

2. FOREST ECOLOGY.

Plant-animal Problems.

The year just past has been marked by a distinct advance in the study, and to a certain extent in the solution, of the numerous ecological problems confronting the Service. Up to the present, in dealing with ecology, it has been the habit to treat merely of the combinations of plants which form portions of the forest. A moment's thought will show that this view of ecology—for forestry purposes, at any rate—is far too limited, and that, in addition to the plants, the animals associated therewith must be considered, especially those browsing and grazing animals of large size which now abound in nearly all forests from the East Cape to Stewart Island. Viewed in connection with this statement, the outstanding feature of the past year's work has been the destruction of some 64,000 animals in State forests. These include wild cattle, wild horses, deer, chamois, wild pigs, goats, rabbits, hares, and rats, as mentioned elsewhere in this report. When it is considered that this figure excludes the activities of other Departments of State, excludes all private efforts, and is the result, in the main, of a six months' campaign only, it can surely no longer be denied that our forest population of alien forest-destroyers is so large as to exert a most profound ecological influence on the vegetation of the country, and that this influence must be, in all its aspects, detrimental to the realization of the maximum forest production. The fact that action on such a large scale has been made possible has afforded much gratification; but the point cannot be too strongly made that the campaign has just begun, and that any slackening of effort will lose the ground already won. This campaign has been the only step taken to apply generally and on a large scale the results of ecological investigations.

Indigenous-forest Problems.

In other directions, however, investigations have gone forward, and quite noteworthy conclusions have been arrived at. Dr. Cockayne records proofs of the "weed significance," from a silvicultural viewpoint, on certain indigenous ferns. Numerous field studies inaugurated by him have proved that colonies of *Blechnum discolor* and *Dicksonia squarrosa* appear and multiply vegetatively at a rapid rate by means of rhizomes, a fact not before suspected. These colonies undoubtedly prevent all regeneration of native species beneath their shade; and quite independently of Dr. Cockayne's investigations other officers of the Service established plots to find out whether fern-growth could be regulated sufficiently to allow adequate natural regeneration on the forest-floor. Northern plots seek to establish kauri regeneration at Waipoua by control of the tree-fern *Cyathea dealbata*; southern plots aim at controlling *Blechnum discolor* to establish natural stands of silver-beech (*Nothofagus Menziesii*) in Southland.

Still other aspects of the regeneration of the native timber species are being studied at Erua (silver-pine growth plots), and at Rimu in Westland, where the factors controlling regeneration of rimu (*Dacrydium cupressinum*), miro (*Podocarpus ferrugineus*), and silver-pine (*Dacrydium Colensoi*) have been a subject of study by Messrs. Foweraker and Hutchinson for the past six years. The reports of these two members of the staff of Canterbury College School of Forestry have been referred to in many previous reports; but, of necessity, concrete results were not obtainable for the first few years of observation and establishment of plots. This year, however, can record such satisfactory statements as the following: "Silver-pine and rimu seedlings are now protruding above the top of the 4 ft. growth of fern in numbers sufficient to give promise of a fully-stocked pole stand. This same area, searched carefully in 1928, showed no individuals above the fern level." And elsewhere: "Distinct growth (of rimu seedlings) has been made. The maximum is a height of over 2 ft. in an individual seedling three years old." These investigators conclude their report in the following terms: "It is asserted that the results so far secured, vague and indefinite as they may be held in quantitative terms, have left the investigators more firmly convinced each successive season that the rimu forests are fully capable of reproducing and developing under existing site conditions, and may be depended upon to hold their own and to extend their area over cut-over lands if given adequate fire protection, with perhaps also the exclusion of stock . . . The results so far secured indicate that true economy would dictate at this juncture a really serious consideration of the value of the native forests as permanently producing assets." This is couched in strong terms, and merits at least a continuance of investigations with such hopeful tendencies.

To sum up the position, it would seem to be now assured that certain native species could be successfully re-established in selected optimum sites, the great liability incurred by the very long rotation being probably offset by the cheapness of natural establishment and consequent low interest charges, along with the ultimate greater value of the product.

In order to carry these as yet almost academic conclusions to the next logical stage of small-scale trial in the field, work is, as already mentioned, proceeding at Waipoua Silvicultural Research Station (for kauri); at Rimu, in Westland (for rimu); and at Wairio, in Southland (for silver-beech).

Mixed Indigenous-Exotic Problems.

A totally different series of problems is presented by the possibility of improving cut-over or degenerate native-forest areas by the use of shade-bearing exotic conifers, with the ultimate aim of producing a mixed crop of exotic conifers with indigenous second growth.

To this end have been established the Erua Experimental Area in the North Island, and certain compartments of Golden Downs Plantation in Nelson. The former is a cut-over podocarp area, underplanted, after differing treatments of the residual stand, with both pines and cypresses of various species. Good results so far have been achieved with both Douglas fir and Lawson's cypress, whilst lodgepole pine is also promising. The latter is an area of very poor and deteriorated upland beech forest marching with the Golden Downs Plantation boundaries. Dead and moribund veteran beech-trees have been felled, and in the gaps so caused Douglas fir and various cypresses have been planted. The experiment is yet young, but all species chosen are promising well, and if deer can be excluded as successfully as they have been for the past three years it is almost certain that an unremunerative native hardwood stand badly understocked will be cheaply converted into a good exotic-softwood stand quite fully stocked.