

# Possum monitoring plots in Waione Block, Tongariro Forest

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# Summary

The Waione Block of Tongariro Forest contains an important kiwi population and has significant vegetation values. A system is required for routinely monitoring the effects of possum browse, the general health of the forest and regeneration of canopy species in this block. A circuit with five plots has been established, starting and finishing on Pukehinau Road.

## 1. Introduction

The Waione Block of Tongariro Forest is of high conservation value because of its faunal diversity and in particular its North Island brown kiwi population. The block contains heavily logged forest with patches of unlogged podocarp/tawa forest. To ensure that the habitat is maintained in good condition the Department of Conservation requires a method for routinely monitoring the effects of possum browse, the general health of the forest and regeneration of canopy species. The area was visited in March 1995 and the project discussed with Ian Atkinson (research consultant) and Harry Keys (DoC, Turangi). Subsequently Ian Atkinson wrote to the department with some suggestions for monitoring the block. A 1080 poison carrot operation carried out on 23 June 1995 included this area. Possum catch rate dropped from 35.5 to less than 4.2 per 100 trap nights, a decrease of about 90% following the operation (H. Keys, pers. comm.).

## 2. Objectives

1. Establish a "circular" track of practical length through representative site and vegetation types.
2. Record sapling and larger sub-adult size classes for all potential canopy species along the track, preferably at equally spaced fixed points.
3. Determine browse condition of palatable indicator species (eg. *Fuchsia excorticata*, *Metrosideros robusta*, *Podocarpus hallii*), considering photographic and caging techniques.
4. Identify suitable trees at marked points which could be used to monitor possum effects on palatable fruit (eg *Beilschmiedia tawa*) and identify how this would best be done.
5. Present the baseline data in a form which can be followed by conservation staff in subsequent years, identifying appropriate monitoring procedures (eg standard/best dates, methods, analytical techniques, etc.).

### 3. Method

A modification of the draft method being developed by Payton *et al.* (1993) for assessing possum-related damage in native forests was used in measuring the plots. This method scores the foliage density/browsing of plant indicator species to assess possum-related damage. It is based on the assessment/re-assessment of permanently marked individuals. Their method is fully explained in their report which will need to be used as a guide for remeasurement of the plots (Payton *et al.*, 1993). Because of the considerable distance from Pukehinau Road to the Waione Stream, plots were considered more practical than continuous transects as suggested by Ian Atkinson (pers. comm to DoC).

A circuit which could be remeasured in one day was set up in the Waione Block of Tongariro Forest on 16-18 October 1995 by Chris Ecroyd and Cathy Jones. It passes through five plots selected as representative of the area's vegetation types and designed to monitor possum browse, the general health of the forest and regeneration of the canopy species. A reduced sample size for each species was chosen, as it would have required at least two extra plots to achieve the recommended number of 40-50 stems (Payton *et al.*, 1993), and it would not be possible for the circuit to be accurately remeasured in one day. The method was modified by reducing the sample size to fit a circular track of practical length and measuring additional saplings and seedlings of potential canopy species. The robustness of the sample size could be tested by establishing further plots and comparing the results with those from the present plots.

Each of the indicator species measured (Table 1) was marked with a numbered aluminium tag at about 1.5 m above the ground on the high side. Those that were too small to put a nail into were marked with a waterproof paper tag and numbered separately with a black marker pen. The indicator species assessment sheet, crown density scale sheet and plot data sheets used were those designed by Payton *et al.* (1993). For each of the selected indicator trees we recorded the bearing and distance from the central yellow post, tag number, species name, diameter at breast height (1.5 m), crown density, whether it was an individual stem or a whole tree, canopy or subcanopy component, abundance of the species at that plot site, dieback, recovery class, possum use, and presence of flowers and fruit.

In addition, the location and height or dbh of saplings and seedlings of other future canopy species (Table 2) were recorded on the species assessment sheet. These species were not marked in any way, but for each plant the bearing and distance from the central yellow peg and dbh (at 1.5m) were recorded. These saplings and seedlings could be marked at a later date if it assisted with future remeasurements.

No expensive equipment is required for the measurement of these plots (see Appendix 1).

### 3.1 LOCATION AND PLOT LAYOUT

The circuit starts on Pukehinau Road at map reference NZ Mapping Series No. 260 Map S19 GR 232369 (Fig. 1), goes down a ridge to just above the junction of two small streams, crosses the southern one of these and continues down the next ridge to the Waione Stream. From 20 m above the Waione Stream the circuit goes upstream, crossing a small wetland to a third ridge and climbs up that ridge back to Pukehinau Road at S19 230367. The starting point is marked on the road margin with 40 cm high yellow posts and goes through an area which has been cleared in the past and is still fairly bare with some low-growing vegetation and toetoe. The beginning of the track is on the margin of the toetoe and is marked with two orange-on-white permalat markers. The circuit is marked in an anticlockwise direction only, with white, and some orange, permalat markers. Plots 4 and 5 (566 & 567) are marked with white permalat crosses.

Each plot has a yellow post at its centre (see Fig. 1). Plot 1 (tag number 562) is on the ridge, just into the bush below the starting point. Plot 2 (563) is on the northern side of the middle ridge, just after crossing the side-stream. Plot 3 (565 - there is no 564) is under a large rimu at the base of the third (southernmost) ridge, just after crossing the wetland. Plot 4 (566) is halfway up that same ridge just above and to the right (south) of a large rimu and hinau growing together. Plot 5 (567) is at the top of that ridge just below the road about 3 m to the left (north) of a large hinau.

To compare data from these plots with data from subsequent remeasurements the means for each plot by species should be calculated and a paired T test or equivalent non-parametric test used for the statistical analysis.

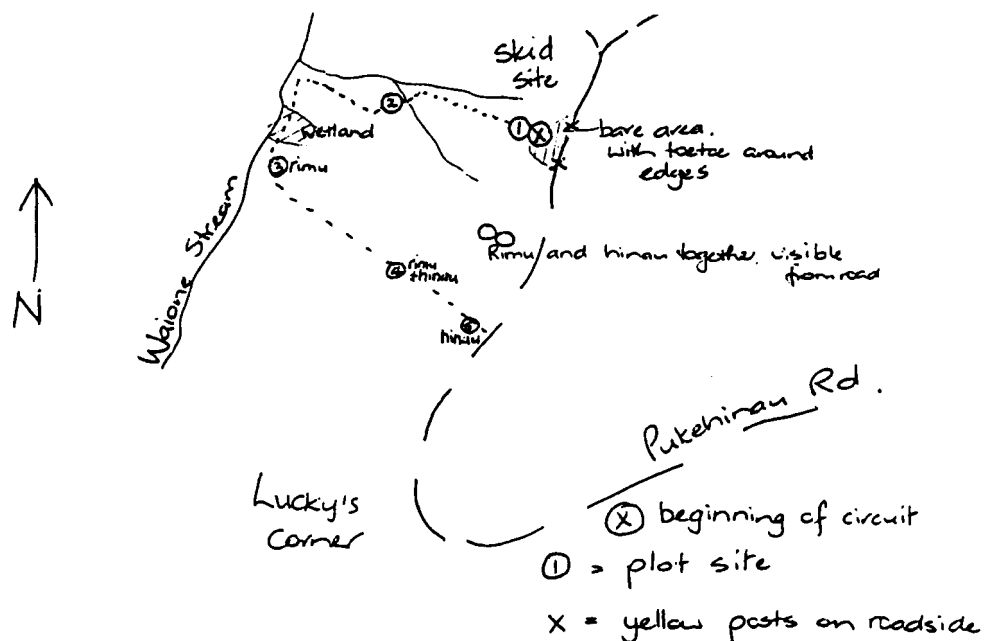


Figure 1: Location of plots.

## 4. Results and discussion

The species selected as indicator species are listed in Table 1 and the future canopy species measured are in Table 2. Mahoe, Hall's totara and heketara were selected as indicator species because they had been tested by Payton et al. (1993) and were abundantly present in the area. Tawa was chosen as an indicator species additional to those tested because it is browsed in this area. The other species on their list were not present in sufficient numbers to be used for monitoring. Lancewood was included because of the observed health problems with this species at this site.

When assessing browse damage on tree canopies several metres above it is difficult to be certain whether the damage has been caused by possums, insects or other factors. It is useful to have an illustration of typical possum browse to refer to for assessing leaf damage, and Figure 2 has been included for this purpose.

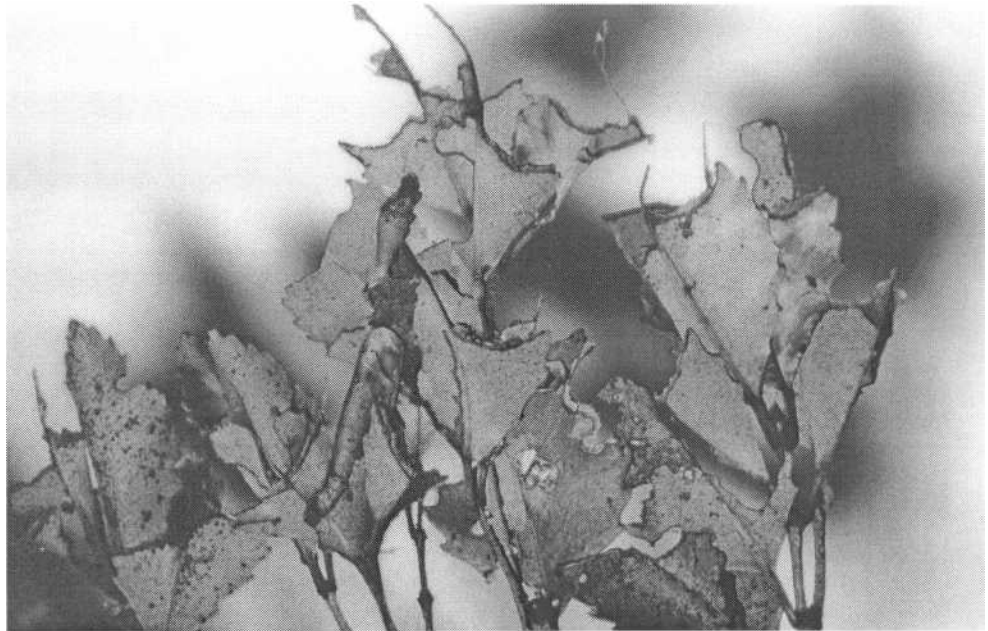


Figure 2: Possum browse on kamahi. Note the midribs protruding from many of the half-eaten leaves.

All browse scores in this assessment were graded as light (1) or moderate (2), with mahoe and Hall's totara showing most browsing. The average browse scores range from 0 (no browse) for lancewood to 1.2 for Hall's totara. These average scores were calculated from column "W" in the Species Data sheets, excluding trees marked "X" for which the browse could not be estimated.

Table 1: Average whole crown browse scores (W) for each indicator species.

Species name	Common name	No. of plants	Average browse score
<i>Bellschmidia tawa</i>	tawa	33	0.3
<i>Meliccytus ramiflorus</i>	mahoe, whiteywood	22	1.1
<i>Myrsine salicina</i>	toro	14	0.4
<i>Olearia rant</i>	heketara	32	0.2
<i>Podocarpus hallii</i>	Hall's totara	11	1.2
<i>Pseudopanax crassifolius</i>	lancewood, horoeka	20	0

There was very little sign of recent possum activity, such as recent browse or tracking, but there was considerable dieback, possibly attributable to possums in the past, on mahoe and toro. The Hall's totara were all saplings and their browse damage was not very obvious. A high percentage of Hall's totara shoots were without terminal buds, which may have been removed by possums, and the presence/absence of apical buds was used in the assessment of the browse damage on this species.

The lancewoods were generally very unhealthy, most having recently lost large quantities of leaves. There were no indications that this was caused by possums, and a climatic factor such as snow or unseasonally cold conditions is considered more likely.

During spring 1995 lancewoods on the Mamaku Plateau (near Rotorua) and near Pureora Village (on the northern slopes of the Hauhangaroa Range) were observed with similar damage but in March 1996 there were signs of recovery on some plants at Mamaku. Although lancewood is usually ignored by possums (Brockie, 1992) and therefore not a suitable indicator species for possum browse, it is suggested that the health of this species should be monitored to determine the severity and cause of the serious leaf loss observed in 1995 (Fig. 3).



Figure 3: Lancewood suffering from recent defoliation.

Table 2: Other future canopy species measured.

Species name	Common name	No. of plants
<i>Dacrydium cupressinum</i>	rimu	4
<i>Elaeocarpus dentatus</i>	hinau	2
<i>Knightsia excelsa</i>	rewarewa	1
<i>Nestegis cunninghamii</i>	black maire	7
<i>Nestegis lanceolatus</i>	white maire	3
<i>Prumnopitys ferrugineus</i>	miro	17
<i>Prumnopitys taxifolius</i>	matai	1

Some of the future canopy species measured (Table 2) are likely to be seriously affected by possum browse. For example rewarewa inflorescences are often browsed and broken off by possums (C. Ecroyd, pers. obs.). There were tawa and other trees close to the plots which could be used to monitor the effects of possums on palatable fruit. However, they would need to be sampled soon after the fruit had fallen on the ground. It is suggested that under each of c. 25 tawa trees 50 fruits are scored for the presence or absence of possum damage.

Photographic techniques for the monitoring of possum browse effects were considered unsuitable owing to the difficulty of having the same or comparable equipment available for future remeasurements, problems with taking



suitable photographs in the forest situation and to the complexity of quantitatively analysing the photographs. Monitoring caged and uncaged plants of a species which is highly attractive to possums, such as *Dactylanthus taylorii*, would have been effective but no species suitable for protecting with small enclosures were found in the area. If plants were located the monitoring should be carried out using the methods described in Jones, 1995.

## 5. Conclusions

A relatively simple plot system has been devised to monitor the effects of possums on the general health of the forest and regeneration of canopy species in the Waione Block of Tongariro Forest. Because of the requirements for the monitoring to be able to be done in one day a reduced sample size was accepted.

## 6. Recommendations

1. The plots should be remeasured every two years at the same time of year.
2. The same observers should be used as much as possible to reduce observer bias.

## 7. Acknowledgements

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## 8. References

- Brockie, R.E. 1992. A living New Zealand forest. David Bateman, Auckland.
- Jones, C. 1995. *Dactylanthus taylorii*, survey monitoring and management. Ecological Management, No. 3, p. 1-5.
- Payton, I.; Pekelharing, C. and Frampton, C. 1993. Monitoring possum-related damage in native forests. Draft report to Department of Conservation by Landcare Research New Zealand Ltd.

## Appendix 1: Procedure for remeasuring plots

### A. List of gear required:

Information on how to locate plots  
Laminated crown density assessment sheet  
Laminated indicator species assessment sheet  
Old and new plot sheets  
Species data sheets  
Clipboard  
Compass  
30 m measuring tape  
Height pole  
Diameter tape  
Callipers for measuring seedlings  
Tree tags (deer tags?) and wire  
Flathead nails  
Hammer

### B. Basic procedure

1. Remeasurement should be carried out at the same time of year as the previous measurement. It will require two people, one recording and one measuring. Locate the plots and check the plot data recorded. Locate and remeasure the plants listed on the species data sheets using the instructions on the laminated sheets.
2. For each plot calculate the averages for each species in a column. Compare the data with that from the previous measurement using a paired T test.