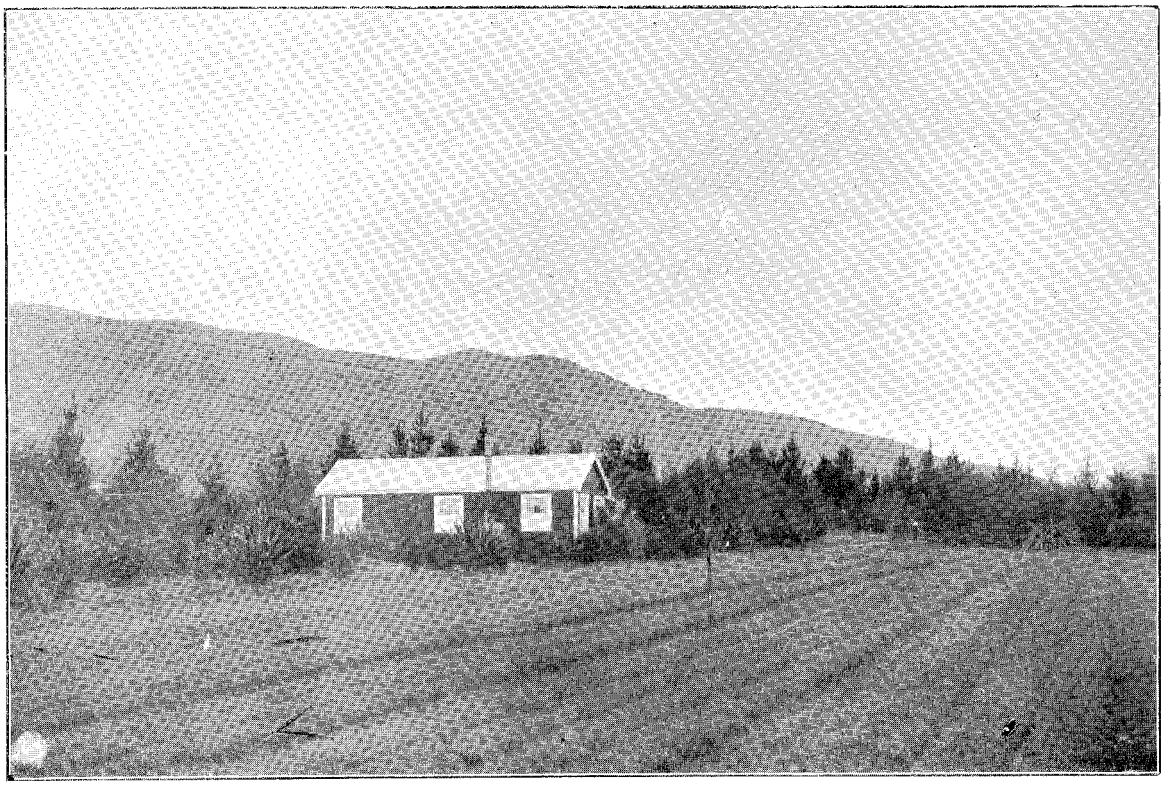
Name of Tree.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Larix europaea	100,000	12	3 0 0	300 0 0	The unfavourable season experienced has not permitted trees generally to attain their customary robust growth.
Pinus Laricio	350,000	7	3 0 0	1,050 0 0	
„ ponderosa	140,000	4	3 0 0	420 0 0	
„ Benthamiana	6,000	4	3 5 0	19 10 0	
„ austriaca	3,000	5	3 0 0	9 0 0	
„ maritima	300	4	3 0 0	0 18 0	
„ muricata	300	7	3 0 0	0 18 0	
„ scopulorum	40	4	3 0 0	0 2 4	
„ strobus	100	2	3 0 0	0 6 0	
Pseudo-tsuga taxifolia	17,000	7	3 5 0	55 5 0	
Picea sitchensis	50,000	3	3 5 0	162 10 0	
Cupressus Lawsoniana	1,900	4	4 5 0	8 1 6	
Thuja plicata	4,000	10	3 10 0	14 0 0	
Alnus glutinosa	500	6	3 0 0	1 10 0	
Various trees	2,900	..	4 0 0	11 12 0	
Totals	676,040	..	..	2,053 12 10	

Trees transferred from Nursery to Plantations, &c., 1912–13.

Where sent.	Name of Tree.	Number.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Conical Hills Plantation	Larix europaea	422,375	15	3 0 0	1,267 2 6	An excellent growing percentage has resulted.
	Pinus Laricio	455,175	10	3 0 0	1,365 10 6	
	„ ponderosa	106,475	8	3 0 0	319 8 6	
	„ insignis	18,535	12	3 0 0	55 12 1	
	„ muricata	325	20	3 0 0	0 19 6	
	„ maritima	1,250	8	3 0 0	3 15 0	
	Pseudo-tsuga taxifolia ..	23,850	8	3 5 0	77 10 3	
	Picea sitchensis	9,075	10	3 5 0	29 9 10	
	„ excelsa	225	10	3 0 0	0 13 6	
	Thuja plicata	13,850	12	3 10 0	48 9 6	
	Cupressus macrocarpa ..	360	10	3 0 0	1 1 7	
	Alnus glutinosa	14,600	24	3 0 0	43 16 0	
	Fraxinus excelsior ..	9,950	10	3 0 0	29 17 0	
	„ americana ..	1,625	10	3 0 0	4 17 6	
	Betula alba	3,150	10	3 0 0	9 9 0	
	Populus fastigiata ..	3,425	..	2 0 0	6 17 0	
	Salix viminalis	4,475	..	2 0 0	8 19 0	
		1,088,720	..	..	3,273 8 3	
Dusky Hill Plantation	Pinus Laricio	9,000	10	3 0 0	27 0 0	Used for replacing failures in previous plantings.
	„ insignis	650	12	3 0 0	1 19 0	
	Thuja plicata	850	12	3 10 0	2 19 6	
	Fraxinus excelsior ..	1,000	10	3 0 0	3 0 0	
		11,500	..	..	34 18 6	
Selwyn Plantations	Pinus insignis	1,000	12	3 0 0	3 0 0	Used for sand-dune planting.
	„ maritima	750	8	3 0 0	2 5 0	
	„ muricata	250	8	3 0 0	0 15 0	
		2,000	..	..	6 0 0	
Conical Hills Plantation	As per details above ..	1,088,720	..	..	3,273 8 3	
Dusky Hill Plantation	„ ..	11,500	..	..	34 18 6	
Selwyn Plantations	„ ..	2,000	..	..	6 0 0	
Queenstown Domain Board	Assorted trees	1,000	..	..	3 0 0	
New South Wales Government	„	1,700	..	..	5 2 0	
Hyde Domain Board	„	870	..	..	2 12 2	
Totals ..	..	1,105,790	..	..	3,325 0 11	

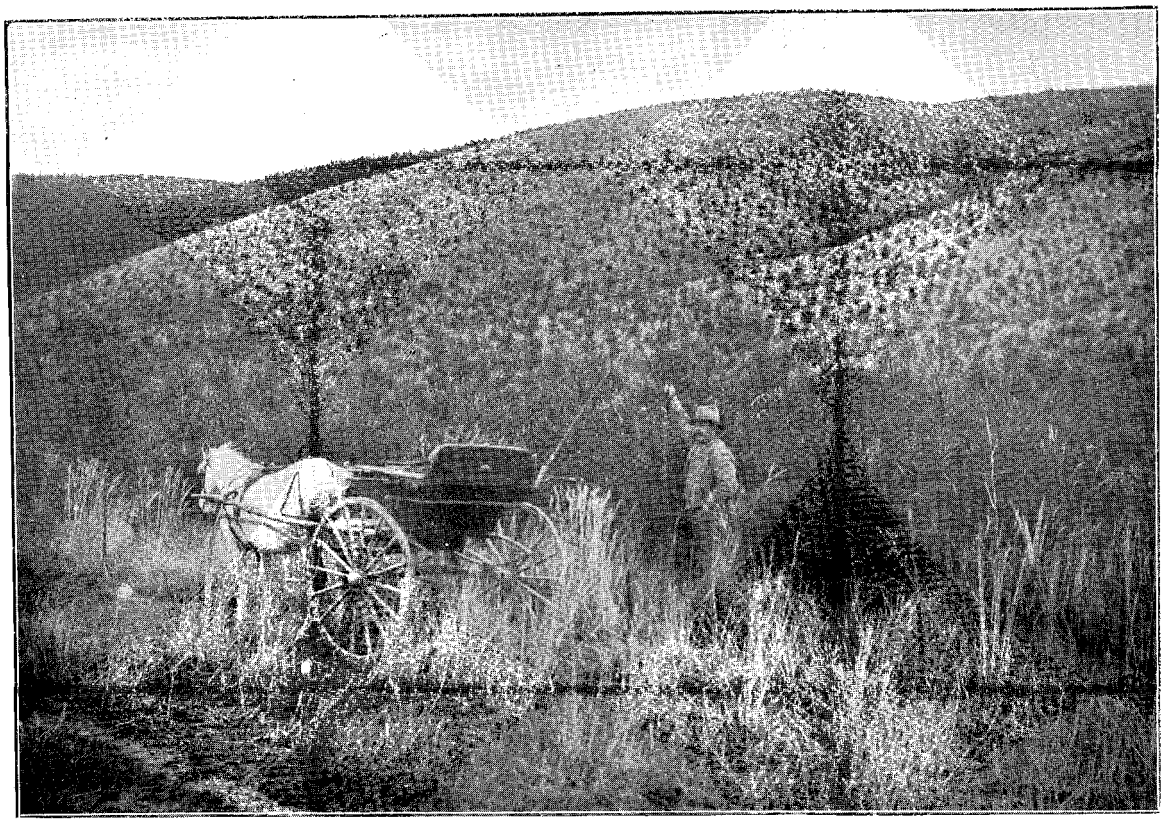
W. T. MORRISON,
Nursery Foreman.

R. G. ROBINSON,
Superintending Nurseryman.

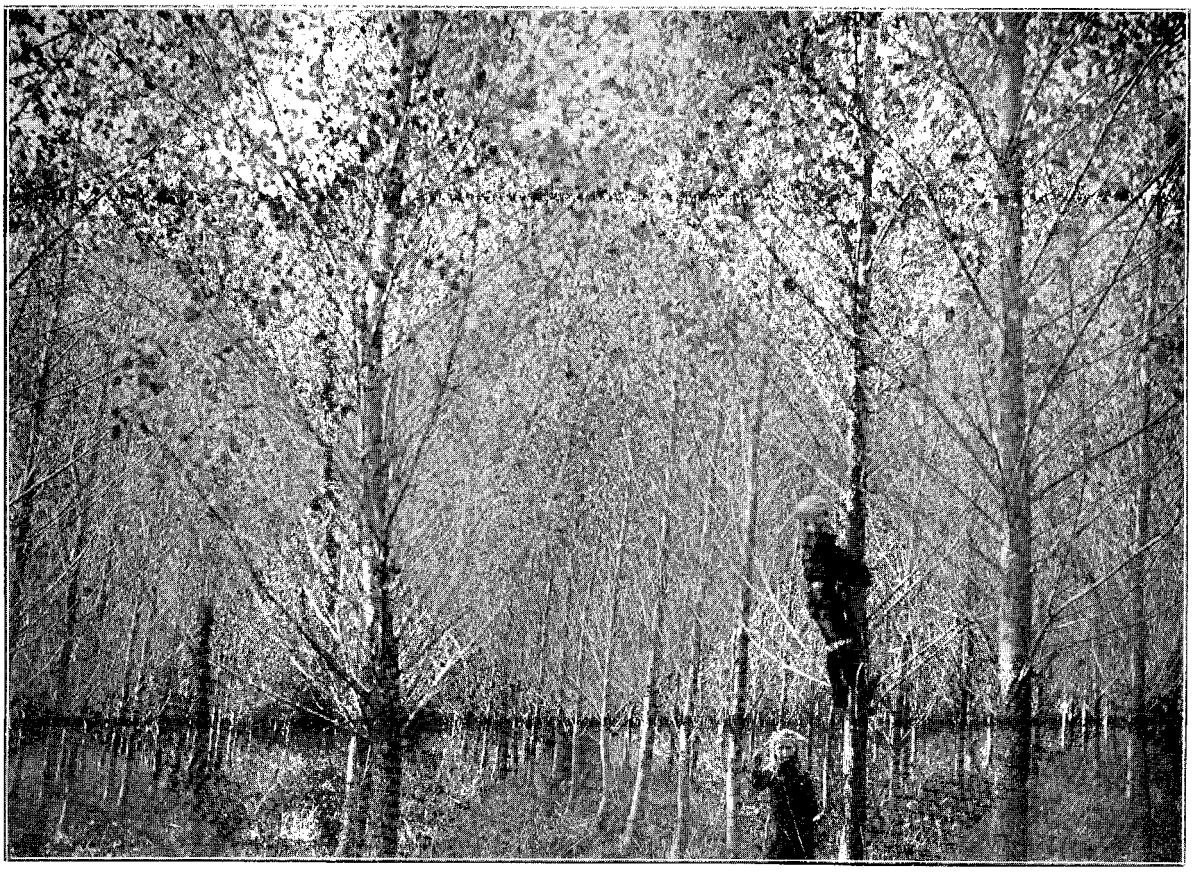


Two-year-old Pinus Laricio in Seed-beds.

Beech Forest and Artificial Plantation at Dusky Hill, intersected by Pomahaka River.



Flourishing Picea excelsa Compartment at Conical Hills. More Vigorous Growth is made on Lower Ground.



Populus deltoides at Dusky Hill Plantation, Age Fourteen Years, Height 38 Feet.

CONICAL HILLS PLANTATION, OTAGO.

(Area, 3,672 acres; altitude, 400 ft. to 1,050 ft.; commenced operations, 1903.)

Instruments for registering meteorological data were acquired for this station, and being placed at an elevation of about 1,000 ft., the comparative value of such records with those kept on the lower altitudes has more than compensated for the small expenditure thus incurred. During the year 38·55 in. of rain fell on 164 days. The maximum shade temperature was 86° in February and the lowest 22° on several occasions in July and August. Freezing-point was reached on seventy-two nights, and, as might be anticipated, the five frosts occurring late in October proved somewhat detrimental to the leaders of the less hardy varieties of trees. Although we do not possess the appliances for ascertaining details of wind-pressure, it is indeed doubtful if in any previous year since operations began here the south-westers have been either so persistent or of such force, and under these conditions it is not surprising to find youthful trees occupying exposed situations acquiring a decided tendency to lean to the leeward side.

In this brief review of the year's work it is encouraging to be able to allude to the satisfactory results achieved. Much headway has been made by the well-established trees, and the issue from the season's planting has been equally encouraging, probably only 5 per cent. of deaths accruing from the 1,088,720 trees operated with. Notwithstanding the prevalence of an unhealthy appearance throughout the *Larix europea* blocks, it is questionable if over any similar period more vigorous headway has been made by the larch, whose height has been increased from 15 in. to 24 in. With each succeeding year the meritorious growing qualities of *Pinus laricio* is made evident, and its progress has so far been checked neither by climatic influences nor pests of any kind, and a steady increase annually of from 15 in. to 20 in. has been maintained since the second year after planting. Under similar conditions *Pinus austriaca* are thriving; but the species has contracted, though only in a mild form, the disease known as pine aphis (*Chermes laricis*), which, according to personal observation in older plantations, seriously interferes with the pine in its youth, but appears to lose its influence with the tree's advancing age. Again *Pinus ponderosa* has demonstrated the various conditions under which it may be successfully planted, whether on semi-fertile flats or exposed rocky ledges; where the surface soil is not over abundant this yellow-pine succeeds with a consistent annual progress of from 9 in. to 13 in. Although the *Picea excelsa* have for years remained almost stationary (with the exception of those growing in the more favoured positions), it is not unreasonable, in view of their present healthy state and sturdy growth, to forecast the continuation of the past season's headway and subsequent development into commercially valuable timber, although it is not the present desire of the Department to extend the Norway deal compartments. As hitherto recorded, the Oregon pine (*Pseudo-tsuga taxifolia*) flourishes on low altitudes, where the soil is of at least fair fertility and shelter abounds. An annually recurring trouble in the Oregon compartments, which contain 87,325 trees, is, however, the injury to leaders by heavy winds; but should a wind-barrier be provided prior to operating with this valuable tree, no reason can be advanced why complete success should not be the outcome. On the low-lying areas both *Alnus glutinosa* and *Populus deltoides* are showing their partiality for the conditions. Of the two varieties, alder maintains more consistent growth, with an average annual headway of about 18 in., or 2 in. in excess of the poplar. In accordance with a projected scheme for covering the hilltops with *Pinus radiata* and effecting the double purpose of shelter and dense forest, some 18,250 pines of this species were planted, but only with a fair measure of success, owing to heavy gales interfering with their root-hold at a critical period. Where established, both *Pinus radiata* and *Pinus muricata* yearly make from 30 in. to 48 in. of vertical headway, and are both reliable shelter-producers. Experience gained here clearly shows the fallacy of attempting to grow any of the hardwoods on exposed hillsides. Shelter and a soil of medium fertility is essential, and under such conditions ash and oak are readily responding. A small experimental lot of *Pinus rigida* promises well, but *Pinus strobus* are evidently occupying an uncongenial position.

Pitting and Tree-planting.—In carrying out the usual yearly replanting-work some 58,085 trees were utilized, which reduces the number available for extension purposes to 1,030,635. In view of the mutual benefit arising from contract planting, a similar arrangement to that of the previous year was adopted, and employees were able to earn a reasonable wage by planting at 12s. 6d. per thousand. The preparation of 1,288,060 grubber pits was also undertaken at the same rate, and every satisfaction given. Our requirements being slightly exceeded owing to an unexpected decreased output of trees, the surplus pits will be availed of during the current year, when less expenditure will be necessary to carry on operations generally.

Fire-breaks.—The fact of having ploughed, disced, and harrowed some 93 acres of fire-break on this station alone this year should impress persons who are repeatedly referring to our lack of attention in providing barriers to any fire that might arise either from outside or within the forest reserve that this phase of afforestation receives full consideration. There will always be danger from conflagrations, particularly when plantations are surrounded by holdings where tussock growth is abundant; but such danger is reduced to a minimum whilst the gang of men are in the vicinity of the outbreak. Great uneasiness would be felt, however, in the event of any outbreak at such a time when firefighters were unprocurable, and, although our external fringing fire-breaks might check the progress of the fire unaided notwithstanding the prevalence of a high wind, there is always the danger of burning debris being blown from a considerable distance and defeating the object of our cultivated breaks. To renew his pasture, an owner of adjoining property fired the tussocks; but a strong wind springing up made the position somewhat serious until the Department's employees came on the scene and assisted in the timely suppression of the "burn." In pursuance of a scheme outlined in last report, an experiment having

an economic bearing on fire-break work was satisfactorily launched, and results point conclusively to the advantage that may be derived by grazing fire-break areas with sheep. Some 55 chains of fencing were used in forming an enclosure of about 12 acres fringing the Pomahaka River, and during the spring and summer months some twenty wethers were permitted to graze over the reserve. As the herbage was closely cropped, the fire-preventive measure was quite as effectually accomplished as if the area had been ploughed. The external fire-line was extended some 116 chains, and this affords the desired protection on the western side

Divisional Plans.—The appended plan, showing the planting arrangement and acreages, was carefully prepared by local officers in the absence of a qualified surveyor, and will suffice until the whole area is planted, when much advantage would accrue from the preparation of a perfectly accurate drawing.

General Maintenance.—Reference to the associated statement of expenditure will show that £1,020 4s. 7d. was spent under the item of "General Upkeep," which included such works as removal of coarse undergrowth, tree-pruning, repairing of roads, providing employees with fuel, cutting noxious weeds, horse-shoeing and repairs, rabbiting, and other minor works.

The expenditure for the year amounted to £2,975 15s. 9d. (being an outlay of £241 16s. 3d. less than that of the previous twelve months), which provided employment for an average of 20·8 men.

Since the initiation of the afforestation-work at this station £23,748 12s. 1d. has been expended, details of which are outlined on the table appended hereto

The following is the first record of the year's rainfall and temperature taken at this station :—

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	Inches.		Degrees.	Degrees.	
April	1·21	12	74	29	1
May	3 54	14	64	26	14
June	6·96	22	54	25	11
July	1·96	10	58	22	19
August	1·62	12	64	22	17
September	2·77	11	62	30	3
October	4·77	14	64	31	5
November	2·79	18	68	38	..
December	1·25	8	82	40	..
1913.					
January	2·48	11	83	38	..
February	3·77	14	86	32	1
March	5·43	18	80	32	1
Totals	38·55	164	..	..	72

Schedule II.—Statement of Expenditure.

	For Year.			To Date.		
	£	s.	d.	£	s.	d.
Planting operations and maintenance—						
Tree-planting	621	8	6	5,158	6	1
Pitting	805	3	4	7,003	8	11
Clearing	30	19	6	697	2	8
Cartage of trees	32	4	6	353	19	11
General upkeep of plantation ...	1,020	4	7	5,671	10	7
General repairs	62	9	0	433	18	5
Horse-feed	54	5	8	151	16	4
Permanent works—						
Fencing	39	4	3	1,203	15	0
Formation	9	7	0	268	18	10
Buildings	6	7	0	320	7	11
Stock, implements, &c.—Tools, implements	34	2	5	316	18	1
Supervision and clerical—						
Salaries—						
Supervision of free labour ...	185	0	0	1,565	0	0
Superintending Nurseryman's proportion and clerical assistance	75	0	0	603	9	4
	£2,975	15	9	£23,748	12	1

Schedule III.—Trees Account.

	Number.
Trees received during year	1,088,720
Less to replace blanks	58,085
Planted on new area	1,030,635
Previously planted	6,695,712
Total number planted on 2,838 acres (average age, five years and three-quarters)	7,726,347

Schedule IV.—Property Account.

	£	s.	d.
Land (3,672 acres): Crown land, not charged to Forestry Account			
Buildings	320	7	11
Live-stock			
Improvements	268	18	10
Fencing	1,203	15	0
Stores in hand	137	2	3
	£1,930	4	0

Balance-sheet.

	£	s.	d.
Total expenditure	23,748	12	1
Less Property Account	1,930	4	0
Cost of operations	£21,818	8	1
2,838 acres planted (average age, five years and three-quarters).			
Estimated value of plantation per acre	£10	2	6

Summary of Trees in various Blocks at Conical Hills Plantation.

No. of Block.	Year planted.	Area planted.	Name of Tree.	Number planted.	Total Number.	Remarks.
		Acres.				
I	1903	56	Fraxinus excelsior	76,350	..	Mixed.
			Picea excelsa	76,350	..	,,
					152,700	
		4	Fraxinus excelsior	10,275	..	Pure.
					10,275	
II	1904	37	Quercus pedunculata	23,025	..	,,
			Acer pseudo-platanus	53,150	..	,,
			Juglans regia	14,600	..	,,
			Sophora tetraptera	225	..	,,
			Cytisus laburnum	2,550	..	,,
			Betula alba	250	..	,,
			Populus (vars)	2,550	..	,,
			Alnus glutinosa	725	..	,,
			Pyrus aucuparia	2,750	..	,,
					99,825	
		65	Larix europaea	179,075	..	,,
					179,075	
		79	Pinus austriaca	69,000	..	,,
			,, Laricio	100,000	..	,,
			,, ponderosa	18,250	..	Mixed.
			,, Benthamiana	24,950	..	,,
			,, strobus	1,900	..	Pure.
			,, halepensis	325	..	,,
					214,425	
		106	Picea excelsa	179,225	..	Mixed.
			Fraxinus excelsior	101,625	..	,,
			Picea sitchensis	2,950	..	Pure.
			Pseudo-tsuga taxifolia	5,775	..	,,
					289,575	
III	1905	78	Pinus austriaca	90,500	..	,,
			,, ponderosa	9,850	..	,,
			,, Benthamiana	3,450	..	,,
			,, rigida	750	..	,,
			,, radiata	6,075	..	Windbreak.
			,, Laricio	100,000	..	Pure.
			,, strobus	3,150	..	,,
					213,775	
		96	Fraxinus excelsior	74,725	..	Mixed.
			Picea excelsa	150,675	..	,,
			Pseudo-tsuga taxifolia	35,875	..	Pure.
			Picea sitchensis	275	..	,,
					261,550	
		34	Larix europaea	93,565	..	,,
					93,565	

Summary of Trees in various Blocks at Conical Hills Plantation—continued.

No. of Block.	Year planted.	Area planted.	Name of Tree.	Number planted.	Total Number.	Remarks.
		Acres.				
III	1905	9	Larix europaea	13,610	..	Mixed.
			Pinus Laricio	10,888	..	,,
					24,498	
		28	Acer pseudo-platanus	47,996	..	Pure.
			Alnus glutinosa	6,025	..	,,
			Pyrus aucuparia	445	..	,,
			Acer saccharum	525	..	,,
			Robinia pseudo-acacia	6,975	..	,,
			Populus (vars)	3,150	..	,,
			Cytisus laburnum	7,625	..	,,
			Juglans regia	4,180	..	,,
					76,921	
IV	1906	91	Pinus ponderosa	32,625	..	Mixed.
			,, Laricio	12,140	..	,,
			,, strobus	75	..	,,
			,, rigida	75	..	,,
			,, muricata	5,375	..	Mixed windbreak.
			,, radiata	1,308	..	Ditto.
			,, austriaca	196,875	..	Pure.
					248,473	
		99	Picea excelsa	189,300	..	Mixed.
			Fraxinus excelsior	55,650	..	,,
			,, americana	1,475	..	,,
			Pseudo-tsuga taxifolia	23,850	..	Pure.
					270,275	
		57	Larix europaea	155,340	..	,,
					155,340	
		45	Quercus pedunculata	36,075	..	Mixed.
			Acer pseudo-platanus	28,800	..	,,
			,, saccharum	2,050	..	Pure.
			Betula alba	50,600	..	,,
			Juglans regia	1,300	..	,,
			Robinia pseudo-acacia	1,375	..	,,
			Populus (vars)	2,825	..	,,
					123,025	
		10	Larix europaea	13,610	..	Mixed.
			Pinus Laricio	13,610	..	,,
					27,220	
V	1907	45	Pinus austriaca	22,875	..	Pure.
			,, Laricio	54,575	..	Mixed.
			,, ponderosa	27,675	..	,,
			,, Benthamiana	10,720	..	,,
			,, muricata	5,775	..	Windbreak.
					121,620	
		67	Larix europaea	181,400	..	Pure.
					181,400	
		23	Picea excelsa	62,675	..	,,
					62,675	
		13	Betula alba	31,425	..	,,
			Quercus pedunculata	2,500	..	,,
			Populus fastigiata	2,750	..	,,
					36,675	
VI	1909	92	Pinus Laricio	183,575	..	Mixed.
			,, austriaca	34,875	..	,,
			,, ponderosa	20,925	..	,,
			,, Benthamiana	12,525	..	,,
					251,900	
		315	Larix europaea	858,350	..	Pure.
					858,350	
		65	Picea excelsa	120,650	..	Mixed.
			,, sitchensis	45,000	..	,,
			Pseudo-tsuga taxifolia	5,225	..	,,
			Fraxinus excelsior	4,925	..	,,
			,, americana	925	..	,,
					176,725	

Summary of Trees in various Blocks at Conical Hills Plantation—continued.

No. of Block.	Year planted.	Area planted.	Name of Tree.	Number planted.	Total Number.	Remarks.
		Acres.				
VI	1909	37	Acer pseudo-platanus	33,700	..	Pure.
			Quercus pedunculata	54,175	..	,,
			Alnus glutinosa	13,500	..	,,
					101,375	
VII	1910	220	Larix europaea	600,250	..	,,
					600,250	
		202	Pinus Laricio	512,203	..	Mixed.
			,, austriaca	15,600	..	,,
			,, ponderosa	13,053	..	,,
			,, Benthamiana	7,925	..	,,
					548,781	
		31	Fraxinus excelsior	16,225	..	,,
			Picea excelsa	36,700	..	,,
			,, sitchensis	15,050	..	,,
			Pseudo-tsuga taxifolia	16,600	..	,,
					84,575	
		17	Betula alba	14,625	..	Pure.
			Alnus glutinosa	7,900	..	,,
			Quercus pedunculata	18,050	..	,,
			Acer pseudo-platanus	1,025	..	,,
			Fagus sylvatica	4,250	..	,,
			Sequoia sempervirens	200	..	,,
			Thuja gigantea	25	..	,,
					46,075	
VIIA	1910	27	Pinus Laricio	36,747	..	Mixed.
			,, ponderosa	36,747	..	,,
					73,494	
VIII	1911	210	Larix europaea	572,725	..	Pure.
					572,725	
		183	Pinus Laricio	258,825	..	Mixed.
			,, ponderosa	215,350	..	,,
			,, austriaca	23,400	..	Pure.
			, muricata	575	..	,,
			,, Benthamiana	200	..	Mixed.
			,, Jeffreyii	25	..	,,
			Picea sitchensis	100	..	,,
					498,475	
		8	Fraxinus excelsior	21,575	..	Pure.
					21,575	
		4	Thuja gigantea	10,450	..	,,
					10,450	
		3	Betula alba	8,075	..	,,
					8,075	
IX	1912	212	Pinus Laricio	437,175	..	,,
			,, insignis	18,075	..	,,
			,, ponderosa	100,000	..	,,
			,, maritima	1,250	..	,,
			,, muricata	325	..	,,
			Cupressus macrocarpa	360	..	,,
			Thuja plicata	13,850	..	,,
					571,035	
		157	Larix europaea	422,375	..	,,
					422,375	
		8	Fraxinus excelsior	9,950	..	,,
			,, americana	1,625	..	,,
			Betula alba	3,150	..	,,
			Salix viminalis..	4,475	..	,,
			Populus fastigiata	3,425	..	,,
					22,625	
		5	Alnus glutinosa	14,600	..	,,
					14,600	
Totals	..	2,838	..	..	7,726,347	

H. Howe,
Plantation Foreman.
H. G. Robinson,
Superintending Nurseryman.

DUSKY HILL PLANTATION, OTAGO.

(Area, 845 acres; altitude, 400 ft. to 800 ft.; commenced operations, 1898.)

A comparison of the meteorological statistics between this and other local stations shows that, although the total rainfall for the year almost coincided, the precipitations were somewhat more frequent. The influence of the favourable season upon the larch is decidedly conspicuous, and, although perhaps tree-growth was not marked by any greater rapidity, a more healthful tone now certainly prevails over the *Larix europaea* blocks where two years ago unseasonable defoliation occurred. The partial discoloration of needles during the summer months is still apparent; but indications point to a gradual recovery from what appeared to be a fungus disease, and which is now attributed to the effects of the prolonged dryness experienced during the year 1909.

Allusions to Tree-growth.—In commenting upon the progress of different varieties of trees and their success in association, the undertaking of experimental work here for the benefit of the more recently created plantations cannot be lost sight of. Anticipations of prominent writers have not been borne out by the progress of the various trees used in mixture, and it is quite certain that knowledge of the local possibilities of each variety operated with must also be gained before even a partial success can be obtained in mixed planting.

Originally a compartment was formed of larch, Oregon pine, ash, and Norway spruce. The ultimate crop was to be Oregon pine and ash, and the functions of the larch were principally to nurse the more valuable trees. Contrary to expectations, however, most inconsistent headway has been made by the ash and Oregon pine, as only about 35 per cent. of the latter and 10 per cent. of the former trees have been able to keep apace with the rapidly progressing larch, and, strangely enough, the Norway spruce, a supposed shade-bearer, remains at thirteen years of age only about a foot taller than when planted, whilst the nurses have attained an average height of about 36 ft. Throughout this compartment exceedingly strong specimens of Oregon pine, measuring at breast-high about 25 in. in girth, are noticeable, clothed almost to the ground-surface with strong live branches, and clearly demonstrating the necessity of closer planting and the failure of the surrounding larch to sufficiently check the natural branching habit of the valuable evergreen. Each succeeding year the superiority of Japanese larch over the European species in uniformity of growth and healthfulness is proved. It is a somewhat slower grower here, but an examination of the interior discloses a greater evenness in pole development, with laterals of a more slender nature. After harbouring a belief for some years that all the *Picea excelsa* and *Picea sitchensis* would eventually respond to the conditions and make rapid headway, we are forced by their continued sluggish growth to admit that the spruces will not succeed on the very exposed sidelings, although where the soil is more fertile and partial shelter is available the prospects are excellent. A shelter-break of *Pinus radiata* bordering the Pomahaka River has been planted, and further experimental work in loosening the surface around each tree is in operation, so that it may yet be possible to report favourably on the spruce-plantations. An improvement in the growth of the hardwoods—*Fraxinus excelsior*, *Fraxinus americana*, *Quercus pedunculata*, and *Acer pseudo-platans*—is due to the abundance of moisture; but the suceptibility to injury from early frosts was again shown by the walnuts and chestnuts and any belief that either of these trees can be satisfactorily grown for timber purposes locally should now be discarded. The *Pinus Laricio* and *Pinus austriaca* are justifying their inclusion here by healthy and speedy development. Of the two pines, the Corsican species, by a regular annual growth of about 16 in., promises to surpass the Austrian, which, however, is probably hampered slightly by the presence of the white aphis, whose influence temporarily lessens the yearly growth by from 2 in. to 4 in. During the past two seasons exceedingly good results in the pure *Populus deltoides* stand is noticeable; but, as may be seen from the photograph herewith, the branching habit requires controlling by closer planting. The cuttings were planted fourteen years ago at from 6 ft. to 7 ft. over a swampy area, and the trees have now attained a height of from 36 ft. to 40 ft.

Red Deer.—The presence of the red deer is decidedly irritating, and the animals continue to injure the young hardwoods. It is safe to assert that some hundreds of valuable ash-trees, ranging from 3 ft. to 10 ft. high, have been destroyed by this agency, although not irretrievably, as by judicious pruning it is possible to foster a new robust leader when the root system is in a healthy state. A suitable rifle being procured during the year, a stalking expedition was arranged occasionally, and it is gratifying to be able to say that four trespassing animals were thus destroyed, although the density of the plantation renders the complete eradication of the pest a tedious matter.

General Maintenance.—Rather more labour was devoted to tree-pruning than usual, and the item "Removal of coarse growth from around trees" helped to increase the expenditure under this heading to £122 16s. 6d.

Realizing that the removal of decayed lateral branches of larch requires to be undertaken as soon as possible, the trial cutting over some acres was continued, and proved somewhat more costly than we anticipated. One man was able to cut and remove the small branches from 400 to 500 trees per day, so that such labour could not be carried on over an acre under the present conditions for less than £2.

Some 11,500 trees, principally *Pinus Laricio*, were received from Tapanui Nursery, and used for replanting purposes, and arrangements are now well in hand to continue this seasons's policy begun of replanting small blocks containing bark-bound hardwoods.

All fire-breaks were put into an effective state somewhat earlier than usual; but little anxiety from fires was felt here, as rarely was the vegetation sufficiently dry to permit of firing.

A useful shed of small dimensions was erected for the storage of tools, and minor improvements were effected to gates and buildings.

An expenditure of £346 10s. 10d. was incurred during the year, which advances the total expenditure to £13,185 8s.

Schedule II.—Statement of Expenditure

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	...	3,094 16 2
Pitting	...	3,619 2 7
Clearing	...	496 5 11
Cartage of trees	...	216 12 8
General upkeep of plantation	122 16 6	2,696 1 2
General repairs	9 14 6	70 15 5
Horse-feed	3 18 2	130 16 6
Permanent works—		
Fencing	...	258 2 3
Formation	...	366 7 2
Buildings	30 1 8	403 11 6
Stock, implements, &c.—Tools, implements	...	153 12 6
Supervision and clerical—		
Salaries—		
Supervision of free labour	160 0 0	1,270 10 0
Superintending Nurseryman's proportion of and clerical assistance	20 0 0	408 14 2
	£346 10 10	£13,185 8 0

Schedule III.—Trees Account.

	Number.
Trees received during year	11,500
Less to replace blanks	11,500
Planted on new area	...
Previously planted	2,180,837
Total number planted on 845 acres (average age, nine years)	2,180,837

Schedule IV.—Property Account.

	£ s. d.
Land (845 acres): Crown land not charged to Forestry Account	...
Buildings	403 11 6
Live-stock	...
Improvements	366 7 2
Fencing	258 2 3
Stores in hand	24 7 11
	£1,052 8 10

Balance-sheet.

	£ s. d.
Total expenditure	13,185 8 0
Less Property Account	1,052 8 10
Cost of operations	£12,132 19 2
845 acres planted (average age, nine years). Estimated value of plantation per acre	£11 15 0

F. Benfell,
Plantation Foreman.
R. G. Robinson,
Superintending Nurseryman.

Waitahuna Plantation, Otago.

(Dredged area, 11 acres; altitude, 331 ft.; commenced operations, 1906.)

Sufficient data has now been secured from this experimental area to permit, without apprehension for the results, the furtherance of any projected extension tree-planting work being carried on under similar conditions. Although exceedingly rapid growth is being made by several varieties of trees, such progress is surpassed by the alarming vigour, within the reserve, of the noxious plants, gorse and broom, which, although annually attended to, have spread so rapidly as to necessitate the allocation of a greater expenditure in this direction with each succeeding year since commencing operations. The secret of success, then, lies in the fact of operating solely with the fast-growing trees, or those that create early density. Prior to planting, all traces of the noxious plants were removed; but this did not prevent thousands of seedlings from springing up almost immediately after, and, where such comparatively slow-growing trees as *Pinus strobus*, *Pseudo-tsuga taxifolia*, *Picea excelsa*, and *Fraximus excelsior* are situated, much expense is necessary in protecting the leaders from injury.

Although no meteorological records are available, it is evident by the issue of double leaders and injury to foliage that a severe early frost was experienced in this district, and the European larch and Oregon pine appear to have suffered mostly. Of the shelter trees, *Pinus muricata* is growing with greater vigour than *Pinus radiata*, although the latter species have increased their height by nearly 30 in. Both *Pinus ponderosa* and *Pinus Laricio* are thriving, and undoubtedly these two varieties of trees would constitute the main body of future artificial forests on dredged tailings. After promising well, the *Larix europaea* are beginning to assume a somewhat sickly appearance over the lower branches, but by next report it will be possible to determine if this discoloration can be rightly attributed to climatic influences. Satisfactory headway is also being made by alder, birch, and poplar, whilst Oregon pine is succeeding where a greater proportion of clay and soil is incorporated with the gravel and boulders. The clearance of noxious weeds was begun after the closing of the year's accounts, and such expenditure will therefore be excluded from the current season's statements.

The expenditure to date reaches £203 0s. 7d., as per details on schedule hereunder.

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting		20 2 0
Pitting		27 6 0
Clearing		23 0 3
Cartage of trees		3 0 0
General upkeep of plantation		37 2 3
General repairs		4 0 0
Permanent works—		
Fencing		57 11 1
Formation		3 10 0
Stock, &c.		...
Supervision and clerical		
Salaries—		
Supervision of free labour		9 0 0
Superintending Nurseryman's proportion and clerical assistance		18 9 0
	...	£203 0 7

Schedule III.—Trees Account.

	Number.
Trees received during year	...
Less to replace banks	...
Planted on new area	...
Previously planted	30,525
Total number planted on 11 acres (average age, five years)	30,525

Schedule IV.—Property Account.

	£ s. d.
Land (11 acres): Crown land not charged to Forestry Account	...
Buildings	...
Live-stock	...
Improvements	3 10 0
Fencing	57 11 1
Stores in hand	...
	£61 1 1

Balance-sheet.

	£ s. d.
Total expenditure	203 0 7
Less Property Account	61 1 1
Cost of operations	141 19 6
11 acres planted (average age, five years)	...
Estimated value of plantation per acre	£10 5 0

R. G. Robinson,
Superintending Nurseryman.

Eweburn Nursery, Ranfurly, Central Otago.

(Area, 49 acres; altitude, 1,400 ft.; established, 1896.)

The rainfall recorded at this station for the past year was 22·67 in., which fell on 122 days. This is an exceptional fall for here, and beats all previous records. The rainfall exceeded that of the preceding year by 6·41 in. The lowest reading of the thermometer in the screen was 11°, on the 11th of August, and on the ground 8°, on the 13th August, 1912. The number of nights frost occurred on in the screen was 129 and on the ground 190 nights. The maximum shade-temperature was 84°, on the 19th January, 1913. The rainfall for the year has been very evenly distributed, except in the month of December, when it only registered 56 points. The season altogether has been very favourable to tree-growth generally, and the crop of seedlings is one of the best yet raised here.

The work of sowing seeds was commenced on the 20th September, which is somewhat earlier than usual, and with very beneficial results, and I am of opinion that early sowing is the best for this station. The estimated number of seedlings raised is 1,435,750, and their value £1,438 9s. 3d. The *Larix europaea* have done exceedingly well; but, owing to the unsatisfactory nature of this tree on the plantations, I am of opinion that it would be wise to discard it, and substitute pines in preference.

Lining-out trees was commenced on the 4th September, but owing to the small number of trees to handle, the work was of short duration. The cause of such shortage is that only a small quantity of seed was available, and the output depends on the amount of seed sown and successful germination. In consequence of this shortage, there will only be some 200,000 trees available for removal to the plantation.

During the year 36 acres of land was broken up at Gimmerburn and sown down in oats, and the result has been very satisfactory, there being about 65 tons of clean oaten sheaf for chaffing. This will be cut up for use here and at other stations as required.

The nursery live-stock has been increased by the addition of a fine foal.

All tools, buildings, roads, &c., have been kept in repair, and hoeing, weeding, watering, &c., have also been carried out when necessary. The trees in stock have made very satisfactory growth for the year.

The expenditure for the year amounts to £1,081 18s. 1d., and the total to date £14,046 14s. 8d.

The number of trees transferred to the Naseby Plantation was 608,250, and 7,360 to other stations and public bodies, their value being £1,698 17s. 1d.

The number of trees of all ages on the 31st March, 1913, is 2,364,850, and their value £2,839 18s. 3d.

The average number of men employed during the year was 5·94.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	In.		Deg. Fahr.	Deg. Fahr.	
April	1·38	9	71	29	10
May	0·93	10	59	21	21
June	2·32	16	53	20	24
July	2·07	10	53	21	26
August	1·50	10	50	11	25
September	1·32	9	64	26	8
October	3·71	11	69	29	9
November	1·63	11	75	34	..
December	0·56	5	81	30	1
1913.					
January	2·69	9	84	30	1
February	1·65	8	83	29	2
March	2·91	14	75	23	2
Totals	22·67	122	..	..	129

Schedule II.—Statement of Expenditure

	For Year.			To Date.		
	£	s.	d.	£	s.	d.
Tree-planting and maintenance—						
Tree-growing	314	6	10	5,488	1	10
General maintenance and repairs ...	302	14	9	2,838	11	9
Tree-seeds	44	11	6	542	11	2
Manures		...		40	15	3
Horse-feed, purchased and grown ...	155	11	2	669	15	6
Miscellaneous works	6	6	6	51	5	1
Stock and material—Tools, implements ...	7	16	4	839	12	3
Permanent works—						
Buildings		...		830	11	2
Nursery-formation	48	11	0	673	9	4
Fencing		...		340	1	0
Water-supply		...		310	0	10
Supervision and clerical—						
Proportion of Superintending Nurseryman's salary	25	0	0	472	7	4
Proportion of Nurseryman's salary ...	170	0	0	910	1	8
Clerical assistance	7	0	0	39	10	6
	£1,081	18	1	£14,046	14	8

Schedule III.—Trees Account.

	During the Year.		Since 1896 to Date.		Estimated Value, as Schedule V.
	Number.	Cost of Raising.	Number.	Cost of Raising and Maintenance.	
		£ s. d.		£ s. d.	£ s. d.
Trees raised	1,435,750	133 9 10	5,606,972	14,046 14 8	..
Trees sent out	615,610	..	3,242,122	..	..
Balance in stock			2,364,850	..	2,839 18 3
Value of land, improvements, and stock (Property Account)				..	2,652 10 6
Total value				..	5,492 8 9

Schedule IV.—Property Account.

	£ s. d.
Land (50 acres). Crown land not charged to Forestry Account ..	..
Buildings	839 11 2
Live-stock	139 7 5
Improvements	983 10 2
Fencing	340 1 0
Stores in hand	359 0 9
Total	£2,652 10 6

Schedule V.—Details of One-year-old Trees, sown 1912–13.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Amount of Seed sown.	Value per Thousand.	Total Value.	Remarks.
			lb.	£ s. d.	£ s. d.	
Pinus Laricio	443,000	1½	50	1 0 0	443 0 0	Healthy plants.
„ ponderosa	181,900	2	24	1 0 0	181 18 0	Strong plants.
„ Benthamiana	10,400	2½	8	1 5 0	13 0 0	Germination thin.
„ Torreyana	450	6	1	1 5 0	0 11 3	Strong plants.
Larix europaea	800,000	6	76	1 0 0	800 0 0	Even crop.
Totals	1,435,750	..	..	..	1,438 9 3	

Two-year-old Trees, sown 1911–12.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Pinus Laricio	535,000	..	3	1 5 0	668 15 0	Sturdy plants.
„ ponderosa	52,200	..	6½	1 5 0	65 5 0	„
„ Benthamiana ..	8,300	..	6	1 10 0	12 9 0	„
Larix europaea	197,600	..	12	1 5 0	247 0 0	„
Totals	793,100	..	..	..	993 9 0	

Three-year-old Trees, sown 1910–11.

Name of Tree.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Pinus Laricio	81,700	6	3 0 0	245 2 0	Sturdy plants.
„ ponderosa	46,200	8	3 0 0	138 12 0	„
Larix europaea	8,100	6	3 0 0	24 6 0	„
Totals	136,000	..	..	408 0 0	

Trees transferred from Nursery to Plantations, &c., 1912–13.

Where sent.	Name of Tree.	Number.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Naseby Plantation ..	Pinus Laricio ..	438,425	8	3 0 0	1,315 5 6	Sturdy plants.
	„ ponderosa ..	61,775	8	3 0 0	185 6 6	
	„ austriaca ..	33,600	8	3 0 0	100 16 0	
	Larix europaea ..	59,300	12	1 5 0	74 2 6	
	Willow-cuttings ..	9,750	..	1 0 0	9 15 0	
	Poplar-cuttings ..	5,400	..	1 0 0	5 8 0	
		608,250	..	..	1,690 13 6	
Hyde Domain	Pinus ponderosa ..	250	..	..	0 15 0	
	„ Laricio ..	140	..	..	0 8 5	
	Pyrus aucuparia ..	20	..	..	0 1 2	
Tapanui Nursery ..	Willow-cuttings ..	2,450	..	..	2 9 0	
	Poplar-cuttings ..	4,500	..	..	4 10 0	
Totals.. ..	..	615,610	..	..	1,698 17 1	

A. W. Roberts,
Nurseryman in Charge.

Naseby Plantation, Central Otago.

(Area, 1,350 acres; altitude, 2,300 ft.; commenced operations, 1900.)

The rainfall for the past year as recorded at this station was 29·36 in., on 146 days. The highest reading of the thermometer (in shade) was 84° in the months of January and February, 1913; and the lowest 8°, in the month of August, 1912. Frost occurred on 198 nights.

The season, taken on the whole, has been a very satisfactory one, except that the larch planted during the spring were badly frosted. The trees put out this season have done well, and the percentage of deaths should be very small. The trees previously planted have also made satisfactory growth, and these have been run through to replace blanks, so that the block is now well filled up.

The work of keeping down rabbits has been a source of trouble, and so long as they are so plentiful outside the enclosure they will always cause bother. In these parts the land is simply infested with the vermin outside, but through the vigilance of the employees the pest has been kept well under control, and little or no damage has been done.

During the year the crossings were formed in the plantation for the purpose of distributing the trees to the various sites, and drains opened up in wet places. The latter work will be continued during the coming year. By the addition of floors to the men's tents they have been made very much more comfortable.

Owing to the small output of trees for the incoming season, no pitting has been carried on during the fall of the year, there being sufficient over from last year to occupy all the available trees. After planting this season's trees there will not be sufficient ground for the reception of trees next season, and I would advise that the fence be extended in order to meet requirements. I would advise that this work be carried on as soon as possible, in order to get the land cleared of vermin before planting begins.

The fire-breaks have been reploughed, and are now in good order. Clearing all undergrowth from trees, painting gates, buildings, &c., have also been done, and all tools kept in good repair.

Planting was commenced in August and finished in November, the number of trees planted being 608,250, and of these 49,600 were used to replace blanks in the previous year's planting. The area planted for the season was 205 acres, making a total of 541 acres on the new site, and including the old one, 691 acres. The total number of trees on both sites is 1,856,359.

The expenditure for the year was £1,076 19s. 7d., and the total to date £6,432 11s. 3d.

Schedule 1.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	Inches.		Degrees.	Degrees.	
April	1·74	14	69	22	15
May	1·45	8	54	20	29
June	3·04	17	50	14	27
July	2·71	14	50	11	30
August	2·13	6	62	8	28
September	2·39	10	62	23	20
October	3·96	14	70	22	15
November	2·33	16	45	25	10
December	0·93	7	82	26	5
1913.					
January	2·91	14	84	26	6
February	1·94	13	84	26	6
March	3·83	13	74	24	7
Totals	29·36	146	..	..	198

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	352 18 9	1,422 2 2
Pitting	254 17 6	1,590 8 9
Clearing	...	20 17 10
Cartage of trees	5 19 0	108 16 9
General upkeep of plantation	256 2 0	1,423 19 10
General repairs	43 16 7	56 3 0
Horse-feed	...	164 10 0
Permanent works—		
Fencing	...	768 10 11
Formation	9 5 9	86 11 9
Buildings	...	116 11 1
Stock, implements, &c.—Tools, implements	9 16 0	32 16 0
Supervision and clerical—Salaries—		
Supervision of free labour	112 4 0	425 14 11
Superintending Nurseryman's proportion and clerical assistance	32 0 0	215 8 3
	£1,076 19 7	£6,432 11 3

Schedule III.—Trees Account.

	Number.
Trees received during year	608,250
Less to replace blanks	49,600
Planted on new area	558,650
Previously planted	1,297,709
Total number planted on 691 acres (average age, seven years)	1,856,359

Schedule IV.—Property Account.

	£ s. d.
Land (1,350 acres): Crown land not charged to Forestry Account	...
Buildings	116 11 1
Live-stock	...
Improvements	86 11 9
Fencing	768 10 11
Stores in hand	33 9 3
	£1,005 3 0

Balance-sheet.

	£ s. d.
Total expenditure	6,432 11 3
Less Property Account	1,005 3 0
Cost of operations	£5,427 8 3
691 acres planted (average age, seven years).	
Estimated value of plantation per acre	£10 5 0

Summary of Trees in various Blocks at Survey Paddock Plantation.

No. of Block.	Year planted.	Area planted.	Name of Tree.	Number planted.	Remarks.
I	1900–2	52¾	Larix europaea Pinus austriaca „ Laricio „ ponderosa	147,870	Mixed.
II	1902–4	32¾	Pinus austriaca „ ponderosa „ Laricio	89,070	„
III	1904–6	24½	Pinus austriaca „ ponderosa	66,500	„
IV	1906–9	28	Pinus austriaca „ ponderosa	77,000	„
			Various trees on fence-line and along fire-breaks	9,114	
			Total number of trees	389,554	

T. Screen,
Plantation Foreman.
A. W. Roberts,
Nurseryman in Charge.

Sitka Spruce, Tapanui, Age Nine Years, showing how Sensitive Leaders are injured by Winds.

Oregon Pine at Dusky Hill Plantation, showing the Living Lateral Branches although closely surrounded by Larch.

A Typical Oregon Pine in an Exposed Position, showing Injury to Leader and subsequent Natural Recovery.

Gimmerburn Plantation Reserve.

(Area, 425 acres; altitude, 1,200 ft.; commenced operations, 1903.)

Owing to the favourable season, the trees at this station have made very good growth, and at the present time are looking very healthy. Owing to the work of planting being abandoned, there has been no one employed except to plough up land for oats and destroy vermin. The cost of breaking up land, &c., has been borne by the nursery. The land ploughed was sown down in oats, and a good crop was the result, as will be seen by the report on Eweburn Nursery.

The expenditure amounts to £5 for the year, and to date £2,621 0s. 5d.

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting		857 4 3
Pitting		29 9 0
Clearing		...
Cartage of trees		97 10 9
General upkeep of plantation		379 8 5
General repairs		9 13 5
Horse-feed		420 4 0
Permanent works—		
Fencing		387 11 2
Formation		50 0 0
Buildings		57 3 9
Stock, implements, &c.—Tools, implements		19 19 0
Supervision and clerical—		
Salaries—		
Supervision of free labour	5 0 0	233 0 0
Superintending Nurseryman's proportion and clerical assistance	...	79 16 8
	£5 0 0	£2,621 0 5

Schedule III.—Trees Account.

	Number.
Trees received during year	...
Less to replace blanks	...
Planted on new area	...
Previously planted	152,896
Total number planted on 173 acres (average age, seven years)	152,896

Schedule IV.—Property Account.

	£ s. d.
Land (420 acres): Crown land not charged to Forestry Account	...
Buildings	57 3 9
Live-stock	...
Improvements	50 0 0
Fencing	387 11 2
Stores in hand	19 19 0
	£514 13 11

Balance-sheet.

	£ s. d.
Total expenditure	2,621 0 5
Less Property Account	514 13 11
Cost of operations	£2,106 6 6
173 acres planted (average age, seven years).	
Estimated value of plantation per acre	£10 2 6

A. W. Roberts,
Nurseryman in Charge.

Hanmer Spring Nursery, Canterbury.

(Area, 40 acres; altitude, 1,225 ft.; established, 1902.)

Rain fell on 139 days during the year, the total precipitation being 50·73 in. The maximum monthly fall of 14·87 in. was recorded during July. The highest shade-temperature (90°) was registered on the 20th February, and the lowest (15°) on the 4th August. Frosts were recorded on eighty-nine nights during the year, exceptionally low temperatures being registered during the months of July and August, which were easily the coldest and most boisterous months of the year, the heaviest snowfall on record for the last thirty years taking place during July. The snow lay on the ground for a period of six weeks, completely suspending outside operations for the time being. The rainfall throughout the year was very unevenly distributed, fairly moist

conditions prevailing during autumn and winter, the spring being exceptionally wet and the summer a very dry one; so it may be concluded that the weather-conditions throughout the year were not altogether conducive to good results, and adverse conditions had to be contended with. With careful management, however, very satisfactory results were obtained in the seed-beds, the crop of seedlings being an exceptionally fine one. In spite of the dry summer, the growth made by all lined-out stock has been very satisfactory.

Seedling Trees.

Seed-sowing was conducted under somewhat unfavourable conditions as regards weather, heavy winds greatly interfering with the sowing operations. The soil was, however, in fine condition, and the resulting crop of seedlings showed that there was nothing more to be desired in this respect. Though the grass-grub made its appearance in grass land and pastures in many places about the district, notably the Spa grounds and in many gardens in the township, there is no sign of the pest in any part of the nursery. Their absence from the seed-beds may be put down to the constant and thorough working of the ground for the twelve months previous to seed-sowing, and thus keeping the soil free of all growth that would be likely to afford food for the grubs; to a judicious sowing of apterite in the beds during seed-sowing operations and to a periodical thorough soaking of the beds during the growing season, thus practically drowning out any grubs that may have hatched out. Their absence among lined-out stock may mainly be attributed to constant, deep, and thorough cultivation of the vacant areas during the twelve months of their fallow prior to transplanting operations. The total number of seedlings raised during the year is 1,587,100, valued at £1,608 2s., the total number raised to date being 9,760,975.

Larix europaea.—From 120 lb. of seed sown, a crop of 900,000 sturdy plants was raised, a very big advance on the previous season's production, though 48 lb. less seed was sown.

Pinus Laricio.—A good sturdy crop of 300,000 young plants was raised from 74 lb. of seed.

P. ponderosa.—A total of 200,000 young trees was raised from 30 lb. of seed, the plants being very sturdy and well grown.

P. Benthamiana.—From the 10 lb. of seeds sown 8,000 trees resulted, the crop being a sturdy one.

P. radiata.—A very fine crop of 30,000 young trees was raised from 4 lb. of seed, young plants showing an average vertical growth of 6 in.

P. Torreyana.—A small experimental sowing of 1 lb. of seed produced 200 very sturdy plants.

Pseudo-tsuga taxifolia.—The germination was exceptionally good, and the plants are sturdy, about 80,000 young trees being raised from 10 lb. of seed.

Alnus glutinosa.—This seed was collected from trees growing on the plantation adjoining the nursery, about 2 lb. of seed being sown, and resulting in a very fine crop of 60,000 plants.

Sequoia sempervirens.—About 1,000 sturdy plants were raised from ½ lb. of seed.

Sequoia gigantea.—From ¼ lb. of seed a total of 4,500 strong trees was raised.

Cotoneaster Simmondsii.—This seed was collected from a hedge recently planted on the nursery, a crop of 3,400 well-grown plants being raised from about 5 lb. of seed.

Two-year-old Seedlings.

Pinus Laricio.—Owing to wet weather greatly retarding lining-out operations, it was quite impossible to deal with all the seedlings, so it was necessary to leave three of the seed-beds for a further season. The plants have made excellent growth, and are very sturdy.

Two-year-old Lined-out Trees.

The work of lining-out was carried out under very adverse conditions, both as regards weather and soil. Though the whole of the ground was subsoiled during early winter, the heavy snowfall had a very detrimental effect, as it lay on the ground for about six weeks, consolidating the soil to such an extent that considerable extra labour was entailed in bringing it to a proper condition for successful tree-planting. The very moist conditions prevailing throughout the spring also greatly retarded operations, thus considerably reducing the output of trees to the nursery lines. Dry weather followed in the late spring, and continued throughout the summer months. Stock did not suffer to any great extent, however, the hoe being kept going continually between the trees, thus tending to the formation of a "soil mulch," which greatly reduced surface evaporation. The percentage of deaths throughout could be put down at from 8 to 10 per cent.

Larix europaea.—This crop has not attained the vertical growth of previous years, but the plants are sturdy and well rooted. The percentage of loss from transplanting was small, and the grass-grub has not made its appearance as in previous years. A form of needle-cast made its appearance during late spring, caused probably by the previous moist conditions, the lower branches of the trees suffering partial defoliation. The crop soon recovered, however, after drier conditions set in.

Pinus Laricio.—This crop has suffered a fair percentage of loss from transplantation, owing to dry weather immediately following. The trees throughout have not made great vertical growth, but are sturdy and healthy looking.

Pinus ponderosa.—This variety also suffered a fair percentage of loss from the dry weather immediately following the planting season. The young plants have, however, made fine growth, and should make excellent stock by the following season.

Pinus Benthamiana.—Though sturdy plants, this variety has not made the vertical growth of the preceding species; the percentage of deaths is about the same.

Pinus radiata.—This crop proved a failure, only 2,000 plants remaining out of total of 6,000 lined out. When removed from the seed-beds the plants were very weak, having been under snow for some weeks. The majority of the plants had rotted completely, the weight of snow having pressed them flat on the ground. Only a few were fit for transplanting.

Pinus muricata.—These plants were also weak from being under the snow for so long a period, some 5,000 deaths occurring among the 20,000 plants lined out. The survivors have made excellent growth, however.

Pseudo-tsuga taxifolia.—A fair percentage of loss is noticeable amongst these trees also; the plants have, however, made very good growth.

Alnus glutinosa.—These have made remarkably fine growth, the percentage of deaths being practically nil. All the trees are sufficiently well forward for transfer to plantations during the coming season.

On the whole, the operation of lining-out was productive of very fair results, considering the adverse conditions under which the work was carried out, the percentage of deaths being not much above that of previous years. A total of 931,400 trees were dealt with, at an average cost of 1s. 9d. per thousand. The operation was commenced during the last week in August, and was completed on the 19th of October.

Three-year-old Trees.

Larix europaea.—These trees were lifted for transfer to plantations during the winter, but as sufficient pits were not available, it was necessary to line them out again. There have been practically no deaths, and the plants have made excellent growth, and are strong and sturdy. The remarks *re* needle-cast among two-year-olds also apply in this case.

Pinus Laricio.—About 170,000 of these were transplanted from the two-year-old seed-beds, and having done very well, though not making such sturdy growth as those planted at one year old; the percentage of deaths could be put down at 1 per cent. The seed was badly mixed with its variety, *P. austriaca*, as fully 50 per cent. of the break is the latter species. The sorting-out of one variety from another when lifting entails much additional labour, which would be quite unnecessary were pure seed supplied. The whole of this block of trees will be transferred to the plantations during the coming season.

P. ponderosa.—This is the finest yet grown at this station, the trees throughout having made remarkably fine and even growth, the whole crop being fit for transfer to plantations.

P. Benthamiana.—These have made but poor vertical growth, but are strong and sturdy.

P. radiata.—A few of these trees were left over from last season, being too small for transfer to plantations, and were lined out during the spring. The plants are now well grown.

P. muricata.—A small number of this variety was also left from last season, the plants being lined out during the spring; they are now strong trees.

P. austriaca.—These trees have made very sturdy growth.

Pseudo-tsuga taxifolia.—The whole of this variety were lifted for transfer last winter, but the pits not being available, the young plants were again lined out during the spring. The growth made is very satisfactory, and about 12,000 young trees will be available for transfer this winter.

Picea sitchensis.—The majority of these have made excellent growth.

Chamaecyparis Lawsoniana.—A very sturdy crop, and quite fit for transfer to plantations.

Taking the nursery throughout, the average tree-growth is above that of previous years, and the trees have never presented a better or more healthy appearance. It is anticipated that the output for the coming season will be about 1,000,000 trees. The total number of trees in stock on the 31st March was 3,187,100, valued at £5,341 17s.; the number of seedlings raised during the year was 1,587,100, valued at £1,608 2s.: making a total of 9,760,975 seedlings raised to date. Trees to the number of 741,090 were transferred to plantations and Domain Boards during the year, details of which are shown on Schedule V.

General.

Horse-feed.—To provide feed for the teams, about 20 acres was put down in oats during the autumn. The yield of about 20 tons of sheaves was about the average, and should provide sufficient chaff to tide over the winter months. To provide chaff for the ensuing season an area of 20 acres was broken up for the first time, to lie fallow for the winter months, and will be put down in oats during early spring.

The clover and hay crop was a fair one, and will provide ample fodder for use during the winter. The carrot-crop is not up to the average of former years, the roots having made but little growth owing to the dryness of the summer.

Buildings and Improvements.—A small wood-shed was attached to the men's quarters at the nursery; for the convenience of storing chaff-sacks, &c., a substantial bin was constructed in a portion of the shed adjoining the stables. A necessary extension was made to the implement-sheds, and there is now ample accommodation for all implements and vehicles. The concreting of the floors of the implement-shed and workshop was a much-needed improvement.

Nursery-formation.—Necessary work in the form of draining low-lying areas, levelling and formation of roads, was carried out.

Fencing.—About 40 chains of fencing was erected to enclose an additional horse-paddock.

Water-supply.—The existing water-supply continues to give satisfaction at the nursery; the extension of the supply to the stables and dwelling is, however, very desirable.

A considerable amount of work was necessary in the way of maintenance, which consisted of repainting buildings and gates, &c., upkeep of harness and implements, general repair works, shoeing, attention to ornamental borders, reshingling roads, and maintenance of general neatness about workshops, stables, and implement-sheds.

For manurial purposes, and to generally benefit the soil, all vacant areas were sown half with crimson clover and half with oats, the crops being ploughed in when 6 in. high. As the soil was beginnig to cake badly, the above method should be of great benefit in tending to keep the soil more open.

No damage has been done by hares or rabbits during the year.

The daily average of men employed throughout the year is 6·27

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1912.	In.		Deg. Fahr.	Deg. Fahr.	
April	5·56	10	74	30	5
May	2·03	10	66	21	13
June	2·92	16	62	21	18
July	14·87	20	59	21	22
August	0·94	6	62	15	23
September	4·59	21	65	28	4
October	4·42	13	73	29	3
November	4·88	14	73	35	..
December	1·77	7	85	35	..
1913.					
January	3·55	10	84	35	..
February	3·64	6	90	32	1
March	1·56	6	83	35	..
Totals	50·73	139	..	..	89

Schedule II.—Statement of Expenditure.

	For Year.			To Date.		
	£	s.	d.	£	s.	d.
Tree-planting and maintenance—						
Tree-growing	577	6	9	4,777	3	9
General maintenance and repairs ...	152	7	9	716	17	6
Tree-seeds	73	11	6	625	11	11
Manures	20	13	1	84	13	8
Horse-feed, purchased and grown ...	109	19	6	600	4	8
Miscellaneous works	37	13	0	212	11	4
Stock and material—Tools, implements ...	34	0	4	574	10	11
Permanent works—						
Buildings	11	4	6	1,068	3	9
Nursery-formation	54	8	6	526	10	9
Fencing	7	2	0	89	11	9
Water-supply		...		448	12	4
Supervision and clerical—						
Proportion of Superintending Nurseryman's salary	35	0	0	186	0	0
Proportion of Nurseryman's salary ...	112	0	6	806	1	10
Clerical assistance	13	0	0	63	0	0
	£1,238	7	5	£10,779	14	2

Schedule III.—Trees Account.

—	During the Year.		Since 1896 to Date.		Estimated Value, as Schedule V.
	Number.	Cost of Raising.	Number.	Cost of Raising and Maintenance.	
		£ s. d.		£ s. d.	£ s. d.
Trees raised	1,587,100	150 7 2	9,760,975	10,779 14 2	..
Trees sent out	741,090	..	6,573,875	..	..
Balance in stock			3,187,100	.. ..	5,341 17 0
Value of land, improvements, and stock (Property Account)				.. ..	2,968 10 7
Total value					8,310 7 7

Schedule IV.—Property Account.

	£ s. d.
Land (40 acres): Crown land not charged to Forestry Account ...	...
Buildings	1,068 3 9
Live-stock	124 0 0
Improvements	975 3 1
Fencing	89 11 9
Stores in hand	711 12 0
	£2,968 10 7

Schedule V.—Details of One-year-old Trees, sown 1912–13.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Seed sown.	Value per Thousand.	Total Value.	Remarks.
			lb.	£ s. d.	£ s. d.	
Larix europaea	900,000	5	120	1 0 0	900 0 0	Very fine crop.
Pinus Laricio	300,000	2	74	1 0 0	300 0 0	Good crop.
„ ponderosa	200,000	2	30	1 0 0	200 0 0	„
„ Benthamiana	8,000	3	10	1 5 0	10 0 0	Poor germination.
„ radiata	30,000	6	4	1 0 0	30 0 0	Very fine crop.
„ Torreyana	200	4	1	1 5 0	0 5 0	Sturdy trees.
Pseudo-tsuga taxifolia	80,000	2	10	1 5 0	100 0 0	Very fine crop.
Alnus glutinosa	60,000	6	2	0 15 0	45 0 0	„
Sequoia sempervirens	1,000	3	0½	4 0 0	4 0 0	Sturdy trees.
„ gigantea	4,500	3	0¼	4 0 0	18 0 0	Good crop.
Cotoneaster Simonsii	3,400	5	5	0 5 0	0 17 0	„
Totals	1,587,100	..	..	..	1,608 2 0	

Two-year-old Trees, sown 1911–12.

Name of Tree.	Number in Seed-beds.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Larix europaea	..	96,000	14	2 5 0	216 0 0	Very fine crop.
Pinus Laricio	..	300,000	3	2 5 0	675 0 0	Sturdy trees.
„ „	300,000	..	3	1 5 0	375 0 0	„
„ ponderosa	..	80,000	4	2 5 0	180 0 0	Fine crop.
„ Benthamiana	..	7,000	4	2 10 0	17 10 0	„
„ radiata	..	2,000	8	2 5 0	4 10 0	Medium plants.
„ muricata	..	15,000	8	2 5 0	33 15 0	Fair take.
Pseudo-tsuga taxifolia ..	..	4,000	6	2 10 0	10 0 0	Good plants.
Alnus glutinosa	..	89,000	24	1 0 0	89 0 0	Very fine crop.
Totals	300,000	593,000	..	..	1,600 15 0	
	893,000					

Three-year-old Trees, sown 1910–11.

Name of Tree.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Larix europaea	100,000	24	3 0 0	300 0 0	Very sturdy trees.
Pinus Laricio	490,000	10	3 0 0	1,470 0 0	„
„ ponderosa	80,000	10	3 0 0	240 0 0	Very fine trees.
„ Benthamiana	7,000	8	3 5 0	22 15 0	Sturdy trees.
„ radiata	2,400	12	3 0 0	7 4 0	„
„ muricata	400	12	3 0 0	1 4 0	„
„ austriaca	1,400	10	3 0 0	4 4 0	„
Pseudo-tsuga taxifolia	12,000	12	3 5 0	39 0 0	„
Picea sitchensis	10,000	11	3 5 0	32 10 0	„
Chamaecyparis Lawsoniana	3,800	14	4 5 0	16 3 0	„
Totals	707,000	..	..	2,133 0 0	

Trees transferred from Nursery to Plantation, &c., 1912–13.

Where sent.	Name of Tree.	Number.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
		£		£ s. d.	£ s. d.	
Hanmer Springs Plantation	Larix europaea ..	434,000	18	2 5 0	976 10 0	Sturdy plants.
	Pinus Laricio	208,740	10	3 0 0	626 4 4	
	„ ponderosa ..	49,000	10	3 0 0	147 0 0	
	„ radiata	6,575	12	2 5 0	14 15 10	
	„ muricata ..	1,025	10	2 5 0	2 6 1	
	Alnus glutinosa ..	12,900	6	0 15 0	9 13 6	
		712,240	..	..	1,776 9 9	
Selwyn Plantation Board	Pinus Laricio	17,000	10	3 0 0	51 0 0	
	„ ponderosa ..	9,000	10	3 0 0	27 0 0	
	„ radiata	650	12	2 5 0	1 9 3	
		26,650	..	..	79 9 3	
Omaka Domain Board	Larix europaea ..	1,000	18	2 5 0	2 5 0	
	Pinus Laricio	500	10	3 0 0	1 10 0	
	„ ponderosa ..	200	10	3 0 0	0 12 0	
	Pseudo-tsuga taxifolia ..	500	12	2 10 0	1 5 0	
		2,200	..	..	5 12 0	
Hanmer Springs Plantation	As per details above ..	712,240	..	..	1,776 9 9	
Selwyn Plantation Board	„ ..	26,650	..	..	79 9 3	
Omaka Domain Board	„ ..	2,200	..	..	5 12 0	
Totals ..	..	741,090	..	..	1,861 11 0	

W. G. Morrison,
Nurseryman in Charge.

Hanmer Springs Plantation, Canterbury.

(Area, 3,668 acres; altitude, 1,225 ft.; commenced operations, 1901.)

Operations have again been conducted under extremely adverse conditions, chiefly climatic. The winter was a phenomenally severe one, and unprecedented in this district. For seven weeks during the months of July and August work on the ground was completely suspended, free labour only being employed at pruning, the greater part of the larch areas on both Nos. I and II plantations being gone over in this respect. Whilst the snow was deep hare drives were organized, no less than eighty hares being destroyed in two days. The early part of the spring was very moist; but the summer, on the other hand, was a very dry one, and to this may be attributed the rather heavy death-rate among newly planted trees. The deaths are most numerous among pines which were planted in dry gravelly situations devoid of any growth to prevent evaporation. *Pinus Laricio* is the chief sufferer, the deaths in this species amounting to about 30 per cent. Larch have also suffered somewhat, but not so badly as Corsican pine, the loss being about 12 per cent. Among *Pinus ponderosa* the death-rate could be put down at about 9 per cent.

Spring frosts did some damage to the leaders of larch just as the growth was starting, but they soon recovered. A form of needle-cast made its appearance among this species early in the season, caused no doubt by dry weather-conditions following so soon after a very wet winter and spring. The lower branches of the trees only were affected, the leaders being untouched; the defoliation being more marked on trees growing on the flat country than among those on the sidelings; in fact, on the greater part of the sidelings there was no sign of the needle-cast. The trees appeared to shake off the disease towards the end of summer, and took on to some extent their usual healthy appearance. With this one exception all varieties of trees present a flourishing appearance, and the average growth compares well with that of other seasons.

Pinus Laricio has again demonstrated itself as well adapted for this locality, the average annual growth being from 10 in. to 20 in. *Pinus ponderosa* has also thrived well, and in one instance where it was mixed with *P. austriaca* about eight years ago it is now fully 7 ft. above the latter. The Oregon pine, which in previous years has been rather slow in growing, has asserted itself this season, and has put on a vertical growth of from 6 in. to 20 in.; it is evidently responding to the shelter afforded by the Corsican pine, with which it is mixed. Larch has not made the rapid growth of previous years, the dry season no doubt accounting for this. *Picea sitchensis* is still very slow in starting, but it is possible that it will go ahead when its admixture, *Pinus ponderosa*, gives it shelter. Alder has made its usual rapid growth; but spruce has made but little headway.

Operations were, as usual, carried on by a combination of free and prison labour, the larger portion being done by the latter, some difficulty being experienced in obtaining suitable free labour. Tree-planting was commenced on the 3rd May, and was completed on the 9th October. A total of 717,240 trees were planted, including 5,000 willow-cuttings; of this number, 664,415

were planted on new area, and 52,825 were used for replacing failures in former plantings, mainly on No. I plantation. Only a small portion of No. II plantation was dealt with in regard to the replanting of failures, as time and labour could not be found for the purpose. It is, however, intended to have this work put through during the coming season.

The area planted during the past season is 244 acres, making a total area of 1,964 acres now under forest, containing 5,346,871 trees. A further area of 1,060 acres was acquired for afforestation purposes. Of this block, an area of about 350 acres was securely enclosed by a substantial netting fence, 182 chains in length, which was erected by contract at a labour-cost of 4s. per chain.

The greater part of the enclosed area was covered by a thick growth of manuka, which had to be cut down and burned before pitting operations could be commenced. This work was entirely performed by prison labour, an excellent job being made of it. Before the commencement of pitting fire-breaks and roads were marked off, a chain-wide fire-break cutting the area in halves, and a half-chain break following the fence-line, the roads following the fire-breaks where convenient. A paddock of 20 acres was reserved for cropping purposes; this was ploughed, and will be allowed to fallow before the winter.

Red deer again made their appearance in the planted areas during the winter, and did a good deal of damage to larch. One was shot inside the enclosure. The growth of manuka and tussock, which encumbered each side of the main road bordering the plantations and was such a menace as regards fire, was cleared and burned, thus enabling the ploughing of fire-lines right up to water-tables of road. Culverts have been formed where required, and the formation of necessary roads was carried on in various parts of the plantation. Pits to the number of 358,487 are now available for the season's planting.

Prison Labour.—The bulk of the work has been done by prison labour. The number of prisoners available for forestry operations has exceeded that of other years, the daily average employed being 15·22 men. The total value of work done for the year was £1,127 0s. 10d. The thanks of the Department are due to the Prisons staff for their efforts in making the work a success. The following are the values and particulars in brief of the work for the year: Pitting, 483,033, £362 5s. 6d.; tree-planting, 643,865, £334 14s. 5d.; clearing, 290 acres, £290 19s. 5d.; general upkeep, £41 16s.; horse-feed, £5 11s. 3d.; fencing, £13 10s.; formation, £78 14s. 3d.

Free Labour.—Free labour was employed partly by contract and partly by day labour, the daily average employed throughout the year being 5·35 men. A total of 109,650 pits were opened for the year, at a cost of 19s. per thousand, the whole of the work being done by contract. Trees to the number of 21,225 were planted by contract, at a total cost of £7 19s. 3d. Cartage of trees to plantations cost £10 14s. 3d. An area of 13 acres was cleared of scrub, at a cost of £13 19s. 6d. General maintenance work was a large item of expenditure during the year, the total labour-cost being £459 17s. 4d. Under this expenditure are included the following works: Opening blank pits and replanting failures; grubbing out briars, gorse, &c.; cleaning foreign growth from around young trees; pruning and cutting-out of double leaders, almost the whole of the larch area being gone over in this respect; destroying hares; ploughing fifteen miles of fire-breaks.

Part of the formation of roads was also done by free labour. A total length of 182 chains of fencing was erected, at a cost of 4s. per chain. An expenditure of £12 19s. 6d. was also incurred in harvesting operations, ploughing ground for oat-crop, and carting chaff from Culverden.

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	342 13 8	3,057 11 8
Pitting	466 2 8	4,493 9 7
Clearing	304 18 11	1,617 6 9
Cartage of trees	10 14 3	89 11 4
General upkeep of plantation	501 13 4	2,972 6 2
General repairs	3 1 6	17 13 10
Horse-feed	19 10 5	173 18 5
Permanent works—		
Fencing	193 3 5	1,316 18 8
Formation	124 2 2	1,209 10 8
Buildings	1 11 5	750 11 1
Stock, implements, &c.—Tools, implements	51 14 2	466 4 8
Supervision and clerical—		
Salaries—		
Supervision of free labour	90 0 0	866 14 4
,, prison labour	171 0 6	603 17 2
Superintending Nurseryman's proportion and clerical assistance	46 0 0	418 7 0
	£2,326 6 5	£18,054 1 4
Estimated value of prison labour (apportioned in above items)	£1,127 0 10	£6,381 4 8
Actual expenditure	£1,199 5 7	£11,672 16 8

Schedule III.—Trees Account.	Number.
Trees received during year (including 5,000 willow-cuttings)	717,240
Less to replace blanks	52,825
Planted on new area	664,415
Previously planted	4,682,456
Total number planted on 1,964 acres (average age, eight years)	5,346,871

Schedule IV.—Property Account.	£	s.	d.
Land (2,668 acres): Crown land not charged to Forestry Account			
Buildings	750	11	1
Live-stock			
Improvements	1,209	10	8
Fencing	1,316	18	8
Stores in hand	142	17	0
	£3,419	17	5

Balance-sheet.	£	s.	d.
Total expenditure (prison labour included)	18,054	1	4
Less Property Account	3,419	17	5
Cost of operations	£14,634	3	11
1,964 acres planted (average age, eight years).			
Estimated value of plantation per acre	11	2	6

A. J. Boydell,
Plantation Foreman.

W. G. Morrison,
Nurseryman in Charge.

Dumgree Plantation, Marlborough.

(Area, 881 acres; altitude, 100 ft.; commenced operations, 1903.)

To ascertain the feasibility of converting the unplanted portion of this reserve into a revenue-producing property a visit was made to the plantation in February last, in the company of Ranger Townsend, and the required information duly presented. This opportunity was also availed of to determine the condition of tree-growth generally.

While a steady uniform progress in all varieties of trees was noticeable over the level ground, exceedingly vigorous headway is being made by *Pinus ponderosa*, *Pinus Laricio*, and *Larix europaea* on the terraces, where "leaders" from 30 in. to 36 in. are conspicuous. The conditions are evidently also suitable for *Pinus strobus*, which is progressing at the rate of about 15 in. annually. Amongst the other varieties of succeeding trees may be mentioned *Pinus radiata*, *Pinus muricata*, *Betula alba*, *Populus* (varieties), and *Alnus glutinosa*, and in a smaller measure *Pseudotsuga taxifolia*. It is not contrary to fact to say that the established pines at this abandoned station are increasing their height more rapidly than on any of the South Island plantations.

Anticipations of the damage by fire have been realized, although the benefits accruing from the pruning scheme outlined two years ago are now very obvious. The ascertaining of a perfectly incontestible statement of the number of trees existing over the area originally planted would be almost impossible; but, basing calculations on the number planted, and making special allowance for deaths by various causes, the total number of trees living reaches 569,640, as per details on general statement.

Constable Williams has evidently fulfilled his promise faithfully to exercise constant watchfulness over the plantation in return for the sheep-grazing privilege, and it is gratifying to know that, although grass fires occurred in the immediate vicinity on several occasions, the young plantation escaped injury from this source. Undoubtedly the presence of sheep on the reserve had the desired effect of restraining cocksfoot-grass growth from reaching the seeding-stage, and thus minimize the danger of any rapid spread of fire should such have gained access to the enclosure.

A small expenditure of £5 3s. (being principally devoted to rabbiting) has advanced the actual total expenditure to £10,054 16s. 10d., but by including the value of prison labour this figure is increased by £2,365 14s. 7d., as detailed on supporting statements.

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting		1,777 10 7
Pitting		3,898 11 1
Clearing		13 5 0
Cartage of trees		73 10 6
General upkeep of plantation	3 3 0	1,509 2 4
General repairs		23 17 8
Horse-feed		...
Acquirement of land		3,600 0 0
Permanent works—		
Fencing		122 17 10
Formation		158 5 7
Buildings		41 2 8
Stock, implements, &c.—Tools, implements		276 3 2
Supervision and clerical—		
Salaries—		
Supervision of free labour		347 14 9
,, prison labour		467 16 3
Superintending Nurseryman's proportion and clerical assistance	2 0 0	110 14 0
	£5 3 0	£12,420 11 5
Estimated value of prison labour (apportioned in above items)		2,365 14 7
Actual expenditure	£5 3 0	£10,054 16 10

Schedule III.—Trees Account.

	Number.
Trees received during year	...
Less to replace blanks	...
Planted on new area	...
Previously planted	569,640
Total number planted on 209 acres (average age, seven years)	569,640

Schedule IV.—Property Account.

	£ s. d.
Land (857½ acres)	3,600 0 0
Buildings	...
Live-stock	...
Improvements	158 7 7
Fencing	122 17 10
Stores in hand	1 4 11
	£3,882 10 4

Balance-sheet.

	£ s. d.
Total expenditure (prison labour included)	12,420 11 5
Less Property Account	3,882 10 4
Cost of operations	£8,538 1 1
209 acres planted (average age, six years)	...
Estimated value of plantation per acre	£10 12 6

R. G. ROBINSON,
Superintending Nurseryman.

Approximate Cost of Paper.—Preparation, not given; printing (1,500 copies, including plans and illustrations), £120.

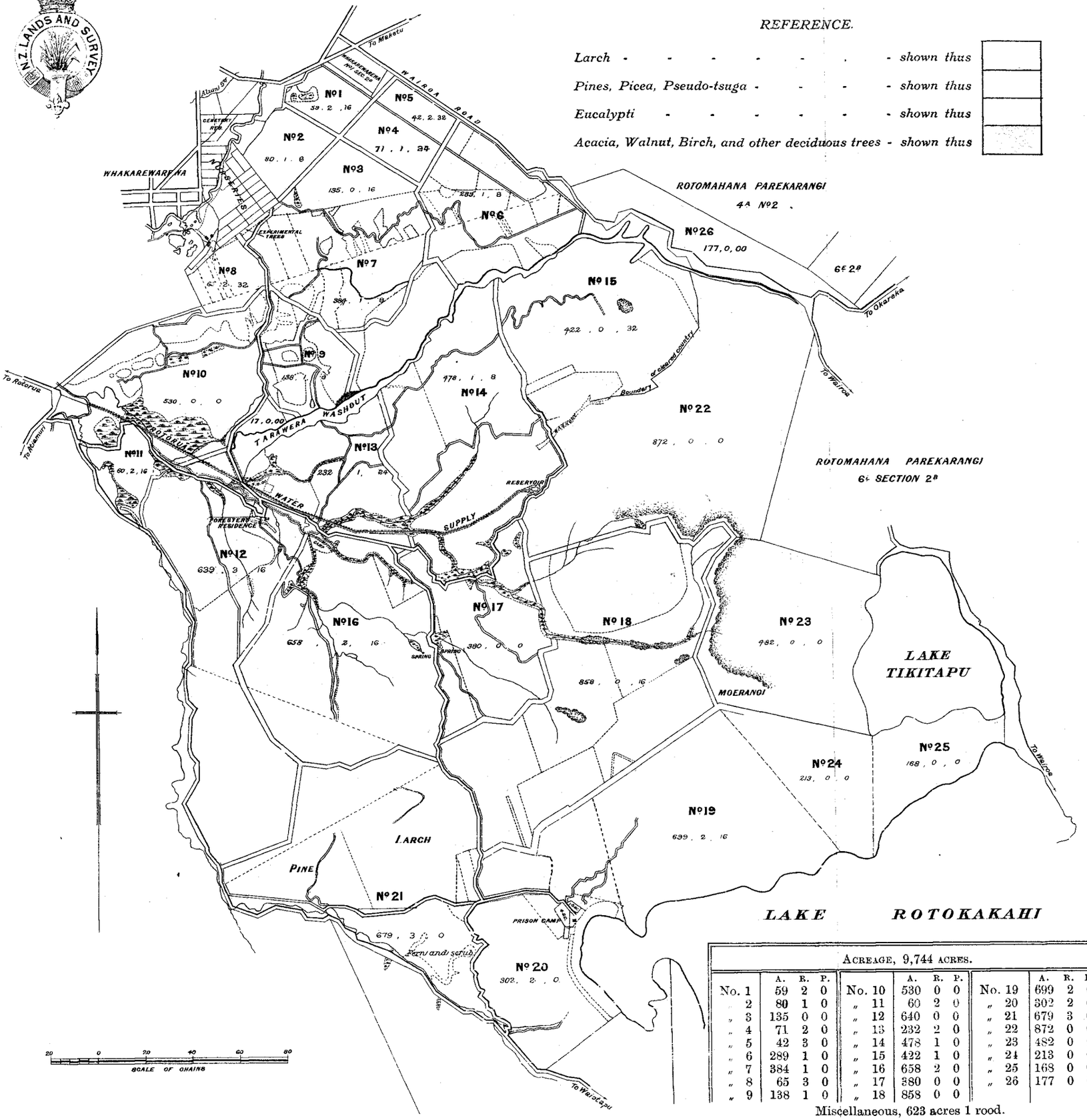
By Authority: JOHN MACKAY, Government Printer, Wellington.—1918.

Price 2s.

ROTORUA NURSERY AND WHAKAREWAREWA PLANTATION.

REFERENCE.

Larch - - - - - - - -	*shown thus*
Pines, Picea, Pseudo-tsuga - - - -	*shown thus*
Eucalypti - - - - - - -	*shown thus*
Acacia, Walnut, Birch, and other deciduous trees -	*shown thus*



ACREAGE, 9,744 ACRES.

	A.	R.	P.		A.	R.	P.		A.	R.	P.
No. 1	59	2	0	No. 10	530	0	0	No. 19	699	2	0
„ 2	80	1	0	„ 11	60	2	0	„ 20	302	2	0
„ 3	135	0	0	„ 12	640	0	0	„ 21	679	3	0
„ 4	71	2	0	„ 13	232	2	0	„ 22	872	0	0
„ 5	42	3	0	„ 14	478	1	0	„ 23	482	0	0
„ 6	289	1	0	„ 15	422	1	0	„ 24	213	0	0
„ 7	384	1	0	„ 16	658	2	0	„ 25	168	0	0
„ 8	65	3	0	„ 17	380	0	0	„ 26	177	0	0
„ 9	138	1	0	„ 18	858	0	0				

Miscellaneous, 623 acres 1 rood.

E.S.Wood, Delt. 1911.

H. T. McCARDELL, CHIEF DRAUGHTSMAN, HEAD OFFICE, WELLINGTON.

BY AUTHORITY: JOHN MACKAY, GOVERNMENT PRINTER.

PLAN OF
WAI-O-TAPU STATE PLANTATION.

REFERENCE.

Larch - - -	*shown thus*	
Pines - - -	,,	
Eucalypti - - -	,,	
Birch, - - -	,,	

No. 1. 128 . 2 . 0
No. 2. 181 . 0 . 32
No. 3. 178 . 0 . 0
No. 4. 323 . 1 . 0
No. 5. 268 . 0 . 0
No. 6. 524 . 0 . 0
No. 7. 163 . 3 . 0
No. 8. 284 . 0 . 0
No. 9. 307 . 3 . 32
No. 10. 215 . 2 . 0
No. 11. 536 . 1 . 24
No. 12. 200 . 2 . 0
No. 13. 427 . 0 . 0
No. 14. 388 . 2 . 0
No. 15. 674 . 0 . 0
No. 16. 406 . 0 . 0
No. 17. 256 . 1 . 24
No. 18. 824 . 2 . 0
No. 19. 948 . 0 . 0
No. 20. 279 . 2 . 0

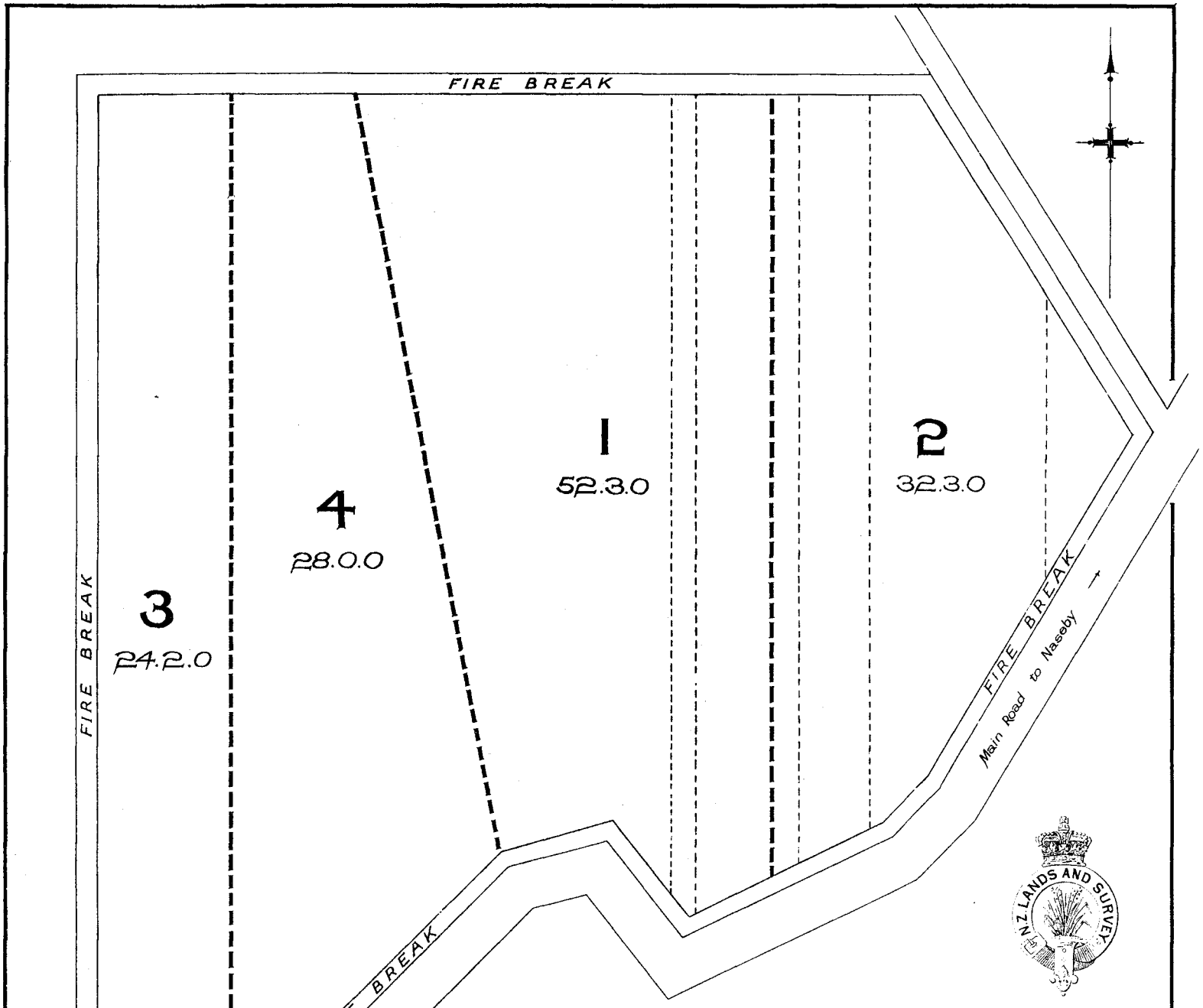
GALATEA ROAD
Mangahakomiuka Stm
PRISON CAMP
HORSE PADDOCK
PADDOCK
PADDOCK
OLD CAMP
MAIRS ROAD
GALATEA ROAD
OLD ROAD

TOTAL AREA, 7,777 AC. 1 R. 8 P.

	A.	R.	P.		A.	R.	P.
No. 1.	128	2	0	No. 11.	536	1	24
,, 2.	181	0	32	,, 12.	200	2	0
,, 3.	178	0	0	,, 13.	427	0	0
,, 4.	323	1	0	,, 14.	388	2	0
,, 5.	268	0	0	,, 15.	674	0	0
,, 6.	524	0	0	,, 16.	406	0	0
,, 7.	163	3	0	,, 17.	256	1	24
,, 8.	284	0	0	,, 18.	824	2	0
,, 9.	307	3	32	,, 19.	948	0	0
,, 10.	215	2	0	,, 20.	279	2	0
				Miscellaneous	262	1	16

40 30 20 10 0 20 40 60 80
SCALE OF CHAINS

H. T. McCARTHY, CHIEF DRAUGHTSMAN, HEAD OFFICE, WELLINGTON
By Authority: JOHN MACKAY, GOVERNMENT PRINTER



PLAN OF THE NASEBY SURVEY PADDOCK PLANTATION, CENTRAL OTAGO.

SCALE OF CHAINS
3 2 1 0 6 12

BLOCK No. 1 (planted 1900–02)	contains	147,870	trees.
BLOCK No. 2 (planted 1902–04)	"	89,070	"
BLOCK No. 3 (planted 1904–06)	"	66,500	"
BLOCK No. 4 (planted 1906–09)	"	77,000	"
Various trees (Betula alba, Pinus radiata, Pyrus aucuparia, &c.), planted on fence-line and along fire-breaks		9,114	"
TOTAL		389,554	"

REFERENCE.

Larix europaea and Pinus austriaca, shown thus

Pinus austriaca and P. ponderosa, shown thus

Pinus laricio and P. ponderosa, shown thus

E. H. WILMOT, CHIEF SURVEYOR OTAGO.

A.J.M. 1913.

H.McCardell, Chief Draughtsman, Head Office, Wellington.

By Authority: John Mackay, Government Printer.

BLOCK II

REFERENCE.

Larix europaea	shown thus
Pinus muricata, P. laricio, P. austriaca	shown thus
Fraxinus excelsior, Picea excelsa, Picea sitchensis, Pseudo-tsuga taxifolia	shown thus
Larix europaea and Pines	shown thus
Native bush	shown thus
Quercus pedunculata, Acer pseudo-platanus, Betula alba, Alnus glutinosa, and other deciduous trees	shown thus

BLK. 12 RANKLEBURN DIST.

To be planted in 1913

Plan of the CONICAL HILLS PLANTATION, Otago.

SCALE OF CHAINS
20 15 10 5 0 20 40

A.J.Morrison. 1913.

E. H. WILMOT. CHIEF SURVEYOR OTAGO.

H.McCardell, Chief Draughtsman, Head Office Wellington

1500. 6.13. 503.

By Authority: John Mackay, Government Printer.