Exotic-forest Problems.

With respect to the planting of exotic forests, the aspect of site in relation to timber-production is being investigated along with the collection of empirical data regarding the most suitable silvicultural treatment necessary to obtain maximum crops.

The early planted stands of exotics have now reached the stage when they can indicate the comparative values for timber-growing uses of varying sites, and at the same time the necessity for definite silvicultural treatment in order to maintain growth-increment on an ascending curve. The sample plots established within the last decade are not as yet of sufficient age to prescribe decisively the optimum methods for treatment, but measurements of volume growth of plots carried out during the year in three regions give support to the recent large-scale thinning operations in all species, and demonstrate in quantitative terms that delay in treatment is being accompanied in the majority of crops by a loss in increment which will ultimately prolong the period before financial returns may be expected from these plantations.

Further investigations are being conducted by means of tabulated sample plots which have been established throughout the Dominion. These include permanent growth-study plots, covering eleven species, of crop ages varying from ten to thirty-one years. The plots established prior to 1921 have been twice remeasured, while others have had one remeasurement. Plot methods have been recently revised and standardized, and the available data have been correlated. Further plots cover experiments on crop establishment by direct seeding (five species), site and species trials (fifteen species), methods of plantation-formation, spacing, crop mixtures, and type of stock, stem-pruning for improved timber-production, and plantation-soil investigations.

Closely related to the silvicultural treatment of the exotic crops are the various investigations begun by the entomological and mycological branches as improvement in the hygienic condition of the plantations. The overdue necessity for detailed field-work in these branches of forest pathology is well exemplified by the discovery of a fairly widely spread infestation of *Hylastes ater*, a species of bark-beetle not previously known to occur in New Zealand (discussed in last year's report). The practical effect of this discovery will probably be an enforced modification of current practice in regeneration of cut-over pine stands in districts infested by the beetle.

3. Waipoua Silvicultural Research Station.

The reasons for setting up this station, and the duties of the officer in charge, were briefly outlined in last year's report. Although the station has been in operation for only eight months, much good work has been accomplished. Suitable domestic accommodation for permanent officers and casual labourers was provided, and a workshop and small office with dark-room attached, were erected. A small nursery was established, and three large sample plots laid out to secure information on different modes of forest and soil treatment. The main boundaries of the forest were traversed and flagged to minimize trespass, which has always been flagrant. Portion of one boundary, however, is still in dispute, as the land-titles are obscure. Telephone communication was extended throughout the forest as a measure of fire protection. Photographic and other recording data are being built up, and already 150 photographs have been filed. Next year the forest growing stock will be inventoried more completely, the work of the past eight months having established the fact that there are, roughly, only some 9,000 acres of commercial kauri forest on the area. This has been known qualitatively for many years (*vide* Dr. L. Cockayne's "Botanical Survey of Waipoua Kauri Forest," 1908). The next step is to get the stock in accurate quantitative terms. When this has been achieved the logical procedure will be to determine whether decadent or over-mature trees can be economically removed whilst regenerative measures are being taken to balance removal by new growth increments.

4. Bleeding of *Pinus radiata* and *Pinus pinaster*.

The experiments inaugurated at Riverhead in September, 1929, to investigate the bleeding of *Pinus radiata* and *P. pinaster* were concluded during the year. Both the French and American systems of bleeding were investigated, the former being undoubtedly best suited for use in New Zealand. The bleeding was not carried out for the whole season, but the results secured indicate that at least 8·5 lb. of resin per tree can be secured per annum from the *Pinus radiata* trees investigated, which is in excess of the yield secured from *P. pinaster*, *P. longifolia*, *P. austriaca*, and *P. excelsa* tapped in their native habitats. The yield from *P. pinaster* was not so great, but can still be considered satisfactory. As the present experiments were made on a relatively small scale, definite figures for cost of collection on a commercial scale cannot be given, but, allowing for the various factors involved, it appears that this cost would be much higher in New Zealand than in France and North America, owing to the different class of labour employed and the higher wages paid.

5. Forest-products Investigations.

The establishment of the fundamental physical, mechanical, and chemical properties of the indigenous and exotic timbers, together with the development of the basic principles governing the arts of kiln drying, wood-preservation, and pulping, and their translation into commercial practice, are the major objectives of the Branch of Forest Products. On the major projects, active progress is reported hereunder.

The study of the fundamental physical and mechanical properties of the indigenous species initiated in 1921 has now been extended to cover twenty-four species, and will probably be brought to a conclusion during the year ended 31st March, 1932. The shipments examined during the year ended 31st March, 1931, included rimu from the West Coast, South Island, silver-beech from Southland, kohekohe, tanekaha, and mangeao. Under a similar study of the exotic timbers a shipment of macrocarpa was also examined. Supplementary to these investigations, further progress has been made with the formulation of structural grades, rules, and the establishment of working-stresses for use by architects, builders, engineers, &c.