

# Restoration of lowland totara forest in Canterbury

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The New Zealand School of Forestry at the University of Canterbury has recently received a generous financial gift from an anonymous donor to facilitate restoration of lowland totara (*Podocarpus totara*) forest in Canterbury. The School of Forestry is using this funding to undertake a field trial assessing factors that might enhance the establishment and early growth of totara on a range of sites in Canterbury. The purpose of this article is to briefly review the role of totara in Canterbury and outline the scope and intent of the trial.

Prior to the arrival of humans, lowland and montane Canterbury was largely forested (Molloy et al. 1963, Molloy 1969). On the foothills of the Southern Alps, beech forest (mainly *Nothofagus solandri*) graded into mixed podocarp-beech forests in damp gullies and on the upper plains, with totara, kahikatea (*Dacrydium dacrydioides*) and matai (*Prumnopitys taxifolia*) amongst the dominant trees. Across the upper Canterbury Plains, totara dominated the forests, merging into shorter stature, open woodland on well-drained soils, with kanuka (*Kunzea ericoides*) an important species (Molloy 1969). Small areas of podocarp forest occurred on deeper peaty soils near the coast (similar to present day Riccarton Bush). Banks Peninsula was covered in an almost continuous mantle of luxuriant podocarp forest, with totara, matai and kahikatea dominant at lower altitudes, and thin-barked totara (*Podocarpus hallii*) on summit ridges. Of the podocarps, totara appears to have been by far the most abundant species throughout the lowland Canterbury forests.

With Polynesian settlement of Canterbury, starting some 1000 years ago, and European colonists arriving about 150 years ago, this forest has been largely removed. During Polynesian settlement, fires destroyed forests on the drier northwestern parts of Banks Peninsula and the Canterbury Plains (Molloy et al. 1963, McGlone 1983). However, forest removal during the early stages of European settlement was much more extensive and saw the



Podocarp dominated forest, with lowland totara, matai and kahikatea, Peraki Saddle Scenic Reserve, Banks Peninsula. Photo: David Norton.



Figure 1: One-year-old totara cuttings being grown on for the School of Forestry by Waiora Trust in their Christchurch nursery (July 1993).

demise of lowland Canterbury forests (Johnston 1969). For example, between 1860 and 1900 over 20 sawmills operated on Banks Peninsula, reducing forest cover from c. 75% of the land area to about 5%. Today the remaining forests are small fragments, often no more than a few hectares in area. With the exception of the recently acquired Hinewai/Otanerito conservation area (c. 1000 ha of regenerating forest and abandoned farmland; Wilson 1989, 1990), the largest reserve on Banks Peninsula (Mt Herbert Scenic Reserve) is only 240 ha, of which only 80 ha is primary forest (Kelly 1972). Mean reserve size on the peninsula (an overestimate of mean forest fragment size) is 28 ha, and only four reserves are greater than 50 ha (Norton 1991).

The restoration trial being undertaken by the School of Forestry aims to assess the major factors that might enhance the establishment and early growth of totara on a range of sites in Canterbury. Study sites have been selected to cover the full range of this species, and include the wetter eastern side of Banks Peninsula, drier Port Hills, Canterbury Plains and lower foothills. Seeds and/or cuttings have been collected from two totara provenances, Banks Peninsula and upper plains/foothills, and are now being grown on ready for planting.

The trial will be laid out as a split plot within a randomised block design with four major plots, and four replicates. Twenty plants will be used for each plot, split between two treatments. The major plots are: control, mulch (options to use organic material or paper), tree shelters, and a nurse crop (kanuka). The trial will then be split using presence/absence of fertiliser as the two treatments. The kanuka plants will be planted out one year prior to the totara, so that they are established and growing when the totara are planted. It is intended to repeat the whole trial during a second year.

At present, totara seedlings and cuttings are being grown on in commercial nurseries in Christchurch (Fig. 1) ready for planting in the field. We had initially hoped to establish the trial during the 1994 winter, but slow growth of plants means that this might be postponed until winter 1995. We had also hoped to include matai in the trial, but very poor propagation success with this species has resulted in it being dropped from the trial at this stage.

Once the trial has been established monitoring will be undertaken annually, probably as part of an undergraduate student class field trip. Monitoring will involve measurement of plant survival, height, diameter at various heights, and general assessment of health. Some plant harvesting may also be undertaken to obtain biomass information.

It is presently proposed to run the trial for 20 years, at which time some plants will be harvested to look at biomass allocation, wood properties, etc. However, it is hoped that most plants will be left in the ground to form the nucleus for restoration at each site.

This study will provide the opportunity for a number of ancillary studies (suitable for student research projects). For example, a project could look at the influence of different treatments on water relations in the study plants or investigate the effects of different treatments on wood quality. Other projects could include study of rooting behaviour and biomass allocation.

As part of this project, a detailed review of the ecology of all New Zealand *Podocarpus* species (*P. acutifolius*, *P. hallii*, *P. nivalis* and *P. totara*) is being undertaken by a School of Forestry postgraduate student (Rachel Ebbett) and will provide invaluable background to the trial. This review will be formally published when completed.

The School of Forestry sees this trial as an important contribution to our knowledge of both forest restoration and totara ecology. The trial will build on existing knowledge of the ecology of Canterbury forests and on forest restoration more generally. With the rapidly increasing interest in restoration ecology, we hope that the results of this trial will assist others keen to see the area of totara dominated forests in Canterbury increased. Furthermore, totara is one of the premier timber trees in New Zealand, and is especially important to Maori for carving, so this trial will also have benefits for commercial production of totara and for its use for cultural purposes. We plan to report in future issues of New Zealand Forestry on the progress of the School of Forestry totara restoration trial.

### Acknowledgements

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## IFA Study Tour to Canada and USA September-October 1994

The Institute of Foresters of Australia (IFA) is organising a study tour to take in the joint Society of American Foresters (SAF), Canadian Institute of Forestry (CIF) and International Union of Societies of Foresters (IUSF) Conference in Alaska, plus a look at forestry aspects from Vancouver to San Francisco. Dates are from September 17 to October 15, 1994 and the itinerary is as follows:

17 September	Sydney to Anchorage, Alaska
18-22 September	Conference
23-24 September	Two-day post-conference tour – Kenai Peninsula
25-28 September	Vancouver – local forestry issues
29 Sept – 14 Oct	Bus to San Francisco stopping at Seattle, Centralia, Portland, Timberline Lodge – Mt Hood National Forest, Eugene, Coos Bay, Redding, Reno, San Francisco – looking at a range of forestry activities and National Parks.

IFA have up to 10 spare places on the tour. Costs ex Australia will be around \$A6000 per person, plus lunch and dinner meals.

Any NZIF members interested in joining this tour should contact the NZIF Secretariat, Susan Sheppard, for further details.