The other area inspected was well to the head of the Kawhatau at a higher altitude. Here many of the first four shrubs mentioned above had been killed, as had koromiko, *Olearia colensoi*, and *Gaultheria rupestris*. The two usual ferns, kio-kio and *Polystichum vestitum*, had suffered, and in one place a small slide had been started with the destruction of the former fern and seedlings of *Olearia colensoi*.

(*d*) *Open Tops.*—As far as could be seen the open tops have not suffered a great deal, the tussock grasses and many of the herbs and shrubs being presumably unpalatable. However, where plants recorded under (*c*) are found in this class of country they would suffer similar damage. As we were in mist in this area for a great deal of the time much may have been overlooked. On the way on to the main range from Tussock Creek, Spaniards had had some of the outer leaves eaten. This appeared to have been caused by hares, signs of which were seen here and also on the flats in the upper reaches of the river. On the ridge between the headwaters of the Waikamara and the Kawhatau it was noted that several parallel tracks had been made along the steep mountain side near the summit of the ridge. Slips are commencing at the banks on the upper sides of these tracks and will no doubt grow in proportions as the years go by.

(3) *Eating of Bark.*

Sometimes the trees have the bark stripped from them; in other cases it appears that only a nibble here and there is taken. We have often wondered whether the latter cases are for more or less medicinal value, or for something with more taste than the usual leaves, &c., eaten. Recently in "The Protection of Woodlands," by H. Furst, published in 1893, it was observed that red deer in Germany become very destructive to the bark of trees when ring fenced and not able to obtain their usual wide variety of food. It was suggested that the monotonous diet of hay in winter in the Deer Park, was the cause, the bark stripping being necessary to provide themselves with the tannic acid necessary to stimulate the secretion of certain requisites (*e.g.*, for the formation of antlers and the process of digestion). Even where trees are not killed outright by ring barking, the area on the trunk left uncovered by bark soon becomes riddled by the holes of boring insects and the ultimate death of the tree must be greatly quickened.

(4) *Number of Deer actually seen.*

Five were seen on the divide between the Kawhatau and the Waikamara. Four in the stream leading from this divide into the Kawhatau, and that afternoon and the next morning two were seen, one being a fine 10-pointer stag in the velvet. Proceeding up Tussock Creek to the main divide, two went ahead of us, while on the open tops a mob of six was seen, and others were possibly hidden by the dense mist and rain. In the afternoon seven were seen while following down the Waikamara.

Dead Timber.

An unusual feature of the beech forest of the Waikamara and Kawhatau Valleys was the prevalence of dead timber. To a less extent this was present in the Waipawa Valley also. We are at somewhat of a loss for a satisfactory explanation of this condition, although there are two possible solutions. During one or more exceptionally dry seasons, widespread fires would be likely to occur, most trees dying as a direct result of fire and others dying slowly over a period of years consequent upon conditions changed in this way.

A number of samples of blackened pieces of wood from standing and fallen dead trees were submitted for examination to Mr. L. H. Davis, Analyst, Dominion Laboratory. His remarks are as follows:—

> "In reply to your query concerning the cause of the blackening on the surface of the samples of wood forwarded to me, I can only give an opinion.
>
> "It is practically impossible, at the present stage of our knowledge, to prove definitely by chemical examination whether fire caused the damage.
>
> "However, from microscopical examination, I have formed the opinion that these samples of wood have been swept by fire and then exposed to extensive weathering. In several portions I have found a charred zone which penetrates into the wood, the charring growing lighter as the depth from the surface increases."

However, the distribution of the dead timber seemed too complete and widespread to be attributable to fire, and also varies too much—*e.g.*, in the Waipawa Valley the dead trees were certainly common, but not sufficiently to suggest fire, and on a steep slope in the Waikamara Valley we noticed a number of large beeches standing out above younger trees; they were alive, but slowly dying. In perhaps ten years they may closely resemble the dead beeches so common in the Kawhatau Valley.

Trees infected in their early stages with a mild disease would be likely to continue to maturity, being sufficiently virile to prevent serious inroads, but with the approach of old age the disease would be able to make more rapid headway. Those trees, least favoured by environment, would die prematurely, so that light, further assisted by the decreasing foliage of the larger trees, would early reach the forest-floor, setting up conditions favourable for regeneration. The resultant seedlings would, in time, form a young forest standing beneath the dead forms of the last survivors of the previous generation.

This, of course, is hypothesis only, but disease appeared to be present in the mountain beeches, while the red and silver beeches of lower levels were free. Amongst the fresh foliage of the mountain beeches dead leaves appeared sometimes singly, but often together, a whole twig here and there being affected. Could this apparent leaf-disease be the cause?

Another disease seemed to be present among the beeches. A number of the saplings were dead, appearing to have been barked by deer, while others bore scars, all below the 4 ft. level and most common at about 2 ft. At first sight it looked like deer-damage, especially as the foliage and under-shrubs had been eaten off to the 5 ft. level, but there were no undoubted tooth or antler marks. Further, scars appeared in places inaccessible to deer—for example, between two closely set trunks. No signs of opossums were evident, so we concluded that disease must be present. It appeared first as irregular brown streaks on the outside of the bark. These tended to coalesce, and the bark eventually sloughed off from dead wood. The leaf complaint previously mentioned was present here too, but it showed no correlation with the bark-trouble. The fact that damage occurred only on these parts which had been browsed on by deer, suggests that deer were the agents in spreading infection.

Regeneration of Beech Forests.

During this present summer we had observed a very interesting phenomenen in beech forests in the following localities: Rimutaka Range, Haurangi State Forest—Eastern Wairarapa, and Ruapehu. This was the myriads of beech seedlings of the following species, which had sprung up apparently from seed shed last season: Red beech, (*Nothofagua fusca*, *Nothofagus truncata*,) black and silver beech. Tree-trunks lying on the ground would have cracks along the bole outlined in seedlings, while in many places they appeared like grass on the forest-floor. Areas which we have observed for nine years as being bare of beech regeneration except for very small clumps, are this year carpeted with them. It is possible that the wet summer last year may have made conditions suitable for germination on the forest-floor, where the usual layer of dry, hard beech-leaves would make germination difficult. It is possible that, allied with this, beech trees may have borne more than the usual amount of seed. It will be an interesting study in localities like the Haurangi Reserve to see whether the forests can regenerate with such a liberal start in spite of deer, goats, pigs, &c.

The majority of the bush country traversed in this portion of the Ruahines was mountain beech forest, this species replacing the high country silver beech forest of the Tararua Range. Red beech is found here, as usual, on the lower country and a very small amount of silver beech was also noted, appearing at lower levels than that at which the red beech was first observed. It was interesting to note that the regeneration referred to was present as regards the red and silver beech, but not nearly so abundant in the high mountain beech forest. A possible reason for this is that climatic conditions in the higher altitudes last season did not vary a great deal from the usual, while in lower altitude they certainly did. The denser nature of the alpine mountain beech forest may also have had a retardatory effect.