1914.

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.

TABLE OF CONTENTS.

SIR,— Department of Lands and Survey, Wellington, 2nd June, 1914.

I have the honour to state that the operations of the Forestry Branch of the Lands Department have been vigorously carried on during the past year. Eight and a half million trees were raised in the four State nurseries, about half being raised at Rotorua and the balance at the three State nurseries in the South Island. During the same period six and a half million trees were sent out to the State plantations; and at the 31st March last it was estimated that there were seventeen and a half million trees in the nurseries for planting out in the coming and following seasons. Since the formation of the nurseries in 1896 over sixty-five million trees have been sent to the plantations, and three and a half million trees to outside places.

The total cost to date of the seven nurseries (three of which are now closed) has been £118,392; but of this, however, £24,707 has been expended on permanent works.

During the year in the nine plantations in which operations are now being carried on an area of 1,825 acres was planted, making a total of 22,458 acres planted since 1896. The average cost per acre planted during the year was £5 17s. 5d., which is a satisfactory reduction on previous years. The total expenditure (inclusive of the estimated value of prison labour) since 1896 amounts to £186,041, of which £29,255 was on permanent works such as buildings, formation, fencing, roads, &c.

In the North Island the months of January, February, and March were, for the second year in succession, excessively dry, with the result that there were serious losses in the nurseries, especially with larch and *Pinus ponderosa* seedlings. Though in the plantations the effects of the drought were less severe, nevertheless small groups of larch planted in 1901 and *Pinus radiata* planted in 1904 were killed. In spite of the drought the trees planted during the season have thriven particularly well, and in this respect the season has been the most successful experienced.

It is to be regretted that the supply of prison labour was inconstant, as irregularity and uncertainty in this matter seriously disarrange the operations as schemed out for the season. An unexpected shortage in prison labour cannot readily be compensated by the employment of free labour, as it is not found desirable to have free men and prisoners working together. It is to be hoped that a more regular supply of the valuable prison labour can be arranged for future planting.

Owing to eucalypts varying so much in their characteristics several species are now being tried so as to ensure getting those best suited to New Zealand. As only a small proportion of the seedlings grown experimentally will be required, the balance will be available for distribution to farmers and settlers, as in this way a much wider range of climatic conditions will be tried, and the value of the experiment much enhanced.

As a further precaution against fire three huts have been erected at Whakarewarewa and two at Waiotapu for Rangers, whose sole duty during the dry season of the year will be to patrol the boundaries. The Rangers' huts are connected by telephone with the quarters of the officers in charge, so that immediate assistance can be supplied if required. One fire occurred at Waiotapu, but it was detected soon after starting and quickly put out.

The precautions taken against the grass-grub have proved most successful in the North Island, and practically no damage has been done this year by this pest.

Experiments will be tried next season with the valuable Scots pine (*Pinus sylvestris*), using seed obtained from Norway and Finland, as it is thought trees from these countries may succeed better than trees from British sources have done. Cevennes, Tauric, and Calabrian varieties of the Corsican pine and various eucalypts will also be sown. At Whakarewarewa 1,200,000 *Pinus radiata* will be planted out.

I regret to have to record the death of Mr. Robert Glass, Assistant Forester at Green Lake Prison Camp.

In the South Island weather-conditions were particularly favourable for tree-growing at Naseby and Hanmer; but in the most southern nursery excessive rainfall was most detrimental to seed-germination and cultivation among transplanted trees. For the third year in succession at Tapanui climatic conditions have proved most adverse to tree-raising.

The acquirement of further areas for the extension of plantations is now a matter of urgency, as Conical Hills, Naseby, and Hanmer are nearly full. Experience has proved that in the South Island wind is one of the chief factors that determines the suitability of an area for tree-planting.

In spite of preventive measures the grass-grub has done much mischief in the nurseries in the South Island.

Five depots have been established for fighting incipient fires, and poplars are now being planted to serve as fire-breaks. About a hundred thousand trees were sent out from Hanmer Springs Nursery to plant reserves under the control of the Selwyn Plantation Board. A further hundred thousand are proposed to be allotted for the same purpose for the year 1914–15.

Owing to the now recognized value of *Pinus radiata* as a timber-tree 150 lb. of seed was sown, with the result that 1,190,000 sturdy seedlings were raised.

Experience has now proved that the soil in the southern plantations available for afforestation is not of a quality good enough for the profitable raising of European hardwoods, so the raising of these trees has now been abandoned.

It is much to be regretted that prison labour has now been withdrawn from Hanmer, as this class of labour has proved most satisfactory.

In the report for the year 1910–11 (p. 54) it was incorrectly stated that Mr. W. T. Morrison was the winner of the prize for the best paper written that year. Mr. W. G. Morrison was the writer of the prize paper.

I am pleased to say that, on the whole, the operations for the year have been very successful, and that the staff under the management of Messrs. R. G. Robinson (Superintending Nurseryman for the South Island) and H. A. Goudie (Superintending Nurseryman for the North Island) have worked zealously and well to advance the interests of the State in its afforestation operations. Extended leave was granted Mr. Robinson, who has gone to Europe via Canada, and he will be able to gather information that should be of value in connection with tree-planting in New Zealand. His place is being temporarily filled by Mr. W. T. Morrison.

The Royal Commission on Forestry completed their inspection of State nurseries and plantations at the end of May, 1913, and their valuable report has already been laid before Parliament. Some of their recommendations—*e.g.*, increased provision for preventing fires in plantations, planting of *Pinus radiata*, and the abandonment of larch—have already been adopted, and other recommendations are under consideration.

The reports of the Superintending Nurserymen are attached, together with detailed reports of 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.,

JAMES MACKENZIE,

Under-Secretary for Lands.

The Right Honourable W. F. Massey, Commissioner of State Forests.

SUMMARIES.

Summary of Operations in Nurseries during the Year ended 31st March, 1914.

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, 1914.
							Trees sent to Plantations during Year. / Trees sent to outside Places during Year.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.		£ s. d.		
Rotorua	343 0 0	272 8 1	4,074 3 3	4,689 11 4	4,191,450	0 7 4	4,782,190 / 134,340	8,576,100
Tapanui	345 0 0	296 10 7	1,448 1 11	2,089 12 6	2,342,400	0 2 9	698,389 / 1,650	3,877,080
Eweburn	212 0 0	9 18 3	843 5 9	1,065 4 0	831,100	0 4 2	145,165 / 130,000	2,188,700
Hanmer Springs	198 8 8	83 17 1	1,230 2 9	1,512 8 6	1,199,000	0 3 11	907,990 / 197,465	2,841,150
Totals	1,098 8 8	662 14 0	7,595 13 8	9,356 16 4	8,563,950	0 4 6½	6,533,734 / 463,455	17,483,030

Summary of Operations in Nurseries from 1896 to 1914.

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	3,289 16 8	9,232 0 6	38,772 3 10	51,294 1 0	50,260,941	0 18 6	40,757,019	927,822
Tapanui	2,641 4 11	4,918 7 3	19,807 18 5	27,367 10 7	16,413,409	1 13 4	11,789,449	746,880
Eweburn	1,633 19 6	3,003 12 10	10,474 6 4	15,111 18 8	5,705,987	2 12 11	3,311,210	206,077
Hanmer Springs	1,253 10 6	2,791 6 7	8,247 5 7	12,292 2 8	10,520,480	1 3 4	7,371,015	3.8,315
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	9,447 4 10	24,707 2 10	94,237 14 11	118,392 2 7	86,132,887	1 17 9	65,193,788	3,456,069

* Nursery now closed.

Summary of Operations in Plantations during the Year ended 31st March, 1914.

Name of Plantation.	Trees. Number received from Nursery.	Number used to replace Losses.	Number planted on New Area.	Expenditure. Supervision and Clerical.	Formation, Buildings, Roads, Fencing.	Planting Operations.	General Upkeep.	Totals.	New Area planted.	Cost per Thousand Trees planted.	Cost per Acre planted.	General Upkeep per Acre planted.
North Island—				£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Acres.	£ s. d.	£ s. d.	£ s. d.
Whakarewarewa ..	1,702,745	444,175	1,258,570	702 17 0	570 5 10	2,307 0 10	1,768 1 7	5,348 5 3	475	2 13 0	7 0 6	0 5 8
Waiotapu ..	1,469,695	890,635	579,060	319 0 0	332 1 0	558 1 2	1,361 7 4	2,570 9 6	213	2 2 6	5 15 6	0 3 11
Kaingaroa ..	1,609,750	..	1,609,750	509 0 0	236 19 2	828 15 8	110 2 8	1,684 17 6	600	0 18 5	2 9 9	0 3 8
Puhipuhi	..	..	..	25 0 0	0 14 3	4 9 6	379 3 7	409 7 4	..	..	..	0 6 4
South Island—												
Conical Hills ..	698,764	23,080	675,684	265 0 0	69 7 5	555 4 0	1,306 13 8	2,196 5 1	259½	0 18 9*	2 8 1	0 10 5
Dusky Hill ..	8,250	8,250	..	186 0 0	36 17 3	..	145 0 10	367 18 1	..	..	..	0 7 0
Waitahuna ..	..	..	..	3 0 0	..	..	22 17 1	25 17 1	..	..	..	2 7 0
Gimmerburn ..	..	..	..	10 0 0	..	..	..	10 0 0	..	..	..	..
Naseby	145,165	67,300	77,865	235 0 0	70 0 10	251 19 6	268 6 4	825 6 8	28	4 10 7	12 12 1	0 10 9
Hanmer Springs ..	900,165	221,760	678,405	315 0 0	484 8 9	1,055 12 3	390 3 10	2,245 4 10	249¼	1 16 2	4 18 8	0 4 7
Dumgree	..	..	..	5 0 0	..	..	5 10 2	10 10 2	..	..	..	..
Totals ..	2,134,534	1,655,200	4,879,334	2,574 17 0	1,800 14 6	5,561 2 11	5,757 7 1	15,694 1 6	1,824¾	2 3 3	5 17 5	0 11 0

* This low cost is arrived at owing to a large number of pits having been prepared during the previous year.

Summary of Operations in Plantations from 1896 to 1914.

Name of Plantation.	Trees. Number received from Nursery.	Number raised from Seed sown *in situ*.	Number used to replace Losses.	Total Number in Plantation.	Expenditure. Supervision and Clerical.	Formation, Buildings, Roads, Fencing.	Planting Operations.	General Upkeep.	Totals.	Total Area planted.	Cost per Thousand Trees planted.	Cost per Acre planted.	General Upkeep per Acre planted.
North Island—					£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Acres.	£ s. d.	£ s. d.	£ s. d.
Whakarewarewa ..	17,012,214	109,725	3,176,343	13,945,596	4,430 0 4	5,708 6 0	23,687 12 6	12,332 18 7	46,158 17 5	6,224	2 3 2	4 16 8	0 2 6
Waiotapu ..	22,073,110	83,121	3,902,042	18,254,189	4,608 3 0	6,035 10 7	22,662 3 4	7,680 2 1	40.985 19 0	6,960	1 12 10	4 6 0	0 1 6
Kaingaroa ..	1,618,650	..	250	1,618,400	860 7 9	2,836 10 2	1,568 9 11	270 9 2	5.535 17 0	600	1 14 9	4 13 8	0 4 6
Puhipuhi ..	2,133,520	..	1,133,520	1,000,000	1,007 9 7	1,200 5 9	3,840 11 11	3,861 5 4	9,909 12 7	1,200	..	4 10 9	0 6 6
South Island—													
Conical Hills ..	9,170,367	..	768,336	8,402,031	2,433 9 4	2,179 7 1	13,768 1 7	7,563 19 0	25,944 17 0	3,097½	3 1 8	8 7 6	2 13 7
Dusky Hill ..	2,998,787	..	817,950	2,180,837	1,865 4 2	1,218 10 8	7,426 17 4	3,042 13 11	13,553 6 1	845	6 4 3	16 0 9	4 4 0
Waitahuna ..	42,025	..	11,500	30,525	30 9 0	61 1 1	73 8 3	63 19 4	228 17 8	11	7 10 0	20 16 1	6 12 8
Gimmerburn ..	936,235	..	783,339	152,896	322 16 8	514 13 11	984 4 0	809 5 10	2,631 0 5	173	17 4 1	15 4 2	5 7 0
Naseby	2,247,200	..	312,976	1,934,224	876 3 2	1,074 10 7	3,394 5 0	1,912 19 2	7,257 17 11	719	3 15 0	10 1 10	3 1 4
Hanmer Springs ..	7,363,190	..	1,342,914	6,020,276	2,203 18 6	4,227 13 10	10,313 11 7	3,554 2 3	20,299 6 2	2,213¼	3 7 5	9 3 5	1 16 9
Dumgree ..	1,679,765	..	1,110,125	569,640	931 5 0	4,198 9 3	5,762 17 2	1,538 10 2	12,431 1 7	209	*	*	*
Raincliff.. ..	..	..	..	50,000	..	..	..	..	1,104 12 5	206	*	*	*
Totals ..	67,275,063	192,846	13,359,295	54,158,614	19,569 6 6	29,254 18 11	93,482 2 7	42,630 4 10	186,041 5 3	..	5 3 8	9 16 1	2 9 0

* Data not available.

REPORT ON THE AFFORESTATION OPERATIONS IN THE NORTH ISLAND, 1913–14.

[By the Superintending Nurseryman, North Island, Rotorua.]

The year under review is the second one in succession in which extraordinary dry weather has been experienced, and as a consequence the effects of the drought upon plant-life are more serious than those recorded last year. The ill effects of the drought are confined chiefly to the nursery, where considerable losses have occurred in the seed-beds of two-year-old larch and this year's crop of *Pinus ponderosa*. Although the plantations did not apparently suffer to any appreciable extent, yet there is evidence to show that the dry weather, which started in January, 1913, and prevailed for about three months, was not compensated for by the rain which fell during the succeeding winter and spring months. During the months of January, February, and March of 1914 the ground in the plantations, except where recently cultivated, contained practically no moisture for 18 in. below the surface. A small area of land at Whakarewarewa, which has hitherto been too swampy to plant, dried up completely, and it was successfully cleared and burned. At Kaingaroa a stream fed by a number of small springs, which has hitherto been regarded as a reliable source of supply of water for the prison camp, failed entirely about the middle of February last. The deaths amongst the older trees, although not extensive, provide further evidence as to the dry condition of the soil. Larch which were planted in 1901 and *Pinus radiata* planted in 1904 died out in small groups here and there throughout the respective blocks; these were well-established trees, and might have been regarded as perfectly immune from the effects of the dry weather.

During the year 3,447,380 trees were planted on new area of 1,288 acres, thus making a total of 14,984 acres planted to date, carrying approximately 34,818,185 trees. Notwithstanding the dry weather experienced, the trees planted have thriven remarkably well, and in this respect the past year may be regarded as one of the most successful experienced at the North Island stations. The results clearly demonstrate the value of preparing the pits well ahead of the planting, as the loose ground is capable of absorbing more moisture during wet weather, and retaining that moisture longer, than is the hard consolidated land. The use of the puddle-tub, too, is of inestimable value, for no matter how carefully the trees are handled when being sent from the nursery to the plantations they become dry to a more or less extent. If the roots are dipped in puddle the evil results of drying are reduced to a minimum.

Prison Labour.

The tabulated information which is given hereunder in respect to this class of labour displays the results in an abbreviated form. So far as the number of prisoners who have been made available for tree-planting work is concerned, it will be noticed that no improvement has taken place during the year. The value of such labour for this class of work has repeatedly been set out in these annual reports; but unless both prison camps can be kept reasonably full of prisoners it would be infinitely better to completely close one of them, so as to enable the other one to be kept full. The spasmodic nature of this labour makes the progress of the work very difficult, because it is not always possible to adhere to the working-plans for the year. In the event of there being insufficient prisoners to complete the tree-planting work in proper season the difficulty cannot be solved by employing free labour, because of the danger of trading occurring between the free men and the prisoners. This difficulty has arisen on more than one occasion, and, as a consequence, arrangements have had to be made late in the season to prepare pits and plant the trees by free labour on another part of the plantation. Forestry work does not permit of schemes being made in such a hurried manner, but requires that the work should be anticipated at least three years ahead. Seed has to be procured and trees raised which will be suitable for the various areas which it is intended to plant, and it is highly desirable that these areas should be cleared and pitted well ahead of the actual tree-planting. If the prison labour cannot be regulated to meet these requirements, then its value for afforestation purposes is very much reduced. It is earnestly hoped that an effort will be made at an early date to alter the present conditions so as to make them more acceptable to this Department. At Kaingaroa there is accommodation for fifty-six prisoners, and the Green Lake Prison can accommodate thirty-three. Kaingaroa camp could easily accommodate all the prisoners which both camps generally contain, and if there is a difficulty in getting suitable men it would be preferable to close the Green Lake camp and concentrate the available prisoners at Kaingaroa.

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
1913–14	12·36	1,113 5 0	90 1 4	11·66	1,019 17 3	87 9 4
Totals	..	26,388 2 6	..	..	8,573 16 0	..
Averages	‡28·98	..	69 12 3	§12·16	..	72 6 4

* One month's work. † Nine months' work. ‡ 13·08 years. § 9·75 years.

Year.	Average Number employed.	Value of Work.	Value per Man per Day.
Waiotapu Plantation.			
		£ s. d.	s. d.
1913–14	12·36	1,113 5 0	5 9
1900–14	28·98	26,388 2 6	4 5
Whakarewarewa Plantation.			
1913–14	11·66	1,019 17 3	5 7
1905–14	12·16	8,573 16 0	4 7

THE PROCURING OF TREE-SEEDS.

The majority of farmers recognize the great importance of obtaining seeds which are true to type and of good germinating quality, and they realize—perhaps to a lesser extent—that the source of the seed is also a very important matter. When purchasing seeds great care is therefore taken to procure only such as are likely to succeed, for the simple reason that success or failure of the crops depends to a large extent upon the quality of the seeds. If such care is necessary for crops which, as a rule, take only part of a year to mature, how much more important is the procuring of tree-seeds the crops from which take forty to fifty years to reach maturity? Too great importance cannot be attached to the source of tree-seeds, as it is a well-known fact that seeds of a given species gathered in a place where the climatic conditions are similar to the locality in which it is desired to grow the species are much more likely to give satisfaction than are seeds gathered in a dissimilar climate. For instance, if it was desired to grow Douglas fir in the Canterbury District, failure would probably result from seeds gathered in the moist coastal districts of California; whereas good results would probably be obtained from seeds gathered in the drier Colorado State. In addition to the selection of seed as regards climatic conditions, there is another important aspect of the question which should be equally borne in mind—namely, the strain or selection of the parent trees. If it is desired to obtain healthy, vigorous, and large-growing trees for plantation-work, then the seed must be gathered from trees which have all these characteristics. Seed gathered from diseased or misshapen trees will naturally perpetuate in the progeny the defects of the parents. The germinative quality and purity of seeds is also of great importance. In Europe—notably, at Copenhagen and at Zurich—State seed-testing stations are conducted, where for a comparatively small sum any one can have seeds tested for purity and germination, and obtain a certificate of same. It is now usual for European seed-merchants to have their seeds tested at one of these establishments, and furnish to each large buyer such a certificate duly attested. The supplies of seeds for use in the State nurseries have had necessarily to be mostly imported from the Northern Hemisphere, as, with few exceptions, all the species grown cannot be procured from trees growing in the Dominion. *Pinus radiata*, many species of *Eucalypti*, and a number of the broad-leaved deciduous trees are the exceptions; and it has always been customary to purchase New-Zealand-saved seed of these trees when such is procurable. *Pinus radiata* having been largely planted throughout New Zealand for shelter purposes, there is usually very little difficulty in procuring all the seed required for State afforestation; and, in fact, the export of this seed to the European market is now fairly large, so that we can depend entirely on the New Zealand product for our requirements. The past experience in obtaining *Eucalypti* seeds has been very disappointing, owing to the confusion in the nomenclature of this genus both in New Zealand and Australia. Fortunately, this difficulty has been greatly overcome by the researches of Australian and New Zealand botanists, and it is now possible to procure supplies of seed true to name.

Of the American timber-trees the chief difficulty has arisen with *Pinus ponderosa*. This species occupies immense areas in the mountainous regions of North America, ranging from Southern British Columbia to Northern Mexico, and from the midland States of Nebraska and Western Texas to the Pacific Ocean. With a species so widely distributed it is not surprising that there are numerous forms, so that the quotation of the specific name only is not sufficient guarantee that the form most adapted for New Zealand conditions is being supplied. It has been found that the seeds vary considerably in size, and that some forms are very slow growing, whilst others are among the fastest of the pines we grow. According to some American authorities there is also a considerable difference in the dimensions attained by the various forms, and in the quality of the timbers of each. What is true of *Pinus ponderosa* is also true of almost all trees, and it is with the object of overcoming this difficulty that the present article is being written. The length of time which must elapse between the sowing of the seed and the utilization of the timber-crop is sufficient argument to justify this question being ranked as of first importance; and it must be admitted that it is not true economy to spare any extra expense in the early stages of our work if such extra expenditure will ensure the plantations being filled with the best possible timber-trees. Of the species which can be procured from New-Zealand-grown trees the seed should be gathered under the supervision of a capable officer, who would see that the best types of parent trees were selected from which to collect the seeds. This would occasion more expense than if the seed was purchased direct from a seedsman, but we would be certain that our crops came from a thoroughly healthy strain. Those seeds which it is necessary to import should be purchased from seedsmen who specialize in catering for the requirements of foresters. Fortunately for us, forestry is not a new science in Europe, and the difficulties which beset us have been largely overcome by the forestry authorities in France, Germany, America, &c., whose demands for seeds which are good in every respect have been met by many reputable firms of seed-merchants.

Experiments with Eucalypti.

The various species of *Eucalypti* present so many forms, which are due largely to the influence of climatic conditions—as well as to hybridization—that extensive experiments will yet require to be made before the possibilities of our own climate for the cultivation of this genus are fully realized. And with the object of extending our knowledge of this important subject a considerable number of species were grown, which will be found enumerated on the schedule attached to the report on Rotorua Nursery. It will be noticed that some of the species mentioned were procured both from New Zealand trees and from Australian-grown trees. The object of this was to ascertain if there was any actual difference as regards hardiness between the seedlings raised. Up to the present our experience goes to show that most of the species indigenous to Tasmania will thrive moderately well in the Rotorua district, and that it is preferable to obtain seeds of these from New Zealand trees, or, if this is impossible, direct from Tasmania. A few of the species found in Tasmania are also found in Victoria and South Australia, but the continental-saved seed is not likely to give as good results generally in New Zealand as is the Tasmanian seed. Certain of the continental species may yet prove to be very hardy, provided that the forms found in the inland mountainous districts are selected. A form of *Eucalyptus eugenoides*, one of the stringy-barks of New South Wales and Victoria, has proved hardy at Rotorua and on Mr. Reynold's farm at Cambridge. It is of slow growth, but produces a valuable and durable timber.

E. Muelleriana—yellow stringy-bark—has also proved fairly hardy at Rotorua; but, like the *E. eugenoides*, it is of slow growth. In the Whangarei district several valuable species have been grown successfully, including *E. resinifera* (mahogany), *E. capitellata* (stringy-bark), *E. regnans* (mountain-ash), and *E. Gunii* (cider-gum). The plantations at Puhipuhi are composed chiefly of *Euc. resinifera* and *Euc. Gunii*, and both species make very vigorous growth in this district. Both transplant well, and on this account are comparatively cheap trees to handle. We find that most of the stringy-barks and the mountain-ash do not transplant easily, and as a consequence the death-rate is usually very high.

As only a small proportion of the seedlings grown experimentally will be required for our own use, it has been decided to distribute collections of species to tree-growing enthusiasts throughout the Dominion. In this way a much wider range of climatic conditions will be dealt with, and the value of the experiments greatly increased.

Protecting the Plantations from Fire.

The scheme as outlined in last year's report has been partly given effect to, and it is intended to perfect the system before next summer. Three huts, each 16 ft. by 12 ft., were erected on Whakarewarewa Plantation, and two on Waiotapu Plantation. One of the huts at each plantation is occupied by a Ranger, whose sole duty during the dry weather is to patrol the boundaries and keep a watch for fires. The Rangers' huts are connected by telephone with the officer in charge The remainder of the huts are occupied by plantation labourers, whose assistance in case of fire will thus be quickly obtained. Although very dry weather was experienced during the summer months, the only outbreak of fire which needed to be suppressed was at Waiotapu, and the damage caused by this was very slight. This fire started on Crown land adjoining the plantation enclosure, and was caused by the galley-chimney at a roadman's camp becoming ignited and spreading the fire into the scrub. It was noticed by the Ranger almost immediately it started, who promptly procured assistance, and had the outbreak suppressed before it had time to extend and become unmanageable. The damage to the plantation, which consists of about an acre of six-year-old Austrian pines being scorched, was caused by the hot smoke being carried over the road and in amongst the trees, those nearest the roadside suffering most.

Insect Pests.

Practically no damage has been wrought in the nursery or plantations by insects or plant-diseases during the year. The measures taken to protect the larch seedlings from the attacks of the brown beetle (*Odontria puncticollis*) have been most successful, both the one-year and two-year old trees being almost entirely free from any injury by this pest.

Proposals for 1914.

Rotorua Nursery.—Of the 8,500,000 trees in the nursery, about 4,500,000 will be sent to the plantations during the coming planting season. The remainder, which are mostly too small for permanent planting, will be kept for another year in the nursery. Provision will also be made for growing the Douglas fir to a larger size than those usually sent out, and about 700,000 larch will be treated in a like manner. These large trees are required for planting on country where the heavy growth of bracken would make the planting of small trees very unsafe. The tree-seeds on order for sowing next spring are sufficient to produce five million seedlings (approximately), and compose the following species: *Pinus strobus*, *P. ponderosa*, *P. radiata*, *P. Laricio*, *Pseudo-tsuga Douglasii*, and *Castanea sativa*; also the following for experimental purposes, small lots of each being ordered: *Pinus excelsa*, *P. Laricio* var. *calabrica*, *P. Laricio* var *cebennensis*, *P. Laricio* var *taurica*, *P. sylvestris* (Finnish seed), and *P. sylvestris* (seed from West Norway). It is also intended to make further experiments with the *Eucalypti*, chiefly *Euc. regnans* and *Euc. Macarthuri*.

Whakarewarewa Plantation.—Trees to the number of 1,500,000 will be planted here during the next planting season, and preparations for their reception are now well forward. Of the above total 1,200,000 will be *Pinus radiata*, which it is intended to plant in rows 6 ft. apart, with the trees 3 ft. apart in the rows. This course is being adopted owing to the very heavy growth of bracken and tutu which covered the land prior to the clearing, and which will come away again and compete seriously with the young trees until they are sufficiently grown to hold their own. The balance of the planting

will consist chiefly of larch, of which a number are required to complete a block already partly planted. A block of 100 acres of thirteen-year-old larch will be underplanted with sweet-chestnut.

Waiotapu Plantation.—About 1,200,000 trees, principally Corsican and heavy pines, will be planted here during the coming winter. Pits for these are in readiness, and planting will probably commence about the 1st May. This enclosure, which consists in all of about 7,500 acres, will be completely planted by the end of this year.

Kaingaroa Plains Plantation.—The prisoners have prepared close on 2,000,000 pits at this station, and planting will commence about the beginning of May. The species to be planted is Corsican pine, which has proved an excellent tree for this climate.

Puhipuhi Plantation.—Preparations are well in hand for planting 250,000 *Eucalypti*, principally the species *E. resinfera* and its variety *grandiflora*. This species is commonly known in Australia under the name of mahogany, and is a valuable timber-tree. It is also intended to make experimental plantings of a number of species, such as *E. saligna*, *pilularis*, *sideroxylon*, *Salmonophloia*, and others which are too tender to thrive in the Rotorua climate.

General.

Owing to the sudden death of Mr. Robert Glass, Assistant Forester at the Green Lake Prison camp, some staff alterations were necessary. Mr. J. J. Rodgerson, who for a number of years has assisted with the free labour, was appointed as Assistant Forester in charge of the prison labour, and Mr. T. I. O'Dwyer was appointed as successor to Mr. Rodgerson.

I have to express my thanks to all the officers for their close attention to their duties during the year.

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

Number and Species of Trees growing in the North Island.

Name of Trees.		Whakarewarewa Plantation.	Waiotapu Plantation.	Kaingaroa Plains Plantation.	Puhipuhi Plantation.	Totals.
Botanical Name.	Common Name.					
Acacia melanoxylon	Blackwood	123,174	1,296	..	..	124,470
Acer pseudo-platanus	Sycamore	41,536	..	..	..	41,536
Alnus glutinosa	Alder	29,468	..	..	..	29,468
Betula alba	Silver-birch	6,585	39,230	..	..	45,815
Cupressus Lawsoniana	Lawson's cypress	..	11,367	..	..	11,367
,, thurifera	Mexican cypress	420	400	..	..	820
Eucalyptus (species)	Gums	2,105,632	72,000	..	981,500	3,159,132
Juglans regia	Walnut	9,925	..	..	..	9,925
Juniperus virginiana	Red-cedar	670	..	..	..	670
Larix europaea	European larch	6,182,560	8,728,230	..	..	14,910,790
,, leptolepis	Japanese larch	26,625	..	..	..	26,625
,, occidentalis	Western larch	50	..	..	..	50
Liquidambar styraciflua	Sweet-gum	1,700	..	..	..	1,700
Picea excelsa	Norway spruce	195,025	..	..	..	195,025
,, 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
,, Jeffreyii	Jeffrey's pine	2,200	6,643	..	..	8,843
,, Lambertiana	Sugar-pine	170	3,925	..	..	4,095
,, Laricio	Corsican pine	3,542,285	6,271,335	1,609,750	..	11,423,370
,, Massoniana	Japanese black-pine	10	10	..	..	20
,, Montezumae	Mexican pine	500	50	..	..	550
,, Murrayana	Ledgepole pine	10,225	4,100	..	..	14,325
,, muricata	Bishop pine	6,320	43,800	..	18,500	68,620
,, patula	Mexican pine	1,500	200	..	..	1,700
,, ponderosa	Heavy pine	772,325	1,153,700	..	..	1,926,025
,, ,, var. scopulorum	Rock-pine	575	1,475	..	..	2,050
,, radiata	Monterey pine	147,800	246,875	..	..	394,675
,, resinosa	American red-pine	375	2,150	..	..	2,525
,, rigida	Pitch-pine	..	12,200	..	..	12,200
,, Sabiniana	Grey-pine	25	..	..	..	25
,, sylvestris	Scotch fir	..	200	..	..	200
,, strobus	Weymouth pine	..	159,950	..	..	159,950
,, taeda	Torch-pine	1,100	..	..	..	1,100
,, teocote	Mexican torch-pine	2,250	3,000	..	..	5,250
,, Thunbergii	Japanese black-pine	750	..	..	..	750
,, Torreyana	Torrey's pine	1,320	..	..	..	1,320
Platanus orientalis	Oriental plane	1,900	..	..	..	1,900
Populus (varieties)	Poplar	600	..	..	..	600
Pseudo-tsuga Douglasii	Douglas fir	232,143	89,712	..	..	321,855
Sequoia sempervirens	Redwood	90,673	..	..	..	90,673
Thuja plicata	White-cedar	3,275	14,200	..	..	17,475
Ornamental shrubs and plants and shelter-trees	..	475	36,936	8,650	..	46,061
Totals	..	13,945,596	18,254,189	1,618,400	1,000,000	34,818,185

Rotorua Nursery.

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

The rainfall for the twelve months ended 31st March, 1914, amounted to 41·11 in., falling on 152 days, the heaviest monthly fall being in November, when a total of 6·66 in. was recorded for twenty-two days. The months of July and August were very wet ones, 10·77 in. falling on thirty-six days; while during December rain fell on seventeen days, with a total fall for the month of 4·47 in. The maximum shade temperature for the year was 79° F., this being recorded on several occasions during the months of December, January, and February. The minimum shade temperature was recorded in June, when the thermometer registered 22° F. Frost occurred on ninety-seven nights during the year, being most severe in June, when the temperature was at freezing-point or below it on twenty-one occasions.

During the early part of the year the weather was unusually dry, and great care had to be exercised in transplanting the young trees. From July to December the rain was frequent and heavy, while the last three months of the year were extremely dry. This is the second year in succession in which an unusually dry summer has been experienced, and to this fact the large proportion of seedlings which succumbed may be attributed.

Seedling Trees.

The trees raised during the year from seed are, as a whole, a splendid lot. Certain species suffered from the dry weather to a large extent, while others have made unusually good progress. The number raised is estimated at 4,191,450, details of which will be found by referring to Schedule V, which is attached to this report. The principal crops are referred to in the following notes:—

Larch (Larix europaea).—From 3 cwt. of seed 1,000,000 trees were raised. The seedlings are strong, healthy, and vigorous, and free from the larvæ of the beetle, which hitherto has made the growing of this species somewhat risky.

Corsican Pine (Pinus Laricio).—Owing to the small seed-crops in Europe it was impossible to obtain the usual quantity of seed of this tree. Only 13½ lb. were sown, resulting in a crop of 15,000 seedlings. Germination was very poor, being only about 3½ per cent.

Heavy Pine (Pinus ponderosa).—From 340 lb. of seed 1,000,000 plants were raised. Germination was good, and the seedlings, on the whole, have made fairly good growth. About one-third of the crop is what we have always regarded as the typical *P. ponderosa*, while the remainder resembles the variety known as the rock-pine, or *Pinus ponderosa* var. *scopulorum*. Contrary to expectations, the drought has been somewhat severe on the seedlings thought to be rock-pine, and less severe on the typical form, from 10 to 15 per cent. of the former having been killed.

Weymouth Pine (Pinus strobus).—From the sowing of 46 lb. of seed 100,000 seedlings resulted. The germination has been unusually good, and the crop as a whole is the best one that has been raised here for many years.

Monterey Pine (Pinus radiata).—This is a very fine crop, germination was good, and the seedlings made strong healthy growth. The trees raised from 200 lb. of seed are estimated at 1,000,000. These will be transferred to Whakarewarewa Plantation during the coming winter.

Douglas Fir (Pseudo-tsuga Douglasii).—From 130 lb. of seed 75,000 trees were raised. Excellent growth has been made by the seedlings, which vary in height from 2 in. to 6 in.

Eucalypti.—The principal crops are *E. resinifera* and *E. resinifera grandiflora*, which combined number 250,000 trees. These were raised especially for planting at Puhipuhi Plantation. The germination was very good, and the plants are vigorous and healthy. The balance of the crop of *Eucalypti*, numbering about 30,000, comprises twenty-four different species, which were grown experimentally, and which will be given a thorough trial in each of the plantations. The species to which the most interest will probably be attached is *E. Macarthuri*, this being the very valuable timber-tree grown by Mr. Richard Reynolds at Trecarne, Cambridge, and so favourably commented upon by the Royal Commission of Forestry, 1913. This species has not previously been tried in the Rotorua district, but there is every indication that it will prove hardy and otherwise suitable. Seed was supplied by Mr. Reynolds from his trees. *Euc. regnans* and the fastigiate form of this species has been grown from small packages of seed obtained from various sources. This species has proved hardy in Rotorua, and is the fastest grower of any yet tried. It is common in many of the plantations formed by the Railway Department, and has been planted to some extent by landholders in the Waikato. Everywhere it appears to develop rapidly into tall, straight, and magnificent specimens. At Whakarewarewa trees of this species have attained a height of 70 ft. in fourteen years. A small quantity of seed was saved from these and sown last spring. Seed gathered by the Rev. J. H. Simmonds, principal of the Wesley Training College, Auckland, from magnificent specimens growing in the Waikato was also sown with successful results; and from sample packets presented by the Victorian Forestry Department, and Mr. Andrew Murphy, Woy Woy, New South Wales, some 500 plants were successfully raised. As this species produces a valuable building-timber, the experiments with the seeds from the various sources will be of considerable value to the Department.

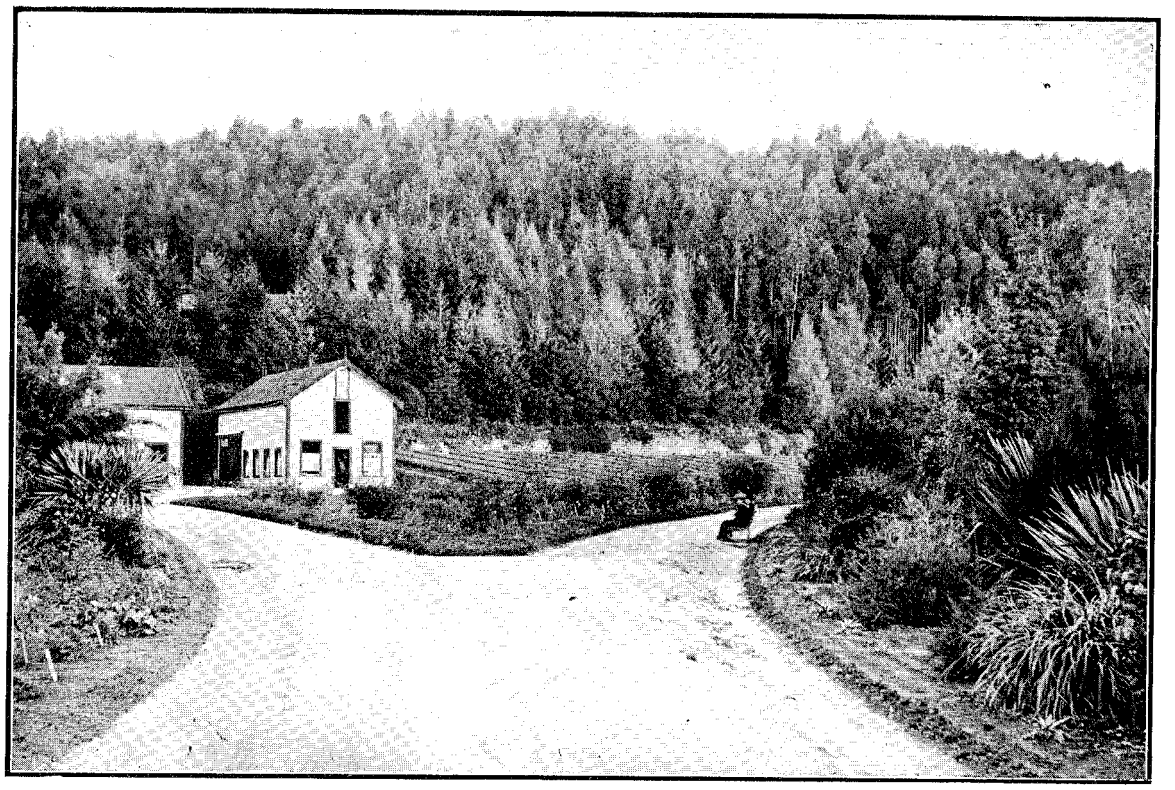
All the other species of *Eucalypti* mentioned in the schedule have grown satisfactorily. In every instance a special endeavour was made to procure the seed from reliable sources, so that the results obtained with each species could be regarded with confidence.

Various conifers and broad-leaved trees were raised from seed experimentally to add to our collection of specimens.

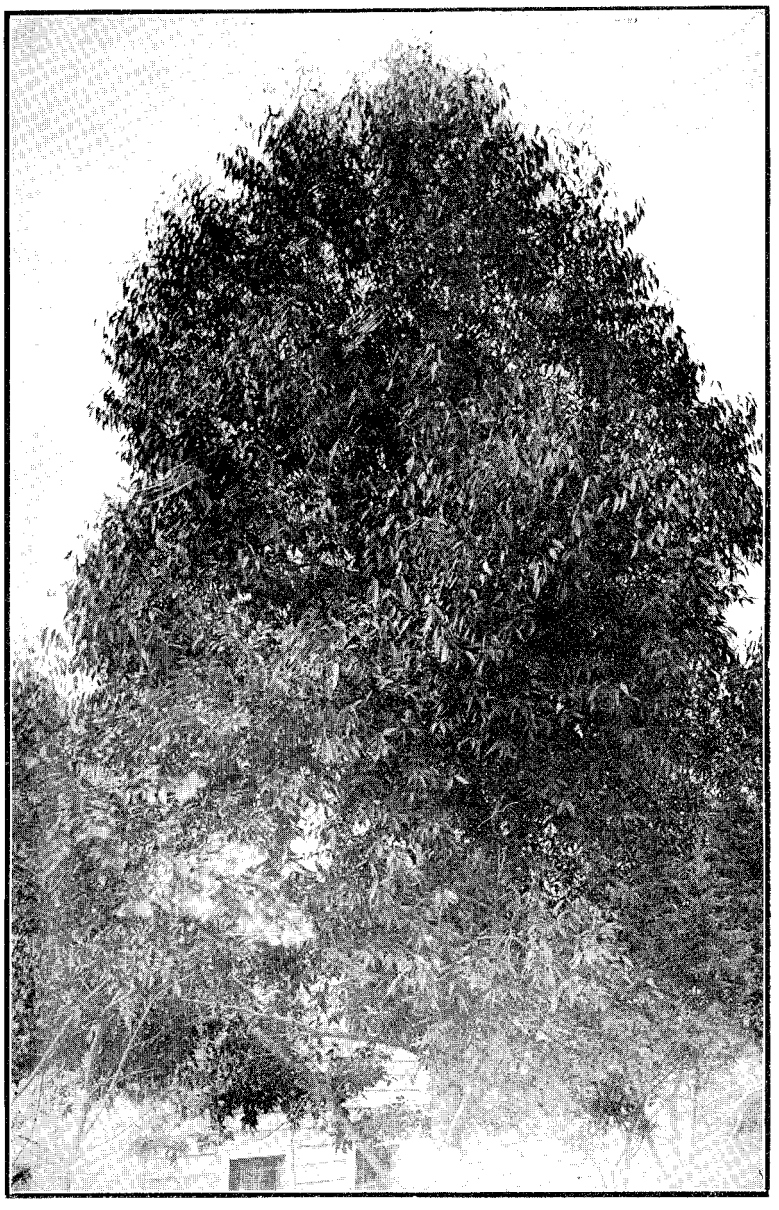
Two-year-old Trees in Seed-beds.

Larch (Larix europaea).—This crop made excellent growth up to the beginning of January, but the dry weather experienced subsequent to this date caused a heavy death amongst the trees. The

ROTORUA.—PINUS STROBUS LINED OUT.

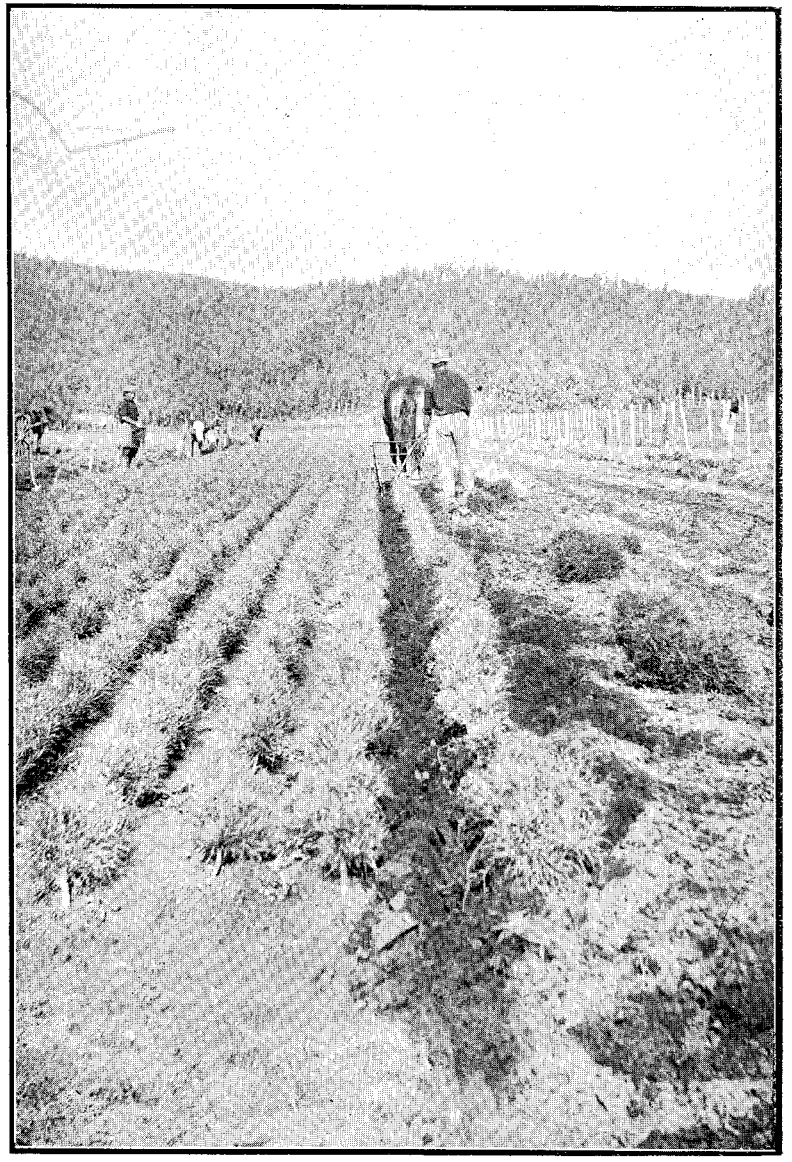


VIEW IN ROTORUA NURSERY.—EUCALYPTI PLANTATION IN BACKGROUND.

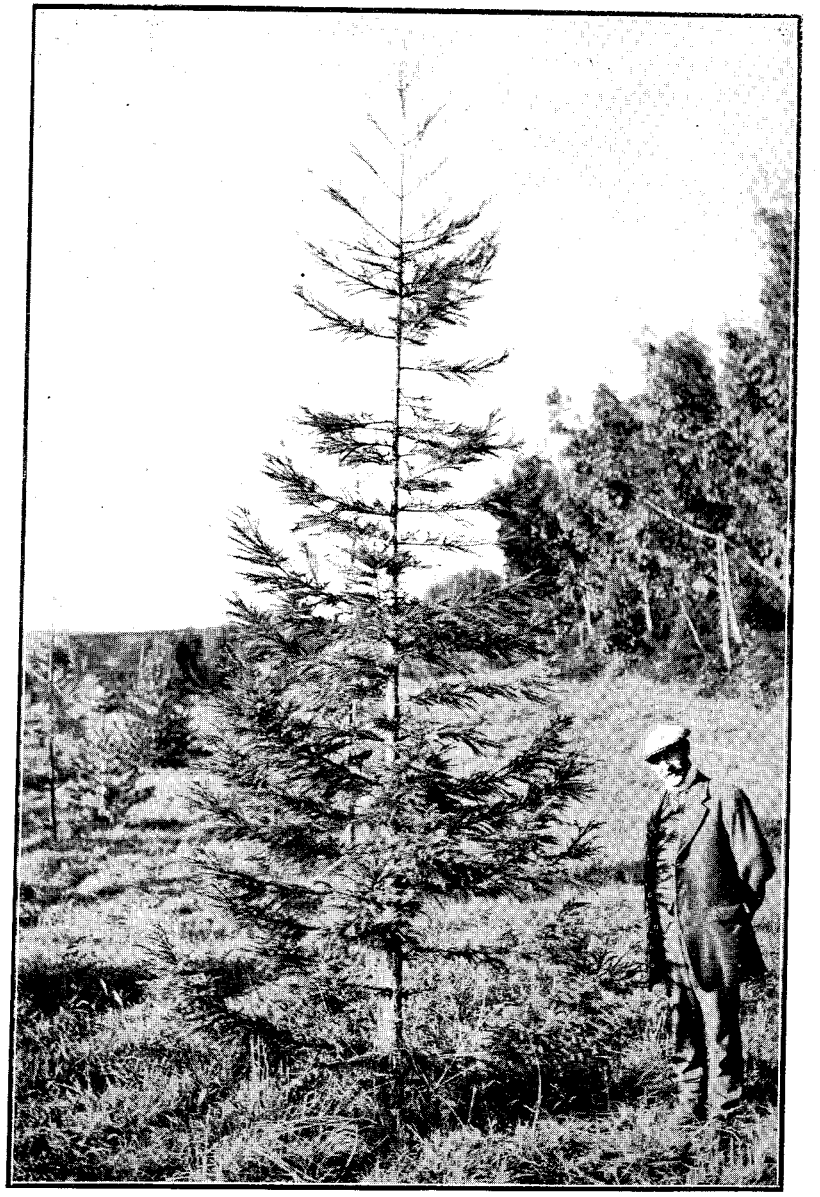


KAMO.—EUCALYPTUS DIVERSICOLOR (KARRI OF WESTERN AUSTRALIA). THIS VALUABLE TREE GROWS WELL HERE.

ROTORUA.—PLANTATION OF EUCALYPTUS RISDONI, VAR. ELATA; HEIGHT, 45 FEET.

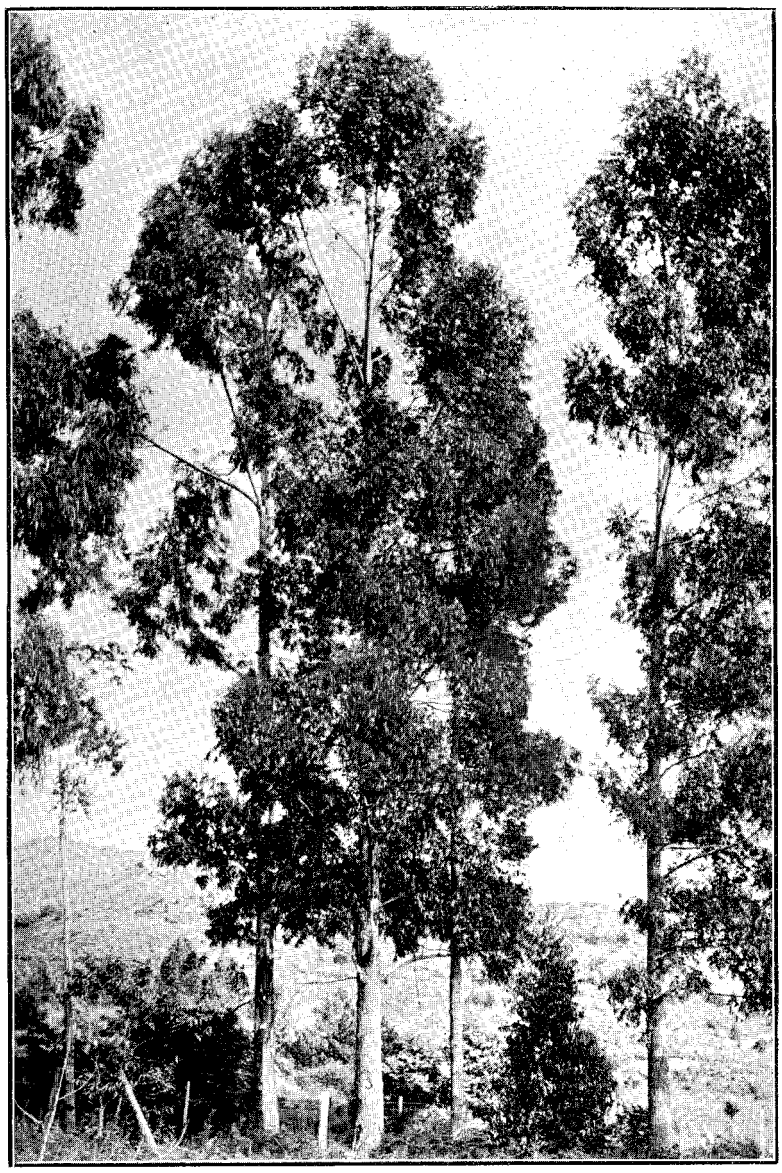


ROTORUA.—PLOUGHING OUT PINES.



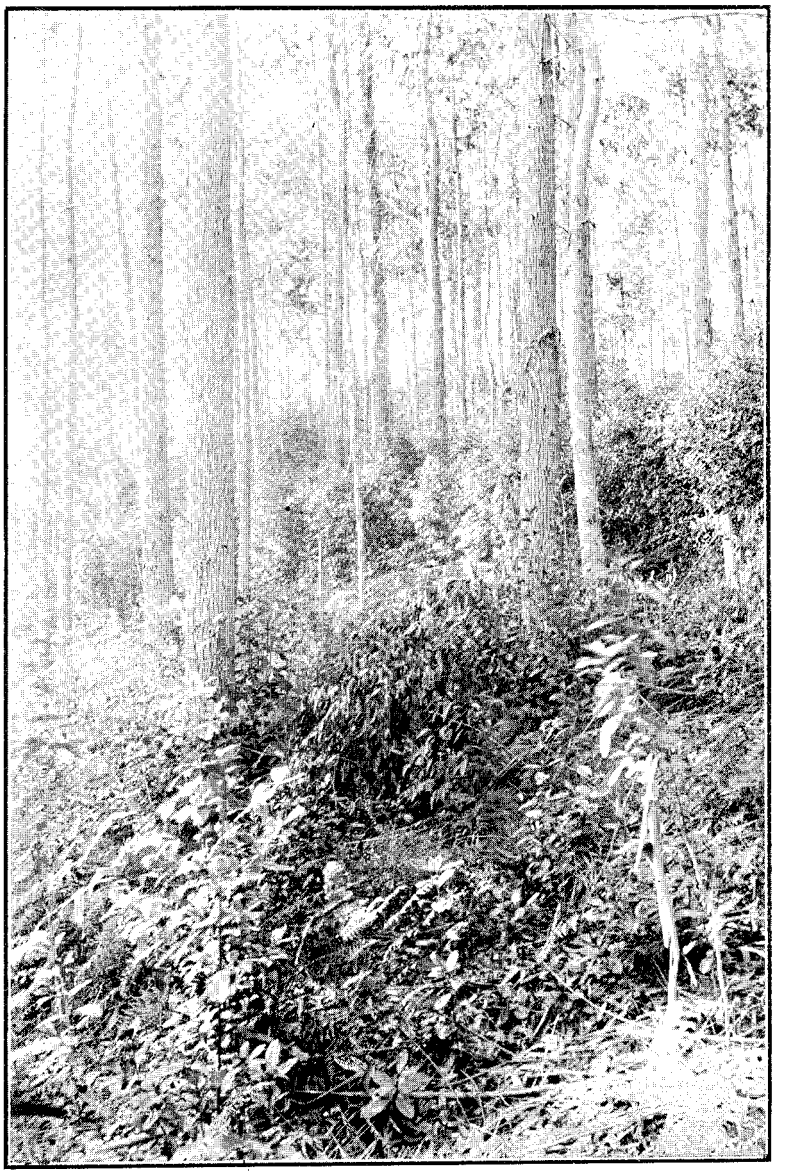
ROTORUA.—CRYPTOMERIA JAPONICA; AGE, EIGHT YEARS; HEIGHT,

ROTORUA.—SEED-BEDS OF EUCALYPTUS RESINIFERA GRANDIFLORA.



ROTORUA.—EUCALYPTUS REGNANS, VAR. FASTIGATA; AGE, FOURTEEN YEARS; HEIGHT, 76 FEET.

ROTORUA.—DOUGLAS FIR SEEDLINGS.



ROTORUA.—INTERIOR OF PLANTATION OF EUCALYPTUS REGNANS, VAR. FASTIGATA.

ROTORUA.—EUCALYPTUS AMYGDALINA; AGE, ELEVEN YEARS; HEIGHT, 48 FEET.

ROTORUA.—TWO-YEAR-OLD SEEDLING PINUS LARICIO.

ROTORUA NURSERY AND WHAKAREWAREWA PLANTATION.

E. H. WILMOT,
Surveyor General.

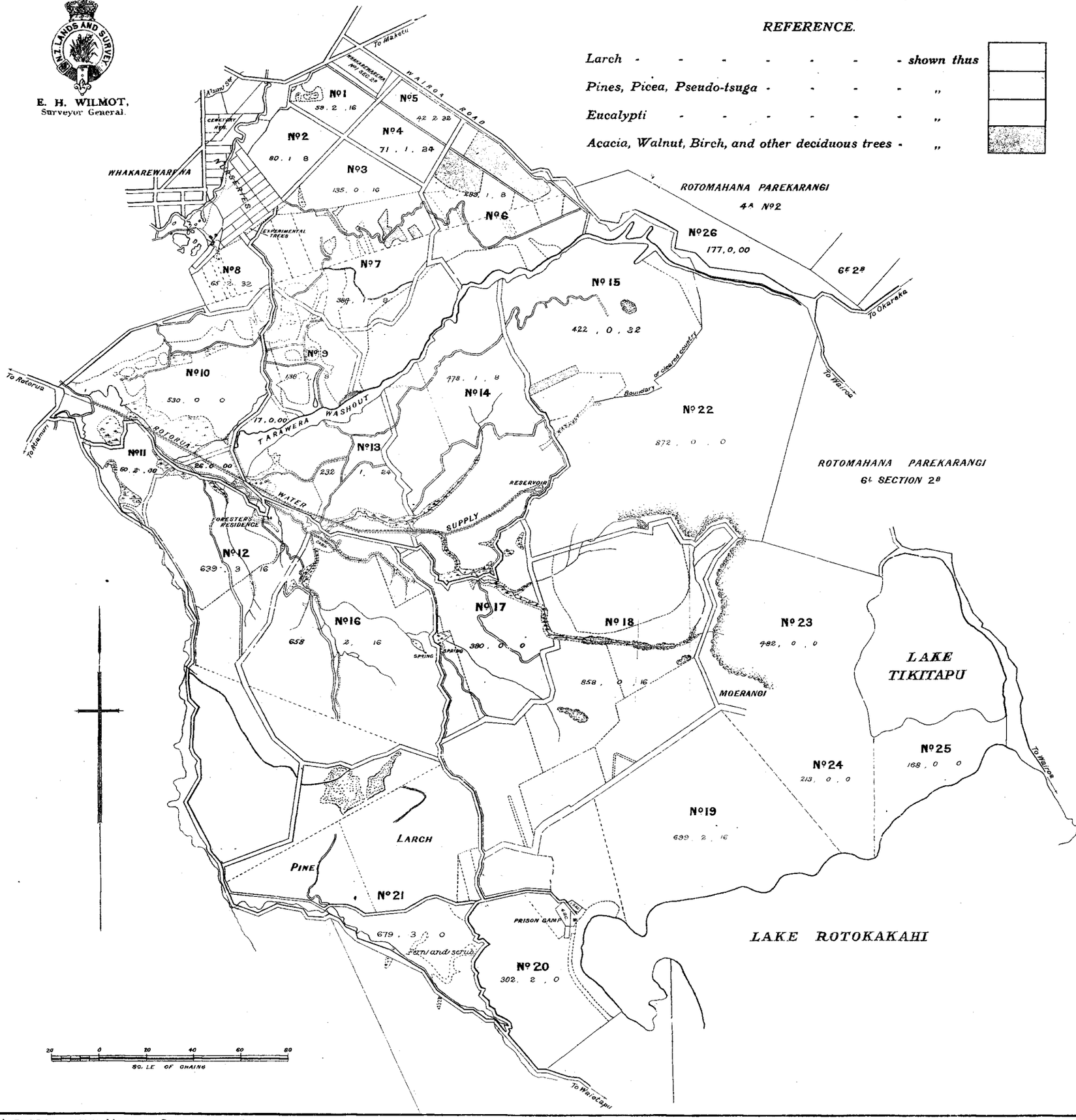
REFERENCE.

Larch - - - - - - - - shown thus

Pines, Picea, Pseudo-tsuga - - - - - ,,

Eucalypti - - - - - - - ,,

Acacia, Walnut, Birch, and other deciduous trees - ,,



BY AUTHORITY: JOHN MACKAY, GOVERNMENT PRINTER

M. CROMPTON SMITH, CHIEF DRAUGHTSMAN, HEAD OFFICE, LANDS AND SURVEY DEPARTMENT, WELLINGTON

beetle (*Odontria puncticollis*) has been successfully controlled by the use of scrim, and the damage to the young trees from this source is practically nil.

Corsican Pine (Pinus Laricio).—Wonderfully good growth has been made by these trees, 90 per cent. of which are large enough to be transferred to permanent positions in the plantations. The drought had no ill effects upon this crop, and no deaths have occurred. This species has again proved itself a splendid drought-resister.

Heavy Pine (Pinus ponderosa).—The dry weather has retarded the growth of this species to a considerable extent, and it will be necessary to keep 75 per cent. of them for another year in the nursery.

Two- and Three-year-old Lined-out Trees.

The pines and larch have made good growth. Douglas fir suffered severely from the drought, and about one-third of the trees died, while the remainder made poor growth.

Cost of Work.

Lifting, sizing, counting, and bundling trees for the plantations cost on an average 2s. 1d. per thousand. Lining out seedlings cost 1s. 10d. per thousand. The average cost of growing trees since the inception of the nursery is 18s. 6d. per thousand.

Manuring.

The green crops sown for soiling purposes have made splendid progress as a whole, and should be the means of increasing the fertility of the soil to a considerable extent. All the land set apart for sowing tree-seeds in 1914 was sown with either red clover only or red clover mixed with cocksfoot. In order to ensure a good sward, 8 cwt. of basic slag per acre was sown along with the seed, and the results more than justify the expenditure. An experimental sowing was made on one of the blocks by mixing basic slag and superphosphate in equal proportions along with the clover-seed, the sowing of the whole being done immediately after mixing. Judging by the result there does not appear to be any advantage derived from the addition of the superphosphate to the mixture. Germination took place as quickly and as well, and the growth generally was as good, on the plots where basic slag only was applied. The seed-bed plots have in the past received fairly liberal dressings of stable manure, and consequently the growth of clover on these plots is very good. On land which has never received stable manure—and this applies to the whole of the nursery with the exception of the seed-bed ground—the growth of clovers and other soiling crops is very slow, and it is always a question whether the soiling crops or the sorrel and other weeds will dominate. Artificial manures, no matter how heavily applied, do not appear to compensate for the lack of humus in the land, but they act very beneficially, provided the crop can be allowed to remain for about twelve months. Unfortunately the nursery area is not sufficiently large to allow of the land being left in a soiling crop for more than about eight months, consequently such slow-starting crops as clovers never attain to any great size before it becomes necessary to turn them under. Russian rye has been used as a soiling crop to a large extent during the past few years, and generally has done very well. This year, however, very poor growth was made by the rye, and as a result the benefits accruing from it are small. Most of the cereals tried for this purpose make very few leaves, and are in the ground only a short time before the flower-head begins to show. The rape, which was sown after the rye had been turned in, has not done as well as usual, but the exceeding dry and hot weather will account for the partial failure of this crop. The best autumn crop which has been obtained is a mixture of Cape barley and winter tares. This gives great promise of furnishing a large amount of leafage for turning under. The paddocks which were top-dressed in the spring with basic slag made remarkably good headway, and the expenditure on the manure has been amply returned in the shape of hay and green feed for the horses.

Trees to the number of 4,916,530 were sent out from the nursery during the year, and the total output since the inception of the nursery is 41,684,841. During the year 4,191,450 trees were raised from seed, which brings the total raised to date up to 50,260,941. Tabulated information with respect to the trees follows this report.

Proposals for 1914.

It is estimated that the number of trees available for sending to the plantations during the winter of 1914 is 4,750,000. These will be distributed between the plantations at Whakarewarewa, Waiotapu, Kaingaroa, and Puhipuhi.

Further accommodation for vehicles and implements is urgently required, and the question of renewing the foundations of the stable-building will also have to be faced at an early date. This building was erected in 1899, and the wooden foundations are perished in many places.

The average daily number of workmen employed was 28·03. Tables showing expenditure, &c., are attached hereto.

Following is a record of rainfall and temperature for the year.

H. A. Goudie,
Superintending Nurseryman.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1913.	In.		Deg. F.	Deg. F.	
April	0·74	3	74	28	9
May	2·94	13	60	23	16
June	1·83	10	60	22	21
July	5·53	20	62	27	15
August	5·24	16	60	30	16
September	1·98	14	64	29	8
October	3·89	15	73	30	7
November	6·66	22	75	31	1
December	4·47	17	79	33	..
1914.					
January	1·07	6	79	38	..
February	2·79	10	79	33	1
March	3·97	6	78	35	3
Totals	41·11	152	..	..	97

Schedule II.—Statement of Expenditure.

	For Year.	To Date.
	£ s. d.	£ s. d.
Tree-planting and maintenance—		
Tree-growing	2,777 1 11	27,608 1 8
General maintenance and repairs ..	372 16 8	4,310 17 3
Tree-seeds	474 7 2	3,173 14 10
Manures	164 17 5	1,171 12 8
Horse-feed	285 0 1	2,147 9 11
Miscellaneous works	..	360 7 6
Stock and material—Tools and implements ..	265 9 1	1,438 0 10
Permanent works—		
Buildings	..	2,782 12 0
Seed-frames	..	1,799 2 1
Nursery-formation	..	2,322 15 1
Fencing	..	221 12 8
Water-supply	6 19 0	667 17 10
Supervision and clerical—		
Proportion of Superintending Nurseryman's salary	79 0 0	2,614 1 7
Nursery Foreman's salary	220 0 0	
Clerical assistance	44 0 0	675 15 1
	£4,689 11 4	£51,294 1 0

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	4,191,450	0 7 4	50,260,941	0 18 6	91,832 16 5
Trees sent out	..	..	41,684,841	..	80,594 5 5
Balance in stock			8,576,100	..	11,238 11 0
Value of improvements and stock (Property Account)			..	..	4,979 16 9
Total value			..	..	16,218 7 9

Schedule IV.—Property Account.

	£ s. d.
Land (160 acres): Crown land not charged to Forestry Account ..	..
Buildings	1,610 7 2
Improvements	1,551 4 10
Fencing	114 2 1
Stores in hand	1,704 2 8
	£4,979 16 9

Schedule V.—Details of One-year-old Trees, sown 1913.

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	500	12	6 0	0 10 0	0 5 0	Good.
Callitris rhomboidea	50	4	0 0½	1 0 0	0 1 0	"
" Muelleri	200	4	0 0½	1 0 0	0 4 0	"
" calcarata	500	4	0 0½	1 0 0	0 10 0	"
Cupressus obtusa	50	1	0 0¾	1 10 0	0 1 6	Fair.
" Lawsoniana	5,000	4	2 0	1 10 0	7 10 0	Good.
Carpinus betulus	50	2	10 0	1 0 0	0 1 0	Fair.
*Eucalyptus capitellata	30	6	0 1	0 10 0	0 0 4	
" Cambagei	500	6	0 1	0 10 0	0 5 0	
" citriodora	200	6	0 1	0 10 0	0 2 0	
" corynocalyx	3,000	6	0 1	0 10 0	1 10 0	
" globulus	1,500	8	0 1	0 10 0	0 15 0	
" hemiphloia	1,500	6	0 1	0 10 0	0 15 0	Seed from Woods and Forests Department, South Australia.
" leucoxylon	800	6	0 1	0 10 0	0 8 0	
" obliqua	20	6	0 1	0 10 0	0 0 3	
" odorata	100	6	0 1	0 10 0	0 1 0	
" pilularis	200	6	0 1	0 10 0	0 2 0	
" punctata	100	6	0 1	0 10 0	0 1 0	
" sideroxylon	500	6	0 1	0 10 0	0 5 0	
" viminalis	800	9	0 1	0 10 0	0 8 0	
" eugenioides	600	6	0 1	0 10 0	0 6 0	Seed from R. Reynolds, Esq., Cambridge, Waikato.
" Macarthuri	12,000	8	0 3	0 10 0	6 0 0	
" obliqua	200	6	0 1	0 10 0	0 2 0	
" Macarthuri	1,000	8	0 1	0 10 0	0 10 0	Seed from Rev. Simmonds, Auckland.
" regnans	300	6	0 1	0 10 0	0 3 0	
" goniocalyx	500	6	0 0½	0 10 0	0 5 0	
" gomphocephala ..	400	6	0 0½	0 10 0	0 4 0	
" regnans	300	6	0 0¼	0 10 0	0 3 0	
" resinifera	175,000	8	6 0	0 10 0	87 10 0	
" " grandiflora ..	75,000	8	1 0	0 10 0	37 10 0	Seed from New South Wales.
" saligna	1,500	6	0 0½	0 10 0	0 15 0	
" salmonophloia ..	500	6	0 0½	0 10 0	0 5 0	
" siderophloia	2,000	6	0 0½	0 10 0	1 0 0	
" occidentalis	500	6	0 0½	0 10 0	0 5 0	
" Muelleriana	500	6	0 1	0 10 0	0 5 0	Seed from Forestry Department, Victoria.
" regnans	3,000	6	0 0½	0 10 0	1 10 0	
Larix europaea	1,000,000	3	344 0	1 0 0	1,000 0 0	Very good.
Picea ajanensis	100	1	0 0⅕	1 5 0	0 2 6	Fair.
" Glehni	25	1	0 0⅕	1 5 0	0 0 8	"
Pinus canariensis	100	8	0 1	1 0 0	0 2 0	Good.
" Laricio	15,000	2	13 8	1 0 0	15 0 0	Poor.
" luchuensis	25	2	0 0¼	1 0 0	0 0 6	Fair.
" massoniana	100	2	0 0⅕	1 0 0	0 2 0	Good.
" Murrayana	5,000	2	0 2	1 0 0	5 0 0	Fair.
" ponderosa	1,000,000	2½	340 0	1 0 0	1,000 0 0	Good.
" " var. scopulorum ..	14,000	2	10 0	1 5 0	17 10 0	"
" radiata	1,000,000	6	214 0	1 0 0	1,000 0 0	Very good.
" strobus	100,000	2	46 0	1 0 0	100 0 0	"
" taeda	18,000	3	7 0	1 5 0	22 10 0	Good.
Pseudo-tsuga Douglasii	750,000	4	130 0	1 5 0	937 10 0	Very good.
Sequoia sempervirens	200	2	0 8	4 0 0	0 16 0	Fair.
Totals	4,191,450	..	..	..	£4,248 11 9	

* All the Eucalypts have made exceptionally good growth.

Details of Two-year-old Trees, sown 1912.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Abies pectinata	250	1	1 5 0	0 6 3	Poor.
Cupressus Lawsoniana	250	6	2 0 0	0 10 0	Good.
Cryptomeria japonica	1,500	9	2 10 0	3 15 0	"
Larix europaea	1,500,000	12	1 5 0	1,875 0 0	"
Picea excelsa	250	2	1 5 0	0 6 3	Poor.
" sitchensis	250	3	1 10 0	0 7 6	"
Pinus densiflora	100	9	1 5 0	0 2 6	Good.
" Laricio	1,500,000	6	1 5 0	1,875 0 0	Very good.
" ponderosa	500,000	3	1 5 0	625 0 0	Fair.
" strobus	8,000	3	1 5 0	10 0 0	"
" Thunbergii	100	6	1 5 0	0 2 6	Good.
Totals	3,510,700	..	..	£4,390 10 0	

Schedule V.—Details of Lined-out Trees.

Name of Tree.	Age.		Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
	Two Years.	Three Years.		£ s. d.	£ s. d.	
Acer pseudo-platanus ..	4,000	..	15	1 10 0	6 0 0	Good.
Cupressus Lawsoniana ..	1,500	..	8	3 15 0	5 12 6	Very good.
Larix europaea	60,000	..	12	2 5 0	135 0 0	Good.
„ leptolepis	..	1,500	12	3 10 0	5 5 0	„
Pinus Laricio	..	350,000	6	3 10 0	1,225 0 0	„
„ Montezumae	..	200	9	3 5 0	0 13 0	„
„ patula	..	250	9	3 5 0	0 16 3	„
„ ponderosa	..	120,000	5	3 0 0	360 0 0	„
„ strobus	..	30,000	7	3 0 0	90 0 0	Very good.
Pseudo-tsuga Douglasii ..	300,000	..	2	2 10 0	750 0 0	Poor.
„ ..	..	6,500	3	3 5 0	21 2 6	„
Totals	365,500	508,450	..	..	2,599 9 3	
	873,950					

Details of Trees transferred to Plantations, &c., 1913–14.

Where sent.	Name of Tree.	Number.	Value per Thousand.	Total Value.
			£ s. d.	£ s. d.
Whakarewarewa Plantation ..	Acer pseudo-platanus	9,000	0 10 0	4 10 0
	Alnus glutinosa	3,075	0 15 0	2 6 1
	Eucalyptus Smithii	875	0 10 0	0 8 9
	„ Stuartiana	1,750	0 10 0	0 17 6
	„ umbra	400	0 10 0	0 4 0
	„ viminalis	850	0 10 0	0 8 6
	Larix europaea	137,550	1 5 0	171 18 9
	„ „	105,700	2 5 0	237 16 6
	„ leptolepis	26,625	3 0 0	79 17 6
	Pinus Laricio	825,500	1 5 0	1,031 17 6
	„ „	296,350	2 5 0	666 15 9
	„ Massoniana	10	2 5 0	0 0 6
	„ Montezumae	500	2 10 0	1 5 0
	„ patula	1,500	2 10 0	3 15 0
	„ ponderosa	263,425	1 5 0	329 5 8
	„ „	3,250	3 0 0	9 15 0
	Pseudo-tsuga Douglasii	3,310	1 10 0	4 19 3
	„	4,000	2 10 0	10 0 0
	„	18,250	3 5 0	59 6 3
	Sequoia sempervirens	825	8 0 0	6 12 0
		1,702,745	..	2,621 19 6
Waiotapu Plantation	Larix europaea	55,000	1 5 0	68 15 0
	Pinus Laricio	1,215,375	1 5 0	1,519 4 4
	„ „	176,350	2 5 0	396 15 9
	„ Lambertiana	10	2 10 0	0 0 6
	„ Massoniana	10	2 10 0	0 0 6
	„ Montezumae	50	2 10 0	0 2 6
	„ patula	200	2 10 0	0 10 0
	„ radiata	22,700	1 0 0	22 14 0
		1,469,695	..	2,008 2 7
Kaingaroa Plains Plantation ..	Pinus Laricio	38,250	3 0 0	114 15 0
	„	1,296,500	1 5 0	1,620 12 6
	„	275,000	2 5 0	618 15 0
		1,609,750	..	2,354 2 6
Whakarewarewa Plantation ..	As per details above	1,702,745	..	2,621 19 6
Waiotapu Plantation	„	1,469,695	..	2,008 2 7
Kaingaroa Plains Plantation ..	„	1,609,750	..	2,354 2 6
Point Halswell Prison, Wellington	Pinus Laricio	125,000	1 2 6	140 12 6
„ „ ..	Betula alba	6,000	1 2 6	6 15 0
Tokanui Mental Hospital	Pinus Laricio	250	1 2 6	0 5 8
Roseneath School, Wellington ..	„	200	1 2 6	0 4 6
Waikeria Prison	„	2,000	1 2 6	2 5 0
Victoria College, Wellington ..	Assorted shrubs	180	3d. each	2 5 0
Karangahake Public School ..	Shelter-trees	36	..	0 4 0
Rabbit Island Domain Board, Nelson	Eucalyptus viminalis	200	..	0 7 0
„ „	„ Smithii	50		
Agriculture Department, Mamaku	Shelter-trees	24	..	0 3 0
Domain Board, Taihape ..	Pinus Laricio	400	1 2 6 and packing	0 10 0
Totals	..	4,916,530	..	7,137 16 3

Whakarewarewa Plantation.

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

Trees to the number of 1,702,745 were received from Rotorua Nursery during the season. Of this number, 1,258,570 were planted on new area, 149,385 were planted in old areas where larch which had been destroyed by frost were cut out, and the remainder, 294,790, were used to replace failures—chiefly *Pinus Laricio*—in the two preceding years' plantings. The planting of new area, being at some distance from the prison camp, was almost entirely done by free labour, and the trees handled by the prisoners were mostly used for replacing failures in the blocks within easy reach of the camp. The area planted amounted to 475 acres, making the total area now under young forest 6,224 acres, containing 13,945,596 trees.

Favoured by moist mild weather in the spring and early summer the trees commenced to grow almost from the start, and, although checked later on by continued dry weather, had already become so well established that they were affected but slightly, the percentage of failures being considerably below the average year. *Pinus Laricio*, which formed the bulk of the planting on new area, has done especially well, quite eclipsing any previous planting of this species, and not more than 2 per cent. of failures have to be recorded. Where used to replace failures in former plantings the same good results are to be found, and the only place where failures are noticeable is on the areas from which frosted larch were removed; these areas were replanted early in the season when the weather-conditions were not so favourable, and are so situated that it is difficult to get any tree to do well.

The young plants were much better rooted than is usually the case with *Pinus Laricio*, and this no doubt helped them considerably; but the moist condition of the soil at the time of planting, and the absence of frost afterwards, were the chief factors contributing towards the success of this species. With the larch the same good results have been obtained, although the spell of dry weather checked the growth, and caused a number of them to have an unhealthy appearance for a time.

Amongst *Pinus ponderosa* the percentage of failures is slightly greater than in *P. Laricio*, but, on the whole, is less than usual, and the growth made is quite satisfactory. Douglas fir planted in a very favourable situation have made excellent growth, as have also a small planting of Japanese larch on the same block.

A few hundred Mexican pines—*Pinus patula* and *P. Montezumae*—were planted out, but the locality proved unsuitable, frost being responsible for their failure. *Eucalyptus Smithii*, *E. viminalis*, and *E. umbra* were tried, but only a partial success resulted with the two former species, while *E. umbra*—which is a somewhat tender species—was a total failure.

Vigorous growth, quite equal to that of any previous year, has been maintained by the older trees. In the month of February a considerable number of the larch had their leaders nipped by frost, but in the majority of cases it will probably not have a very serious effect.

Prison Labour.—The daily average number of men employed was 11·66, showing a slight increase on the daily average employed during the previous year. It was, however, only during the latter half of the year that the strength of the camp had been fairly well maintained; in the planting season, when a good gang would have been of great assistance, the number of men available was comparatively small. If the number of men who are at present in the camp could be maintained throughout the coming planting season much better results might be expected. The work of the prisoners, which was estimated at a total value of £1,019 17s. 3d., has been performed in a creditable manner, and consisted chiefly of general maintenance-work, pitting, and clearing for tree-planting.

Free Labour.—An average daily number of 28·63 men were employed, and the average cost of the various works undertaken were as follows: Clearing for tree-planting, £1 7s. 9d. per acre; pitting of new area, 5s. 5d. per thousand; pitting old areas, 13s. 7d. per thousand; planting new area, 6s. 11d. per thousand; replanting old areas, 8s. 2d. per thousand; and planting blanks, £1 5s. 3d. per thousand. The formation of 85 chains of roading cost, on an average, 11s. 10d. per chain; and 169 chains of fire-break were cleared, stumped, and burned off at a cost of 3s. 11d. per chain.

With the exception of about 50,000 trees, the planting on new area was all done on the block of land purchased from the Natives during the previous year, the trees available being sufficient to completely fill it up. As the land was fairly easy to work, the cost of preparing the ground and planting it was somewhat below the average cost of this work. For the coming season's planting the block on which the free labour will be engaged will be exceptionally heavy, and the pitting and planting proportionately expensive.

Sowing in situ.—In order to determine the practicability of raising woods by direct sowing in this locality, experiments were made in the spring-time with the seed of *Pinus Laricio* and *P. radiata*. Three experiments in different methods of sowing were made with each species. In the first experiment the land—which had previously been cleared and burned off—was roughly cultivated by hand in rows 3 ft. apart, the seed was sown on the rows and raked in, ½ lb. of seed being used to the quarter-acre. In the second the seed was broadcasted amongst the ashes after the growth was burned off; and the third sowing was made by scattering the seed on land lightly covered with a growth of fern and manuka. These experiments resulted in failure, as *P. Laricio* never germinated at all, while the germination of *P. radiata* was very poor—the best result being obtained where the ground was slightly cultivated. It would appear, therefore, that in order to raise a sufficient number of seedlings to the acre either an enormous quantity of seed would be required, or the ground must be specially prepared to form a good seed-bed; in either case the work on rough country would in all probability be unsatisfactory, and would undoubtedly be more costly than the present method of raising the plants in the nursery. Small birds also not only pick up exposed seeds, but take the seedlings as they come through the ground, and there is always the risk of unseasonable frosts destroying a young crop over which there is no protective covering. There is good reason to believe, however, that where land

can be easily ploughed, and the climatic conditions are suitable, certain species of trees, such as *Eucalypti*, might profitably be grown by direct sowing.

Fire-protection.—An improved system for dealing with outside fires which endanger the planted area has been in operation during the dry season. The eastern boundary, which follows the Wairoa Road for a distance of about five miles, owing to the difficulty of seeing it from other parts of the plantation, has been proved by the experience of former years to be particularly dangerous. On this boundary a Ranger has been stationed, whose duty it is to patrol the road during dry weather and to attend to the fence and fire-break, and such matters as trespassing persons, stock, &c. For his accommodation a small building was erected near his work, where he also keeps an outfit of tools sufficient for the use of ten or twelve men, thus reducing loss of time as much as possible should any fire in the vicinity be considered dangerous. The building is connected by telephone with the nursery, and, if necessary, communication may be obtained at any time of day or night. The appointment of a Ranger relieves the responsible officer on duty considerably, as on Sundays and holidays he has quite enough to do in attending properly to other parts of the plantation. On a recently acquired section on the Waiotapu Road two huts for workmen have been erected in a position from which several miles of the boundary on that side may be seen. The men living there take turns in staying about the camp on Sundays during dry weather, and would be ready to give prompt warning of and render assistance in dealing with an outbreak occurring in the neighbourhood. In addition to these buildings, an old kitchen and dining-shelter previously used by the Health Department is being converted into suitable quarters for workmen, so that in future a number of men will always be available in case of emergency.

For the next season's tree-planting pits to the number of 774,700, prepared by prison labour, are available, and it is intended to shortly commence with the preparation of an area of land sufficient to accommodate another 800,000 trees.

D. J. BUCHANAN,
Assistant Forester.

Schedule II.—Statement of Expenditure.

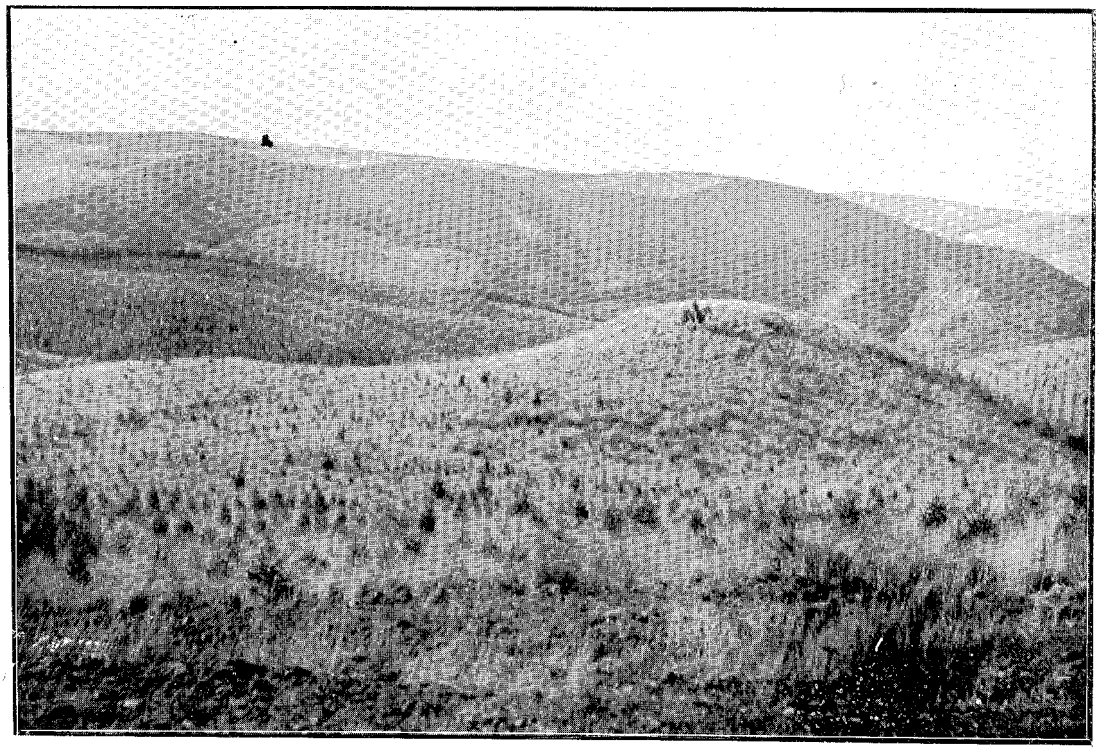
	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	465 19 9	6,444 13 6
Pitting	639 6 2	6,785 15 2
Clearing	942 13 1	8,766 19 2
Cartage of trees	17 13 10	344 9 8
General upkeep	1,618 3 4	11,389 10 3
Thinning	28 18 0	97 15 7
General repairs	121 0 3	943 10 10
Horse-feed	241 8 0	1,247 16 11
Permanent works—		
Fencing	65 19 10	1,201 7 8
General formation	140 3 4	2,231 15 5
Buildings	201 14 9	1,380 15 4
Water-service	..	95 5 6
Stock, implements, &c.—Tools and implements	162 7 11	799 2 1
Supervision and clerical—		
Supervision of free labour	490 17 0	4,430 0 4
,, prison labour	170 0 0	
Clerical assistance	42 0 0	
	5,348 5 3	46,158 17 5
Value of prison labour for which no payment has been made, apportioned in above items	53 19 5	7,607 18 2
Actual expenditure	£5,294 5 10	£38,550 19 3

Schedule III.—Trees Account.

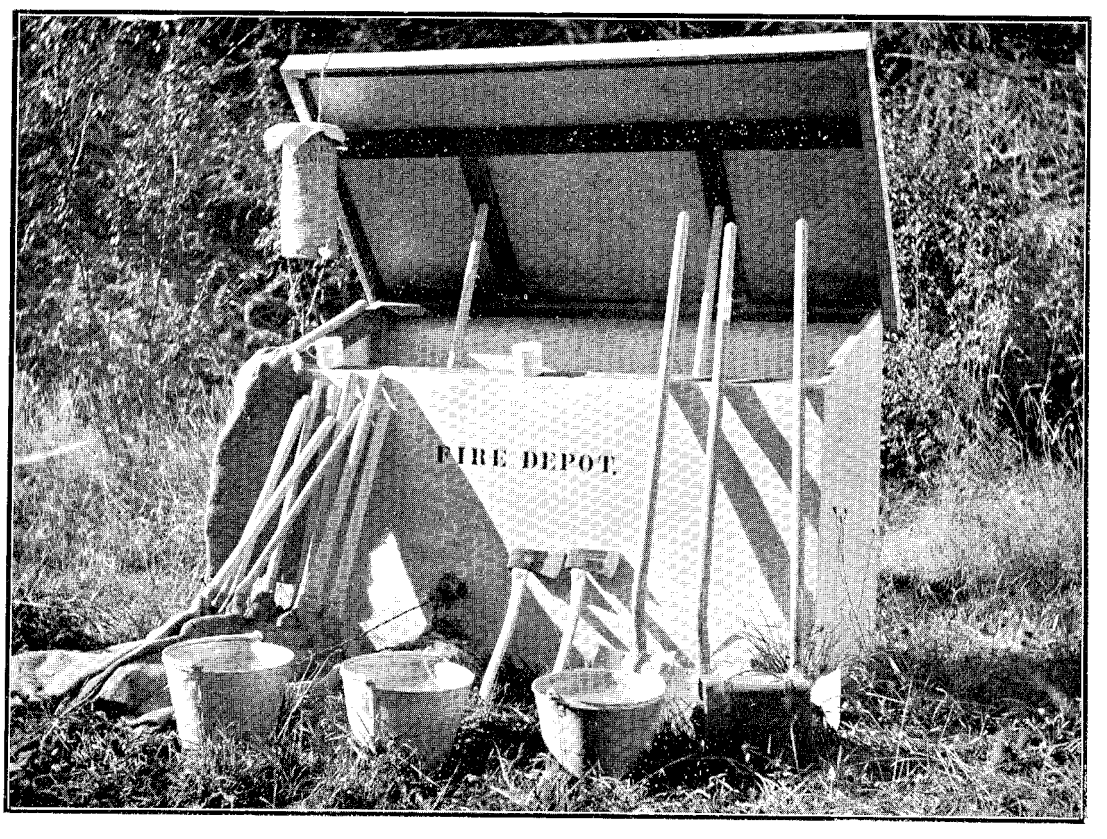
	Number.
Trees received during year	1,702,745
Less to replace blanks	444,175
Planted on new area	1,258,570
Previously planted	12,687,026
Total number planted on 6,224 acres (average age, six years)	13,945,596

Schedule IV.—Property Account.

	£ s. d.
Land (9,547 acres): Crown land not charged to Forestry Account	..
Buildings	1,051 16 5
Improvements	1,612 1 2
Fencing	761 19 11
Stores in hand	785 15 3
	£4,211 12 9



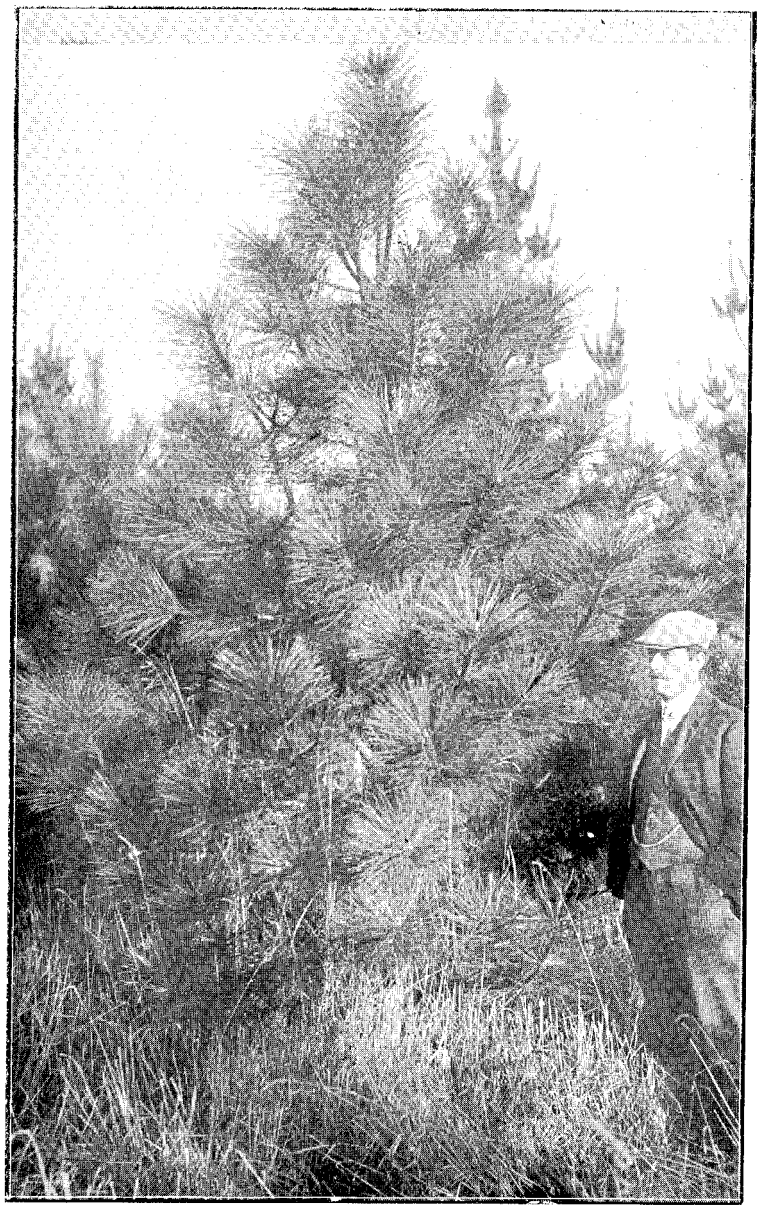
Typical Country now being afforested in South Otago.



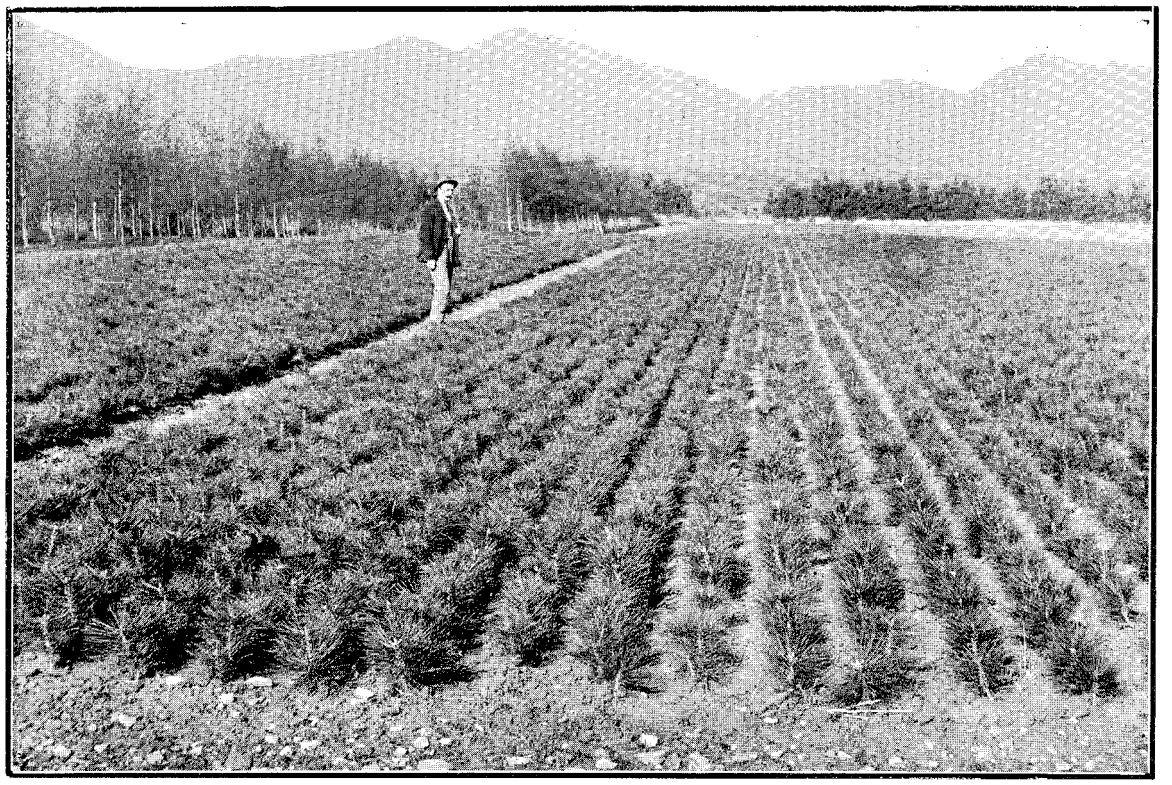
Fire Depot introduced into South Island Plantations.

NOTHOFAGUS FUSCA (RED-BEECH); AGE, THIRTEEN YEARS; HEIGHT, 20 FEET.

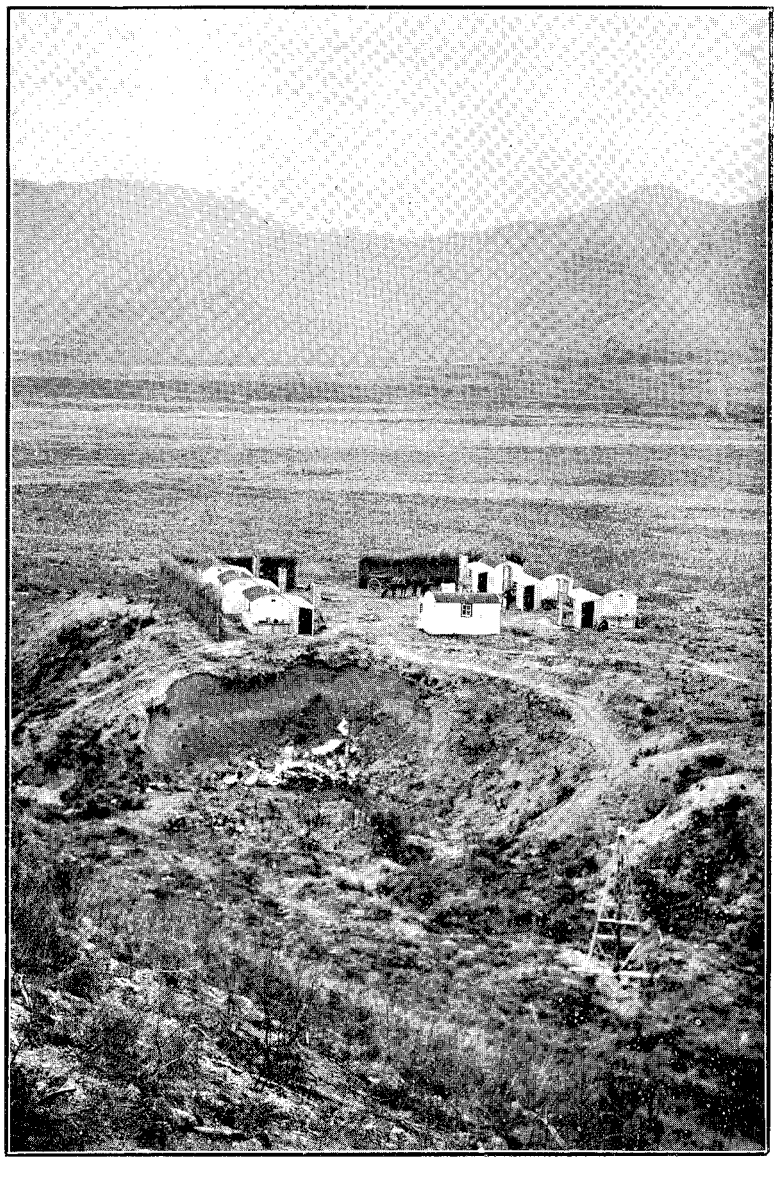
CUPRESSUS LAWSONIANA (LAWSON'S CYPRESS); AGE, THIRTEEN YEARS; HEIGHT, 15 FEET.



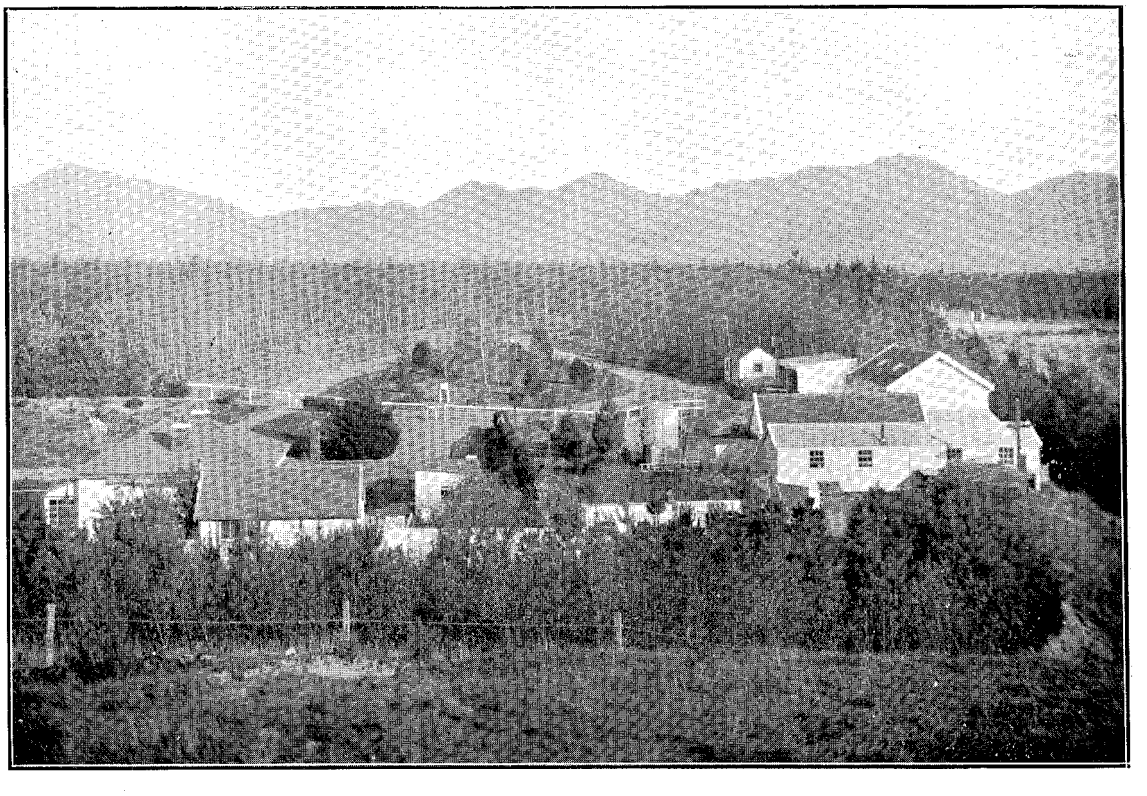
PINUS PONDEROSA (BULL OR HEAVY PINE); AGE, TEN YEARS; HEIGHT, 14 FEET.



THREE-YEAR-OLD PINUS PONDEROSA AT HANMER SPRINGS NURSERY



New Area now being afforested at Hanmer Springs, showing Employees' Camp.



Nursery Buildings at Hanmer Springs, with Birch and Larch Plantation in the Background.

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 14 385. 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

Mangahukimoka Stm.

PRISON CAMP

HORSE PADDOCK

PADDOCK

PADDOCK

OLD CAMP

MAIRS ROAD

GALATEA ROAD

OLD ROAD

40 30 20 10 0 20 40 60 80

SCALE OF CHAINS

M. Crompton Smith, Chief Draughtsman, Head Office Lands and Survey Department, Wellington.

By Authority: John Mackay, Government Printer

Balance-sheet.

	£ s. d.
Total expenditure	46,158 17 5
Less Property Account	4,211 12 9
Cost of operations	£41,947 4 8
6,224 acres planted (average age, six years).	
Estimated value of plantation per acre	9 7 0

Summary of Trees planted.

	Numbers.
Number on plantation at present day—	
Contents of various blocks	13,945,121
Ornamental and shelter trees at prison camps, &c.	475
Total trees now living	13,945,596
Number used to replace failures, &c.—	
Experimental trees not suited to district	266,305
Used to replace failures	2,910,038
Total	17,121,939
Less trees raised from seed sown *in situ*	109,725
Trees received from nursery	17,012,214

Summary showing Area of Whakarewarewa Plantation (6,223·94 Acres in Trees).

	Acres.
Larch	2,554·80
Pines	1,903·20
Blackwood	79·00
Eucalypti	1,534·30
Walnut	9·70
Spruce, *Picea, Pseudo-tsuga*	127·00
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	487·21
Unplanted land	2,418·80
	9,580·80

Waiotapu Plantation.

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

The weather-conditions at the commencement of the season were not altogether favourable for tree-planting: frosts, being both frequent and severe, caused considerable delay. The rainfall was also below the average, thus necessitating the repuddling of all trees as they were received from the nursery. The healthy appearance now presented by the young trees planted during this period more than justifies this extra expenditure. During the spring and early summer there was a plentiful rainfall, but owing to the long dry spell which followed there has been a premature shedding of leaves. The pines have suffered most; *Pinus radiata* in particular seems to be unable to withstand a prolonged drought, several fine nine-year-old trees having died, while others show evidence of having had a struggle for existence.

The 1,469,695 trees received from the nursery during the year were planted as under: 579,060 on new area, 676,235 in replacing blanks in former years' plantings, and 214,400 *Pinus Laricio* used in replacing larch. About 213 acres of new area was planted with 578,800 *Pinus Laricio*. Where the trees are sheltered all have done well, and are making vigorous growth. Those planted early in the season on low-lying country have not done so well, and show a large death-rate; they received a further set-back late in February, when 10° of frost was registered. A few *Pinus patula*, *Pinus Montezumae*, and *Pinus Massoniana*, planted for experimental purposes, have made fair growth, and are healthy, except that the *Pinus Massoniana* are more or less affected by the pine aphis.

An experimental seed-sowing of *Pinus Laricio* and *Pinus radiata* was made early in October, the object being to find out if direct sowing was going to be profitable. A pound of each species was sown broadcast amongst the standing growth on half an acre; this proved a failure, as none of the seed germinated. A second plot of similar size, where the seed was sown after the growth had been burnt off, also resulted in failure, a few seed only germinating. With a third sowing, made in drills 3 ft. apart over a quarter acre, the result was again a failure; the *Pinus radiata* germinated fairly well, although not sufficiently thick to be of any practical use. Birds and early frost did a good deal of damage, and the crop is now very uneven.

The greater portion of the land planted with *Pinus Laricio* during the two previous seasons was low-lying, and subject to severe frosts, and this accounts to a great extent for the large number of trees required to replace failures. 22,700 *Pinus radiata* seedlings used in replacing failures were planted in two separate lots: the first planting was made in April, with disappointing results, quite 75 per cent. being killed by frost. From a planting made in October much better results were obtained, the death-rate not exceeding 10 per cent. The average cost of tree-planting was 4s. 10d. per thousand, and the replacing of failures 7s. 9d. per thousand.

Of the experimental planting made two seasons ago, *Pinus ponderosa* var. *scopulorum* continues to make strong sturdy growth. *Pinus teocote*, where planted in sheltered places, has made an average growth of about 5 ft., and from present indications should prove to be one of the fastest-growing trees we have. It is, however, susceptible to frost, and is not likely to prove generally useful here. A heavy thinning was made over an acre of nine-year-old *Pinus radiata*, between six and seven hundred trees being left standing. Considering the remarkably rapid growth made by this species, it is apparent that one heavy thinning at this stage will be as effective as two light thinnings during the same period, and at the same time greatly reduces the cost of production. The remainder of this block of 24½ acres was cleaned by removing the side branches to a height of about 6 ft. above the ground, the average cost of this work being £2 12s. per acre.

About 665,000 pits are available for the coming season, and this will complete the planting of the enclosed area. Maintenance of fire-breaks accounted for an expenditure on labour of £318 1s. 10d. 235 chains of new fire-breaks were formed, varying in width from ⅓ chain to 3 chains, the average cost being 4s. 5d. per chain. The necessity of keeping the fire-breaks in good order is demonstrated annually. This summer a fire broke out alongside our boundary on Maungakakaramea, and, although the fire did not actually cross the fire-break, about 2 acres of *Pinus austriaca* were rather badly scorched, trees 12 chains away from the fire being affected.

A fire Ranger was appointed during the year, his duties being to keep the plantation under constant observation during the summer months, and to attend to fire-breaks and fences during winter. Two wooden buildings were erected at the No. 2 camp, each having accommodation for two men. More buildings are needed to meet the present requirements.

About 15 tons of hay was saved from the horse-paddock at the No. 1 camp. Rabbits were kept in check by trapping, poisoning, and digging out the burrows. Where the fire-breaks have been newly worked trapping is difficult, and poisoning during the winter months is found to be more effective.

The average daily number of men employed during the year was 15·68. A record of rainfall and temperature is attached.

[J. Mason,
Assistant Forester.

Schedule 1.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1913.	In.		Deg. F.	Deg. F.	
April	0·60	4	74	22	12
May	2·65	13	63	19	17
June	1·50	7	64	18	21
July	4·86	14	67	20	14
August	5·32	15	62	20	12
September	2·06	11	66	21	10
October	3·40	14	73	25	6
November	4·85	21	74	27	3
December	4·72	18	85	29	3
1914.					
January	0·92	5	84	31	3
February	1·46	8	85	22	3
March	5·15	10	79	22	4
Totals	37·49	140	..	..	108

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	411 1 0	7,597 13 2
Pitting	..	7,164 6 1
Clearing	..	6,123 2 6
Cartage of trees	15 9 0	612 19 8
General upkeep	1,243 19 6	7,075 19 4
Thinning	55 0 0	55 0 0
General repairs	62 7 10	553 13 9
Horse-feed	131 11 2	1,159 10 11
Permanent works—		
Fencing	..	2,119 18 11
General formation	53 0 0	1,482 17 1
Buildings	138 16 5	1,417 4 0
Water-service	..	..
Stock, implements, &c.—Tools and implements	140 4 7	1,015 10 7
Supervision and clerical—		
Supervision of free labour	277 0 0	4,608 3 0
Clerical assistance	42 0 0	
	2,570 9 6	40,985 19 0
Value of prison labour for which no payment has been made, apportioned in above items ..	..	24,665 2 6
Actual expenditure	£2,570 9 6	£16,320 16 6

Schedule III.—Trees Account.

	Number.
Trees received during year	1,469,695
Less to replace blanks	890,635
Planted on new area	579,060
Previously planted	17,675,129
Total number planted on 6,960 acres (average age, six years)	18,254,189

Schedule IV.—Property Account.

	£ s. d.
Land (7,777 acres) Crown land, not charged to Forestry Account	..
Buildings	967 19 1
Improvements	930 9 6
Fencing	1,142 15 2
Stores in hand	785 15 3
	£3,826 19 0

Balance-sheet.

	£ s. d.
Total expenditure	40,985 19 0
Less Property Account	3,826 19 0
Cost of operations	£37,159 0 0
6,960 acres planted (average age, six years).	
Estimated value of plantation per acre	9 5 0

Summary of Trees planted.

Number on plantation at present day—	Number.
Contents of various blocks	18,197,748
On fire-breaks	11,367
Ornamental and shelter trees at prison camps, &c.	43,586
Experimental trees	1,488
Total trees now living	18,254,189
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 suited to district	757,214
Used to replace failures	3,127,403
	22,156,231
Less trees raised from seed sown *in situ*	83,121
Trees received from nursery	22,073,110

Summary showing Area of Waiotapu Plantation (6,960·43 Acres in Trees).

	Acres.
Larch	3,176·69
Pines	3,591·29
Eucalypti	180·50
Birch	11·95
Roads, tracks, and fire-breaks	312·30
Lands unsuitable for planting, including swamps, creeks, horse-paddocks, and residence reserves	260·25
Unplanted land	244·32
	7,777·30

Kaingaroa Plains Plantation.

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

The afforestation-work at this station has been done entirely by prison labour, with very satisfactory results, and it is regrettable that, instead of increasing, the number of prisoners sent to this station has decreased. During the year the average number of men employed daily was 12·36, and the value of the work performed was £1,113 5s., or an average of about £90 1s. 4d. per man. Last year the average daily number of prisoners employed was 15·20, while an average taken for the period from 1900 to the present date gives 28·98.

An area of 600 acres was planted with Corsican pine, 1,609,750 trees being used. Previous plantings were chiefly in the nature of shelter-belts to protect the camp and stock paddocks, and accounted for 8,650 trees, mostly Monterey pine, so that to date 1,618,400 trees have been planted at this station.

The first part of the planting season was extremely dry, and it was necessary to "puddle" the trees when they were received from the nursery. Even with these extra precautions it appeared at first as if the results would be far from satisfactory, but it is pleasing to report that a most successful season has been experienced. The trees have made good progress, and the death-rate does not exceed 8 per cent.

Experiments to determine the feasibility of raising forests by the direct sowing of seeds were conducted under four different methods, but in each case the results show that direct sowing in this district cannot profitably replace the present system of planting. *Pinus radiata* and *Pinus Laricio* were the species tried, and the methods were as follow: 1 lb. of seed was sown on half an acre of land in each of the first three experiments.

(1.) An area carrying a rather open growth of manuka scrub was chosen, and the seed broadcasted without preparing the land in any way. Result, total failure, not a single plant being got.

(2.) A similar area adjoining No. 1 was cleared and burned, and the seed broadcasted amongst the debris. Result, total failure.

(3.) After clearing and burning, the land was marked off in parallel rows, and the soil in each row was scarified to the depth of 3 in. The seed was sown in the loosened soil, and covered with a brush harrow. Germination was very sparse, and fully half of the seedlings died as the result of the subsequent dry, hot weather.

(4.) Half an acre was ploughed and harrowed and sown with a mixture consisting of 1 bushel of oats and 4 lb. of *Pinus radiata*. Germination was much better here than in No. 3 experiment, but still not sufficiently good to properly stock the land with trees. Here, too, the dry weather proved too severe for the seedlings, fully 50 per cent. succumbing.

Under any method of direct sowing there appears to be a tremendous waste of seed by birds, and by loss in seedlings after germination has taken place. To allow for these losses it would be necessary to make very heavy sowings, the cost of which would be prohibitive. Although the weather this year has been unusually dry the failures must not be altogether attributed to this fact. The variable spring climate of this high country is somewhat severe even on strong transplanted trees, and it cannot reasonably be expected that minute seedlings will flourish under such conditions. The question is an important one, and in order that the trials shall be absolutely conclusive further experiments will be made next year. There does not appear to be any doubt but that cultivation of the land is essential to success, and consequently the next trials will all be made on land which at the present time is ploughed and in readiness to receive the beneficial weathering effects of the coming winter.

This plantation area is being divided into blocks of about 300 acres, with 2-chain fire-breaks separating each block. It is intended to plough the 2-chain reserve and keep it bare for a few years, but a further precaution against the spread of fire will be taken by planting a chain-wide belt of poplars or other non-inflammable trees around each block of pines.

The water-supply for the prison camp caused much anxiety owing to the springs completely drying up in the month of February. No doubt the unusually dry weather experienced during the past two years has been the cause of the diminution of the water-supply, so that given normal weather-conditions the trouble is not likely to recur.

The rabbits, although not by any means plentiful, were responsible for some damage being done to the young trees, and it has been necessary to trap and poison them at intervals during the year.

The average number of free labour employed during the year was 2·25. Following is a statement of expenditure for the year along with other tabulated information.

R. MacRae,
Assistant Forester.

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	434 2 4	474 14 4
Pitting	257 5 11	650 13 8
Clearing	22 19 4	318 8 10
Cartage of trees	23 15 0	32 15 0
General upkeep	64 0 8	206 2 8
General repairs	46 2 0	64 6 6
Horse-feed	90 13 1	91 18 1
Permanent works—		
Fencing	..	42 6 3
General formation	173 15 9	844 8 4
Buildings	9 17 5	1,372 19 6
Water service	2 4 0	484 5 1
Stock, implements, &c.—Tools and implements	51 2 0	92 11 0
Supervision and clerical—		
Supervision of prison labour	467 0 0	860 7 9
Clerical assistance	42 0 0	
	1,684 17 6	5,535 17 0
Value of prison labour for which no payment has been made, apportioned in above items	76 4 6	685 19 6
Actual expenditure	£1,608 13 0	£4,849 17 6

Schedule III.—Trees Account.

	Number.
Trees received during year	1,609,750
Less to replace blanks	..
Planted on new area	1,609,750
Previously planted	8,650
Total number of plants on 600 acres (average age, one year)	1,618,400

Schedule IV.—Property Account.

	£ s. d.
Land (33,355 acres) Crown land, not charged to Forestry Account	..
Buildings	1,180 10 3
Improvements	1,327 13 3
Fencing	36 15 11
Stores in hand	785 15 3
	£3,330 14 8

Balance-sheet.

	£ s. d.
Total expenditure	5,535 17 0
Less Property Account	3,330 14 8
Cost of operations	£2,205 2 4
600 acres planted (average, one year).	
Estimated value of plantation per acre	7 5 0

Summary of Trees planted.

Number on plantation at present day—	Number.
Contents of various blocks	1,609,750
Shelter-trees	8,650
Total trees now living	1,618,400
Number used to replace failures	250
Total trees received from nursery	1,618,650

PUHIPUHI PLANTATION.

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

In addition to the usual work required to keep the fire-breaks and fences in order, a considerable expenditure on wages has been necessary in pruning back the trees which were damaged by fire last year. This work was in progress during the whole of last winter and spring, and the results are extremely satisfactory. Very few trees were actually lost by the fire, and those ones which were cut back to the ground-level have thrown up strong healthy saplings from the root-stock which in some cases have attained a height of 8 ft. during the past summer. Some further work will be entailed in thinning out the saplings and leaving only the strongest one on each tree, but this work can be most profitably done if left until the end of next winter.

Preparations are now well forward for planting about 250,000 eucalypts during the coming season. The trees are being sent from the nursery at Rotorua, and comprise *Eucalyptus resinifera* and *E. resinifera grandiflora*, along with about twenty other different species which will be planted in small lots for experimental purposes. Owing to the extensive planting of totara at this station some years ago, and the poor results obtained with this tree, there are several areas upon which very few trees are alive, and it is proposed to stock these with *E. resinifera* or its variety *grandiflora*. This species has proved quite at home at Puhipuhi, and has done better than any other species except *E. Gunnii*. It is known as "mahogany" in Australia, and sometimes as red or forest mahogany. The timber is exceedingly hard and durable, and being of a rich red colour is valuable for heavy furniture and inside finishings in buildings. It is a perfect substitute for jarrah. The variety, *grandiflora*, is simply a mountain type with a much larger fruit than the specific form. It is thought that it may prove to be a hardier form, and therefore suitable for a wider range of climates than the species.

The average number of workmen employed during the year was 2·52. Following is a record of rainfall and temperature for the year.

H. A. GOUDIE,
Superintending Nurseryman.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1913.	In.		Deg. F.	Deg. F.	
April	2·56	5	72	32	1
May	3·64	21	62	34	..
June	4·69	12	66	32	1
July	4·30	16	62	32	1
August	8·70	23	60	32	1
September	1·70	9	66	34	..
October	1·91	11	76	40	..
November	4·18	15	70	40	..
December	3·28	12	74	40	..
1914.					
January	0·77	5	87	40	..
February	0·76	6	88	44	..
March	3·38	7	84	42	..
Totals	39·87	142	..	..	4

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	4 9 6	1,110 11 5
Pitting	..	1,552 14 0
Clearing	..	963 17 0
Cartage of trees	..	179 13 3
General upkeep	379 3 7	3,718 7 4
General repairs	..	142 18 0
Horse-feed	..	33 16 3
Permanent works—		
Fencing	..	471 0 3
Purchase of land	..	10 4 3
General formation	..	36 13 0
Buildings	..	355 4 9
Water service	..	..
Stock, implements, &c.—Tools and implements ..	0 14 3	327 3 6
Supervision and clerical—		
Supervision of free labour	15 0 0	1,007 9 7
Clerical assistance	10 0 0	
	£409 7 4	£9,909 12 7

REPORT ON AFFORESTATION OPERATIONS IN THE SOUTH ISLAND.

[By the Superintending Nurseryman, Tapanui.]

In the compilation of annual reports on the progress of afforestation-work no attempt is made to treat exhaustively any of the subjects written upon, and the object of the officers is accomplished if they are able to clearly disclose the leading features associated with their stations, and show how the expenditure has been allocated. As arrangements are well in hand for the publication of special articles on forestry matters by officers, this idea will tend to curtail these annual reports, while at the same time greater prominence will be given to the more important subjects, which are usually overshadowed by statistics.

The weather-conditions particularly favoured tree-growing in both Naseby and Hanmer Springs districts; but we were again unfortunate in the most southern nursery in having to experience an unusually heavy and persistent rainfall, particularly over that period when plenty of sunshine is required for seed-germination and cultivation amongst transplanted trees. Hanmer Springs register showed that 45·82 in. of rain fell there on 128 days, while at Tapanui a precipitation of 47·80 in. on 203 days was recorded. Perhaps the most interesting meteorological data is associated with Naseby Plantation, where the excellent fall of 36·41 on 125 days doubtless is responsible for the unusually uniform headway being made by trees generally there. The opinion formed that considerably heavier downpours occur over the areas skirting the base of Mount Ida is specially borne out this year, as at Ranfurly Nursery, only twelve miles distant, the year's fall amounted to only two-thirds of that on the plantation. Any further points of comparison can be ascertained on reference to the rainfall charts appended to the reports on each central station.

Nursery-work and Associated Expenditure.

Generally a very fair measure of success has been achieved in the actual raising of some 4,372,500 seedlings in the three nurseries. This result, accruing from 1,015¼ lb. of seed, is not up to expectations; but to a second sowing at Tapanui, in consequence of a failure with the main crop, may be attributed the low germinating average. It is gratifying to be able to report, however, on the unprecedented development of the yearlings, which will give plenty of scope for an increased number of transplants during the lining-out period. Although a careful record of costs connected with the purchase of seed and actual labour applied in raising the yearlings shows that an average expenditure of 3s. 6d. per thousand has been devoted to the work, it must be admitted that the subsequent decay of seedlings through the effects of either damping-off, grass-grubs, or frosts tends to make this figure of little value. Each nursery is well stocked with trees, ranging from the yearling to the transportation stage. The grand total, details of which are taken from Schedule V, amounts to 8,906,930 trees, representing a value of £14,006 14s. 9d., and this position is almost equally satisfactory to that of the previous year. The average cost on the present operating nurseries of producing trees sufficiently strong for permanent planting reached £1 16s. 6d., an amount slightly above last year's figure. The probability, however, of in future transferring certain one-year-old pines to plantations should reduce the growing average fully 25 per cent. Since the year 1896 some 24,436,769 trees of various ages have been transported to State plantations, while, in addition, public bodies have benefited by a distribution of 2,528,247, making a total output to date of 26,965,016 trees. An outstanding feature of the season's nursery-work is the excellent results attained with a special strain of *Pinus ponderosa*, which have, on being transferred to lines in the yearling stage, made such phenomenal root and vertical growth that probably 95 per cent. of the number transplanted are now quite robust enough for planting on any situation. For comparative and selection purposes, it would be advantageous if the seed-suppliers were obliged to certify as to the source of the seed, particularly in relation to the Bull pine, the several species of which are causing confusion amongst those associated with the raising.

Plantation-work and Acquirement of Land.

The very small output from the Otago Central Nursery, occasioned by the curtailment of seed-sowing two years ago, made the combined output of trees to plantations much smaller than in the previous year; but present indications point to a much better result for the approaching season. Some 1,752,344 two- and three-year-old trees were received at the various plantations, as per Schedule V, and planted as circumstances warranted, either by day or contract labour. Of this number, 320,390 were utilized for replacing failures in previous plantings, while the remaining 1,431,954 trees planted on new area enlarged our plantations by 536¾ acres. The total area now planted in the South Island amounts to 7,473¾ acres, which contain 19,340,429 trees. As the table showing trees planted to date was included in last report, it is not considered desirable to reprint the publication this year. Detailed in the summary of operations on plantations will be seen how the annual expenditure of £5,681 1s. 11d. has been allocated, and on another form comparative tables over the whole working period have been worked out in support of the total expenditure to date—£83,450 19s. 3d. A comparison with last report will reveal a slightly increased planting-cost all round, which to a great extent is attributable to the granting of an increase in wages to employees, and a similar reason, together with more stringent working-conditions, can be advanced for the rising upkeep-cost per acre. Generally, where the youthful plantation is making the most progress, less maintenance labour is applied, and this economy in the early life of a fast-growing plantation will doubly enhance the prospects of a financial success. As the points relative to the general upkeep-work are elaborated in detailed reports, and the existing conditions do not favour a just comparison of such work, further reference here is not necessary.

The acquirement of suitable planting-areas at each of the stations has now become an urgent matter. Very little planting-ground will remain at either Conical Hills or Naseby Plantations after the present year's output from nurseries has been operated with, while another season's work should complete the block resumed two years ago at Hanmer Springs. Several areas have been examined during the past year with a view to acquirement for tree-planting; but, after careful consideration and comparison with those now being operated upon, an unfavourable report was inevitable. Enthusiasts frequently allude to areas which the Department should afforest, but they generally overlook such factors as altitude and exposure. Wind is a climatic factor of tremendous importance in afforestation-work, and experience gained proves that tree-growth diminishes speedily as exposure becomes greater. The highest altitude at which trees may be planted with prospects of success can only be determined by experiments and a minute observation on the local growth of indigenous timbers; but there can be no doubt that, whilst a sheltered hillside or plateau ranging between 1,500 ft. and 3,000 ft. above sea-level might be expeditiously converted into a revenue-producing forest, only failure cou'd be expected from operating on such an altitude throughout the greater portion of Otago and Canterbury. Although in the sheltered gullies and sidelings lying well to the sun trees such as Oregon pine, ash, &c., are succeeding, a very large extent of the ground now being worked is only adapted for pine-growing.

Brief Comments on Progress of Trees.

A marked improvement in tree-growth is apparent at each plantation this season, and more particularly so at Hanmer Springs. Both *Pinus Laricio* and *P. ponderosa* are firmly established as our most satisfactory growers, and may be expected to increase their height annually from 12 in. to 3 ft., according to situations occupied. Although *Pinus austriaca* at Naseby are infested with *Chermes aphis*.

which interferes somewhat with the progress of trees, in the more moist localities the Austrian pine is making unrestricted headway, and promises to rival in vigour the recognized healthier Corsican species, The Oregon pines are showing their partiality for shelter, but winds play such havoc with the tender leaders that it is questionable if we shall be able to produce any quantity of this valuable timber. Although the *Larix europaea* are in places showing evidence of renewed activity, it seems unlikely that our earlier anticipations regarding the suitability of the larch for even the most ideal conditions in the south will be borne out. Frosts and winds have undoubtedly played an important part in stunting the growth ; but to these factors solely cannot be attributed the continued premature needle-shedding. Perhaps it will be possible, after examining larch plantations on the Continent, to accurately determine the cause and probable outcome of the trouble.

Control of Pests.

Grass-grubs.—In accordance with intentions outlined in last report, special provision was made to combat the destructive grass-grubs. The almost continuous wet condition of the surface, however, forbade our complete adherence to the proposed scheme, although through the efforts directed considerably less destruction amongst the seedlings has eventuated this year than in the previous one. At Tapanui the yearlings, which have hitherto given us the greatest cause for anxiety, almost escaped injury, although the lined-out trees have again suffered, but in a lesser degree. Soil-fumigation with apterite and vapourite was extensively carried out, over 5 cwt. of these compounds being used in the operation. In addition, 5 tons of gas lime and 2 tons of kainit were also applied to areas over which the larvæ were numerous ; but blocks so treated require to remain fallow for at least from nine to twelve months, during which time the discs and cultivator should be freely used. The most difficult problem to face, then, in affected localities is the eradication of the pest over the lining-out areas, and, after conducting a series of experiments, no better means of accomplishing this end can be advanced than judiciously applying gas lime or apterite to render the soil obnoxious to the beetles, and subsequent frequent cultivation when the ground is in a sufficiently arid state that no consolidation of the surface will accrue from the necessary trampling by horses. Several tests with apterite, vapourite, permanganate of potash, &c., to demonstrate the possibility of killing outright the grubs, with the application of a reasonable quantity of the compounds, ended disappointingly, and, in my opinion, the asphyxiation of beetles or grubs cannot be accomplished with the mentioned fumigators at a price otherwise than prohibitive. According to the Biologist to the Department of Agriculture, three species of grass-grubs are in evidence at Tapanui—*Odontria zealandica, O. xanthosticta, O. sandageri*—and this fact explains the lengthened periods of flights by the beetles. An excellent dry summer has permitted the desired intense-cultivation work to be carried on, and the trouble from the pest will more than likely be lessened during the ensuing season.

Red Deer.—Although it has been necessary to obtain special warrants empowering officers at Conical Hills and Hanmer Springs Plantations to destroy trespassing deer, it is gratifying to be able to report that generally less damage to trees has been effected by the animals than in the preceding year. Arrangements are now in hand to heighten the northern boundary-fence at Hanmer Springs Plantation, and a similar scheme to check the ingress of the red deer at Dusky Hill will be initiated, should circumstances at any time warrant this expenditure. An occasional stalking expedition by officers resulted in several animals being shot.

Pinus Radiata.

A few passing remarks concerning the increased activity in operating with *Pinus radiata* may not be out of place here. Until recently the timber of the Monterey pine was not regarded seriously by tree-planters generally as possessing such commercial qualities as a number of others of the same genus ; but an awakening to the fact that *Pinus radiata* not only provides rapid shelter but produces marketable timber in less than twenty years has steadily gained ground, until now the excellent future of the fast-growing pine is acclaimed on all sides. Special provision was made last year by the Department to raise an unusually large number, and from 150 lb. of seed no less than 1,190,000 sturdy yearlings have resulted. The light seed-cost and simplicity of propagation of *Pinus radiata* renders comparatively cheap afforestation-work possible with this pine, which finds low-lying and elevated positions equally favourable for its progress. We are at present planting the species 6 ft. apart, a spacing distance that appears in older plantations to provide ample room for bole development up to a profitable thinning-out stage without unduly interfering with the well-known characteristics of the tree. In the most southern plantations, where the strong south-west winds and severe frosts influence our work so largely, only a moderate amount of success has hitherto attended our operating with seedling trees ; but an experiment is now under way which should enhance the prospects of successfully dealing with yearlings on exposed sites. Some 90,000 Monterey pines, seven months old, have been carefully lifted and transplanted in lines, where they will remain until August, when transference to plantation for permanent planting will be undertaken.

Hardwoods.

Much experimental work with hardwoods has already been conducted in the chief South Island plantations ; but, generally, the outcome has not merited further perseverance with such varieties as *Quercus* and *Fraxinus*. It is true, where fertile sheltered valleys have been allocated to these hardwoods the progress has been consistently fine ; but, as these conditions are not found to any extent on the areas now being afforested, the number of flourishing oak and ash trees is indeed small. Some

hundreds of thousands of acorns sown *in situ*, after germinating excellently on the sheltered hillsides, subsequently failed to respond to the conditions, and the ground thus occupied was ultimately replanted with pines. During the past two or three years at Tapanui Nursery the testing of various *Eucalypti* has been quietly undertaken, and the success attained has led me to believe that the more favoured positions at our local plantation could be profitably afforested with the hardier gums. There is, however, always a danger through late frosts of fatal injury to even the stronger members of the *Eucalyptus* family in the inland portions of Otago, and bearing this in mind, it would surely be unwise to at least for some years operate on an extensive scale with any of the Australian hardwoods. During the coming spring a trial planting will be made with *Eucalyptus viminalis*, *E. Macarthuri*, *E. coriacea*, *E. Gunnii*, and other species, which the Superintendent at Rotorua Nursery has promised to forward for comparative purposes with those grown locally.

Fire-preventive Measures.

Depots of Fire-fighting Appliances.—It is generally recognized that greater immunity from wholesale loss by fire is felt in creating isolated medium-sized plantations than in operating over extensive continuous tracts of country; but there can be no doubt that small plantations possess many disadvantages, which, however, are being partially overcome as new ideas are introduced. No single area now being afforested in the South Island is sufficiently large to merit the engagement of a Forest Ranger at the present juncture; but, by the initiation of a system whereby depots containing fire-fighting appliances are established at various accessible points of each planted area, the problem of reasonable fire-prevention becomes less complicated. At both Conical Hills and Dusky Hill Plantations, neat galvanized-iron boxes (as illustrated), measuring 6 ft. by 3 ft. by 4 ft., have been constructed, and each one is provided with the following appliances, which would likely be invaluable in subduing any outbreak of fire: Ten handled sack fire-beaters; two pipe torches; five shovels; two small axes; four buckets; one water-bag; three pannikins; one oil-bottle and waste. Although the bag fire-beaters are not very serviceable in their ordinary state, owing to their susceptibility to ignition, the information kindly tendered by Mr. A. G. Napier, Superintendent of the Dunedin Fire-brigade, has led to adding greater efficiency by impregnating the sacks with an antipyrene, several of which solutions are now being experimented with. The greatest drawback lies in the necessity of having to keep the bags in a moist state; but probably the beaters will be superseded during the coming year by wire or other non-inflammable appliances. Employees are made conversant with the exact position of each depot, and how to combat an outbreak of fire in the incipient stage. Similar provisions are being made at the Central Otago and Hanmer Springs stations.

Grazing Fire-breaks with Sheep.—Experiments in keeping down coarse vegetation on fire-breaks with the aid of sheep are sufficiently advanced to warrant its adoption on a much more extensive scale. So far no injury to either the growing trees or floor of the young forest is apparent on the fire-break, whilst certain fire-breaks have been kept in an absolutely effective condition. The introduction of the grazing system may be specially recommended for plantations where a rocky surface makes cultivation-work both costly and difficult. It is likely that a small area would require to be put down in turnips in case of a severe winter being experienced; but this would not influence the financial aspect to the extent of making the undertaking less profitable.

Cultivation-work.—In carrying out the necessary cultivation-work connected with the fire-lines throughout our four plantations an area of some 262 acres required to be either ploughed, disked, or harrowed, according to the state of the surface. So far it has been possible to conduct this labour during the spring and early summer months, when teams can be spared; but in the larger-sized plantations the question of keeping at least one team steadily occupied until the advent of autumn is now under consideration. Although the amount of horse-work was reduced as much as practicable, an expenditure of £140 was incurred in this direction.

Fire-resisting Trees.—A feeling of unanimity prevails regarding the necessity of making still greater use of certain fire-resisting trees for not only the outer fringes of plantations, but also for bordering the internal fire-barriers on either side. With this end in view, a number of *Populus deltoides* are being planted in nurseries for stooling purposes, and future propagation of this valuable poplar will be a simple matter. Several attempts at striking the cuttings at fairly high elevations on the plantations resulted in only a small percentage taking root, and it has been decided not to repeat this system in future. An interesting test to disclose the extent to which poplar foliage may be subjected to heat without becoming ignited resulted very satisfactorily, and this demonstration, although on a comparatively small scale, was sufficient to convince one of the advantage that would accrue from the inclusion of *Populus deltoides* where fire-resistance is aimed at. The autumn foliage requires great heat to be applied before bursting into flames, and even then is quickly subdued, so that a surface fire would not be assisted to any extent by fallen poplar leaves.

Removal of Prison Camp from Hanmer Springs.

In adherence to the decision of the Justice Department to discontinue the utilization of prison labour at Hanmer Springs, operations ceased in October, after consideration had been given to the Department's request to complete the season's tree-planting scheme. As free labour has hitherto been used in conjunction with prison labour on the plantation, little difficulty was experienced in numerically strengthening the free working-gang, for the accommodation of which several prison huts were purchased for the formation of a central camp. Very satisfactory progress was made by the prisoners during the last seven months in camp, when work to the value of £462 12s. 4d. was performed. This

increased the total value of work carried out by the Justice Department since the initiation of prison labour at Hanmer Springs to £6,849 17s., as summarized hereunder :—

Estimated Value of Prison Labour.

	During the Year. £ s. d.	Since 1903 to Date. £ s. d.
Planting trees	130 1 6	2,641 0 4
Preparing pits	166 13 4	2,096 16 8
Clearing	39 18 9	927 8 9
General upkeep	106 8 9	516 9 6
General repairs	..	153 1 9
Horse-feed	..	15 10 0
Fencing	..	80 1 6
Formation	25 10 0	293 16 6
Buildings	..	125 12 0
Totals	£468 12 4	£6,849 17 0

Selwyn Plantations, Canterbury.

Although a shortage of trees was experienced at the South Island stations in consequence of an unfavourable growing season, the projected operations of the Selwyn Plantation Board were not affected, and it was possible to forward nearly 100,000 trees from the Hanmer Springs Nursery to Reserve 1757, Hororata, where they were received in excellent condition, and planted out by three State employees. Of the 85,000 *Pinus Laricio*, 12,000 *P. ponderosa*, and 465 *P. radiata* operated with, about 90 per cent. succeeded ; and when it was recognized that coarse cocksfoot covers the whole area, this growing percentage must be regarded as very satisfactory. At Chaney's, where some 20,500 marram-grass sets have now been put out, and are well established, the dunes are quickly becoming less troublesome ; and, by gradually extending the scheme originally advocated, no further sand-encroachment need be feared. The proposals for the coming year include the planting of some 90,000 *Pinus Laricio* and *P. radiata* at Ardlui Road Reserve, and some 10,000 *P. radiata* on the gorse-infected area at Chaney's. In conjunction with Overseer McIlwraith, several experiments with the hardier *Eucalypti* will also be undertaken, whilst other works having an important bearing on the future planting scheme of the Board are also being aimed at.

Tree-planting on Sand Areas at Tarras and Cromwell.

During the spring of 1911 the Department allocated a small expenditure towards the planting of pines and marram-grass to restrain the drifting sand at Sandy Point, Tarras. In addition to covering the terraces with marram-grass, which has succeeded beyond expectations, an experiment in lining-out some 3,000 pine seedlings on the sandy surface was conducted. Some 1,950 *Pinus radiata* and 550 *P. muricata*, having developed sufficiently for permanent planting, were last September utilized in creating shelter-belts at Tarras and Cromwell. An excellent growing-percentage has eventuated, and the Mayor of Cromwell, in a recent reference to the success of the undertaking, states that fully 95 per cent. of the 500 *Pinus radiata* planted on the sand area has succeeded. An almost equally good report is received on the Tarras undertaking, although should the enclosing fence, even for a brief period, become inefficient by being undermined by rabbits, which are numerous in the locality, the measure of success will be speedily discounted. An experiment to test the possibility of using the hardier trees for creating a wind-barrier on abrupt, gravelly river-faces resulted so disappointingly that any further outlay in this direction cannot be recommended. In return for assistance rendered, a few hundred of the smaller plants were distributed to adjoining property-holders for the formation of shelter-belts about their homesteads.

General.

A conference of officers connected with the Forestry Branch was held in February of the present year, when methods and conditions were freely discussed. The benefits derived from such periodical meetings are obvious and might be continued with advantage to all concerned.

An opportunity being afforded me of visiting America and the Continent of Europe to attend a Forestry Conference and study afforestation matters generally, every effort will thus be made to acquire the most modern ideas for diffusion amongst officers.

The collecting of timbers and seeds is being persevered with steadily, and since the despatch of 380 specimens of woods to the Auckland Exhibition some seventy additional specimens, principally hardwoods, from various sources have augmented the present collection. Cone-collecting for educational purposes is receiving some little attention, and in this connection the best thanks of the Department are due to Mr. T. W. Adams for his assistance.

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

Outline of Proposals for 1914–15.

During the coming year arrangements are being made for the planting of about 2,750,000 trees, in addition to conducting the necessary maintenance-work, as outlined hereunder :—

Conical Hills Plantation.—Probably 900,000 trees will be used here in extending the planted area and replacing previous failures. A moderate expenditure will also be devoted to the usual maintenance work.

Dusky Hill Plantation.—It will be necessary to replant a small area here with suitable trees, as those already occupying the ground are apparently not finding the conditions favourable for their development. The total expenditure anticipated will not exceed £380, and the greater proportion of this amount will be allocated to the "General upkeep" item.

Waitahuna Plantation.—Should the *Piceas* not make a fair recovery this season, they will be replanted with pines during the ensuing year.

Naseby Plantation.—The acquirement and enclosing of an additional planting-area will be undertaken, and about 650,000 trees operated with. Such works as tree-pruning, rabbiting, and keeping the fire-lines in an efficient state will also be attended to.

Gimmerburn Plantation.—As certain varieties originally planted here are succeeding, an effort will be made to utilize 50,000 pines in filling up the large spaces rendered vacant through failure attending efforts of some years ago. In addition, the idea of producing horse-feed for local nursery requirements will be continued.

Hanmer Springs Plantation.—Should no difficulty be experienced in securing the necessary free labour, probably over a million trees will be planted out at this station during the year. The early acquirement of a further planting-area is also desirable here.

Selwyn Plantations.—Every effort will be made to put out 100,000 pines on the Hororata and Chaney's Reserves, and marram-grass planting on a reduced scale will also be undertaken on the sand areas.

Mackenzie County.—In pursuance of an agreement made two years ago, this Council will be supplied with some 40,000 larch for extending its reserves and distributing to local settlers.

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

Tapanui Nursery, Otago.

(Area, 173 acres; altitude, 500 ft.; established, 1897.)

For the third year in succession the climatic conditions experienced here have made successful tree-raising an exceedingly difficult matter. The annual rainfall, amounting to 47·80 in. on 203 days, exceeded that of the previous year by over 4 in., and, unfortunately, the precipitations and cold sunless days were most frequent from September to December—a period over which warmth is not only essential for favourable germination of tree-seeds, but for systematic tillage and the development of sturdy, fibrous-rooted stock. Nothing abnormal occurred with regard to atmospheric temperature, as 24° in July constituted the lowest register, and 90° in the screen in February the maximum year's temperature.

Raising of Seedlings.—Almost immediately prior to the actual sowing of seeds, heavy rains caused a partial inundation of the area reserved for the seed-beds, and in consequence a good deal of labour had to be expended in replacing the removed soil.

Seed-sowing was carried on under fair conditions in October, but poor germination and weakly plants were the outcome, particularly in the *Pinus Laricio* beds. To overcome what appeared to be a partial failure, a second sowing was resorted to, and over a million of *Pinus radiata* seedlings were raised from about 1 cwt. of seed. These plants have attained the desired size for transplanting, for, by having removed the protecting frames early, the drawn-up state so characteristic of the Remarkable pine has been avoided. From 100 lb. of seed 420,000 *Pinus ponderosa* were raised, and the young plants, although scarcely as well forward as in former years, are a fine sturdy lot. Small quantities of the Japanese and European larch were sown with the usual success, although a comparatively small number of these plants only are required for replanting purposes. An excellente rop of *Pseudo-tsuga taxifolia* eventuated from 14 lb. of well-bodied seed, and a large proportion of the 40,000 young Oregon pines are sufficiently strong for removal to lines next planting season. A fair measure of success was attained with sowings of *Pinus Benthamiana, P. austriaca, P. muricata, P. scopulorum, P. densiflora,* and *Cupressus macrocarpa,* although the latter seedlings appear to have offered most attraction to the grass-grub. Some eighteen species of *Eucalypti* were experimented with, and the propagation of two or three of the hardier gums will be more extensively carried on next year.

The estimated number of yearlings in stock is 2,342,400, which are valued at £2,343 16s. as per Schedule V. An expenditure of £325 2s. 8d. was incurred in the preparation of the ground, purchase of seed, sowing, and subsequent labour in connection with the raising of the seedling crop.

Transplanted Trees.—An unusually good growing percentage resulted from the season's lining-out; but again the presence of grass-grubs accounted for the speedy death of fair numbers of pines and larch.

Although tree-growth generally was backward up to midsummer, weed-growth was also similarly affected. Since Christmas, however, vigorous headway has been made in all classes of trees, and the quality of stock should be much superior to that of the past two seasons. An excellent strain of *Pinus ponderosa* seed was secured last year, and the 120,000 seedlings, on being transferred to lines, have now developed into fine sturdy trees of sufficient strength for permanent planting, even on the most exposed positions. The 600,000 *Pinus Laricio* in seed-beds, although not so tall as in previous years, are undoubtedly equally as sturdy, and should transplant well. It is not possible to count so favourably on the lined-out Corsican pines, which are evidently not partial to a moist, cold spring. Very encouraging results have been attained with *Pinus Taeda, P. sylvestris, P. patula, P. Banksiana, P. Montezumae,* and their future progress on the plantation will be carefully watched. Previous attempts to raise the Scotch fir ended in the young plants becoming literally smothered with aphis; but we have now evidently secured a better type, which will be given an opportunity to succeed at a high elevation. Some 3,000 *Populus deltoides* cuttings were prepared, and nearly 100-per-cent. "strike" eventuated. A glance at the associated schedules will disclose all details relative to the trees in stock, and brief comments on the various crops.

Preparation of Ground.—Undoubtedly one of the most important and indeed difficult propositions to be faced annually here is the preparation of ground for the reception of seedlings. By repeated cultivating the lighter surface soil becomes incorporated with the lower clay, and unless a fairly dry spell is experienced, more harm than good arises from working the ground. It is satisfactory to record, however, that we have not been debarred from conducting the necessary double ploughing and subsequent cultivating-work this year, and this fact alone should ensure more encouraging results next season. For manurial purposes a rye and clover crop was ploughed under; but the area thus treated cannot reasonably be brought into use for at least another year, owing to the presence in such numbers of *Odontria sandageri* and *O. xanthosticta* in all stages of development. In many places the clover crop was eaten outright by the pest, thus demonstrating the disadvantages arising from the adoption of this usually excellent means of soil-restoration.

Horse-feed.—An additional 41 acres of heavy land adjoining the nursery were acquired, principally for the production of horse-feed. About half of this area, although only receiving a hurried preparation, yielded about 25 tons of well-headed, oaten sheaves, or sufficient with our other winter produce to keep the horses well supplied during the ensuing year. About 8 tons of rye and clover and an abundance of turnips are also being harvested, although the carrot crop is not of much account. Several paddocks were worked up and repastured, whilst others have received a natural surface-sowing and are in good order for winter.

Miscellaneous works.—A number of inexpensive improvements were introduced. The necessity of renewing a number of our seed-frames becoming apparent, some forty-five, 6 ft. wide, were constructed and used with success. About 20 chains of roads were top-dressed with gravel.

The expenditure amounted to £2,089 12s. 6d., providing employment for an average of 8·8 men, and the total expenditure since initiation reaches £27,367 10s. 7d.

The year's output to plantations, public bodies, &c., was 700,039 (the lowest for a number of seasons), which are valued at £2,116 7s. as per Schedule V.

Some 3,877,080 young trees in various stages are now in stock, against which the value of £5,714 9s. 9d. has been shown.

Statements 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.	
1913.	In.		Deg. Fahr.	Deg. Fahr.	
April	4·13	17	68	29	6
May	5·62	25	66	29	10
June	2·06	18	56	25	13
July	4·46	23	58	24	11
August	5·73	14	59	26	11
September	2·46	16	68	30	6
October	5·27	18	75	32	2
November	4·41	15	75	31	1
December	5·42	15	84	33	..
1914.					
January	3·23	19	86	37	..
February	3·59	12	93	34	..
March	1·42	11	78	35	..
Totals	47·80	203	..	..	60

Schedule II.—Statement of Expenditure.

	For Year.			To Date.		
	£	s.	d.	£	s.	d.
Tree-planting and maintenance—						
Tree-growing	630	4	0	13,296	19	11
General maintenance and repairs ..	429	10	1	3,109	11	3
Tree-seeds	158	10	4	1,363	10	11
Manures	69	0	7	314	8	8
Horse-feed, purchased and grown ..	105	2	5	1,385	0	4
Miscellaneous works	55	14	6	338	7	4
Stock and material—Tools, implements ..	134	12	8	1,140	6	7
Permanent works—						
Buildings	86	16	10	2,358	4	2
Nursery-formation	18	11	4	521	1	7
Fencing	52	0	2	669	10	10
Water-supply	4	9	7	229	4	1
Supervision and clerical—						
Proportion of Superintending Nurseryman's salary and clerical assistance ..	190	0	0	2,418	12	11
Nursery Foreman's salary	155	0	0	222	12	0
	£2,089	12	6	£27,367	10	7

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	2,342,400	325 2 8	16,413,409	27,367 10 7	..
Trees sent out	700,039	..	12,536,329	..	..
Balance in stock			3,877,080	..	5,714 9 9
Value of land, improvements, and stock (Property Account)				..	4,944 15 9
Total value					10,659 5 6

Schedule IV.—Property Account.

	£ s. d.
Land (173 acres): Crown lands not charged to Forestry Account ..	..
Buildings	2,358 4 2
Live-stock	274 0 0
Improvements	750 5 8
Fencing	669 10 10
Stores in hand	892 15 1
	£4,944 15 9

Schedule V.—Details of One-year-old Trees, sown 1913–14.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Seed sown.	Value per Thousand.	Total Value.	Remarks.
			lb.	£ s. d.	£ s. d.	
Pinus Laricio	100,000	1½	133	1 0 0	100 0 0	Medium crop.
„ ponderosa	420,000	1½	100	1 0 0	420 0 0	Sturdy plants.
„ Benthamiana	800	2	5	1 5 0	1 0 0	„
„ austriaca	400,000	2½	32	1 0 0	400 0 0	Excellent results.
„ radiata	1,100,000	3	120	1 0 0	1,100 0 0	„
„ muricata	16,000	1	1	1 0 0	16 0 0	Sturdy plants.
„ scopulorum	13,000	1½	4	1 0 0	13 0 0	„
„ densiflora	3,000	1	0¼	1 0 0	3 0 0	Fair crop.
Larix europaea	150,000	1	45	1 0 0	150 0 0	Not very robust.
„ leptolepis	60,000	1	10	1 0 0	60 0 0	Fair results.
Pseudo-tsuga taxifolia	40,000	1	1¼	1 5 0	50 0 0	Well-grown plants.
Cupressus macrocarpa	15,000	2	2	1 0 0	15 0 0	Germinated poorly.
Sequoia gigantea	1,000	1	0½	4 0 0	4 0 0	„
Eucalypti (18 varieties) ..	23,600	3	1	0 10 0	11 16 0	Experimental.
Totals	2,342,400	..	..	..	2,343 16 0	

Two-year-old Trees, sown 1912–13.

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	600,000	..	3	1 5 0	750 0 0	Well-rooted plants.
„ „	..	17,000	3	2 5 0	38 5 0	„
„ ponderosa	..	120,000	7	2 5 0	270 0 0	Excellent crop.
„ Benthamiana	..	9,000	3	2 10 0	22 10 0	„
„ radiata	..	45,000	9	2 5 0	101 5 0	Strong trees.
„ muricata	..	20,000	5	2 5 0	45 0 0	Well grown.
„ Taeda	..	4,000	4	2 5 0	9 0 0	Very promising.
„ maritima	..	3,200	4	2 5 0	7 4 0	Strong plants.
Pseudo-tsuga taxifolia	5,000	..	1½	1 10 0	7 10 0	Attacked by grub.
Larix europaea	..	25,000	8	2 5 0	56 5 0	Fair.
Cupressus macrocarpa	..	400	6	2 5 0	0 18 0	„
Sequoia gigantea	..	400	4	6 0 0	2 8 0	„
„ sempervirens	..	70	4	6 0 0	0 8 4	„
Populus deltoides	..	3,000	20	1 5 0	3 15 0	Well-rooted cuttings.
Totals	605,000	247,070	..	..	1,314 8 4	
	852,070					

Three-year-old Trees, sown 1911–12.

Name of Tree.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Pinus Laricio	592,150	3	3 0 0	1,776 9 0	The grass-grubs seriously interfered with the pines in the early summer-time; but the trees have nevertheless made good progress during the latter part of the growing season.
„ ponderosa	40,440	7	3 0 0	121 6 4	
„ muricata	2,560	8	3 0 0	7 13 7	
„ scopulorum	1,110	4	3 0 0	3 6 7	
„ strobus	1,520	2	3 0 0	4 11 2	
„ Banksiana	1,530	3	3 0 0	4 11 9	
„ sylvestris	220	4	3 0 0	0 13 2	
„ patula	290	3	3 0 0	0 17 4	
„ Montezumae	170	3	3 0 0	0 10 2	
„ picea	510	2	3 0 0	1 10 7	
„ Murrayana	160	8	3 0 0	0 9 7	
„ maritima	120	6	3 0 0	0 7 2	
Larix leptolepis	6,140	9	3 0 0	18 8 4	
Picea sitchensis	29,410	6	3 5 0	95 11 7	
Pseudo-tsuga taxifolia	1,930	8	3 5 0	6 5 5	
Cupressus macrocarpa	1,400	10	3 0 0	4 4 0	
„ Lawsoniana	510	8	4 5 0	2 3 4	
Various trees	2,440	..	3 0 0	7 6 4	
Totals	682,610	..	..	2,056 5 5	

Trees transferred from Nursery to Plantations, &c., 1913–14.

Where sent.	Name of Tree.	Number.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Conical Hills Plantation	Pinus Laricio	336,401	8	3 0 0	1,009 4 0	An excellent growing percentage has resulted.
	„ ponderosa	144,405	8	3 0 0	433 4 3	
	„ Benthamiana ..	6,125	8	3 5 0	19 18 1	
	„ radiata	12,562	10	3 0 0	37 13 8	
	„ muricata	12,070	8	3 0 0	36 4 2	
	„ maritima	380	6	3 0 0	1 2 9	
	„ scopulorum ..	730	6	3 0 0	2 3 9	
	„ Jeffreyii	80	6	3 5 0	0 5 2	
	„ contorta	13	6	3 0 0	0 0 9	
	Larix europaea	117,025	15	3 0 0	351 1 6	
	„ leptolepis	4,550	16	3 0 0	13 13 0	
	Pseudo-tsuga taxifolia ..	15,875	10	3 5 0	51 11 10	
	Picea sitchensis	22,912	6	3 5 0	74 9 3	
	„ excelsa	20	6	3 0 0	0 1 2	
	Cupressus macrocarpa ..	10,350	10	3 0 0	31 1 0	
	„ Lawsoniana ..	1,850	10	4 5 0	7 17 3	
	Thuja plicata	3,900	12	3 10 0	13 13 0	
	Alnus glutinosa	317	12	3 0 0	0 19 0	
	Fraxinus excelsior ..	149	12	3 0 0	0 8 11	
	Betula alba	75	15	3 0 0	0 4 6	
	Populus fastigiata ..	125	20	2 0 0	0 5 0	
	Salix viminalis	225	20	2 0 0	0 9 0	
		690,139			2,085 11 0	
Dusky Hill Plantation	Pinus ponderosa ..	5,000	8	3 0 0	15 0 0	For replanting purposes.
	„ austriaca	3,200	8	3 0 0	9 12 0	
	„ radiata	50	9	3 0 0	0 3 0	
		8,250			24 15 0	
Conical Hills Plantation	As per details above ..	690,139	..	..	2,085 11 0	
Dusky Hill Plantation	„ . ..	8,250	..	..	24 15 0	
New South Wales Government	Assorted trees	1,000	..	..	4 5 0	
Waitati Hospital	„	100	..	..	0 6 0	
Tapanui Hospital	Berberis Darwinii ..	550	..	..	1 10 0	
	Totals	700,039	..	..	2,116 7 0	

W. T. Morrison,
Nursery Foreman.

R. G. Robinson,
Superintending Nurseryman.

Conical Hills Plantation, Otago.

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

During the year 42·98 in. of rain fell on 186 days. The precipitations were distributed fairly well over the twelve months, and permitted work to be carried out without any lengthy intermissions. The maximum shade temperature was registered in February, it being 89°, whilst the lowest reached 22° on several occasions in July and August.

Tree-growth.—Generally an excellent season's tree-growth has resulted; but the condition of our larch-trees of all ages cannot be commented upon favourably. Their leaders continue to make good progress; but there is no mistaking the premature shedding of needles on the side branches, which appear to be affected more acutely near the base of the tree. It is perhaps undesirable to detail in length the progress of each variety of tree planted, as nformation in this respect printed in last year's report might again be applied rightly. Perhaps greater headway has been shown by the various *Piceas* and *Pinus Laricio*, all of which have shown their partiality for wet seasons. It was disappointing to find that poplar cuttings, planted on the higher levels, did not "root" with uniformity, and it is our intention to in future raise rooted poplars in the associated nursery. A trial planting of one-year-old *Pinus radiata* has given so much promise that we intend putting out, under similar conditions, over 100,000 yearlings during the coming season. Excepting in the well-sheltered valleys, the hardwoods—ash, oak, and sycamore—are failing to come up to expectations, and it is fortunate that the Department ceased operating with these varieties some years ago. There are, however, a sufficient number of hardwoods planted at this plantation to furnish all the data required for any future discussion on the question of ash and oak planting. Several small areas, originally containing ash and sycamore, have been replanted with more suitable trees; but there still remains a good deal of work to be accomplished in this direction. The advancement of *Sequoia sempervirens* or *Fagus sylvatica* does not justify the inclusion of either variety in the list of suitable trees for extensive planting, although the latter tree has not yet been utilized for under-planting, for which purpose the beech is highly recommended by continental writers. Both *Cupressus macrocarpa* and *Cupressus Lawsoniana* evidently find the unavoidable exposure detrimental to good progress, and we are thus compelled to place greatest reliance upon the pine family for afforestation under local conditions.

Pitting and Tree-planting.—Owing to the comparatively small output available from the local nursery and a large number of pits remaining unplanted from the previous year, it was only necessary to prepare some 104,400 pits, which were made by contract at 12s. 6d. per thousand. The area now being operated upon, however, is of a very rough nature, and the preparation of this ground, when pits are distanced 6 ft. apart, will cost in future 15s. per thousand, at which rate employees are able to make a reasonable wage.

The expenditure attached to the actual planting of 675,684 trees on new area amounted to £425 0s. 1d., which included heeling-in and distribution. In addition, some 23,080 trees were used for replanting purposes, and this labour was conducted chiefly on No. 1 plantation by the general maintenance staff.

Fire-preventive Measures—Every advantage was taken of the early completion of nursery-work to obtain the services of both teams of horses for putting fire-breaks into an effective state. The ploughing, discing, or cultivating nearly 100 acres of ground was necessary this year; but the presence of thirty-five ewes and lambs over certain areas dispensed with the necessity of cultivating, whilst at the same time an equally satisfactory result was attained. Past experiments have shown the wisdom of extending the grazing idea at this station. The animals so far, having little inducement to wander amongst the trees, have created no damage, and do not require much attention, excepting perhaps during the lambing period.

Some eleven depots for the storage of fire-fighting appliances have been placed at convenient positions over the planted area, and it is needless to emphasize the greater security against the spread of fire that is afforded by having suitable fire-beating contrivances handy. Fuller details of the scheme are outlined in another portion of the report.

Surplus Fencing-material.—To permit of the area being systematically cleared of rabbits, it was necessary to erect temporary divisional fences, which have been from time to time removed as the land became afforested. As the whole of the reserve is now being operated upon, and the fences have fulfilled the purpose aimed at, they have been dismantled, and 230 chains of wire netting, 650 standards, ninety posts, and thirteen strainers have been stored in readiness for the enclosing of a further planting-area, which will likely be acquired during the ensuing season.

Cutting Noxious Weeds.—For some time past a considerable expenditure has been allocated annually to the cutting of Californian thistle and ragwort, and in several of the more fertile gullies these noxious plants have spread slightly. On no occasion, however, has it been deemed prudent to allow employees, with knives or hooks, to undertake cutting-work throughout the more densely timbered areas; but every effort is directed to control the noxious plants by attending to those that may prove detrimental to adjoining properties. As all surface vegetation is gradually suppressed with the advancement of tree-growth, the speedy eradication of thistles and ragwort is thus effected naturally.

General.—As might be expected, the item "General upkeep of plantations" is assuming greater proportions, and this year an expenditure of £1,204 16s. 4d. was devoted to such works as tree-pruning, removal of coarse herbage from young trees, replanting failures, rabbiting, repairing roads, caretaking, &c. The pruning consists principally in removing any double leader that becomes noticeable, although it is almost impossible to detect or remedy these defects amongst the well-advanced blocks of trees.

The expenditure for the year amounted to £2,196 5s. 1d. (being an outlay of £779 10s. 8d. below that of the previous twelve months), which provided employment for an average of 13·2 men.

Since the initiation of afforestation-work here £25,944 17s. has been expended, details of which are outlined in the table appended hereto.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1913.	Inches.		Degrees.	Degrees.	
April	2·58	12	71	30	10
May	4·79	24	62	28	18
June	1·67	16	58	28	18
July	4·45	20	60	21	16
August	3·63	11	60	27	17
September	2·38	13	66	28	6
October	5·27	16	72	30	4
November	3·07	16	76	32	4
December	4·12	14	84	34	..
1914.					
January	2·45	14	86	34	..
February	3·24	12	89	34	..
March	1·22	7	76	38	..
Totals	38·87	175	..	..	93

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	425 0 1	5,583 6 2
Pitting	67 4 4	7,070 13 3
Clearing	37 19 6	735 2 2
Cartage of trees	25 0 1	379 0 0
General upkeep of plantation	1,204 16 4	6,876 6 11
General repairs	30 3 3	464 1 8
Horse-feed	71 14 1	223 10 5
Permanent works—		
Fencing	25 0 7	1,228 15 7
Formation	..	268 18 10
Buildings	..	320 7 11
Stock, implements, &c.—Tools, implements ..	44 6 10	361 4 9
Supervision and clerical (salaries)—		
Supervision of free labour	190 0 0	1,755 0 0
Proportion of Superintending Nurseryman's salary and clerical assistance ..	75 0 0	678 9 4
	£2,196 5 1	£25,944 17 0

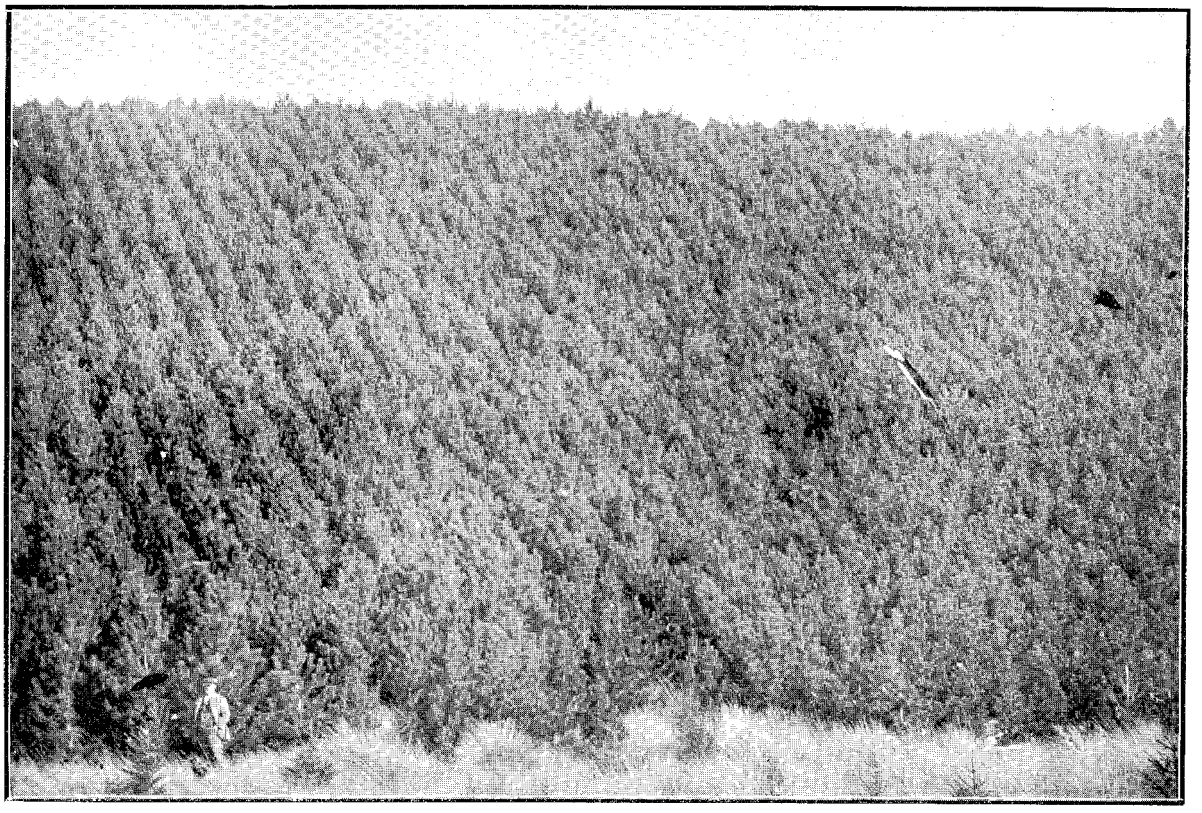
Schedule III.—Trees Account.

	Number.
Trees received during year	698,764
Less to replace blanks	23,080
Planted on new area	675,684
Previously planted	7,726,347
Total number planted on 3,097½ acres (average age, 6½ years)	8,402,031

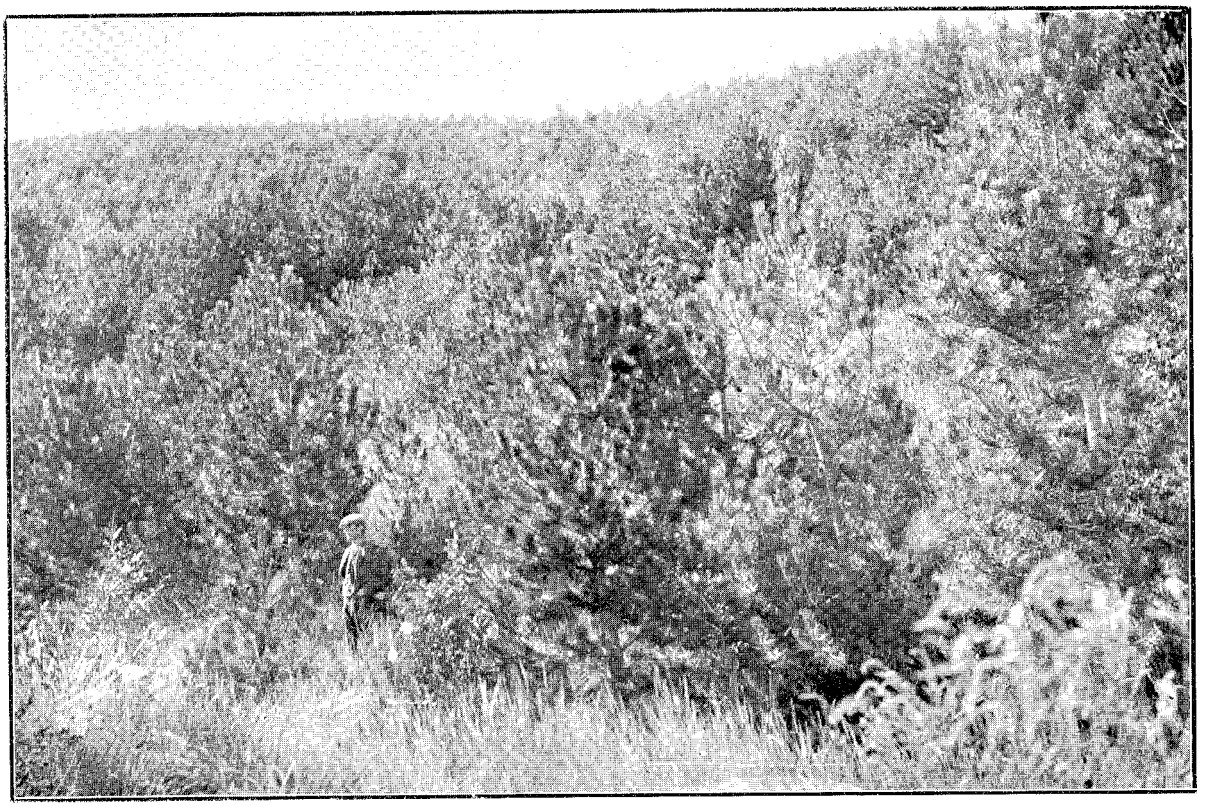
Schedule IV.—Property Account.

	£ s. d.
Land (3,672 acres): Crown land not charged to Forestry Account ..	..
Buildings	320 7 11
Live-stock	27 6 0
Improvements	268 18 10
Fencing	1,228 15 7
Stores in hand	144 15 9
	£1,990 4 1

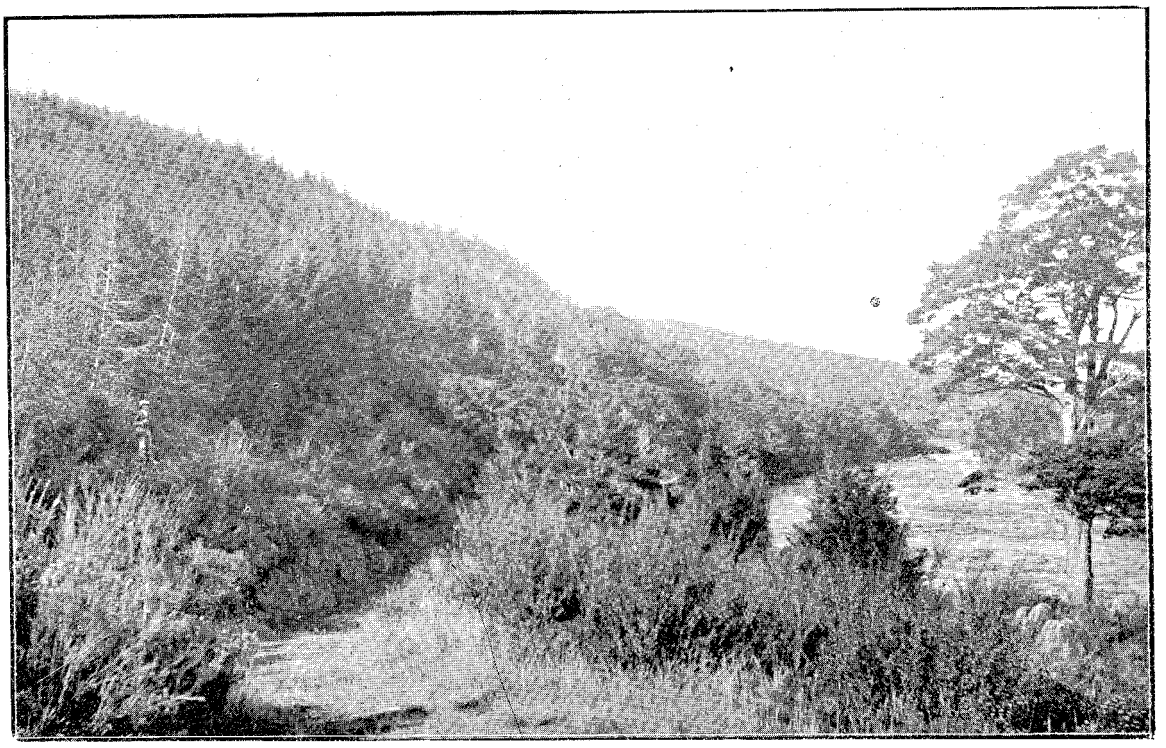
Seed-beds at Tapanui Nursery.



A Healthy Block of Pinus Austriaca at Conical Hills Plantation.



A Block replanted with Pinus Laricio at Dusky Hill since the Fire in 1906.



Larch at Dusky Hill Plantation.

Balance-sheet.

	£ s. d.
Total expenditure	25,944 17 0
Less Property Account	1,990 4 1
Cost of operations	£23,954 12 11
3,097½ acres planted (average age, 6½ years)	
Estimated value of plantation per acre	10 4 0

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

Dusky Hill Plantation.

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

Weather conditions being favourable for tree-growth, it is possible to make satisfactory references to progress generally at this station. On the 18th November, however, a heavy frost cut back the tender growth of *Juglans regia*, which of late years has been so often checked that the production of commercially valuable walnut timber in the locality cannot be looked for. The high winds experienced about the middle of January had also a detrimental effect upon the foliage of *Larix europaea* and *Pseudotsuga taxifolia*, and throughout the blocks of these varieties many leaders were broken. Conspicuous amongst the fast growers this season are English ash and Norway spruce, and, where the conditions are suitable, these varieties are keeping well together, and give every promise of success. The spruces have much improved in colour this year, and even in the most exposed situations the headway made is more uniform than for some years past. Most irregular is the growth of Oregon pine, even where leaders have not been interfered with, and over certain blocks may be seen specimens some 15 ft. in height, whilst the surrounding trees planted at the same time perhaps range from 3 ft. to 6 ft. This apparent novel circumstance is attributed to the different strains of seed procured, and illustrates the importance of selection. On the lower levels the autumn foliage of *Larix europaea* is more natural this year, and an inspection of the trees revealed a decided tendency of the needles to adhere more strongly to partially affected twigs than in the two previous seasons. This fact would indicate the probability of the complete recovery of larch should favourable conditions continue. On the other hand, trees occupying the more elevated positions still retain their sickly appearance, which is most noticeable from December to April. Probably the average rate of growth throughout the larch compartments amounts to 18 in. Remarks written formerly on *Pinus Laricio* may again be applied. Since replanting after the fire of 1906 the *Pinus Laricio* have made steady uniform progress, and the partial shelter thus afforded is also promoting a more vigorous growth of oaks, which were allowed to remain where their presence was desirable.

Our under-planting experiments are not being attended with the desired amount of success. There appears, however, a reasonable prospect of *Thuja plicata* eventually finding the conditions congenial, although the rapid headway of this cedar in its youth is checked in consequence of the network of larch roots and extraordinary dry state of the soil immediately beneath the humus.

The idea of replanting small areas previously planted with trees that are showing no response to shelter is being steadily kept in view, and 8,250 pines, as detailed on Schedule V, were this year planted out with good results. Probably 3,000 trees will be similarly dealt with during the ensuing season.

General.—In addition to conducting the necessary cultivating-work in connection with the fire-breaks, five depots containing fire-fighting appliances were installed here. The costly work of removing decayed lateral branches from larch and pines is now being undertaken only for a narrow strip fringing the various blocks. The effect will add greater efficiency to fire-barriers.

Less damage is now being done to trees by the red deer, although occasionally it is necessary to stalk the animals that have gained access to the enclosure. By the combined agencies of gun and dogs three stags were destroyed.

Several improvements were made to enable maintenance-work to be carried on more expeditiously, and the addition of a small scullery to the foreman's house is much appreciated.

A sum of £367 18s. 1d. was incurred during the year, which advances the total expenditure to date to £13,553 6s. 1d.

Appended are various supporting statements.

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	125 16 1	2,821 17 3
General repairs	4 2 8	74 18 1
Horse-feed	15 2 1	145 18 7
Permanent works—		
Fencing		258 2 3
Formation		366 7 2
Buildings	26 15 11	430 7 5
Stock, implements, &c.—Tools, implements	10 1 4	163 13 10
Supervision and clerical (salaries)—		
Supervision of free labour	160 0 0	1,430 10 0
Proportion of Superintending Nurseryman's salary and clerical assistance	26 0 0	434 14 2
	£367 18 1	£13,553 6 1

Schedule III.—Trees Account.

	Number.
Trees received during year	8,250
Less to replace blanks	8,250
Planted on new area	..
Previously planted	2,180,837
Total number planted on 845 acres (average age, ten years)	2,180,837

Schedule IV.—Property Account.

	£ s. d.
Land (845 acres): Crown land not charged to Forestry Account	..
Buildings	430 7 5
Live-stock	..
Improvements	366 7 2
Fencing	258 2 3
Stores in hand	25 0 3
	£1,079 17 1

Balance-sheet.

	£ s. d
Total expenditure	13,553 6 1
Less Property Account	1,079 17 1
Cost of operations	£12,473 9 0
845 acres planted (average age, ten years).	
Estimated value of plantation per acre	11 17 0

F. BENFELL,
Plantation Foreman.
R. G. ROBINSON,
Superintending Nurseryman.

WAITAHUNA PLANTATION, OTAGO.

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

There is nothing special to refer to in connection with this experimental plantation this year, and remarks outlined in the previous report might be again rightly applied. In the early spring of 1911, when foliage was just breaking through, a sharp frost was experienced in the valley, causing much injury to the young *Larix europaea* planted during the previous year. These trees have not made the expected recovery, and it will be necessary to replant the ground occupied by the affected larch next season. All pines are making excellent progress, and with the increased amount of shelter the *Piceas* are also responding to the conditions.

Attracted by the rich pasture, somebody partly removed the wire-netting, and permitted two calves to graze over the planted area for some months before the Department was made aware of the fact. On visiting the plantation the animals were not in evidence, having been quietly removed. No damage to the trees, however, was done, and the local officer of the Justice Department consenting to keep an eye on the property, a repetition of the trick will probably not be attempted.

It was found necessary to expend £22 17s. 1d. in cutting and burning gorse and broom growing within the reserve. Various supporting statements are appended.

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	22 17 1	59 19 4
General repairs	..	4 0 0
Permanent works—		
Fencing	..	57 11 1
Formation	..	3 10 0
Stock, implements, &c.—Tools, implements	..	..
Supervision and clerical (salaries)—		
Supervision of free labour	..	9 0 0
Proportion of Superintending Nurseryman's salary and clerical assistance	3 0 0	21 9 0
	£25 17 1	£228 17 8

Schedule III.—Trees Account.

	Number.
Trees received during year	..
Less to replace blanks	..
Planted on new area	..
Previously planted	30,525
Total number planted on 11 acres (average age, six 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	228	17	8
Less Property Account	61	1	1
Cost of operations	167	16	7
11 acres planted (average age, six years).			
Estimated value of plantation per acre	10	7	0

R. G. Robinson,
Superintending Nurseryman.

Eweburn Nursery, Ranfurly, Central Otago.

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

The total rainfall recorded at the above station for the past year was 24·22 in., which fell on 112 days. Last season's was a record fall for this district; but it has been exceeded this year by 1·85 in. The maximum shade-temperature was 88° on the 22nd February, 1914. The minimum temperature in the screen was 15° on the 12th July, 1913, and on the ground 12° on the same date. Frost occurred on 127 nights in the screen, and on the ground on 178 nights.

Owing to the heavy rainfall, little or no watering had to be done on the seed-beds; but a great deal of attention had to be paid to keeping off birds, as the covers could not be kept on in case of the seedlings "damping-off." As a result of the copious rain, the seedlings have made very satisfactory growth, although the crop is somewhat thinner owing to "damping-off" and poor seed-germination. *Pinus ponderosa* is much thinner than usual, and from observation I should say the seed is not up to the usual standard. As a trial, 2 lb. of *Pinus muricata* and 4 lb. of *Larix leptolepis* were sown; the former germinated poorly, but the latter is very good. Until these have been transplanted it is hard to say how they will fare; but from an experiment made with about seventy *Pinus muricata* (which were grown from locally saved seed) planted out they should do very well. During the winter months a large number of poplar cuttings were gathered, chiefly *Populus fastigiata*, and these have struck well, the result being a crop of 30,000 well-rooted plants. A part of the seed was sown on the 22nd September, and the remainder during the second week in October.

Lining-out trees was commenced on the 9th September, and completed on the 9th October, and a total of 849,410 trees were handled. The "strike," taken as a whole, is very good; but a number of larch have been destroyed by the grass-grub, the remainder having put on very satisfactory growth. A large number of two-year-old trees in the seed-beds are sufficiently advanced for removal to the plantation, and with those already lined out the estimated number fit for removal will be 700,000; but this depends a great deal on the area available to plant at Naseby.

The output to plantations and private firms was 275,165, which is the lowest for years; but this is accounted for by the short supply of seed during the year 1910–11. Indications for the future point to a continued output of, say, 600,000 to 800,000 trees per year. Owing to the large number of larch on hand, and the decision to stop growing this variety of tree, some 130,000 were sold to various firms and the Dunedin City Corporation.

All spare land has been sown down in oats and ploughed in as manure, and some 6 tons of lime were also used. Cropping was again carried on at Gimmerburn, and 36 acres were sown in oats and harvested, the estimated yield being some 45 tons of good clean sheaf. We have now a quantity of last year's stuff in stack, and a machine is urgently needed to cut the same into chaff as required. The mills do not travel regularly in this district, and it is difficult to get it cut when it is required.

All tools, buildings, harness, &c., have been kept in good repair, and are in excellent order.

The value of trees sent out to plantations, &c., for the year, as per Schedule V, is £475 3s. 9d.

The number of trees of all ages in the nursery at the 31st March, 1914, was 2,188,700, and their value £3,356 4s.

The annual expenditure amounts to £1,065 4s., and the amount to date £15,111 18s. 8d.

The average number of men employed during the year was 5·7.

Details of expenditure, &c., are appended.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1913.	In.		Deg. Fahr.	Deg. Fahr.	
April	1·98	6	69	22	13
May	0·86	10	60	21	24
June	0·98	6	57	19	27
July	1·60	9	58	15	24
August	1·80	10	58	23	21
September	1·20	7	66	25	9
October	1·72	9	73	29	4
November	4·38	18	72	35	..
December	3·72	13	83	32	1
1914.					
January	3·12	10	81	34	..
February	1·27	7	88	36	..
March	1·59	7	77	29	4
Totals	24·22	112	..	..	127

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Tree-planting and maintenance—		
Tree-growing	387 15 2	5,875 17 0
General maintenance and repairs	251 5 6	3,089 17 3
Tree-seeds	63 10 5	606 1 7
Manures	7 17 3	48 12 6
Horse-feed, purchased and grown ..	108 5 5	778 0 11
Miscellaneous works	24 12 0	75 17 1
Stock and material—Tools, implements ..	1 16 3	841 8 6
Permanent works—		
Buildings	..	830 11 2
Nursery-formation	8 2 0	681 11 4
Fencing	..	340 1 0
Water-supply	..	310 0 10
Supervision and clerical—		
Proportion of Superintending Nurseryman's salary and clerical assistance ..	42 0 0	553 17 10
Proportion of Nurseryman's salary ..	170 0 0	1,080 1 8
	£1,065 4 0	£15,111 18 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	831,100	173 7 4	5,705,987	15,111 18 8	..
Trees sent out	275,165	..	3,517,287	..	..
Balance in stock			2,188,700	..	3,356 4 0
Value of land, improvements, and stock (Property Account)				..	2,664 11 3
Total value					6,020 15 3

Schedule IV.—Property Account.

	£ s. d.
Land (acres): 50 acres not charged to Forestry Account	..
Buildings	830 11 2
Live-stock	149 7 5
Improvements	991 12 2
Fencing	340 1 0
Stores in hand	352 19 6
	£2,664 11 3

Schedule V.—Details of One-year-old Trees, sown 1913–14.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Seed sown.	Value per Thousand.	Total Value.	Remarks.
			lb.	£ s. d.	£ s. d.	
Pinus austriaca	300,600	3	80	1 0 0	300 12 0	Strong plants.
„ ponderosa	182,900	2	47	1 0 0	182 18 0	Fair crop.
„ Benthamiana	5,400	4	5	1 5 0	6 15 0	Strong plants.
„ muricata	2,400	2	1	1 0 0	2 8 0	„
„ scopulorum	10,200	2	4	1 0 0	10 4 0	Fair crop.
Larix europaea	240,000	4	74	1 0 0	240 0 0	Good crop.
„ leptolepis	10,000	4	4	1 0 0	10 0 0	„
Alnus glutinosa	45,600	8	10	0 15 0	34 4 0	Strong plants.
Poplars (various)	30,000	24	..	1 0 0	30 0 0	„
Willows (various)	4,000	24	..	1 0 0	4 0 0	..
Totals	831,100	..	..	..	821 1 0	

Two-year-old Trees, sown 1912–13.

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	531,000	..	4	1 5 0	663 15 0	Strong plants.
„ ponderosa	181,900	..	6	1 5 0	227 7 6	„
„ Benthamiana ..	10,400	..	6	1 10 0	15 12 0	„
„ Torreyana	400	..	6	1 10 0	0 12 0	„
Larix europaea	35,000	..	6	1 5 0	43 15 0	„
„	..	284,000	8	2 5 0	639 0 0	„
Totals	758,700	284,000	..	..	1,590 1 6	
	1,042,700					

Three-year-old Trees, sown 1911–12.

Name of Tree.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Pinus Laricio	180,000	6	3 0 0	540 0 0	Strong plants.
„ ponderosa	44,300	6	3 0 0	132 18 0	„
„ Benthamiana	1,500	6	3 5 0	4 17 6	„
Larix europaea	89,100	8	3 0 0	267 6 0	„
Totals	314,900	..	..	945 1 6	

Trees transferred from Nursery to Plantations, &c., 1913–14.

Where sent.	Name of Tree.	Number.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Naseby Plantation ..	Pinus Laricio ..	69,075	8	3 0 0	207 4 6	Sturdy plants.
	„ ponderosa ..	48,350	10	3 0 0	145 1 0	
	Larix europaea ..	20,250	12	3 0 0	60 15 0	
	Populus fastigiata ..	5,650	24	2 0 0	11 6 0	
	Pyrus aucuparia ..	1,175	24	4 0 0	4 14 0	
	Cytisus vulgaris ..	665*	24	1 0 0	0 13 3	
		145,165	..	..	429 13 9	
Various institutions, &c.	..	130,000	..	..	45 10 0	Surplus seedlings.
Totals	..	275,165	..	..	475 3 9	

A. W. Roberts,
Nurseryman in Charge.

Naseby Plantation, Central Otago.

(Area, 1,350 acres; altitude, 2,450 ft.; commenced operations, 1900.)

The rainfall for the year was 36·41 in., which fell on 125 days, the maximum fall being 6·04 in. in the month of November, 1913. The increase on last year's rainfall is 7·05 in., which is a very substantial increase. The maximum temperature was 84° in February, 1914, and the minimum 7° in July 1913. Frost occurred on 198 nights. Climatic conditions, which are always a great factor in the success of afforestation operations, have been most favourable during the past year. A fairly evenly distributed rainfall was recorded, while the north-west winds have been less persistent than usual.

The larch this year has been unaffected by late frosts, and a vigorous growth, ranging from 2 to 3 ft. has been made. Well-established pines have also made good growth, *Pinus Laricio* having increased their height by 10 to 15 in., and *Pinus ponderosa* from 8 to 10 in. Younger trees have also made satisfactory growth, and the season on the whole has been a satisfactory one for trees.

To give a greater measure of security, the external fire-lines have been increased another half-chain in width, and belts of fire-resisting trees are being planted round the pine blocks. In order to cope with an outbreak of fire, depots containing fire-fighting appliances have been made, and these will be placed in prominent positions in the plantation. These boxes were made at the nursery, and will be placed in position at an early date.

On completion of tree-planting a new block was taken in, the area being about 250 acres. The material for the fence was obtained from the old subdivisional and boundary fences, and the total length of fencing erected was 166 chains. The new area enclosed includes all the land available at present, with the exception of a small portion on the north-east boundary, which is of little use owing to its rocky nature and the presence of three or four private water-races running through. As there will be no further area to go on with on the completion of this block, I would advise that the lower portion of the run be taken over as soon as possible. The area on the lower portion is about 1,500 acres, and all good land for planting. After finishing the boundary-fence a divisional fence was erected in order to clear the land of vermin, and on an area of about 100 acres 320 rabbits were taken off. This work gives a great deal of trouble, as the pest is very numerous on the adjoining land.

After fencing was completed, the work of pitting was put in hand, and some 309,700 pits have been sunk to date.

The usual work of clearing suppressed trees of all undergrowth, opening up blanks, and ploughing fire-breaks, has been carried out.

All tools have been kept in good repair, and permanent buildings are in good order.

The total number of trees on the old and new sites is 1,934,224, covering an area of 719 acres.

The proposed area to be planted this season is approximately 250 acres.

The expenditure for the year amounts to £825 6s. 8d., and to date £7,257 17s. 11d.

The average number of men employed was 3·03 men.

Schedule I.

Month.	Rainfall.	Number of Days Rain fell.	Temperature.		Number of Days Frosts occurred.
			Maximum.	Minimum.	
1913.	Inches.		Degrees.	Degrees.	
April	3·53	8	64	19	23
May	1·61	13	56	14	29
June	1·11	6	52	13	27
July	2·51	12	58	7	27
August	2·83	12	58	18	26
September	1·74	11	68	20	15
October	2·26	9	72	22	15
November	6·04	17	74	25	12
December	5·96	13	82	28	9
1914.					
January	4·03	8	82	30	2
February	2·69	7	84	30	5
March	2·10	9	77	26	8
Totals	36·41	125	..	..	198

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	52 3 0	1,474 5 2
Pitting	196 14 0	1,787 2 9
Clearing	..	20 17 10
Cartage of trees	3 2 6	111 19 3
General upkeep of plantation	241 12 8	1,665 12 6
General repairs	26 13 8	82 16 8
Horse-feed	..	164 10 0
Permanent works—		
Fencing	69 12 4	838 3 3
Formation	..	86 11 9
Buildings	..	116 11 1
Stock, implements, &c.—Tools, implements ..	0 8 6	33 4 6
Supervision and clerical (salaries)—		
Supervision of free labour	200 0 0	625 14 11
Proportion of Superintending Nurseryman's salary and clerical assistance	35 0 0	250 8 3
	£825 6 8	£7,257 17 11

Schedule III.—Trees Account.

	Number.
Trees received during year	145,165
Less to replace blanks	67,300
Planted on new area	77,865
Previously planted	1,856,359
Total number planted on 719 acres (average age, eight years)	1,934,224

Schedule IV.—Property Account.

	£ s. d.
Land (1,350 acres): Crown land not charged to Forestry Account	..
Buildings	116 11 1
Stock	..
Improvements	86 11 9
Fencing	838 3 3
Stores in hand	33 9 3
	£1,074 15 4

Balance-sheet.

	£ s. d.
Total expenditure	7,257 17 11
Less Property Account	1,074 15 4
Cost of operations	6,183 2 7
719 acres planted (average age, eight years).	
Estimated value of plantation per acre	10 7 6

T. O. SCREEN,
Plantation Foreman.
A. W. ROBERTS,
Nurseryman in Charge.

GIMMERBURN PLANTATION RESERVE.

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

The season has again been a favourable one at this station, and the trees are now making excellent progress. The land has been rabbited several times during the year, and Californian thistles cut. During the year 36 acres were cultivated and sown down in oats, the cost being borne by the nursery. Owing to there being no further planting done at this station, expenditure is kept down as much as possible; but I think it would be advisable to fill in the area where the trees are with poplars, which, I think, would grow very well here. The block is somewhat scattered with trees, and I am of opinion it would be better filled up, and would also choke the Californian thistles.

The expenditure for the year amounts to £10, and to date £2,631 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	10 0 0	243 0 0
Proportion of Superintending Nurseryman's salary and clerical assistance	..	79 16 8
	£10 0 0	£2,631 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, eight years)	152,896

Schedule IV.—Property Account.

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

Balance-sheet.

	£ s. d.
Total expenditure	2,631 0 5
Less Property Account	514 13 11
Cost of operations	£2,116 6 6
173 acres planted (average age, eight years).	
Estimated value of plantation per acre	10 5 0

A. W. ROBERTS,
Nurseryman in Charge.

HANMER SPRINGS NURSERY, CANTERBURY.

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

Rain fell on 128 days during the year, the total precipitation being 45·82 in. The highest shade temperature (88°) was registered on the 13th January, and the lowest (19°) on the 15th June. Frosts were recorded on eighty-one nights during the year, the lowest temperatures being registered during the months of June and July. Comparing the records with the previous year's, an improvement is shown in the weather conditions experienced throughout the year. There were eleven wet days less, a decrease in rainfall of 4·91 in.; the maximum temperature was 88° as against 90°, and the minimum temperature 19° as against 15° the previous year, with a decrease of eight nights with frost. The rainfall was very evenly distributed throughout the year, as will be seen by a perusal of Schedule I, the minimum fall (1·98 in.) being registered during the month of June, and the maximum fall (6·88 in.) during October.

On the whole, weather-conditions were favourable for all nursery operations, and the results obtained amongst seedlings and lined-out stocks are highly satisfactory.

Seedling Trees.

Seed-sowing operations were carried out under favourable circumstances, both as regards weather and condition of soil. The operation was carried out fully a month earlier than the previous year, and the results obtained point to earlier sowing being the more satisfactory. Tree-growth throughout the seed-beds is above the average, the growth being very sturdy, and the plants presenting a very healthy appearance. The grass-grub is not in evidence to any extent, and what little damage is apparent is confined entirely to the larch seedlings. The thorough and constant working of the soil prior to seed-sowing, and the judicious use of insecticide at the time of sowing and subsequently, evidently has the effect of keeping the pest in check.

Pinus austriaca.—This is a very fine crop, the 500,000 young plants being particularly well grown. About 112 lb. of seed was sown.

Pinus ponderosa (special).—Though a thin crop, the plants are sturdy, about 130,000 being produced from about 40 lb. of seed.

Pinus ponderosa.—From the 40 lb. of seed sown a fine crop of about 70,000 sturdy plants resulted.

Pinus Benthamiana.—The germination was not good, but the plants are sturdy, about 5 lb. of seed producing 9,000 strong trees.

Pinus scopulorum.—A fine crop resulted from the 4 lb. of seed, the plants being very well grown.

Pinus muricata.—A fair crop, but of medium growth. These plants root very poorly the first season, resulting in a considerable percentage of loss after lining-out. 1 lb. of seed produced 11,000 plants.

Pinus radiata.—The germination of this variety was very good, a crop of about 90,000 young trees was raised from 30 lb. of seed.

Larix europaea.—This variety germinated very poorly. The crop of 300,000 young trees, however, are particularly sturdy. 75 lb. of seed was sown. The grass-grub has commenced operations among these trees, but the damage so far is hardly noticeable.

Larix leptolepis.—This is the first sowing of this variety at this station. The results are only fairly satisfactory, about 40,000 plants being produced from 6 lb. of seed.

Cupressus Lawsoniana.—These germinated well, a very satisfactory crop of about 14,000 plants being raised from 2 lb. of seed.

Psuedo-tsuga taxifolia.—Germination poor, the 2½ lb. of seed producing only about 14,000 plants. These are very sturdy, however.

Betula alba.—About ½ lb. of seed was collected from trees growing in the adjoining plantations. The germination was poor, only about 4,000 plants being raised.

Cotoneaster Simonsii.—This seed was collected from plants growing in the nursery. Germination was only fair, the 2 lb. of seed producing about 5,000 plants.

Two-year-old Seedlings.

Pinus Laricio.—These trees have made fine growth, and have rooted well, and should give very satisfactory results in transplantation.

Two-year-old lined-out Trees.

Lining-out operations were carried out under favourable conditions throughout, and the 1,184,580 young trees dealt with have done exceedingly well with but one or two exceptions, the percentage of deaths being small. About 5 per cent. would cover the loss quite easily.

Pinus Laricio.—The percentage of loss in the crop through transplantation is very small. The trees have made excellent headway, and are very sturdy and healthy looking.

Pinus ponderosa.—This variety has made satisfactory progress, the loss through transplanting being slight. The plants are very sturdy.

Pinus Benthamiana.—The above remarks also apply to this crop.

Pinus radiata.—The percentage of loss in this crop through transplanting is high, and could be put down at over 25 per cent.; the remaining plants are, however, very sturdy and well rooted.

Larix europaea.—Immediately following transplantation from the seed-bed this species appeared to be attacked with a form of needle-cast, complete defoliation taking place in many instances, and partial defoliation occurring almost throughout the break. The disease was soon shaken off, however, and the plants assumed their normal appearance, and have done exceedingly well, though not making quite the vertical growth of previous years. It is anticipated that the percentage unfit for transfer to plantation during the coming season will be very small.

Alnus glutinosa.—This crop has made the rapid growth characteristic of the species, and the whole crop is fit for transfer to plantation.

Sequoia sempervirens.—A failure. The trees have made poor growth and are easily affected by frost.

Sequoia gigantea.—This variety has done very well indeed, and the plants are all sufficiently well forward for transfer to their permanent places in the plantations.

Pseudo-tsuga taxifolia.—The loss through transplanting was slight; but the plants have not made great vertical headway, though otherwise satisfactory.

Three-year-old Trees.

Pinus Laricio.—Though they have not made the vertical growth of previous years, the trees are very sturdy and well rooted, and should transplant with a minimum percentage of loss when transferred to their permanent position in the plantation. A percentage of *Pinus austriaca* is again noticeable, the seed apparently being again mixed (this matter was referred to in my report for 1912–13).

Pinus ponderosa.—The trees are quite on a par with the crop grown last season, the plants having made fine growth. The whole crop will be transferred to the plantations during the coming winter.

Pinus Benthamiana.—This is a very sturdy crop, the whole being quite fit for transfer.

Pinus muricata.—This crop is a very medium one, the trees having made only fair headway.

Pseudo-tsuga taxifolia.—The growth made is very satisfactory, the whole of the crop being fit for transfer to plantations.

On the whole, the average tree-growth is quite up to that of previous years. The trees are healthy throughout, and, with the exception of the slight attack of needle-cast mentioned in the paragraph referring to larch, the nursery has been quite free from disease. The keeping-in-check of weed-growth, and the other operations necessary to the well-being of the young trees, was a large item of expenditure for the year.

It is expected that the output of trees for the coming season will be about 1,100,000. The total number of trees in stock on the 31st March was 2,841,150, valued at £4,936 1s. The number of seedlings raised during the year was 1,199,000, valued at £1,207 15s. making a total of 10,520,480 raised since the initiation of the nursery. Trees to the number of 1,105,455 were transferred to plantations and Domain Boards during the year, details of which are shown in Schedule V.

General.

Horse-feed.—The production of horse-feed is a large item of expenditure at this station An area of about 30 acres was sown in oats, 10 acres during the autumn and the balance during the early spring. An excellent crop resulted, and should be sufficient for the year for all purposes. The crop of hay was also satisfactory, and will be sufficient for the winter months. The carrot crop was a poor one.

General Maintenance.—A considerable amount of work was necessary in connection with the general upkeep of the nursery, the work consisting of repainting buildings, gates, &c., upkeep of harness, implements and vehicles, horse-shoeing, attention to ornamental borders, reshingling roads, and the maintenance of general neatness of workshops, stables, and implement-sheds.

Tree-seeds.—The expenditure on tree-seeds was £104 16s. 9d.—a considerable increase on the previous year. The quality was fairly uniform throughout, and the germination fair, as will be seen by perusal of Schedule V.

Manures.—This item of expenditure includes purchase of manures, freights, and cartage. The manures were used in connection with seed-beds, and the oat and carrot crops.

Miscellaneous Works.—Under this heading are included all items that cannot be placed under the other headings in the statement of expenditure.

Tools and Implements.—This item includes the purchase of tools, &c., to replace those worn out during the previous years. A new trench-plough was procured for the purpose of more effectual sub-soiling.

Buildings.—Two huts were transferred from the Prison Camp to the nursery for the purpose of providing accommodation for the nursery employees, &c.; also to provide storage-accommodation for tools, supplies, &c.

Nursery-formation.—It was found necessary to tile-drain a low-lying portion of the new nursery area. The expenditure also includes levelling, &c.

Fencing.—This was a very small item, and includes the construction of a new gate.

Water-supply.—There was no expenditure under this heading, the present supply proving quite satisfactory for all nursery purposes. The extension of the supply to the stables and dwelling is, however, very desirable, as in case of fire the present supply at the latter places is totally inadequate to successfully cope with any outbreak.

Soil-restoration Measures.

In order to restore soil-fertility to the areas which have been continuously cropped since the initiation of the nursery, green manuring was resorted to with beneficial results to the soil, crops of oats and rye being ploughed in when from 12 in. to 15 in. in height. The method has the desirable effect of forming humus, and thus keeping the ground open and friable. The areas thus treated are allowed to fallow, subsequent frequent tillage being resorted to.

Live-stock.

Our teams are at present composed mainly of aged horses, three being between fifteen and twenty years old. The Department would benefit by selling these and procuring in their place a team of young horses of a more desirable and useful stamp. Each year the distances to cart the trees increases, and the aged horses are unable to stand the strain of constant road-work. The cartage of supplies from Culverden—twenty-five miles distant—is also heavy, meaning fifty miles in two days, which soon knocks up aged horses.

Proposals.

As the present seed-bed area has been cropped continuously for the last five years, it will be necessary to fallow and plough in green crops for at least two years or more in order to restore fertility. It is proposed, therefore, to transfer seed-sowing operations to a more suitable area. This area has been sown down in clover for four years in succession, last season's crop being ploughed in during the autumn, and the ground allowed to fallow all winter with subsequent constant tillage, which should bring the soil into fine condition for the above purposes.

The expenditure for the year amounted to £1,512 8s. 6d., the total expenditure to date reaching £12,292 2s. 8d.

The daily average of men employed during the year is 6·99.

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.	
1913.	In.		Deg. Fahr.	Deg. Fahr.	
April	5·02	7	78	27	10
May	5·60	13	53	24	17
June	1·98	6	60	19	22
July	2·47	17	63	21	9
August	3·04	11	60	23	17
September	2·29	9	69	22	4
October	6·88	13	77	32	1
November	3·27	13	77	33	..
December	5·22	13	84	35	..
1914.					
January	2·08	7	88	38	..
February	4·55	8	87	37	1
March	3·42	11	85	32	..
Totals	45·82	128	..	..	81

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Tree-planting and maintenance—		
Tree-growing	725 12 6	5,502 16 3
General maintenance and repairs	163 18 5	880 15 11
Tree-seeds	104 16 9	730 8 8
Manures	18 5 2	102 18 10
Horse-feed, purchased and grown	167 19 9	768 4 5
Miscellaneous works	49 10 2	262 1 6
Stock and material—Tools, implements	29 2 2	603 13 1
Permanent works—		
Buildings	28 1 4	1,096 5 1
Nursery-formation	25 15 7	552 6 4
Fencing	0 18 0	90 9 9
Water-supply	..	448 12 4
Supervision and clerical—		
Proportion of Superintending Nurseryman's salary and clerical assistance	57 0 0	306 0 0
Proportion of Nurseryman's salary	130 0 0	936 1 10
Travelling-expenses	11 8 8	11 8 8
	£1,512 8 6	£12,292 2 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	1,199,000	236 18 11	10,520,480	12,292 2 8	..
Trees sent out	1,105,455	..	7,679,330	..	..
Balance in stock			2,841,150	..	4,936 1 0
Value of land, improvements, and stock (Property Account)				..	2,906 11 5
Total value					7,842 12 5

Schedule IV.—Property Account.

	£ s. d.
Land (40 acres): Crown land not charged to Forestry Account	..
Buildings	1,096 5 1
Live-stock	121 0 0
Improvements	1,000 18 8
Fencing	90 9 9
Stores in hand	597 17 11
	£2,906 11 5

Schedule V.—Details of One-year-old Trees, sown 1913–14.

Name of Tree.	Number in Seed-beds.	Height, in Inches.	Seed sown.	Value per Thousand.	Total Value.	Remarks.
			lb.	£ s. d.	£ s. d.	
Pinus austriaca	500,000	3	112	1 0 0	500 0 0	Very sturdy plants.
„ ponderosa (special)	130,000	2	80	1 0 0	130 0 0	Good plants.
„ ponderosa	70,000	3		1 0 0	70 0 0	Very fine crop.
„ Benthamiana	9,000	3	5	1 5 0	11 5 0	Thin crop.
„ scopulorum	12,000	2½	4	1 5 0	15 0 0	Fine crop.
„ muricata	11,000	2½	1	1 0 0	11 0 0	Fair crop.
„ radiata	90,000	4	30	1 0 0	90 0 0	Good crop.
Larix europaea	300,000	4	75	1 0 0	300 0 0	Medium crop.
„ leptolepis	40,000	2½	6	1 0 0	40 0 0	„
Cupressus Lawsoniana	14,000	2	1	1 0 0	14 0 0	Good crop.
Pseudo-tsuga taxifolia	14,000	2½	6	1 5 0	17 10 0	Good plants.
Betula alba	4,000	2	0½	1 0 0	4 0 0	Poor crop.
Cotoneaster Simondsii	5,000	3	2	1 0 0	5 0 0	Fair crop.
Totals	1,199,000	..	..	..	1,207 15 0	

Two-year-old Trees, sown 1912–13.

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	350,000	..	4	1 5 0	437 10 0	Very sturdy plants.
" "	..	174,000	4	2 5 0	391 10 0	Sturdy plants.
" ponderosa	..	126,000	4	2 5 0	283 10 0	"
" Benthamiana	..	4,500	5	2 10 0	11 5 0	"
" radiata	..	9,000	6	2 5 0	20 5 0	Poor.
Larix europaea	..	400,000	10	2 5 0	900 0 0	Sturdy plants.
Alnus glutinosa	..	23,000	12	2 0 0	46 0 0	"
Pseudo-tsuga taxifolia ..	..	87,000	3	2 10 0	217 10 0	Good plants.
Sequoia gigantea	..	4,000	6	6 0 0	24 0 0	Fine plants.
" sempervirens	..	50	3	6 0 0	0 6 0	Poor.
Totals	350,000	827,550	..	..	2,331 16 0	
	1,177,550					

Three-year-old Trees, sown 1911–12.

Name of Tree.	Number in Nursery-lines.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
			£ s. d.	£ s. d.	
Pinus Laricio	370,000	7	3 0 0	1,110 0 0	Sturdy trees.
" ponderosa	80,000	11	3 0 0	240 0 0	Very fine crop.
" Benthamiana	6,000	8	3 5 0	19 10 0	Sturdy trees.
" muricata	3,800	9	3 0 0	11 8 0	Medium trees.
Pseudo-tsuga taxifolia	4,800	12	3 5 0	15 12 0	Very good.
Totals	464,600	..	..	1,396 10 0	

Trees transferred from Nursery to Plantations, &c., 1913–14.

Where sent.	Name of Tree.	Number.	Height, in Inches.	Value per Thousand.	Total Value.	Remarks.
				£ s. d.	£ s. d.	
Hanmer Springs Plantation	Pinus Laricio	388,585	10	3 0 0	1,165 15 1	Well-grown plants.
	,, ponderosa ..	67,100	12	3 0 0	201 6 0	
	,, Benthamiana ..	19,800	9	3 5 0	64 7 0	
	,, austriaca ..	94,680	9	3 0 0	284 0 10	
	,, radiata	3,775	12	3 0 0	11 6 6	
	,, muricata ..	4,300	12	3 0 0	12 18 0	
	Larix europaea ..	195,500	12	2 5 0	439 17 6	
	Cupressus Lawsoniana ..	4,200	12	4 5 0	17 17 0	
	Pseudo-tsuga taxifolia ..	11,800	10	3 5 0	38 7 0	
	Alnus glutinosa ..	109,625	20	2 0 0	219 5 0	
		899,365	..	..	2,454 19 11	
Hororata Plantation	Pinus Laricio	85,000	10	3 0 0	255 0 0	Very fine plants.
	,, ponderosa ..	12,000	12	3 0 0	36 0 0	
	,, radiata	465	15	3 0 0	1 7 11	
		97,465	..	..	292 7 11	
Hanmer Springs Plantation	As per details above ..	899,365	..	..	2,454 19 11	Seedlings.
Hororata Plantation	,, ..	97,465	..	..	292 7 11	
Tapanui Nursery ..	Larix europaea ..	100,000	..	..	100 0 0	
Conical Hills Plantation	Picea sitchensis ..	8,625	..	..	28 0 7	
Totals ..		1,105,455	..	..	2,875 8 5	

W. G. Morrison,
Nurseryman in Charge.

Hanmer Springs Plantation, Canterbury.

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

In reviewing the work of the last twelve months, it may be safely said that the year's operations have been attended with success. With regard to the weather-conditions experienced throughout the year, the same remarks apply as are contained in my report on the nursery.

The withdrawal of prison labour from the station, which had been forecasted for some time, took place early in October. The action of the Justice Department in this matter is to be regretted. The work done by the prisoners was highly satisfactory, and the reforming tendency resulting from such congenial outdoor employment must have done much to minimize recidivation. The work of tree-planting having been completed, very little inconvenience was caused by this withdrawal, as arrangements were immediately made for the engagement of an additional gang of free labourers to carry on operations. To accommodate these, huts were purchased from the Prison Department, and were transferred to a central site on a new area, the camp being constructed in the form of a square. On the two sides exposed to the prevailing winds a substantial breakwind was erected for shelter purpose, and a lean-to and galley were attached to each hut for cooking purposes, thus forming most comfortable quarters for the men.

Tree-growth—Phenomenal growth has taken place among all classes of trees, and the plantation as a whole has made highly satisfactory headway. Spring frosts, which were so prevalent and severe during past years, and which caused considerable damage to the tender leaders of larch, were very slight, and, consequently, this species had made unrestricted headway, in some case a vertical increase of 4 ft. being added. All pines have done remarkably well, more especially *Pinus Laricio* and *P. ponderosa*, which have amply demonstrated their adaptability to the soil and climatic conditions of the station. The Oregon pine continues to hold its own with its admixture of *Pinus Laricio*. The Tideland spruce, which has practically been at a standstill during previous years, has thrown off its lethargy, and made satisfactory headway.

Tree-planting.—The result of the season's planting has been most satisfactory, the death-rate being small, and chiefly confined to river-flats, where gravel is the predominating factor in the soil-formation. The growth of the young trees has been quite up to the average of that of previous years. Tree-planting was commenced on the 14th May, and was completed on the 4th September, the operation being carried out under fairly favourably conditions. Trees to the number of 900,165 were planted, a total of 221,760 being utilized for replacing failures on areas previously planted, the balance, 678,405, being planted on the new area. The area planted during the year was 249¼ acres, making a total of 2,213¼ acres now under forest, containing 6,025,276 trees. Planting was done by both free and prison labour, the former by contract, at a cost of 7s. 6d. per thousand.

Pitting.—This work was also carried out by free and prison labour, the former by contract, at the rate of 15s. per thousand for medium ground, and 17s. 6d. for stony ground, the total number of pits opened for the year being 581,624, costing £483 3s.

Clearing.—An area of about 350 acres was cleared of scrub and burned off, the work costing £254 16s. 2d.

Cartage of Trees.—The transfer of an approximate 900,000 trees from the nursery to the plantation cost £18 3s. 6d. The wagon utilized for this purpose at present is not suitable, being too small and light, necessitating a double journey where one would suffice with a suitable vehicle. It is desirab'e, therefore, that a larger and stronger vehicle be purchased for this purpose.

General Upkeep of Plantation.—Work under this heading cost £336 18s. 6d., and includes the following items: Ploughing and generally keeping clear of growth twenty-two miles of fire-breaks, varying in width from ¼ to 1½ chains; grubbing out briers, gorse, &c.; pruning and cutting-out of double leaders; trapping and shooting hares and rabbits; clearing foreign growth from around young trees.

General Repairs.—The cost of this work for the year was £12 3s. 8d., including repairs to tools, harness, fences, &c.

Horse-feed.—This work includes general harvesting operations, preparation of ground for crop, and sowing. The cost for the year amounted to £41 1s. 8d.

Fencing.—The fencing of the new area was commenced in March, the work being now well advanced. About 80 chains of the old boundary-fence was dismantled, and will be re-erected on a portion of the new boundary. The cost of this work for the year is £189 13s. 1d., including material.

Formation.—New fire-breaks were marked out and ploughed on the new area. A large area of swamp land was drained, and much work was entailed in the formation of the new camp, construction of roads and culverts, &c. The total cost of this work was £102 11s. 10d.

Buildings.—The amount of £151 2s. 3d. was spent on this work. It includes purchase of nine huts, the building of galleys to same and purchase of material, and the construction of frames for tents.

Tools and Implements.—The amount of £41 1s. 7d. was spent on the purchase of spades, slashers, &c., to replace those worn out and broken.

Prison Labour.—Afforestation-work by prison labour only covered a period of seven months, the daily average of prisoners employed being 7·95 for the period. The total value of the work done by prison labour was £468 12s. 4d., apportioned as follows: Pitting, £166 13s. 4d.; tree-planting, £130 1s. 6d.; clearing, £39 18s. 9d.; general upkeep of plantation, £106 8s. 9d.; formation, £25 10s.

The daily average of men employed (free labour) throughout the year was 7·9.

Statements of expenditure, Trees Account, Property Account, and balance-sheet are appended.

Schedule II.—Statement of Expenditure.

	For Year. £ s. d.	To Date. £ s. d.
Planting operations and maintenance—		
Tree-planting	299 9 7	3,357 1 3
Pitting	483 3 0	4,976 12 7
Clearing	254 16 2	1,872 2 11
Cartage of trees	18 3 6	107 14 10
General upkeep of plantation	336 18 6	3,309 4 8
General repairs	12 3 8	29 17 6
Horse-feed	41 1 8	215 0 1
Permanent works—		
Fencing	189 13 1	1,506 11 9
Formation	102 11 10	1,312 2 6
Buildings	151 2 3	901 13 4
Stock, implements, &c.—Tools, implements	41 1 7	507 6 3
Supervision and clerical (salaries)—		
Supervision of free labour	170 0 0	1,036 14 4
Supervision of prison labour	85 0 0	688 17 2
Proportion of Superintending Nurseryman's salary and clerical assistance	60 0 0	478 7 0
	£2,245 4 10	£20,299 6 2
Estimated value of prison labour (apportioned in above items)	468 12 4	6,849 17 0
Actual expenditure	£1,776 12 6	£13,449 9 2

Schedule III.—Trees Account.

	Number.
Trees received during year	900,165
Less to replace blanks	221,760
Planted on new area	678,405
Previously planted	5,346,871
Total number planted on 2,213¼ acres (average age, nine years)	6,025,276

Schedule IV.—Property Account.

	£ s. d.
Land (3,668 acres): Crown land not charged to Forestry Account	..
Buildings	901 13 4
Live-stock	..
Improvements	1,312 2 6
Fencing	1,506 11 9
Stores in hand	165 4 6
	£3,885 12 1

Balance-sheet.

	£ s. d.
Total expenditure	20,299 6 2
Less Property Account	3,885 12 1
Cost of operations	£16,413 14 1
2,213¼ acres planted (average age, nine years).	
Estimated value of plantation per acre	11 5 0

A. J. Boydell,
Plantation Foreman.
W. G. Morrison,
Nurseryman in Charge.

Dumgree Plantation, Marlborough.

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

An inspection was made of this plantation during the latter part of January. The development of *Pinus Laricio*, *P. ponderosa*, *P. muricata*, and *P. radiata* is exceedingly fine, particularly on the terraces, where the annual growth of leaders has in many cases exceeded 3 ft. Undoubtedly the conditions here are eminently suitable for pine-growing after the young trees have become established, and as over a large proportion of the area isolated clumps of trees remain, and from which little profit can be expected, I am of opinion that all vacant spaces of sufficient extent should be replanted with *Pinus Laricio*, *P. ponderosa*, and *P. radiata*. Almost equally satisfactory headway is being made by *Larix europaea* on the northern terrace; but the same mysterious discoloration of needles exists here as in the southern plantations, although perhaps less pronounced.

Grass fires occurred in various parts of the district without gaining entrance to the planted reserve. Constable Williams has again exercised his discretion in keeping the coarse vegetation in check by

systematic grazing with sheep, and also in supervising any work requiring attention. Although the wisdom of forming plantations and subsequently allowing them to remain without a resident caretaker is questionable, the extent of young forest here at present does not perhaps justify such an annually recurring expenditure.

One man was engaged for some little time in ridding the enclosure of rabbits, which of late have become very troublesome. It was, however, impossible to eradicate the pest under the circumstances prevailing last season; but as rabbit-proof has now been substituted for sheep-proof netting the prospect of more satisfactory work is bright. Double leaders being conspicuous throughout the plantation, arrangements have been made to remedy this by pruning. Every effort will also be made to cut the clumps of briers, blackberries, and gorse, which appear to be spreading here and there.

By expending £10 10s. 2d. the total outlay on the plantation to date reaches £10,065 7s., but by including the value of prison labour this figure is increased by £2,365 14s. 7d., as detailed in 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	5 10 2	1,514 12 6
General repairs	..	23 17 8
Horse-feed	..	..
Permanent works—		
Acquirement of land	..	3,600 0 0
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
Supervision of prison labour	..	467 16 3
Proportion of Superintending Nurseryman's salary and clerical assistance	5 0 0	115 14 0
	£10 10 2	£12,431 1 7
Estimated value of prison labour (apportioned in above items)	..	2,365 14 7
Actual expenditure	£10 10 2	£10,065 7 0

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, eight 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	..
	£3,881 5 5

Balance-sheet.

	£ s. d.
Total expenditure (prison labour included)	12,420 11 5
Less Property Account	3,881 5 5
Cost of operations	£8,539 6 0
209 acres planted (average age, eight years).	
Estimated value of plantation per acre	10 14 6

R. G. ROBINSON,
Superintending Nurseryman.

Approximate Cost of Paper.—Preparation, not given; printing (1,500 copies), £100.

By Authority: JOHN MACKAY Government Printer Wellington.—1914.

Price 1s. 9d.