1922.

NEW ZEALAND.

DEER IN NEW ZEALAND.

REPORT ON THE DAMAGE DONE BY DEER IN THE FORESTS AND PLANTATIONS IN NEW ZEALAND.

Laid on the Table of the House of Representatives by Leave.

Introduction and Summary.

The seriousness of the deer question in New Zealand became evident when last year an investigation was made into the relation of grazing to the lands under the control of the State Forest Service. The results of this investigation revealed the fact that the presence of grazing animals was in most cases inimical to the development of a silvicultural policy, unless numbers were strictly controlled to a stage commensurate with forest regeneration. While it appeared that domestic stock could be controlled to this stage, it was evident that wild animals, such as deer, presented a difficult problem of control, as the only method of shifting them, when grazing had proceeded as far as was advisable, was by shooting. It was apparent that the sister industry—agriculture—was equally affected; grazing resources of many runs were being depleted, and damage to farm crops, stock, &c., was manifest.

These facts brought forth the necessity for an economic survey of deer in the Dominion to ascertain the extent of the problem and means of control. The survey has been completed, the summarized results being:—

1. Deer were introduced for sporting purposes. Importations of some 111 head, spread over the years 1861 to 1909, were made. They were released on land at that time thought worthless, some of which has later become of value to the national interests.

2. Deer have increased to large numbers, probably to some 300,000 head. They have spread over large areas of country where it is not economic they should be.

3. Excepting in few cases, deer are detrimental to the national interests:—

(*a.*) Agriculture: Large numbers of stock are displaced on stations and farms. Depletion of the resources of mountain country has occurred from their presence. Damage to stock, crops, and fences is manifest.

(*b.*) Forestry: The presence of deer is inimical to the development of silviculture. In commercial forests they must be entirely eliminated, and only allowed in small numbers in protection forests, &c.

(*c.*) Value to the public: An infinitesimal proportion of the public find sport and recreation through the deer herds. Total license fees of an average of £1,393, at £2 per license, show that 0·0005 per cent. of the population of the Dominion take part in the sport.

4. No community-value is obtained from the herds. The restrictions applied to their protection do not allow of the marketing of the carcase, and practically all meat is left to rot.

5. The herds are distributed over some millions of acres of lands in the Dominion, much of which would carry a greatly increased number of stock in their absence. All food favoured by domestic stock is eaten, and when food is in short supply deer will live where domestic stock die. Herds probably increase by 25 per cent. annually, and through absence of natural enemies, want of culling, in-breeding, or lack of adequate food for the development of horn, have degenerated to a stage where they supply little sport. Estimated damage to mountain pastures, farm crops, fences, stock, dis-

placement of stock, and damage to forests amount to £180,000 per annum ; estimated value of licenses, expenses incidental to sport, attraction of visitors, &c., amount to £7,000 per annum : debit to the national interests of £173,000 per annum.

6. *Conclusions.*—(*a.*) So detrimental is the presence of deer to agriculture that the protection should be entirely removed from them in settled areas ; otherwise many farmers will have to give up their occupation. (*b.*) The development of forestry will be an impossibility unless deer are eliminated in the areas affected.

7. *Control.*—Deer should be relegated to waste areas where their presence will not be troublesome : these areas to be demarcated, and protection to apply only to them. In all other areas the protection should be removed. Shooting, which will follow the removal, will eliminate the pest in the more closely settled areas. In other lands, more remote back-country runs, &c., besides the removal of protection to bring the pest under control, either—(*a*) men must be employed to shoot (the average price paid in the past for culling is 2s. per head) ; or, (*b*) in extreme cases, where no danger to other stock can take place, poisoning is possible (strychnine used on apples, carrots, &c., has been tried successfully).

Importation and Liberation.

There are some ten species of deer naturalized in New Zealand, but the herds of two only—red and fallow—have assumed proportions of any magnitude, and this report will be confined to them.

The introduction of deer into the Dominion is in many cases somewhat obscure. Data relative to importation and liberation is difficult to obtain. The Hon. G. M. Thomson's " Naturalization of Animals and Plants in New Zealand " is the only authority available, and the following notes on importations, &c., have been taken from it :—

" *Red Deer.*—Red deer were first introduced and liberated in Nelson in 1851, but were not successful. Ten years later (in 1861) one stag and two hinds were imported from England, liberated in Nelson, and quickly became established. Three imported were released in the Wairarapa in 1863, fifteen in Otago in 1871, nine in the Rakaia Gorge in 1897. In 1900 a herd descended from those at Nelson was liberated in the Lillburn Valley, Southland. Three were imported from Victoria and liberated in the vicinity of Lake Manapouri, and in the following year (1901) ten (also imported from Victoria) were released in the same district. Six fawns were liberated on Stewart Island in 1901, and twelve from Victoria released in the same place the following year. In 1903, eight fawns from Victoria were liberated at Mount Tuhua, Westland, and eight deer from England at Lake Wakatipu. In 1906 four more from Victoria were added to the Mount Tuhua herd, and eight released at Lake Kanieri. Four from England were liberated at Paraparaumu, Wellington, in 1908, and in 1909 three at Dusky Sound.

" *Fallow Deer.*—In 1864 three were released at Nelson. In 1867 two were imported, twelve in 1869, and one in 1871, all being liberated on the Blue Mountains at Tapanui, Otago. Twenty-eight were imported in 1876, eighteen being liberated on Mangakawa Range, in the Waikato, and ten in the Wanganui district."

This briefly gives the history of the introduction of deer ; and, excepting for occasional importations for the purpose of introducing fresh blood into the herds, has formed the basis of the present great herds of the Dominion.

Present Distribution.

The herds are so widely distributed that to give a written description of the localities in which they are found would entail too much space. Suffice it to say that they are found almost throughout the main mountain-chains of both Islands and are spread over great areas of other lands (see accompanying maps).

Value from the Sporting Aspect.

The sport to be found among the deer herds of the Dominion is said to be as good as, if not better than, that to be had in any other part of the world. Unfortunately, many of the herds have increased so rapidly that they have passed beyond control and have deteriorated to a great extent ; so much is this the case that in some places they have reached such a low standard that they offer little or no attraction to sportsmen at all. An attempt is made here to estimate the sporting-value of the herds in terms of money. Actual figures are difficult, where not impossible, to obtain, an estimate being the only solution.

Actual returns from shooting licenses are available only for the last six years (1916–21 inclusive), the average being £1,137 per annum. As the first three years (1916, 1917, 1918) covered the war period, this is hardly a fair average ; but the latter three (1919, 1920, 1921), post-war and years of plenty, should be quite fair, and average £1,393 per annum. To this must be added other amounts incidental to the stalking fee. In many cases the stalking-grounds are remote ; money has to be spent in reaching them ; guides are also often needed, and from £1 to £1 10s. a day is paid for their services. It is quite probable that the expenditure in this way would treble the value of the licenses—say, £4,179. Again, there are the overseas visitors attracted by the sport. Inquiries throughout the Dominion show that their numbers are not nearly so great as many people seem to imagine. In speaking to a settler in the Hunter Valley, Otago, at one time the stalkers' paradise, and still a great hunting-ground, the information was given that to his knowledge, dating back many years, only four visitors from overseas had come specially to stalk there. Facts such as these are borne out in inquiries in other

places, and in placing this attraction at the same value as the shooting licenses—£1,393 per annum—it will be quite a good estimate. The total of these estimates discloses the fact that the value of the deer herds in the Dominion is approximately £6,965—say, £7,000—per annum.

Cause of Deterioration among some Herds.

There are several factors contributing towards the cause of deterioration in some of the large herds. Firstly, deer have been introduced into a country where there is an absence of natural enemies—strong and weak are alike able to live—the law of the "survival of the fittest" does not apply. In fact, the reverse is the case—the strongest and best developed stags are those shot; and, excepting in cases where rigorous culling is carried out, it is the weaker stags that head the herds, which must naturally sooner or later reflect on the standard of the whole herd. In-breeding has no doubt contributed largely; but by far the greatest factor is that resulting from overstocking, with its consequent lack of adequate food-supply. It is a well-known fact that the best heads are always obtained where there is most feed. As the feed is reduced the heads become smaller is proportion, although, generally speaking, quite regular in stature.

An adequate example of the effect of feed on the size of the head is to be found in the fallow herd of the Blue Mountains. Some years ago this herd became so numerous, had deteriorated to such an extent, and had become such a nuisance to neighbouring farmers that protection was taken off a large portion of the run. In the general shooting which followed hundreds of deer, both strong and weak, were killed, and the herd was greatly reduced in size, leaving more feed for the remainder. I was informed by a local resident prominent in acclimatization circles that under this indiscriminate shooting the standard of the herd has improved immensely, and whereas a few years ago good heads were conspicuous by their absence, the last season some good specimens were taken.

From this example it appears to me that the first step in the rejuvenation of a deer herd is a rigid thinning.

Habits and Food.

The animal is more or less nocturnal in its habits; it feeds in the late afternoon, night, and early morning, and retires to quiet undisturbed places to sleep through the heat of the day. It feeds on practically anything eaten by domesticated stock—grass, farm crops, and in the forests the palatable species of scrub and young trees. When feed is in short supply it will, however, eat almost anything, and will live where domesticated stock would die. Great distances are travelled through the night in search of food, and the animal, being mischievous in nature, often destroys far more than it eats. It is very fond of gambolling about also, and this habit causes some trouble among ewes and lambs.

The Effect on the Industry of Agriculture.

Although my investigation was primarily intended to deal with the relation of deer to the production of timber crops, it soon became apparent that the effect on the sister industry—agriculture—was probably as great, and this report would not be complete without some reference to that phase of the question.

Practically all the herds of the Dominion are on or are contiguous to land used in pastoral or agricultural pursuits, and the damage done on this land has assumed in some cases a distinct menace to the industry. Crops are often ruined in a wholesale manner, large numbers of stock displaced, and the production of others lowered. I will give you some instances to show that this is general. A few days were spent in the Lillburn-Tuatapere district, in Southland; the land is contiguous to large areas of forest country which border on the National Park, and deer are numerous. It is becoming impossible to grow crops. Grain crops are grazed on, trampled down, and even when in the stook are not immune, the sheaves being tossed in all directions and destroyed. Turnip crops are grazed often before they are ready, the bulbs broken, and in some cases rows are pulled up in a spirit of mischief and left to rot. One instance was quoted to me of a settler last season sowing 50 acres of grass on a new bush-burn. Deer started to feed on it before it was ready to graze, the result being that the pasture was for the most part ruined. The seriousness of this is apparent when it is remembered that the only possible chance of getting a "take" of grass on bush country is on the new ash.

Farmers stated that their loss among ewes and lambs through deer playing about among them at lambing-time was considerable. One estimated his reduction in lambs at 30 per cent. They are very emphatic on the question, stating that from their point of view deer are comparable to the rabbit, with the added disadvantages that they are impossible or prohibitive to fence against; they travel great distances to carry out their depredations, which, occuring at night-time, are impossible to guard against. This condition of affairs is general.

Accompanying this report are photographs of a turnip crop at Lake Hawea partially ruined, and off which over 130 head of deer have been shot. Another photograph shows a crop of oats in the Wangapeka Valley, Nelson, in which the owner placed scarecrows and tied his dogs to stakes. Deer grazed to within a few feet of the dogs and scarecrows, and the crop was ruined. At Rotorua farmers have estimated their annual losses at from £50 upwards, and these estimates are conservative. Land in this district is light, pumiceous in nature, and grows splendid crops of turnips and grass, but

requires renewing from time to time. At present it is in many cases impossible to do this, as the young crops are partially or wholly destroyed.

Loss through the displacement of stock is costing the Dominion thousands annually. Many instances have been quoted to me—that of Dr. R. G. Adams, of Blenheim, being the worst, he having last year to abandon a grazing-run of 23,000 acres at Lake Rotoiti, Nelson. His explanation to the Commissioner of Crown Lands was that the place was overrun with deer, leaving no feed for stock. I have a letter from Mrs. Woods, of Beaumont, who occupies the Blue Mountain run. It states: "I used to shear 10,000 sheep off the run and carry 100 head of cattle on that portion known as Siberia. Last year I shore 6,500 and cannot now carry any cattle." Estimated in cash, this displacement assumes a large amount. I have assessed the sheep at 7s. per head and the cattle at £2, which shows that the annual loss on this run alone is £1,425. Mr. Goodyer, of Tarras, estimated his loss at over £1,000 per annum, and said others were affected equally. Mr. McColl, of the Dingle Station, Lake Hawea, assured me that his land should carry one sheep to 10 acres, but owing to the depletion of the low country by rabbits and the high land by deer it only carries one to 20 acres. This applies throughout this mountain country.

It is indeed depressing to these farmers to find that their efforts to control the rabbit pest are nullified by the fact that as they are got under no increase in carrying-capacity is evident, because deer are ever on the increase. Even in its present state the carrying-capacity of this land could be increased greatly were it possible to grow crops in the valleys for winter. This, however, is impossible excepting in the vicinity of the homesteads. The yearly carrying-capacity is governed by that of the low country in winter. Could this be cropped, the number of stock would probably be more than doubled. To have his crops ruined is a great discouragement to the agriculturist, and is distinctly detrimental to the national interest. To keep down the ravages of a pest is a distraction from his legitimate work. Moreover, in the control of this particular pest he is hampered on every side by restrictions which cater for an infinitesimal proportion of the population—the deer-stalker.

Depletion of Mountain Pastures.

Deer are taking a part in the depletion of much of the indigenous flora of the mountains. Many of these plants are incapable of standing heavy grazing: snow-grasses (*Danthonia flavescens* and *D. Raouli*) and blue-grass (*Agropyron scabrum*) are such as these. Stock can be controlled to the stage where the full production from the pastures is maintained, but deer cannot. The fundamental principle in management of mountain pastures entails the removal of stock from time to time—that is, periodic spelling. This is accomplished by moving the stock from one portion of the run to another. At present, as soon as moving of stock has allowed the feed to grow, deer occupy the spelling portions and the land is grazed continually. The best of pastures will deteriorate under a system of continuous heavy grazing. Mountain pastures are extremely subject to its effects, the time being shortly reached when irreparable damage is done and the mountains become denuded of their flora, allowing free access to the agencies which cause erosion.

Effects in Indigenous and Exotic Forests.

Varying degrees of damage are manifest in the forests of the deer-country. Where deer are not numerous little damage is apparent, excepting in the thinning of the palatable species of undergrowth and an occasional barked tree. In places where the herds are big and food in short supply all undergrowth is eaten out as high as the animal can reach, saplings are ring-barked, and regeneration is at a standstill. Accompanying photographs taken in Southland and Otago give an idea of the destruction wrought—it is indeed a depressing sight. I have stated, and will state again, that in some of these areas it is a matter of deer or forests.

Grazing of forests is a delicate art not to be compared with the grazing of pastures. Stock must be strictly limited in number or regeneration becomes an impossibility. Nature has produced a forest-floor suitable to the propagation of seedling trees. Should this be destroyed and the soil exposed to the drying winds seed will not germinate. Enough is not known at present of the necessity of associations of trees in the forest in their effect on regeneration. To the lay mind certain species are weeds of no commercial value, and, being palatable, are better eaten by stock than let grow. This is a fallacy. All natural productions are of a delicately balanced order, and the less we upset that balance the greater chance have we of reproducing our forests. The statement is often made in regard to certain forests of no use for timber-producing purposes, "What does it matter if the undergrowth is killed out? The forest will still be there for climatic and water-conservation purposes." Yes, it will certainly be there, but for how long? A tree has a certain period of life, and should regeneration be stopped the forest has just that remaining period, a space of time measured by the life of the trees already in it. Protection forests with all the undergrowth destroyed, the soil dried by the winds, are very little more protection than the bare hills surrounding it. The Hunter Valley in Otago gives an instance. Floods in the river have been heavier and more erosion of the banks has taken place of late years than ever before, although the forest has not diminished appreciably, if at all, in area. The only apparent reason that can be seen is that the floor of the forest is bare, the soil is almost as hard as the surrounding country, and on this also the flora has diminished. No obstruction is offered to the waters of heavy rains and melting snows; they rush to the valley, producing heavy floods which cause erosion. Grazing of stock and game animals in forests dedicated to the conservation of climate and of stream-flow for our great hydro-electric and other waterworks

is a danger that must be clearly looked to. The importance of making an immediate monetary use of grazing and game-carrying propensities pales into insignificance beside the issue involved in the protection of these works.

Exotic Forests.

Deer are a distinct menace in these. Seemingly the tender bark of some of the young conifers provides an appreciated article of diet. It is becoming increasingly difficult at Whakarewarewa to do planting. In a young compartment of *Pinus insignis*, four years old, hundreds of trees have had the bark eaten or rubbed off them, and are either dead or dying. In one place of approximately an eighth of an acre I counted twenty trees that were completely ringbarked. Close by is a compartment of some 40 acres of sweet chestnuts: these have been browsed on and broken down so that it would be difficult to find more than three dozen trees that are not maimed. A very necessary experiment of underplanting indigenous forest with conifers was started a few years ago, but every one of the young pines (*strobus*) has had its leader bitten or broken off, and the experiment is spoiled. Incidentally the actual cost (£200) has been lost, but the greatest loss is that the experiment has been put back some years. It will have to be repeated elsewhere.

Farmers in the same district have had their young shelter-belts destroyed in the same manner, and shelter-belts are very necessary on the farm.

I am quite certain that the regeneration or replanting of the State's exotic plantations can never be accomplished if the presence of deer is allowed. The older compartments supply the necessary harbour from which the animals will carry out their depredations. European foresters state that the presence of deer is inimical to forest development, and the same thing must apply here.

The National Economic Position.

From the foregoing it will be seen that the damage is great, far exceeding the advantages gained; but it is necessary that the position should be presented, if possible, in comparative figures.

We have, on the one hand, an estimated credit to deer of £7,000. Against this must be balanced (1) displacement of stock, (2) damage to farms (crops, pastures, fences, &c.), (3) damage in the forests. The first two are in many cases dependent on one another and impossible to separate. Loss or partial loss of a crop of turnips, for instance, means a lessened carrying-capacity on the farm. I will therefore consider these together as displacements.

It has been estimated to me that a deer requires as much food as three sheep, or three-quarters that required by a cattle-beast. This estimate is in my opinion correct were the land in question wholly suited to grazing with sheep or cattle, or forest only suited to cattle. I will therefore assume that one cattle-beast is equal to four sheep, and work totally on the basis of sheep.

Taking all the land affected into consideration—viz., (*a*) that totally unsuited to grazing, (*b*) that partially so (mountain country grazed only in summer), (*c*) that wholly suited, and (*d*) that suited to grazing and cropping—it is evident that as the land totally unsuited to grazing carries a big proportion of the herds of deer, the displacement of three sheep for one deer is a high estimate; but to place it at half—say, one deer to one and a half sheep—is a fair average. I have estimated the deer herds of the Dominion at some 300,000 head, so that the number of sheep displaced is approximately 450,000 head. A large proportion of these would be high-country sheep, worth on an average 5s. per annum; another proportion would be those of lower-country ewes producing store lambs worth about 10s. per annum; thirdly, ewes on land suitable to the production of fat lambs. It is on this class of land that damage to the farms is most evident, and I will therefore assess these ewes at £1 per annum. Lastly, there are the cattle displaced in the forest, each equal at present prices to four high-country sheep, or £1 per head per annum. Considering all these, I will make the basis that each sheep displaced is a loss of 8s.—a total of £180,000 per annum.

From the forest aspect the damage in forests harbouring numbers of deer is impossible to assess in terms of cash. I have stated that the presence of anything but strictly controlled grazing is inimical to the perpetuation of these forests for posterity, so that, unless deer are regulated in them to a degree commensurate with forest regeneration, they will ultimately be lost. The value of the damage being done where deer are uncontrolled is therefore the value of those forests.

Control.

In this Dominion the control of deer is vested in the various acclimatization societies in whose district they happen to be. Some of these societies, alive to the necessity of keeping up the standard of their herd, have culled regularly and rigidly, with the result that the herds are more or less under control and have never increased sufficiently to become a menace. Other societies, again, either from lack of funds or knowledge of the damage of increasing herds, have followed a policy of drift, their herds now being completely out of control and spread over land where it is not economic that they should be. To bring these herds back to a standard commensurate with other interests I would suggest the following:—

(1.) On settlement or contiguous to settlement land the protection should be wholly removed, and I have every reason to believe this will provide the means of control in these areas. The carcases and hides of deer killed should be allowed to be marketed: this is only some little compensation for damage done. It will probably be stated that this procedure will be open to abuse, but there can be no abuse in eliminating an obvious pest.

(2.) More remote land, pastoral country, forested lands, &c.: The removal of protection will not provide means of control here. Stalking is an arduous task on this class of land, and to reduce the numbers only two methods are available, *i.e.*: (*a.*) Employing men to shoot. This method will cost money, and is work for experts only. (*b.*) Poisoning has been tried with some success, surreptitiously, of course, the baits being apples and carrots poisoned with strychnine. This is a risky method, and should not be used except in extreme cases.

Recommendations.

Should it be deemed advisable that the protection be not entirely taken from deer, I would recommend that they be confined to areas where there is no possibility of their becoming a nuisance. The areas should be demarcated, and once a deer steps over the boundary there should be no protection for it.

An investigation is proceeding into the probable use to which deer-skins can be put. As the tanning of leather is a long process, it will be some considerable time before the results are known.

A. N. Perham,
Forest Assistant.

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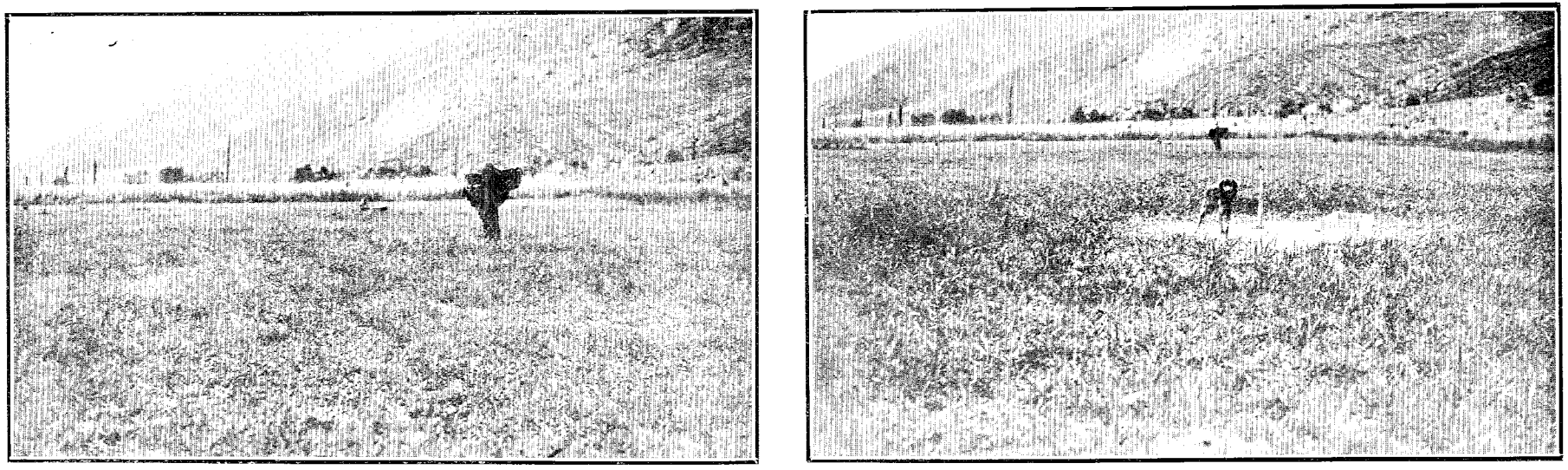
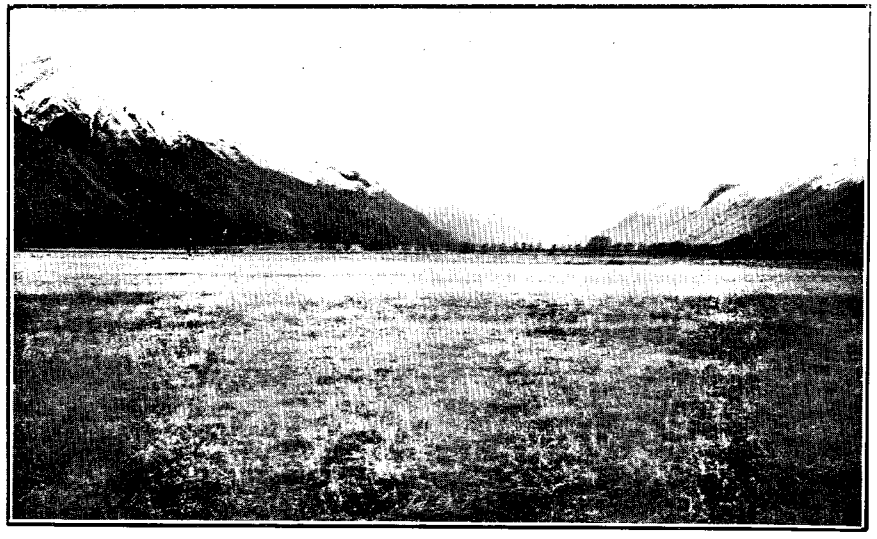
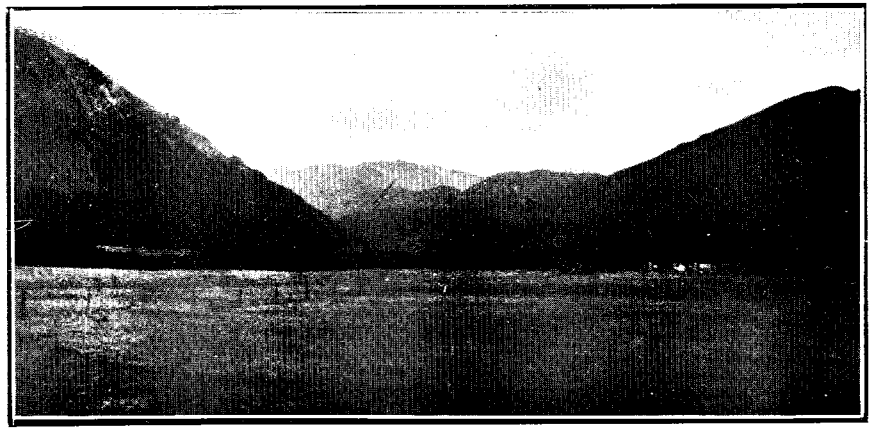


Oat Crop, Wangapeka Valley, Nelson, destroyed by Deer.
(Note longer growth in vicinity of dog and scarecrow.)

Turnip Crop partially destroyed : Lake Hawea.
(Over 130 head feeding on the crop were shot.)



HUNTER VALLEY, OTAGO: SHOWING LAND SUITED TO CROPPING, BUT WHICH CANNOT BE CROPPED OWING TO PRESENCE OF DEER.



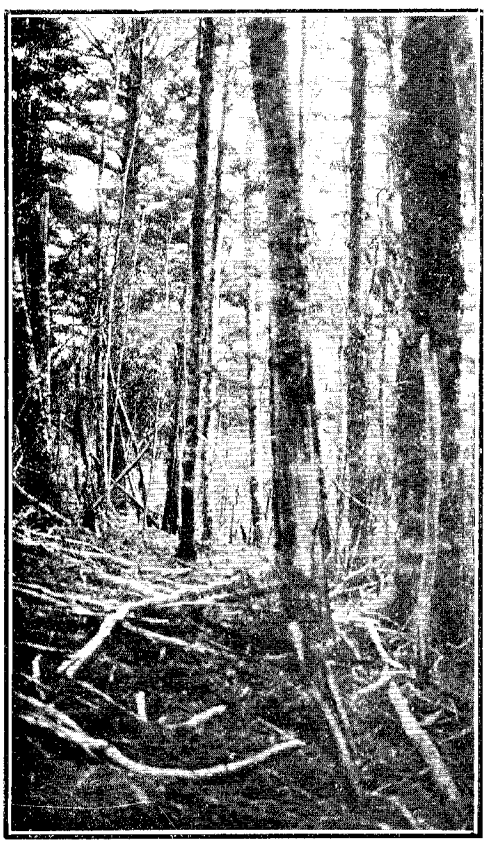
DINGLE VALLEY, OTAGO: SHOWING TYPICAL DEER COUNTRY.
(Carrying at present one sheep to 20 acres, but capable of one to 10 acres in the absence of deer and rabbits.)

BEECH REGENERATION DEAD OR RUINED: HUNTER VALLEY, OTAGO.

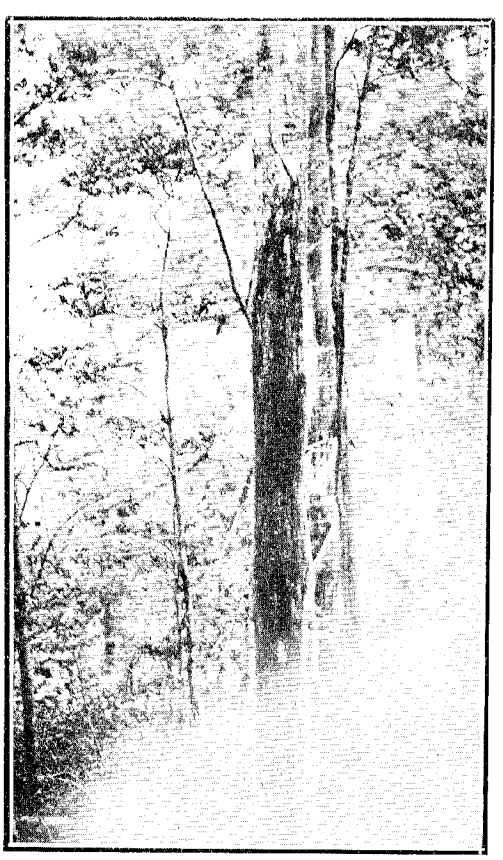
DESTRUCTION AMONG BEECH AND TANEKAHA REGENERATION: HUNTER VALLEY, OTAGO.

Young Totara-tree stripped of Bark: Lillburn, Southland.

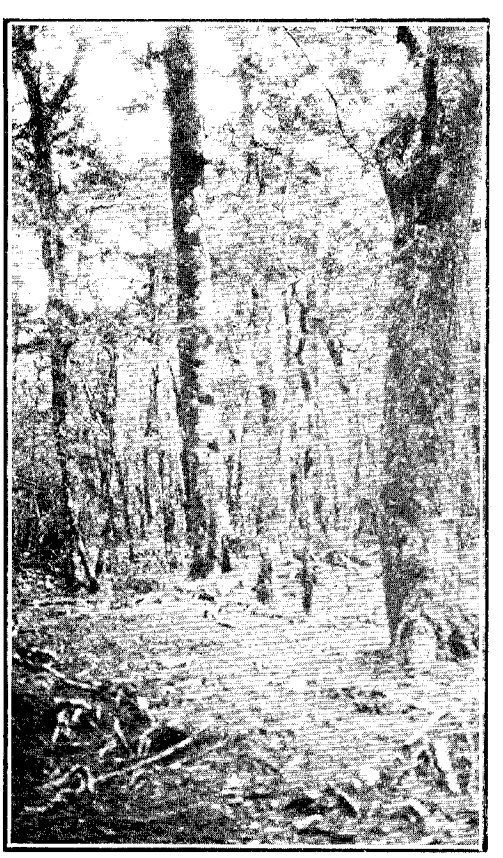
(Out of thirty young totaras only three were not ringed.)



Beech-tree (10 in. diameter) ringbarked and dying: Lillburn, Southland.

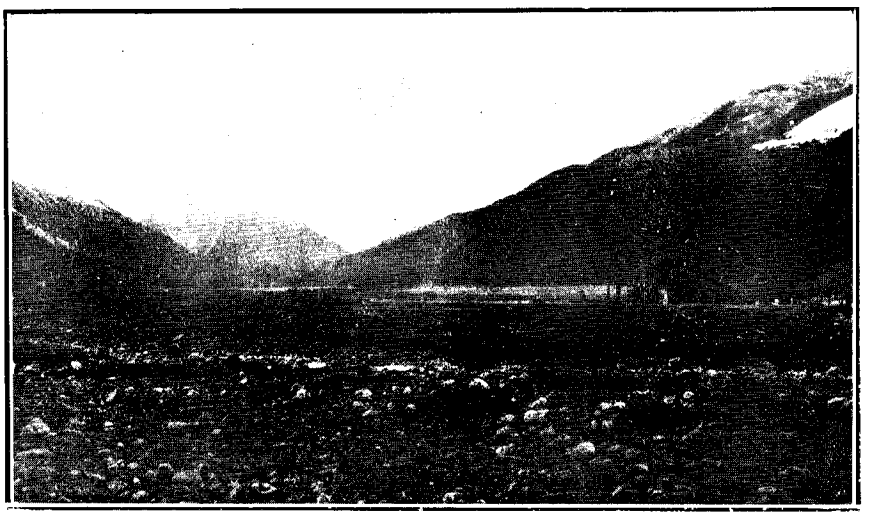


Beech-tree (3 in. diameter) ringbarked and dying: Lillburn, Southland.



Forest in Deer Country, Hunter Valley, Otago.

(Note bare floor and absence of regeneration.)

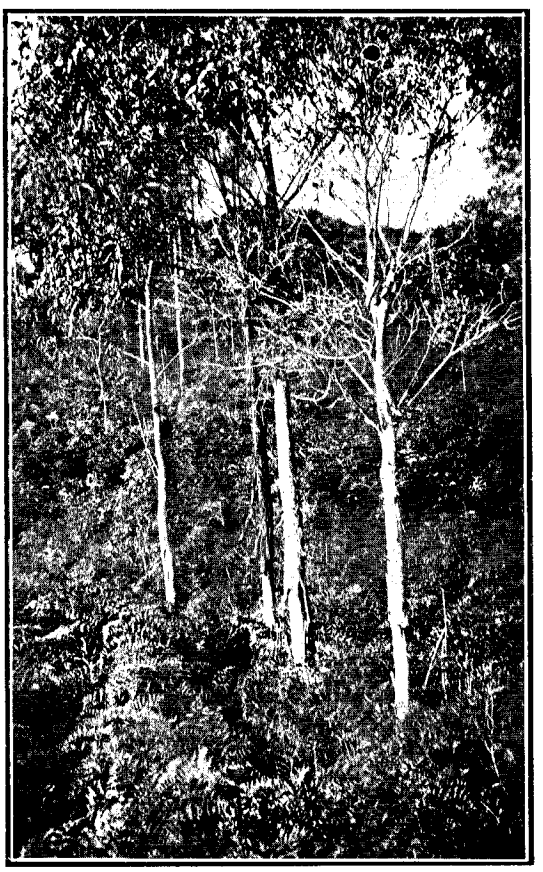


Forested Lands of the Upper Hunter Valley.
(It is imperative that this forest be kept intact for the preservation of stream-flow.)

Douglas Fir ringbarked by Deer: Whakarewarewa Plantation Reserve.

Bark stripped from Pinus insignis by Deer: Whakarewarewa.

Interior View of Forest, Hunter Valley.
(Note bare floor and absence of late regeneration.)

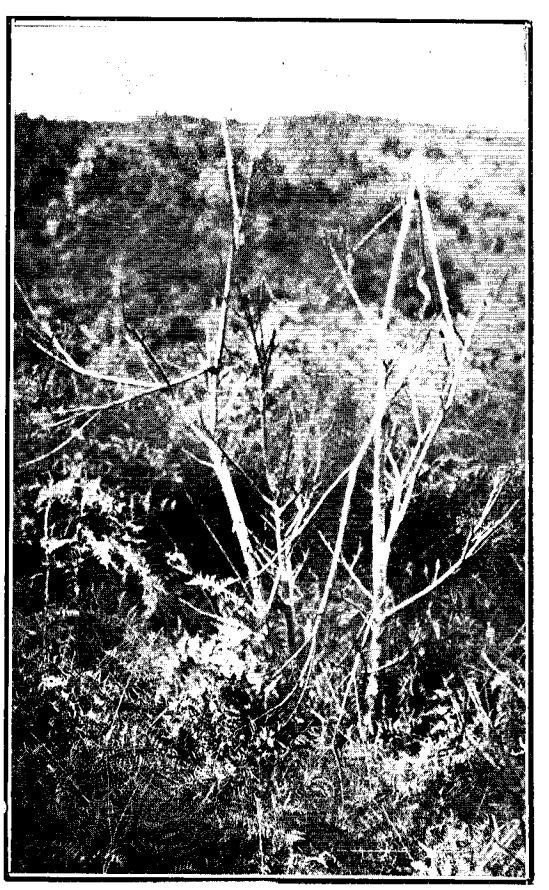


EUCALYPTS DAMAGED BY DEER: WHAKAREWAREWA.

DESTRUCTION AMONG YOUNG PINUS INSIGNIS: WHAKAREWAREWA

(In $\frac{1}{8}$ acre here about twenty trees are destroyed.)

E. VIMINALIS RINGBARKED AND DEAD: WHAKAREWAREWA.



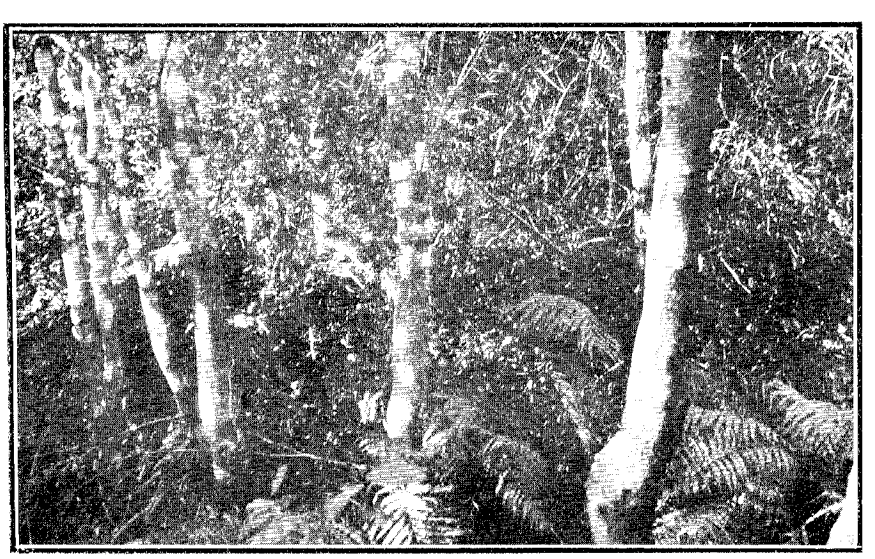
YOUNG CHESTNUT BROWSED OR BROKEN AND MAIMED: WHAKAREWAREWA.

(In 40 acres practically every tree is broken like this.)

PINUS STROBUS WITH LEADER BITTEN OFF: WHAKAREWAREWA RESERVE.

(Every tree in an experiment of underplanting 17 acres in indigenous forest has been treated in this manner.)

PANAX STRIPPED OF BARK: WHAKAREWAREWA RESERVE.



GROUP OF PANAX STRIPPED: WHAKAREWAREWA RESERVE.