

41. *Experimental Plots and Statistical.*—Plots established in 1937 in an underscrubbed portion of a mature kauri forest were recounted. Miniature tree-fern is still proving troublesome, having re-invaded, and prevented regeneration on, plots which had been recleared in 1941. From a single seed-fall 18,000 to 25,000 kauri seedlings per acre germinated, but only removal of the ground cover enables this result to be obtained. Even so, the fibrous humus layer, which dries out in summer, causes severe mortality, although a mean of 4,672 seedlings per acre by 1941 increased to 9,051 by 1945. Quadrats around which a trench had been dug showed a markedly superior regeneration, indicating that on untreated areas the development of seedlings suffers a great deal from fierce competition by tree-roots.

Fifteen plots established for the study of natural regeneration of insignis pine after clear-felling on Whakarewarewa Forest were recounted, and showed an average of 3,000 seedlings per acre, ranging from 400 to 11,000 per acre. Mortality from the bark beetle *Hylastes ater* varied from nil to 5 per cent.; average 2 per cent. The shoe-string fungus caused negligible mortality. Germination is incomplete on plots established in 1944, but the indications are that a good stocking will be secured.

Two newly established plots for investigating natural regeneration of twenty-five-year ponderosa pine on Balmoral Forest revealed a stocking of 2,370 seedlings per acre. This is of interest because this species has so far shown little sign of regeneration anywhere in the Dominion, even under the oldest stands. Plots in wind-blown insignis pine in the same forest upon recounting revealed per-acre stockings varying between 1,640 and 3,880, with but slight losses from *Hylastes ater*.

On Balmoral and Eyrewell Forests standard growth and yield plots in insignis and Corsican pines received the standard quinquennial remeasurement and were subjected to heavy and medium thinnings.

Valuable data on the mortality and suppression in different crown-classes of a sixteen-year unthinned insignis-pine compartment were obtained from remeasurement after four growing seasons of a 1-acre plot on Maramarua Forest. The total of 450 living trees in 1941 fell to 345 by 1945. The former comprised 358 dominants and co-dominants, 67 intermediates, and 25 suppressed trees; and the latter 230, 98, and 17 in the respective crown-classes. Mortality comprised 48, 38, and 19 respectively, total 105. Of the dominants and co-dominants, 80 became intermediates, and 11 of the latter passed into the suppressed class. Net annual basal area increment was 2 per cent., being an increase from 169 to 184 square feet, and crop trees (mainly dominants and co-dominants of good form) showed an annual basal area decrement of 3 per cent. and thinning trees (mainly intermediate and malformed trees) an annual increment of 13 per cent. The last-mentioned increase was, of course, caused in the main by numerous co-dominants of 1941 being left behind in the lower story. These results clearly demonstrate what is going on in many compartments in the State exotic forests owing to unavoidable postponement of thinning until labour again becomes available (see paragraph 33). Under orthodox thinning treatment the annual basal area increment of selected crop trees should be about 4 or 5 per cent. in place of a decrement.

42. *Forest Botany.*—The collection and summarizing of data according to phenological projects now in operation has continued over the past year, but the full value of these data will not be developed until information from many more years' observations has accumulated. Seed stored according to a project begun in 1941 has been tested during the year, and results so far obtained indicate that for indigenous species, such as kauri and kahikatea, storage for any length of time must be at 10–15° F., preferably sealed. For kauri-seed, which does not germinate as well when kept for any length of time even under the best storage conditions as it does when fresh, stratification prior to sowing appears to be deleterious. On the other hand, stratification increases speed of germination in all exotic species studied—American eastern white-pine, Corsican pine, Douglas fir, insignis pine, lodgepole pine; and, generally speaking, the three-year storage term has proved that all the usual storage methods are quite suitable for these species. The 1944–45 season has again been a poor seed year. A number of seed exchanges have been made, chiefly with Australia. Additions made to the herbarium during the year now bring the total number of species to approximately 500.

CHAPTER VI. —FOREST PROTECTION

43. *Fire Damage.*—The December–January period, in which the worst fire danger often occurs, was generally wetter than usual, but short periods of threateningly high fire hazard were experienced in several localities in the late spring and February–March periods. This is evidenced by the number of fires occurring in and adjacent to State forests, for of the total of 52 fires covering 3,920 acres and investigated by Forest Officers, 23, totalling 3,370 acres, occurred in late spring and 22, involving 520 acres, in late January and early February. The total number of fires reported from Forest Service lookouts was 1,512, but only 17 of these, covering an area of 1,995 acres, were in State forests; approximately 200 acres of cut-over forest was burnt, the balance being fern and scrub country. The only serious fire in a State forest occurred in the Waiotapu Forest, where, in November, 57 acres of fifteen-year-old *Pinus ponderosa* and *P. radiata* were burnt. The fire originated during burning-off operations on a firebreak, a spark being carried over an 18 ft. road and starting an outbreak half a chain inside a dry swamp. Immediate efforts to get this fire under control were unavailing, and in a short time it had spread into the planted area. Prompt action by the fire-fighting crews confined the fire to the extent above mentioned. Most of the timber killed by the fire has since been salvaged.

During the year fire destroyed two sawmills owned respectively by Sherriff and Co., Ltd., Alton Valley (Southland Conservancy), and Taupo Totara Timber Co.'s No. 2 Mill, Mokai (Rotorua Conservancy).

44. *Fire Detection and Control, &c.*—Humidity observations and fuel indicator sticks have again proved invaluable aids to the determination and prediction of fire hazard, but the light fuel indicator sticks made from *Pinus strobus* have been showing an apparent loss of volatiles during the period of exposure, indicating the necessity for a more severe pre-conditioning treatment of all new sticks.

In order to improve the fire-control and fire-fighting organization in the Rotorua Conservancy, plans are being developed for the erection before next fire season of an up-to-date fire-control room at Kaingaroa Forest headquarters, with all necessary maps, telephones, and radio equipment. This will take the form of a separate building later to be incorporated in the projected administration block.