IN NEW ZEALAND CONTEMPORARIES

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CONTROL OF OPOSSUMS AN URGENT PROBLEM. L. T. Pracey and R. I. Keen, Vol. 78, No. 4, April, 1949.

All the opossums now established in New Zealand are assigned to the species *Trichosurus vulpecula*. Several sub-species or varieties have been recognised within this widely distributed species in Australia but as there has been much intermingling and interbreeding of stock introduced from different sources at various times during the latter half of the last century, no classification other than that used in the skin trade can be usefully made. The animal was introduced to establish a fur industry and, as late as 1928, it was not generally regarded as harmful to indigenous forests ; but subsequently the cumulative effect of its browsing in greatly increased numbers has led to its recognition as a serious pest of the indigenous as well as of the exotic forest, orchard and garden.

The authors, officers of the Wild Life Branch, Department of Internal Affairs, record observations made mainly in protection forest in the Orongorongo Valley near Wellington. Breeding habits are described : normally there is one pregnancy in the year, but under favourable conditions there may be two ; twin births are rare and it is doubtful whether more than one can ever survive. Feeding habits were studied by field observation supplemented by experimental feeding in captivity and by stomach analyses. Leaves are the principal food, but flowers and fruits rank high ; though bark biting is one of the most obvious opossum signs, bark becomes a significant item of diet only when normal browsing is restricted, as by weather. The frequent correlation between high opossum population and high density of ground feeding animals, such as deer and goats, is attributed to the improvement brought about in the opossum's environment by removal of undergrowth and drying out of the forest floor. Opossums are more numerous in the more open parts of the forest.

Preferred species for browsing foliage, flowers, fruit and bark are given, and it is concluded that a selective feeding, even by a moderate population, must lead to a considerable alteration in the composition of indigenous forests. Where opossum damage is associated with browsing of regeneration by deer or goats, the deterioration of the forest is likely to be much more rapid. The effect of the opossum on the forest birds appears to be mainly indirect, through the reduction of food supply and other alterations to the habitat.

MANUKA BLIGHT SURVEY. T. G. Sewell, Vol. 79, No. 2, August, 1949

During the past year considerable interest has been aroused in the so-called "manuka blight" which has been associated with the death of *Leptospermum scoparium* in parts of Canterbury. The blighted appearance of the affected plants is due to a fungus which develops on the honey dew excreted by a mealy bug type of scale insect of the genus *Eriococcus*. Though as early as 1887 Maskell had recorded six scale insects on manuka, the effects of the present species of *Eriococcus* did not cause comment until 1935, and only since 1946 has its spread led to closer study.

At present there is no evidence of the insect's natural occurrence beyond Canterbury. Though attempts have since been made to extend it to other districts, particularly in the North Island, the author points out that careful consideration must be given before undertaking the further deliberate spread of the blight. If it were effective, the hill country farmer would benefit greatly, but one must recognise the beneficial functions of manuka as a "nurse" for forest regeneration and in controlling soil erosion.

Eriococcus occurs also on kanuka or white manuka (*L. ericoides*) which, however, is not so severely affected, there being only a few recorded instances of death resulting. After a brief description of the mealy bug and its life history as far as this is known at present, the author refers to five of the previously known scale insects which were observed on manuka and kanuka in a recent survey. The hard-scaled species, *Ctenochiton flavus*, *Inglisia leptospermi* and *I. ornata* were sparsely distributed on the West Coast of the South Island and in the North Island. The other soft scale or mealy bug, *Coelostomidia wairoensis*, has a wide distribution, occurring mainly on kanuka in the warmer, sheltered and humid areas of the North Island and in the South Island as far south as Peel Forest. *Coelostomidia* is larger than *Eriococcus*; its red colour, long filamentous protruberance and the moss-like nature of its associated mould help to distinguish it. In only two places in the North Island had death of manuka and kanuka infested with *Coelostomidia* occurred.

The distribution of *Eriococcus* in Canterbury is supported by a map; it occurs in widely different types of soil and to an elevation of at least 1,550 ft. Trees up to 10 ft. high have been killed, but the most susceptible plants are those up to 3 ft. high. The exact cause of death of manuka has not yet been determined.

So far there is no conclusive evidence that *Eriococcus* has become established in any of the districts to which it has been transferred. The insect can be transferred best on branches in the "crawler" stage of its development.

CONTROL OF MANUKA BY BLIGHT. J. M. Hoy, Vol. 79, No. 4, October, 1949.

This article amplifies "Manuka Blight Survey" referred to above. Three species of mealy bug are associated with manuka (*Leptospermum scoparium*) and kanuka (*L. ericoides*) in New Zealand. *Coelostomidia wairoensis* is found principally on kanuka, *C. zealandia* occasionally on manuka, while *Eriococcus* sp. attacks manuka and, to a less degree, kanuka. In all cases the insects are associated with a black fungus which grows on their sticky excretion (honey dew) and gives rise to the name "manuka blight." *Eriococcus* sp. and *C. wairoensis* are described, and former's life history given as far as at present known.

Very few deaths among kanuka can be attributed to *Eriococcus*, but it has been responsible, directly or indirectly, for the death of large areas of manuka throughout Canterbury. Where manuka is from 10 to 15 ft. high a minimum period of 5 years is probably necessary from initial infestation until death of the plant; regrowth manuka may not die for at least 2 or 3 years, even where the original stand has been destroyed by the insect. Consequently early result cannot be expected from introductions of *Eriococcus*, and 6 or 7 years will elapse before even small areas of dead manuka will appear. *C. wairoensis*, though common on kanuka, and to a lesser degree on manuka, throughout the North Island and the northern part of the South Island, has yielded a few cases of mortality among kanuka only, these being in Northland and Tolaga Bay.

Eriococcus is best transferred on infested material between May and September when crawlers are present, the material being tied to or thrust into the base of the plants to be infested. Transfer by transplanting live manuka plants is not favoured. Cases are cited of successful introductions into Hawke's Bay in recent years and, even allowing for transfers made when no crawlers were present, and the supply of *Coelostomidia* in mistake, it is thought that *Eriococcus* must now be established in a considerable number of districts.

The author also refers to the useful purposes served by manuka as a forest "nurse," in control of erosion, as a source of firewood and as shelter for stock, though in the last connection kanuka, which is only rarely killed by *Eriococcus*, is much more important. Canterbury experience shows that the gradual killing of tall manuka and the resulting increase in light reaching the ground has led to the establishment of volunteer grasses and considerable regrowth of manuka,

which being heavily infested is usually killed before reaching a height of 3 ft. In some cases opening of the manuka is enabling bracken and gorse to take hold ; one case of replacement of manuka by tainui (*Pomaderris apetala*) is cited. But in no case in Canterbury has the gradual death of manuka induced erosion. Provided the dead manuka is not burnt, there seems little likelihood of increased erosion ; in any exceptional situations where an adequate cover will not be induced, spaced planting of exotic trees is suggested. In infested stands used as "nurses" for trees some harmful effect may result from honey dew, particularly to slow growing species.

SURVEY OF TREE PLANTING ON AN EAST COAST HILL COUNTRY FARM. M. Sutherland, Vol. 79, No. 5, November, 1949.

The author, who is Farm Forestry Officer, Department of Agriculture, described the results of 40 years of farm forestry on Puketiti Station, Poverty Bay.

The property is 3 miles west of Te Puia Springs and ranges in altitude from 1,000 to 1,733 ft. with an average annual rainfall of 82.93 inches; frosts are insufficient to affect tree growth. The two main soil types are, on the higher knobs, a brown sandy loam on dark yellow sandy loam on rotted compact yellow loam ; and, on the lower slopes, a dull brown, moderately compact clay loam on sticky mudstone clay. The original forest kept the soil surface in an absorbent condition but after clearing, burning and grassing the land surface became unstable, particularly on the mudstone formation. The sticky clay soil tended to slip on the underlying mudstone, while accelerated stream flow caused cutting down of gullies and erosion of stream banks leading to further slipping and slumping.

The station was brought into grass about the beginning of the century but the owners soon realised that some means must be found to counteract the effect of loss of forest cover and to hold up the movement of land in vulnerable areas. Beginning in 1902 the earlier plantings were made to provide shelter for stock, to produce farm timber and to beautify the property, but soon the main objective in planting became the control of erosion. At present the residual forest area covers about 60 acres and some 180 acres have been planted in forest formation, while widely spaced protective planting of broadleaf trees has been carried out over additional unstable pasture areas.

In the general scheme of preventive management the main objectives are :

(a) Reduction in the rate of run-off by the formation of a good sward of grass, local protection of stream banks and tree planting in the stream beds.

(b) Local arrest of earth flowage and slumpage by holding the slumping ground around the toes of slopes with widely spaced trees, mainly willows and poplars.

(c) Consolidation of large areas above and around the fixed toes by the establishment of closely spaced plantations, usually of conifers and eucalypts.

Though experience has enabled routine procedures to be evolved, each area must be treated in accordance with the particular conditions obtaining. Generally measures to combat land movement include three phases : First, fencing an area against stock, thus spelling it from grazing while trees are established. Second, widely spaced planting as a preventive measure to fix and stop land movement. Third, the formation of closely planted areas to hold and permanently stabilise moving land.

The establishment of plantations on a variety of sites and conditions has resulted in a valuable series of tree crops demonstrating different species, ages and treatments. However, the author points out that, though the species proved

suitable at Puketiti may give satisfactory results on much of the coastal hill country of Poverty Bay, caution must be used in applying the same treatment even within this district.

Both pure and mixed plantations have been established. *Pinus radiata* has already produced a large volume of millable timber and is regenerating freely ; but it is questioned whether species of better timber quality and more amenable to growing in mixtures may not be preferable. *Cupressus macrocarpa* is producing much fencing timber and, when accorded suitable silvicultural treatment on a rotation of 40 to 50 years, promises to yield satisfactory building timber, particularly when planted in mixture with suitable hardwoods. Douglas fir and Lawson cypress have grown well. No satisfactory mixture of the former has been achieved, but the cypress has given excellent results in mixture with larch. In favourable situations Californian redwood has reached 104 feet in 40 years as groups among other species.

Among the hardwoods *Salix fragilis*, *S. vitellina* and to a less extent *S. babylonica* have proved suitable for widely spaced planting in pasture, but poplars are now favoured for this purpose. *Robinia pseudacacia* has produced useful post timber of rather poor form at 1,200 feet and should be a valuable tree on suitable gully sites. Trials of the "shipmast" form are now being made. Two small groups of indigenous puriri planted as pure crops indicate that sufficient growth can be made to provide posts in about 30 years. Of the several eucalypts planted on the station *E. regnans*, *E. gigantea*, *E. obliqua*, *E. sieberiana* have grown excellently, while *E. corynocalyx*, *E. botryoides*, *E. acervilla* (*ovata*) and *E. globulus* are making satisfactory growth.

Unfortunately little information is available about the quality of the timbers grown at Puketiti, but there is much material 20 to 40 years old now available for investigation. Such an investigation on a Dominion-wide basis would provide valuable information on the properties and uses of trees commonly used in farm planting.

CONTROL OF SOIL EROSION IN JAPAN. A. W. Allo, Vol. 78, No. 3, March, 1949.

The soil erosion potential in Japan is very great due to its mountainous character with short swift streams, and, in the south, to the heavy monsoonal rains. The greatest single protection against erosion is the forest and scrub cover of the hills and mountains, and there is close co-operation between the forester and the soil conservation officer. Many of the basic principles adopted by the Japanese have been introduced from Europe with modifications to suit local conditions. There is little mechanisation and the amount of manual labour expended in terracing and other protective work is inconceivable in a country of higher living standards.

As a rule stabilisation of the rivers is the first stage in erosion control. Reduction in the rate of flow and consequently in the erosive power of streams is achieved by dams, protection of the beds with rocks or concrete waterways, diversion through country not susceptible to erosion and widening of beds to reduce velocity of flow. Stone is the most widely used material for dams, though major works may be in concrete ; earth and wood are frequently used for small dams in tributary streams ; gully control is usually achieved with stone dams. Cemented stone walls are a common form of river bank protection, though various other materials are used.

When the rivers have been brought under control the Japanese turn their attention to stabilisation and protection of the surrounding hills. The grading of slopes and formation of run-off channels are costly operations but are essential preliminaries to the development of some type of terracing which is normally the ultimate objective. The author describes several methods of terrace construction, some involving the planting of trees and shrubs.

Afforestation for erosion control takes two forms in Japan : the replanting of economically useful timber trees, and the planting of so-called soil improving species. The latter may be given a dominant place on steeper terraced slopes ; they are usually shallow-rooting, easily-established species. Seed of grasses and other soil-binding plants are often sown as an added protection. The author gives a list of trees commonly used for soil protection and improvement, and discusses methods of establishment.

Even in areas of high forest some slips and landslides have occurred under abnormal rainfall, and engineering works such as retaining walls, water channels and closed conduits have been built to prevent such damage.

So far erosion control in Japan has been largely concerned with the repair and restoration of eroded country, but a growing school of thought is now advocating a more positive approach to develop protection works before erosion begins.

NEW ZEALAND JOURNAL OF SCIENCE AND TECHNOLOGY

TOXICITY OF SOME METALLIC SULPHATES TO THE COMMON HOUSE BORER, *ANOBIUM PUNCTATUM* DE GEER. D. Spiller, Vol. 30 B, No. 1, July, 1948.

Author's Summary : (1) A method has been evolved for testing toxicity of timber preservatives to the common house borer (*Anobium punctatum* De Geer) by using large numbers of eggs on small treated blocks of susceptible wood. Blocks are examined after nine months for presence or absence of larvae.

(2) Using this technique it has been shown that the sulphates of sodium, alumium, iron, magnesium and manganese are not sufficiently toxic to warrant their consideration as potential wood preservatives.

TOXICITY OF BORIC ACID TO THE COMMON HOUSE BORER, *ANOBIUM PUNCTATUM* DE GEER. D. Spiller, Vol. 30 B, No. 1, July, 1948.

Author's Summary : Tests have shown that boric acid in quantities equal to 0.043 per cent. of the dry weight of the treated wood, prevents development of the larvae of *Anobium punctatum* De Geer. At 0.022 per cent. and below larvae are able to survive.

EFFECT OF HEAT TREATMENT ON EQUILIBRIUM MOISTURE CONTENT OF THREE NEW ZEALAND GROWN WOODS. D. Spiller, Vol. 30 B, No. 1, July, 1948.

Samples of the three New Zealand woods rimu (*Dacrydium cupressinum* Sol.) kahikatea (*Podocarpus dacrydioides* A. Rich.) and pine (*Pinus radiata* D. Don.) were heated at 86°C., 105°C., 115°C., 130°C., 150°C., for twenty-four hours. Reduction in hygroscopicity was measured by comparing the equilibrium moisture content of the heat treated blocks with that of unheated blocks. With each timber, there was a reduction of from 1.8 to 3.1 per cent. in the E.M.C. at the four lower temperatures. At 150°C., a further reduction of from 1.1 to 1.4 per cent occurred. The differences between woods and the "woodheat interaction" were significant but of no practical importance.

THE LARVAL TRANSFER METHOD OF DETERMINING TOXICITY OF TIMBER PRESERVATIVES TO *ANOBIUM PUNCTATUM* DE GEER. D. Spiller and R. Winsome Denne, Vol. 30 B, No. 3, November, 1948.

Authors' Summary : An attempt was made to assess toxicity of timber preservatives by transferring partly grown *Anobium punctatum* larvae to treated blocks and recording survival after sixteen weeks. When it was found that