

New Zealand Ecological Society

Report of Sixth Annual Meeting

The sixth Annual Meeting of the New Zealand Ecological Society was held in Palmerston North on Thursday and Friday, August 29th and 30th, 1957. To accommodate members travelling from the south, some change in the usual programme was necessary, and the whole of the first day was devoted to contributed papers on a wide variety of subjects. The second day was filled by a symposium on "Sand Country Ecology," with contributions from eight invited speakers in the morning, and a general discussion in the afternoon. The Annual General Meeting, followed by the Presidential Address and supper, was held on Thursday evening. On Saturday over thirty members joined an excursion to tour the sand country which had been the subject of Friday's symposium, and saw at first hand the ecological features and experimental work which had been described. The Forest Service provided transport over the sand dunes, and they and other speakers covered salient points for the excursion. Attendances at the sessions of the Conference fluctuated, the highest being about fifty.

PRESIDENTIAL ADDRESS

Ecology and Grassland

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We will search in vain in many dictionaries for the word "ecology." Similarly will we search in vain amongst many grassland practitioners for a knowledge of ecology or an appreciation of its significance in grassland farming.

Those of us who have virtually grown up with an ecological background and bias find it difficult to understand how it is that some people do not realise its importance. Yet day after day we meet people in various callings who are performing acts which they would regard as being quite unsound were they to understand the ecological significance of what they are trying to achieve.

There is the farmer who rings up his seed merchant and asks him to send out the "same mixture as usual" or merely "enough seed for 20 acres." The merchant may or may not know where the seed is to be sown or how the pasture is to be used. He, nevertheless, sends out a "seeds mixture," which may or may not be suitable. If either the farmer or the merchant had a knowledge of ecology, not necessarily by that name, a suitable type of seeds mixture would have been sown.

Then there is the noxious weeds inspector, whose duty is to ensure that certain plants classed as "noxious" are destroyed. His duties, unfortunately, do not go any further than the point of destruction. The result is that the farmer destroys the weeds but the same weeds re-invade the pasture because the ecological conditions have not been changed. With even a smattering of ecological knowledge the inspector could warn the farmer that he is likely to be in constant trouble if he does not change the conditions so that the weeds will not thrive.

There is also the farmer who, for years, has cut manuka at varying intervals. He has had to cut it repeatedly because he has done nothing to alter the conditions under which it is growing. As soon as he alters the conditions to encourage vigorous and competitive growth of useful pasture plants, the manuka will fail to re-appear.

Grassland farming in New Zealand is based on our ability to successfully destroy vegetation which is useless for grazing animals and to replace it with vegetation which is useful to them. That this procedure is successful is

apparent in that this "replacement vegetation" provides feed for most of 40 million sheep and 6 million cattle upon which 2 million people are basically dependent for their well-being.

To the ecologist some of the changes that have taken place are of interest.

NORTH ISLAND RAIN FOREST

Following the destruction of the hill country forest by axe and by fire, pasture was soon established between the stumps and the logs. As a rule high fertility demanding species were sown and many of these died out as the fleeting fertility disappeared. Ground seldom remains bare for very long and very soon the indigenous forest plants commenced to re-establish in the bare spaces.

In some areas where competition from the sown species and from grazing animals was not adequate, the forest species survived and eventually put the land out of farm production.

In other parts the forest plants as a whole failed to survive and good grassland resulted. The palatable plants were eaten out, and the fragile plants were tramped out. In many areas, however, the tough and unpalatable plants survived. Once this phase had been reached the farmer's endeavour was to increase carrying capacity in the hopes that the unpalatable plants would be eaten or damaged. Usually stock were in the same paddocks for much of the year. The result was the selective and harder grazing of the palatable species which decreased, and allowed the unpalatable ones to increase. In this connection the cycle relating to hard fern is of interest. Under close selective grazing, hard fern which is unpalatable to sheep increases by overground runners. The harder the grazing the more favourable are the conditions for its spread. After a number of years of this treatment the hard fern rings join and it becomes the dominant plant. The result is a drop in carrying capacity to the extent that the palatable and fragile plants are able to establish and survive. The commonest of these is bracken fern. Within a few years this increases to such an extent that it in turn becomes the dominant plant which, because of its taller growth, smothers the hard fern. If it is left, the bracken fern acts as a nursery for the initiation of the re-establishment of forest. In practice this does not usually take place as the farmer burns the bracken and oversows, thus initiating the cycle again. The only permanent control is in the breaking of this cycle by altering the ecological conditions. The best point at which this can be done is in the early stages of the establishment of the hard fern. Topdressing and spelling enable more stock to

be carried and cause the hard fern runners to be lifted off the ground and prevented from rooting. For many years the breaking of this cycle by means of surface seeding and topdressing was impracticable. With the advent of the aeroplane as an item of farm machinery, it is likely that hard fern, if dealt with at the right stage, will be greatly reduced.

Other plants for which somewhat similar cycles exist are manuka, gorse and tauhinu. All of these will appear repeatedly if cut or burnt but are much less likely to re-appear if the fertility is raised to enable more stock to be carried on better pasture. The well known manuka "blight" is providing some good examples of ecological changes. After the "blight" has been operating for several years the leaves of the manuka fall and more light reaches the ground. The result is the establishment of plants, the seed of which is there on the ground ready to germinate. Surface sowing of grasses and clovers associated with topdressing provides competition and assists in preventing the establishment of undesirable plants. If, however, areas are not oversown or topdressed, undesirable plants such as blackberry, gorse and briar, establish easily and ultimately take charge. In this case the effect of the "blight" is merely the replacement of one unpalatable species by one or more other unpalatable and undesirable species.

FERN COUNTRY

To an ecologist some of the changes that have taken place on some of the one-time fern-covered hills of Hawke's Bay are of particular interest.

This fern-covered country was burnt over by the early settlers, and because of the local abundance of *Danthonia* this grass, which thrives under burning, rapidly became dominant. For many years this easily managed *Danthonia* was repeatedly burnt in order to provide palatable spring growth for sheep feed. This represents what is probably the easiest form of pasture management and proved to be satisfactory and economical. During the last 25 years or so the fertility, production and carrying capacity of this country has been raised by the application of phosphatic fertilisers following or associated with the introduction of subterranean clover. This has had the effect of enabling more stock to be carried and more fat lambs to be produced. It has also had the important effect of changing, certainly slowly, but nevertheless surely, a perennial plant covering into an annual plant covering. Where this change has reached an advanced stage the *Danthonia* has been replaced initially by subterranean clover and ryegrass. Later the

ryegrass has tended to be replaced by annual plants such as storksbill and barley grass. These changes are likely to have far-reaching effects, as would be expected with a change such as this. During the last few years the increase of barley grass has caused farmers a great deal of concern and they are agitating for methods of control to be worked out. The ecology of the increase of barley grass suggests that control is likely to be very difficult. Barley grass is relatively unpalatable and is particularly so at and after the flowering stage. The result is that it is then neglected by stock and is, therefore, able to re-seed, re-establish and increase with little hindrance in a sward of annuals. Under the present system of farming it is therefore a logical conclusion that barley grass, together with any other unpalatable annuals, will increase. Chemical control is satisfactory as far as immediate destruction is concerned. It is, however, unsatisfactory in that it is unable to exert any measure of permanent control. Permanent control can be achieved only by the changing of the conditions so that perennials instead of annuals will dominate. Such a change can be brought about only by either lowering the fertility to the state where *Danthonia* will again tend to dominate or by introducing other perennial grasses which will compete successfully with the barley grass. Associated with this is the necessity for finding a perennial clover which can replace the very useful subterranean clover which has the weakness of all annuals, that of dying off each year and re-establishing from seed again.

The marriage of annual with perennial is not a happy stable ecological situation. Present indications are, therefore, that this type of country is faced with the possibility of the development of a major problem. When unpalatable annuals tend to gain ascendancy the country will almost certainly be reduced in carrying capacity.

TUSSOCK GRASSLAND

In the tussock grassland of the South Island very striking changes are now taking place. In Central Otago hordes of rabbits have, for many years, kept to a minimum the amount of vegetation which was palatable to them. The only plant that thrived under those conditions was seabweed. The result was that seabweed dominated the vegetation over large tracts of country. Since the rabbit population was reduced to a low and almost harmless level about two years ago, the vegetative cover has commenced to undergo a marked change. The plants which are now thriving are those which

were palatable to a greater or lesser degree to the rabbits. The number of sheep being carried is not being increased in proportion to the number of rabbits destroyed. This also allows the palatable plants to increase. It does, however, tend to favour the increase of plants which were eaten by the rabbits but which are unpalatable to the sheep. The result is a marked revival of a number of the tussock grasses, the very rapid increase in sweet briar, and the slow spread of St. John's wort. Because of the low intensity of stocking, the increase in the population of annuals has been very great. *Vulpia*, *Aira*, *Bromus tectorum* and *Trifolium arvense* are all invading the seabweed-covered land at a very rapid rate. Associated with this change has been a period in which two comparatively wet summers and at least one mild wet winter have been experienced. If the country is to be re-clothed with useful vegetation it will be necessary to take advantage of the short period that will elapse between the elimination of the rabbit and the domination of the annuals and the unpalatables. The only way in which this can be done is by the introduction and encouragement of the useful perennials whether they are indigenous or introduced.

Another and equally interesting change that is taking place is that associated with the introduction of perennial legumes, particularly white clover, into the higher rainfall tussock country. Experience is showing that this legume can be readily introduced when associated with the application of fertilisers containing phosphorus, sulphur or molybdenum. It is difficult to forecast what the effect of this will be. Indications are that the ultimate effect will be the replacement of the present bunch grass formation by a formation dominated by mat-forming plants which are capable of standing the more intensive stocking which must take place if the run holders are to secure an adequate return for their expenditure on seed, fertilisers and labour. Such changes have taken place already and these changes are likely to become more widespread.

In this address I have endeavoured to discuss a few of the many facets of grassland development. I have tried to point out by examples how important it is that those who control the destiny of our grassland, and therefore our prosperity, should realise that any changes which they make may result in far-reaching effects.

And lastly, I have tried to emphasise, mainly by inference, how important ecology and a knowledge of its significance is to all concerned with grassland.