STUDY OF DEER FENCING AND CHANGES INDUCED IN VEGETATION—ALTON VALLEY

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Summary

In the management of silver beech production forest in the Alton Vally, 2580 acres, comprising mostly virgin forest, have been ring fenced as an experimental project to protect new regeneration against red deer.Notes are given on the design and construction of the fence, the examination of its effectiveness, and the progress made in deer elimination. A series of line plot belt transects which have been laid out across the fence line for study of changes in the vegetation are also described. An outline is given of the data recorded during the two years since the fence was completed; these lend emphasis to the need for the total elimination of the deer which still remain inside.

INTRODUCTION

With the beginning in 1950 of regular silvicultural operations designed to convert by natural regeneration the virgin *Nothofagus* forests of Rowallan State Forest, Western Southland, to new managed crops of silver beech (*N. menziesii*), it was considered necessary to protect regeneration by fencing against red deer. (Williams and Chavasse 1951). The Alton Valley catchment, 2,580 acres, was selected as the first area to be regenerated. This area had carried an effectively high deer population for some thirty years. These animals browsed all silver beech and mountain beech (*N. cliffortioides*) seedlings almost as soon as they appeared. Shooting alone was not expected to afford sufficient protection because of the numbers of deer which would immediately move into the catchment from the vast continuous areas of forest which extend further to the west. Fencing against deer combined with intensive hunting in the fenced area were thus considered essential measures to allow new beech regeneration to grow unharmed.

In carrying out this work, its experimental nature was fully recognized and a research project was initiated with the following objects:

(i) To determine the effectiveness of the fence.

(ii) To record data on deer population levels.

(iii) To determine what changes take place in the composition and condition of the forest where deer are excluded.

(iv) To gain any other information which might be of value in indigenous forest silviculture and protection.

The fence was completed in May, 1953, and a series of permanent, line plot belt transects extending for one chain on either side of

and at right angles to the fence were established in September of the same year. This paper gives an account of the work and an outline of the results which have so far been obtained.

DESCRIPTION OF FENCE

Location. The deer fence surrounds the upper catchment of the Alton Valley. The fence line follows the main catchment ridge. Where it crosses the valley it follows subsidiary ridges and spurs.

Ridges were followed to permit easier construction; major gullies and slopes were avoided to lessen the risk of deer jumping the fence from high take-off points outside. This location also suited forest management and the area fenced is an entire topographical unit.

Design. The design of the fence is shown in Figure 1. The minimum dimensions of the posts were nine feet long by twenty-four square inches in cross section, and the posts were sunk two feet into the ground. Standing trees, frequently miro (*Podocarpus ferrugineus*) and cull beech, were used for nearly all strainers and, wherever possible, for posts. The posts were spaced twelve feet apart and six foot battens split from kamahi (*Weinmannia racemosa*) and sap totara (*Podocarpus hallii*) were spaced six feet apart.

For almost the entire length of the fence through virgin forest, hewn heart totara posts were used. Over a 40 chain stretch where no totara posts were readily available, use was made of mountain beech. The bottom three feet of these were painted with creosote, but a number were left untreated to test the durability of this species.

Through the open land and old workings in the east of the fenced area, it was necessary to use normal posts 5 feet 6 inches long. Some of these were creosoted larch (*Larix decidua*) and others hewn totara. A vertical extension, seven to eight feet long, of stout manuka (*Leptospermum scoparium*), was twitched to these short posts to give the required height. It was found that one or two solid nine foot totara posts for every three short posts greatly improved the strength of the fence on these sections. No leaning outrigger was used at the top of the fence because of the increased cost that would be involved both in erection of the fence and in its maintenance.

In all hollows, tie downs were used to prevent the posts lifting when the wires were strained, and very thorough aprons were constructed with durable stakes and extra barbed wires so that at no point was the bottom wire more than nine inches from the ground. In practice it was found necessary to have the bottom wire generally less than nine inches from the ground because of numerous minor undulations in the surface.

As a final addition it was found necessary to twist on short lacing wire droppers between the 1st and 6th wires every two feet.

Length and Cost of Fence. The total length of the fence is nine miles and fifty-four chains, and, on an acreage basis, the cost has been less than £3 per acre. Though in addition there will be charges

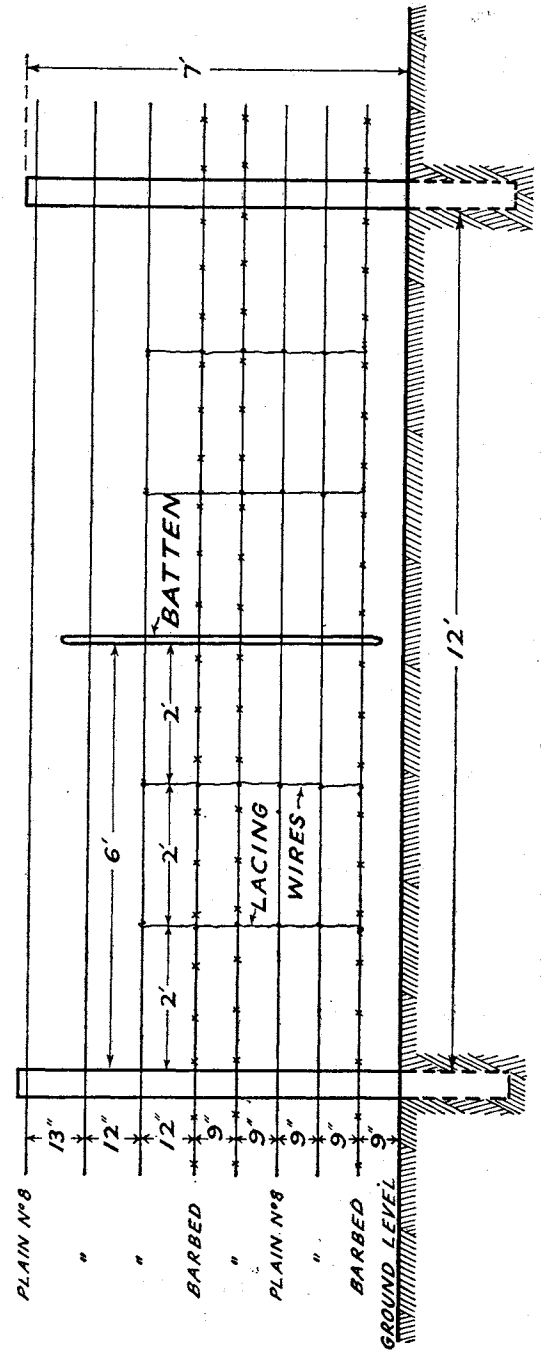

Figure 1. Design of deer fence, Alton Valley enclosure.

for maintenance, the actual total cost per acre may be less as at least six miles of the same fence can be used in the future to exclude deer from adjoining catchments. At the current rate of logging and silvicultural operations, the area of the exclosure is sufficient for about fifteen years working.

Checks on Effectiveness of Fence. In co-operation with the Field Research Crew, Wildlife Division, Department of Internal Affairs, thorough checks were made of the effectiveness of the fence during November and December, 1952. At this time the fence had not been completed in the north-west, and the wire droppers had not been added.

Detailed inspections revealed seventy-two crossings, mostly determined from the evidence of deer tracks coupled with the finding of hairs on the barbed wire. It was found that the main dangers were deer crossing under the fence or through it, most commonly between the lower wires, but at any height up to the space between the 5th and 6th wires, i.e. at 45 to 57 inches. Several crossings were recorded where deer had gone through an 8½ inch vertical gap between well strained wires.

Trial improvements were then made with wire droppers at varying spacings. By further detailed checks it was found that wire droppers two feet apart were necessary to make this design of fence deer proof. These were added, and at the same time any short gaps of nine to ten inches below the bottom wire were sealed with further wires or with logs.

Later, in May 1953, after completion of the fence, a thorough check was again made in co-operation with the Wildlife Division, but no further crossings were discovered. As far as can be ascertained from a careful study of deer tracks, deer have not attempted to jump the fence. Though a few could probably do so, it appears that the total height of six feet ten inches is sufficient to discourage them.

Maintenance of Fence. Periodic inspections have been made, generally fortnightly, or otherwise immediately following any snow, heavy rain, or high winds. The breaks that have occurred have rarely been extensive and in all cases have been quickly repaired. Most have occurred only in the top wires and have been caused by falling limbs. Though a deer was suspected to have broken a lacing wire dropper and then crossed the fence, as evidenced by hair on nearby barbs, this crossing was not confirmed by any sign of tracks. In some cases deer tracks have been found outside a break, but there was no suggestion that the deer had attempted to cross over the loose and tangled wires.

LAYOUT OF BELT TRANSECTS

Description. The line plot belt transects are laid out in selected locations at right angles to the fence extending for one chain on either side. Each belt transect comprises a total of twelve plots, each

one square yard, i.e. six replications, spaced at six feet, fifteen feet, twenty-seven feet, thirty-nine feet, fifty-one feet, and sixty-three feet away from and on either side of the fence. By this means it is hoped that useful comparisons may be obtained between the growth of the vegetation on the plots inside and outside the fence. In selecting the site for each belt transect, great care was taken that the forest type was uniform throughout, and that both halves had the same aspect, slope, and drainage.

In marking out the belt transects, squared pegs hewn from heart totara were driven in at two opposite corners of each plot.

Location of Belt Transects. A total of ten line plot belt transects were laid out. An attempt was made to include all the different forest types encountered along the fence line, and to distribute the belt transects well apart so as to obtain as wide a coverage as possible. The different forest types which have been included are logged mixed beech/podocarp forest, logged pure podocarp forest, virgin mixed beech/podocarp forest, virgin pure podocarp forest, virgin pure silver beech forest, and virgin mixed silver/mountain beech forest. It can be anticipated that within ten to fifteen years' time most of the virgin forest surrounding the belt transects will have been worked, at least on the inside of the fence. This will limit the period of the study, but it is intended to preserve the local environment for as long as possible, preventing any unnatural disturbance of the vegetation within two chains of any of the plots.

Method of Recording Data. The method used for recording the data was by plotting the vegetation on graph paper combined with descriptions and photographs.

A plan of each belt transect was ruled on graph paper and the location of each shrub, tree or fern occurring in each plot was shown by a dot followed by a symbol representing the botanical name of the species. In addition, the measured height of each plant was recorded in inches, and if it had been browsed the letter "b" was also added. For example,

'. Wr 1" represents two *Weinmannia racemosa,* both 1 inch high, not browsed;

and . Nm 12"b represents *Nothofagus menziesii,* 12 inches, browsed.

Descriptions were also made of each plot indicating any other small plants present, such as herbs and mosses, and the degree of shade or any other points of interest. For each belt transect full notes were also made of the location, elevation, aspect, slope, type of forest, and soil. In addition, two photographs were taken of each belt transect, one from inside and the other from outside the fence. These were taken from near the extremities of each belt transect so as to obtain as wide a coverage as possible.

It is intended that observations should be made each year, in September, with detailed records prepared either annually or biennially according to the rate of change in the vegetation.

HISTORY OF DEER POPULATION

Red deer were first liberated in nearby forests in 1900. The population then rapidly increased and is believed to have reached peak density between 1925 and 1935. At this time palatable food plants were almost completely eaten out, and this resulted in a fall in the population levels. (Holloway 1950.) Subsequently, after about 1935, population densities in the Alton Valley are believed to have remained relatively stable. Though the actual numbers of deer present were not great, they were sufficient to check nearly all new young growth of the palatable species, including silver and mountain beech.

In July, 1952, the Deer Research Crew of the Wildlife Division studied population densities in the Alton Valley, using the pellet count technique. These were followed by further checks in December, 1952, and in May, 1953. Interim conclusions drawn as a result of this work (Riney 1953) were that:

(i) the greater proportion of deer use in the Alton Valley occurred during winter and

(ii) that the highest winter use was on south facing slopes.

Following completion of the fence in May, 1953, intensive hunting was undertaken by the Deer Research Crew and has been continued, with periods of spelling, by others, mostly Forest Service employees. With time the deer have become increasingly difficult to shoot; since March, 1954, payments for known kills have been made under a bonus scheme. Up to June, 1955, known kills totalled fifty-eight. Though this is an impressive tally, it was known shortly afterwards that a few more still remained.

OTHER OBSERVATIONS

Belt Transects. A point of interest noted on five of the belt transects which were laid out and measured in 1952 and again measured in September, 1953, was the severity of browsing on *Griselinia littoralis, Weinmannia racemosa,* and *Coprosma foetidissima.* A number of these plants which were only five or six inches tall in 1952 and had never been conspicuous, having been mostly obscured by other shrubs and ferns, had been browsed back by deer to two inches or less.

Another feature was the disappearance or dying out of young miro seedlings. These are generally profuse in podocarp areas but very few develop to saplings. The loss of these seedlings is not attributed to deer but to other ecological causes.

Silver Beech Regeneration Areas. An assessment in July, 1953, of the first areas treated for silver beech regeneration, and which were favoured with good seed years in 1950/51 and 1951/52, showed a stocking of some 18,000 young seedlings per acre. Four per cent. of all new silver beech seedlings and thirty per cent. of those over six inches tall had been browsed by deer. Nearly all of this browsing had occurred after January, 1953. Over several years it has been noted that deer cause most damage to silver beech seedlings from mid-summer to early winter.

Later, in August 1954, a further assessment was made of the same area. At this time a total of thirty-one deer had been shot, but the results indicated, at least superficially, that the position had in no way improved. The total stocking had fallen to 9,000 seedlings per acre, which is a lower stocking than is desired, and 15% of these seedlings had been browsed. This loss was due mainly to increasing competition from *Histiopteris incisa* and other weeds, but some of it was due to deer. Browsing was noted on 24% of all seedlings over four inches tall. There is no knowledge of the original heights of these seedlings before they were damaged, but observations indicate that the intensity of browsing is greatest on the tallest and most vigorous. In several instances particular seedlings over two feet high early in 1954 were later found to have been browsed back to eight or ten inches. Similarly, but less frequently, others over eight inches have been reduced to three or four inches.

CONCLUSIONS

In analysis the initial results are not yet conclusive. They do not take into account the percentage of seedlings which deer may have totally destroyed. Coupled with other periodic observations, however, they are sufficient to show:

(i) The intensity of browsing would appear to increase as the seedlings become taller, particularly after two years of age or when they have grown to a height of four to six inches.

(ii) In the continued presence of deer, young silver beech regeneration is susceptible to severe damage, by reduction of stocking, by malformation of individual seedlings, or by checking of height growth which will lessen the ability of the regeneration to compete with weeds. This is little more than confirmation of previously held views, but does stress the importance of adequate protection in forests where deer populations are high, particularly where there are also silvicultural difficulties and new regeneration is likely to be sparse. Considered in the light of silvicultural measures at present likely to be practicable in the Alton Valley silver beech forests, any excessive loss, malformation, or checking of the regeneration in its early stages might well mean the difference between success or failure. The essentials are the total elimination of the remaining deer, with continued vigilant study of the effectiveness of the fence.

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