Mike Marden and Chris Phillips
MardenM@LandcareResearch.co.nz

Landcare Research
Manaaki Whenua

Totara
Podocarpus totara

INTRODUCTION AND METHODS

Reasons for planting native trees include the enhancement of plant and animal biodiversity for conservation, establishment of a native cover on erosion-prone sites, improvement of water quality by revegetation of riparian areas and management for production of high quality timber. Significant areas of the New Zealand landscape, both urban and rural, are being re-vegetated using native species. Many such plantings are on open sites where the aim is to quickly achieve canopy closure and often includes the planting of a mixture of shrubs and tree species concurrently. Previously, data have been presented showing the potential above- and below-ground growth performance of eleven native plant species considered typical early colonisers of bare ground, particularly in riparian areas (http://icm.landcareresearch.co.nz/research/land/Trial1results.asp). In this current series of posters we present data on the growth performance of six native conifer (kauri, rimu, totara, matai, miro, kahikatea) and two broadleaved hardwood (puriri, titoki) species most likely to succeed the early colonising species to become a major component in mature stands of indigenous forest (http://icm.landcareresearch.co.nz/research/land/Trial2.asp). Data on the potential above- and below-ground early growth performance of colonising shrubby species together with that of conifer and broadleaved species will help land managers and community groups involved in re-vegetation projects in deciding the plant spacing and species mix most appropriate for the scale of planting and best suited to site conditions.

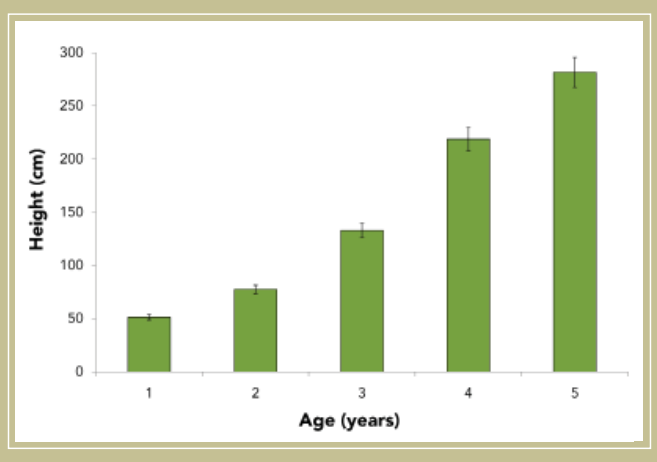
Data are from a trial established in 2006 to assess the relative growth performance of native conifer and broadleaved hardwood tree species. Ten plants were extracted each year for 5 years following establishment and their above- and below-ground growth parameters measured.

Plan view of 5-year old root system (see text box for dimensions)

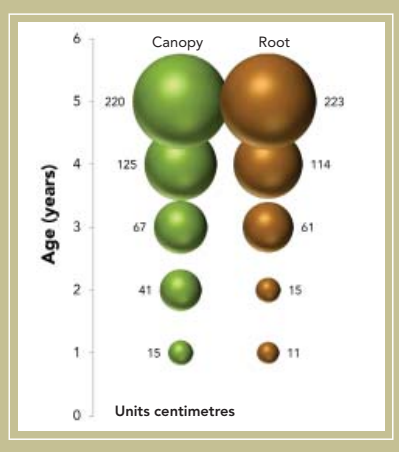

View of canopy and root system of a 5-year old plant (see text box for dimensions)

RESULTS

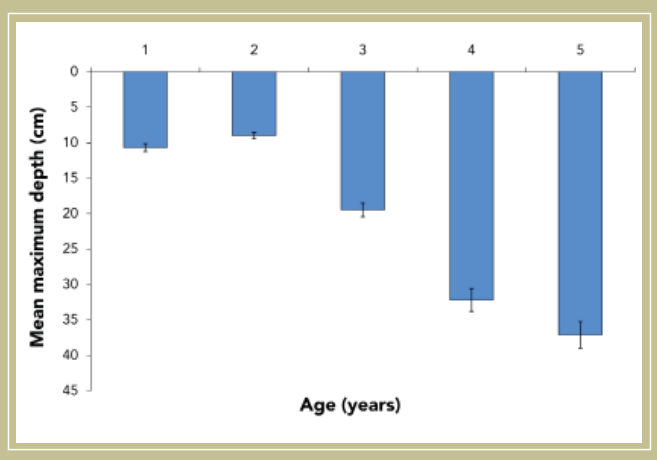
TREE HEIGHT



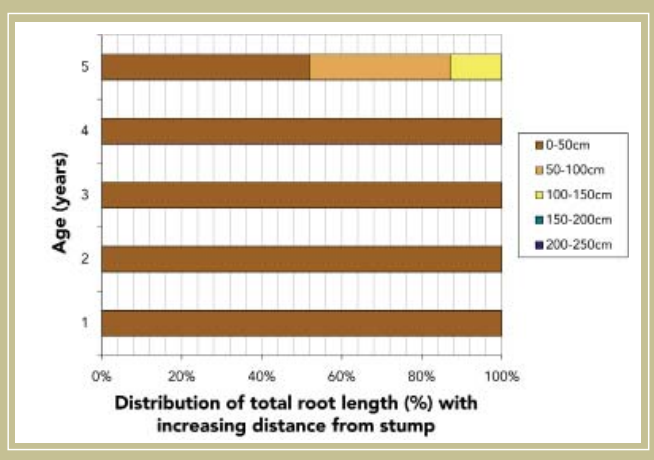
CANOPY AND ROOT SPREAD



ROOT DEPTH



ROOT LENGTH DISTRIBUTION



DISTRIBUTION AND SITE PREFERENCES

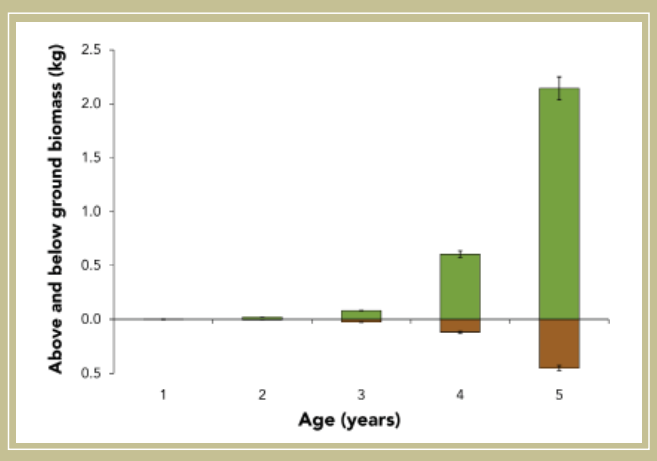
Occurrence	North, South and Stewart Islands
Local occurrence	Lowland and montane forests, sea level to 300 m (South) or 550 m (North)
Preferred soils	Immature soils, not necessarily fertile
Moisture	Free-drained soils, tolerates dry soils, intolerant of poorly drained soils
Properties	Wind, drought and frost resistant save for young seedlings; non-shade-tolerant

SUMMARY OF GROWTH CHARACTERISTICS AT AGE 5

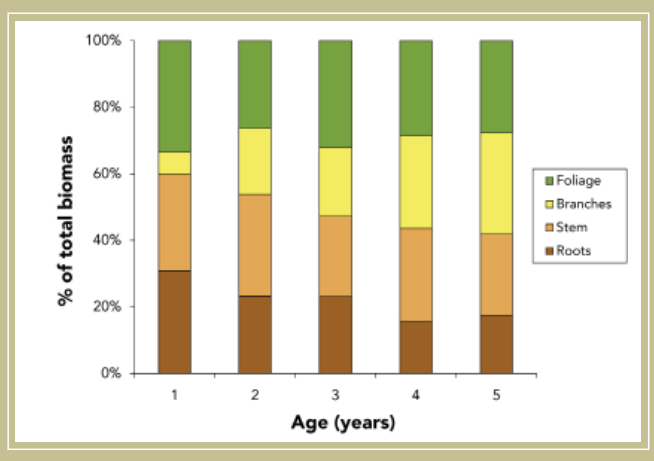
Mean Height	2.82 m
Mean canopy	2.20 m
Mean root spread	2.23 m
Mean max. root depth	0.37 m
Mean above-ground biomass	2.14 kg
Mean below-ground biomass	0.45 kg
Root:shoot ratio	0.29

Notes: Although a forest tree, it is well suited for growing in the open and is the most light-demanding of the conifers. Its growth becomes stagnant in shade or competition, but revives quickly when released. Totara is long lived and grows relatively slowly; when immediate cover is required it needs to be planted alongside faster growing short-lived species. Has poor stem form, often multi-leadered if planted at low stocking. Totara can at times suffer from defoliation by insects and stem damage from cicada eggs, but seems to compete with grasses better than most indigenous species. Relatively unpalatable to domestic stock but is browsed by possums. Survives on sites subject to heavily silting.

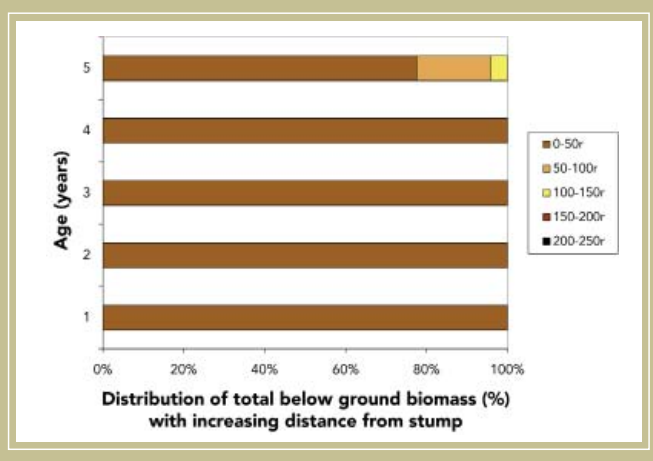
BIOMASS



TOTAL PLANT BIOMASS



ROOT BIOMASS DISTRIBUTION



REFERENCES
Bergin D, Gea L 2005. Native trees: planting and early management for wood production. New Zealand Indigenous Tree Bulletin No. 3. Rotorua, New Zealand, New Zealand Forest Research Institute. 44 p.

Foweraker CE 1929. The Podocarp rain forests of Westland, New Zealand. No 2: kahikatea and totara forests and their relationship to silting. Te Kura Ngahere 2(4): 6–12.

Bergin D 2003. Totara: establishment, growth and management. New Zealand Indigenous Tree Bulletin No. 1. Rotorua, New Zealand, New Zealand Forest Research Institute. 40 p.

Bergin D, Pardy G 1987. Growing totara. New Zealand Tree Grower: 68–70.

Pollock KM 1986. Plant materials handbook for soil conservation. Volume 3: native plants. Water and Soil Miscellaneous Publication No. 95. 66 p.

ACKNOWLEDGEMENTS
This research was funded by Foundation for Research Science & Technology Contract CO9X0305 "Integrated Catchment Management: Ridge Tops to the Sea". The authors acknowledge the assistance with field extraction and processing of plants by interns Maria Borlinghaus (Germany), Claire Butty (France), Sandra Viel (Germany), and Kaisa Valkonen (Finland), and Landcare Research staff Alex Watson, Richard Hemming, and Suzanne Lambie. Graphics by Nicolette Faville and edited by Anne Austin of Landcare Research.