To our grandchildren:
Lucas & Noah Dawson;
Angelina, William and Lucas Hayter; Grace, Francis and Elliot Lucas

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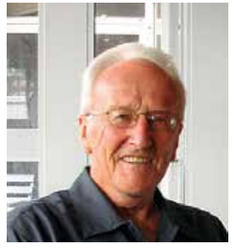
The authors and contributors to the second edition



DR JOHN DAWSON (1928–2019) was Associate Professor of Botany at Victoria University until his retirement in 1988. John devoted much of the last 30 years to research, writing botanical papers and books, and enthusiastically sharing his botanical knowledge through public outreach. John ran many adult education courses on New Zealand native plants and, until his recent illness, guided countless groups around Otari Native Botanic Garden in Wellington. He was passionate about the New Zealand flora, especially *Metrosideros*, the Apiaceae genera, and the native vascular plant species of trees, climbers and epiphytes and their biogeography and ecology. John was the author of many scholarly papers on aspects of the New Zealand flora, and authored several books, including *Forest Vines to Snow Tussocks: The story of New Zealand plants* (1988) and *Seasons in the Forest* (with photographs by Brian Enting, 1990). John also undertook research in New Caledonia on Myrtaceae, its largest family, and in two substantial papers he formally described about a quarter of the c. 250 species there. John's work in botany has been widely recognised. He was a Fellow of the Linnean Society of London (FLS), and in 2016 he was awarded Landcare Research's Allan Mere, a prestigious award to botanists who have made an outstanding contribution to New Zealand botany.

ROB LUCAS lectured in horticulture at The Open Polytechnic of New Zealand until his retirement in 2006. He has been photographing plants for several decades, and his photographs have been widely published in books and magazines. He is the author of *Managing Pests and Diseases: A Handbook for New Zealand Gardeners* (2005), and co-author (with Isobel Gabites) of *The Native Garden: Design themes from wild New Zealand* (1988).

John Dawson and Rob Lucas are co-authors of *Lifestyles of New Zealand Forest Plants* (1993); *New Zealand Coast and Mountain Plants: Their communities and lifestyles* (1996); the award-winning *Nature Guide to the New Zealand Forest* (2000); *The Nature of Plants: Habitats, challenges and adaptations* (2005); *New Zealand's Native Trees* (2011), which won the New Zealand Post's illustrated non-fiction award and its Book of the Year in 2012, and *Field Guide to New Zealand's Native Trees* (2012)

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DR PETER DE LANGE is an Associate Professor within the School of Environmental and Animal Sciences, Unitec Institute of Technology, Auckland. Previously, Peter worked for the New Zealand Department of Conservation for 27 years as their Threatened Plant Scientist. His research interests include biosystematics, cytology, ethnobotany, threatened plant management, and threat classification systems. A Fellow of the Linnean Society (FLS), Peter is the author of 18 books and 190 scientific papers. He has a particular interest in the conservation and documentation of island floras, and he has worked on Norfolk Island, Rarotonga, the Kermadec and Chatham islands and many of the smaller offshore islands of northern New Zealand.

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DR MARK LARGE is a biologist with an interest in fern evolution and paleobotany spanning 35 years. He has authored many publications, including *Tree Ferns* (2004) with John Braggins, and acted as botanical consultant for the popular television series 'Walking with Dinosaurs', and 'How to Grow a Planet' for BBC Scotland.

DR DON MORRISEY is a marine biologist with the Cawthron Institute in Nelson. His main research interests include benthic ecology, such as the environmental effects of marine farms, and biosecurity. He has published research papers and reviews on the ecology and management of temperate mangroves

Publisher's notes and acknowledgements to the second edition

New Zealand's Native Trees was first published in 2011 to widespread acclaim, subsequently winning the New Zealand Post Book Awards in 2012 for the categories Illustrated Non-Fiction and Book of the Year. It was reprinted with corrections in 2013, and went out of print in 2017.

It was an easy decision to publish a second edition – this is clearly a book of considerable significance – but also because the botanical names of some of the trees in the first edition have changed, and ten or more new species have been described. The second edition addresses these name changes and includes the new species.

Several essentially shrubby species have been included that occasionally reach tree stature (for example, the streamside tree daisy, *Olearia cheesemanii* (whose absence in the first edition drew comment from the public) as have a few indisputably shrubby species in order to complete their genus or compare them with a similar species.

Since 2011, the author-photographer Rob Lucas has taken a host of new images of New Zealand's native trees and many of these images have been added to the book, particularly to increase the coverage of species that were under-represented by figures in the first edition, and also some iconic trees such as pōhutukawa, and the northern and southern rātā.

The following trees or shrubs have undergone name changes at the genus or species level since the first edition:

Common name (unchanged)	**Name in 2011 edition**	**Name in 2019 edition**
Hall's totāra, mountain totāra	*Podocarpus cunninghamii*	*Podocarpus laetus*
	Coprosma tayloriae	*Coprosma dumosa*
Kanuka	*Kunzea ericoides* var. *ericoides*	*Kunzea ericoides*
	Kunzea ericoides var. *linearis*	*Kunzea linearis*
	Kunzea ericoides var. *microflora*	*Kunzea tenuicaulis*
Red beech	*Nothofagus fusca*	*Fuscospora fusca*
Silver beech	*Nothofagus menziesii*	*Lophozonia menziesii*
Black beech	*Nothofagus solandri* var. *solandri*	*Fuscospora solandri*
Mountain beech	*Nothofagus solandri* var. *cliffortioides*	*Fuscospora cliffortioides*
Hard beech	*Nothofagus truncata*	*Fuscospora truncata*
Kawakawa, pepper tree	*Macropiper excelsum*	*Piper excelsum*
	Macropiper melchior	*Piper melchior*

The recently described species of trees and shrubs included in the second edition are: *Kunzea amathicola*, *K. robusta*, *K. salterae*, *K. serotina*, *K. toelkenii*, *K. triregensis*, *Melicytus orarius*, *M. venosus*, *Pittosporum rangitahua* and P. roimata*. (* indicates not illustrated)

The following shrub and borderline tree species, subspecies and varieties are also new additions to the book: *Aristotelia fruticosa*, *Coprosma rugosa*, *Coprosma tenuicaulis*, *Cordyline pumilio*, *Corokia buddleioides* var. *buddleioides*, *Corokia buddleioides* var. *linearis**, *Corokia cotoneaster*, *Dracophyllum filifolium*, *Dracophyllum strictum*, *Melicytus orarius*, *Melicytus venosus*, *Olearia cheesemanii*, *Olearia cymbifolia*, *Olearia nummulariifolia*, *Olearia pachyphylla*, *Olearia semidentata*, *Ozothamnus leptophyllus*, *Piper excelsum* subsp. *delangei*, *Piper excelsum* subsp. *psittacorum*, *Piper melchior*, *Pittosporum cornifolium*, *Pittosporum rigidum*, *Plagianthus divaricatus*, *Pomaderris rugosa* and *Solanum aviculare* var. *latifolium*. (* indicates not illustrated)

INTRODUCTION

INTRODUCTION

FROM HOTHOUSE TO ICEBOX

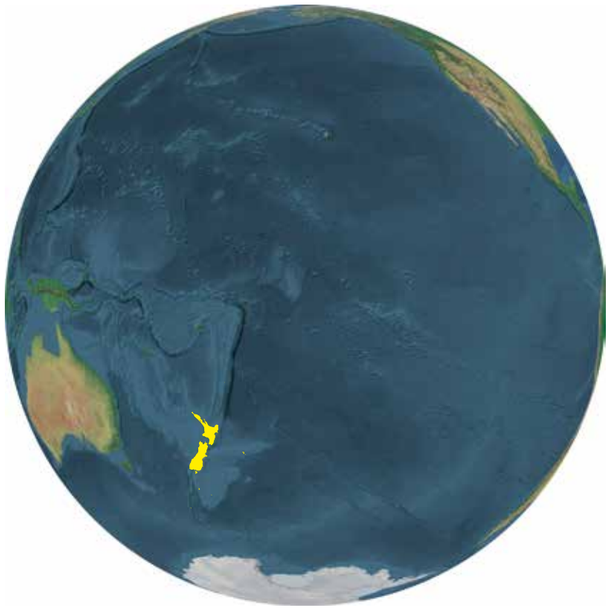
The forms and lifestyles of New Zealand's flora and fauna have, from the time of early European contact, been recognised as something unique. But why this should be has long remained a puzzle, a subject of much research and debate. Today, nearly 250 years later, the accumulated findings of botanical, zoological and geological research allow more informed explanations of why and how plants and animals came to live on these islands—and why they are what they are today.

New Zealand's plant forms and lifestyles are a consequence of protracted, lonely ocean voyages and, more recently, a land regularly reshaped by earthquakes and volcanoes. What is now called New Zealand was set adrift from the Australian continent by the movement of tectonic plates c. 80 million years ago—a slow process as the Tasman Sea was born and shaped. Now it sits in splendid isolation within a hemisphere of seas, astride the belt of strong westerly winds previously known to clipper-ship crews as the Roaring Forties. Thus, New Zealand's plants have evolved within a temperate but very windy climate that can also, at times, be very cool, on landmasses assailed in spring by northwesterly gales from across the Tasman Sea, and in winter by the freezing polar blasts that sweep up from the Antarctic.

Sixty million years ago, world temperatures were much warmer than they are today, and climates were tropical to subtropical, even in the polar regions. The continent of Antarctica was already in position over the South Pole but had a subtropical climate, with forests of conifers and ferns. Flowering plants were not yet prominent. By 55 million years ago, the climate had cooled to warm temperate, and the forests contained many of the flowering plant families and conifers that are found in forests today.

About two million years ago, temperatures plunged as the Ice Age began. Even the warmer interglacial periods during this time had only about half the warmth of earlier times, and the glacial periods were extremely cold. However, the Southern Hemisphere has much more sea than land, so glacial periods in this hemisphere were far less devastating than they were in the Northern Hemisphere, especially on coastal land. New Zealand is c. 1600 km long but narrow, with an extensive coastline, and during glacial periods, the climate was mild enough in the north for conifer–broadleaf forest to survive, and also for southern beech forest to persist sporadically through the country.

BELOW: The islands of New Zealand sit in relative isolation within a hemisphere of water (Geographx). OPPOSITE: The New Zealand landscape is constantly changing, creating new opportunities for adaptable plants. Here the braided Dart River carries eroded material from the Southern Alps into the head of Lake Wakatipu (Craig Potton).



New Zealand's forests today, along with other similar mixed forests in the Southern Hemisphere, are the true descendants of the ancient mid-latitude forests that previously occurred in both hemispheres but became extinct in the Northern Hemisphere during the Ice Age glaciations. Indeed, New Zealand's conifer–broadleaf forest, with its tropical similarities, including large woody vines and epiphytes, is of special interest and importance, being probably the best surviving example of pre-Ice Age forests of middle latitudes. Although some species have become extinct, fossils show that this type of forest in New Zealand has not greatly changed from those warmer times.

The islands that make up New Zealand straddle two active tectonic plates, and the landforms are continually adjusted by earthquakes and volcanic activity. The landscape is a patchwork of high, rapidly eroding, snow-peaked mountains and volcanoes, deep gullies, tumultuous rivers, placid lakes, clear streams and fertile plains—all constantly evolving and changing, offering new sites and opportunities for adaptable plants.

Over the last couple of generations, science has reframed the ways plant distribution and evolution are viewed. It is now known that climatic conditions and species dominance are subject to constant change, as is the position of landmasses on the earth's surface. Genetic science has developed to the point where it is possible to see more clearly the nature of plant relationships, their shared ancestors and the timescales of their divergence.

Where previously it was thought likely that most of New Zealand's flora had evolved in isolation since its separation from Australia, recent evidence suggests that species have constantly arrived and established during much of the time it has been adrift. There is evidence that the ancestors of some notable large trees—for example, kauri (*Agathis australis*)—were present at separation. However, evidence of another ancient group, the southern beeches (*Fuscospora* spp., *Lophozonia menziesii*), does not appear until later. It is now thought that beeches may have arrived and established several times, having suffered multiple extinctions. Yet other groups, such as the hebes (*Veronica* spp.), appear to have been more recent arrivals. These have been quick to establish and take advantage of many of the niches resulting from the land upheavals occurring over the last ten million years.

The flow of new plant species has not been completely one way. A recent genetic study of the genus *Metrosideros* across the Pacific found that species as far away as Hawai'i are closely related to, and are likely to have evolved from New Zealand's pōhutukawa (*M. excelsa*).

WHAT'S SPECIAL ABOUT NEW ZEALAND'S NATIVE TREES AND FORESTS?

High degree of endemism

New Zealand's native trees and forests are unique. They look, smell and feel like no other forests, which is not surprising, as more than 80% of the c. 2400 native species of conifers, flowering plants and ferns in the flora as a whole occur nowhere else in the world. Moreover, c. 35 genera of vascular plants are confined to New Zealand, for example, *Manoao*, *Halocarpus* and *Ixerba*. This remarkably high level of endemism is one of the reasons for New Zealand being recognised by Conservation International as a world biodiversity hotspot. Endemism is higher in geologically diverse and stable areas, such as the northern North Island and the northwest South Island; whereas more geologically uniform and less stable areas such as the southern North Island and the central South Island, have markedly lower numbers of endemic species. New Zealand has been called an ancient life-raft because it has long been isolated from other lands, and this isolation has allowed its unique flora (and fauna) ample time to evolve.

Similarities to tropical rainforests

For early European botanists, settlers and even visitors today, one of the most striking features of New Zealand's conifer–broadleaf forest is the many similarities to tropical rainforests.

Like tropical rainforest, New Zealand's conifer–broadleaf forest usually has five strata; three tree layers, a layer of shrubs and a ground layer of herbaceous plants. In contrast, most temperate forests have three strata at most: tree, shrub and ground. The five strata in conifer–broadleaf forests are lower in stature than their tropical equivalents and comprise: an upper discontinuous layer of emergent trees (mostly conifers) 30–40 m tall; canopy trees, such as tawa (*Beilschmiedia tawa*), 20–25 m tall; subcanopy trees, such as nīkau (*Rhopalostylis sapida*), and *Cyathea* and *Dicksonia* tree ferns, 10–15 m tall; shrubby species and small trees at 3–8 m; and ground plants (many of which are ferns) up to 1 m tall. Also, conifer–broadleaf forests, like tropical rainforests, consist of numerous species, although they are not as rich in this respect as tropical forests.

In conifer–broadleaf forest, the trees themselves exhibit features that are typical of tropical rainforest species, including: many conspicuous, mostly woody vines; large epiphytes (perching plants) in the tree crowns; plank buttresses (thin, supportive flanges from the base of the trunk), as in pukatea (*Laurelia novae-zelandiae*); cauliflory and ramiflory, where flowers arise from trunks and woody branches; and pneumatophores (specialised, upright breathing roots formed by some trees growing in swampy ground).

Tropical rainforest species are evergreen, as are most conifer–broadleaf forest trees; and some conifer–broadleaf species exhibit leaf features that are common in tropical rainforest trees, such as drip tips, where a prolonged leaf tip allows rainwater to run off readily; and pulvini, which are flexible swellings at one or both ends of the leaf stalk (petiole).

The leaves of conifer–broadleaf trees are, on average, considerably smaller than those of tropical rainforest trees and have a much greater tendency to be toothed rather than smooth-margined.

Small, inconspicuous flowers

Elsewhere in the world, and particularly in subtropical and tropical areas, large, attractively coloured, flamboyant flowers are common and designed to attract specialist pollinators, such as nectar-feeding birds, long-tongued bees, hawk moths and butterflies. Here in New Zealand it is different. There are not many butterflies or nectar-feeding birds and there are no native long-tongued bees or hawk moths. New Zealand has few plant species that attract specialist pollinators, such as tūī, bellbird and saddleback; the fuchsias, kōwhai (*Sophora* spp.), *Peraxilla* mistletoes and flax (*Phormium* spp.) are examples of those that do. Most flowers here appear to be designed to attract all comers, especially the small flies and moths that are abundant. Consequently, many are tiny, greenish to white, and lack specialised structures that restrict access to all but favored pollinators. Even some showy flowers, such as the pōhutukawa and rātā (*Metrosideros* spp.), attract hordes of insects as well as flocks of tūī to gorge on the plentiful supply of nectar within each flower.

Why should New Zealand's flowers go against the world-wide tendency towards more specialisation? It has not always been the case. The early flowering plants had large, showy flowers and evolved in tandem with specialist bird and insect pollinators. The fossil record supplies plenty of evidence that lots of colourful plant species lived here once; in Australia and New Caledonia they still do. Whatever the reason/s, today most flowers are promiscuous, designed to attract and be pollinated by a wide range of generalist insects and birds. Given the preponderance of unspecialised insect pollinators in our fauna, and the vagaries of the weather from season to season and year to year, perhaps this is the optimum strategy.

As if to make up for the modest little flowers of most of the species, the fruits that follow are often large, colourful and fleshy, and are eaten by birds. A good example of this is the karaka (*Corynocarpus laevigatus*), with abundant but tiny flowers followed later by large, bright-orange fruits. It is said that the native pigeon, the kererū, is the only native bird large enough to swallow the fruits, digesting the flesh and excreting the unharmed, large seed elsewhere.

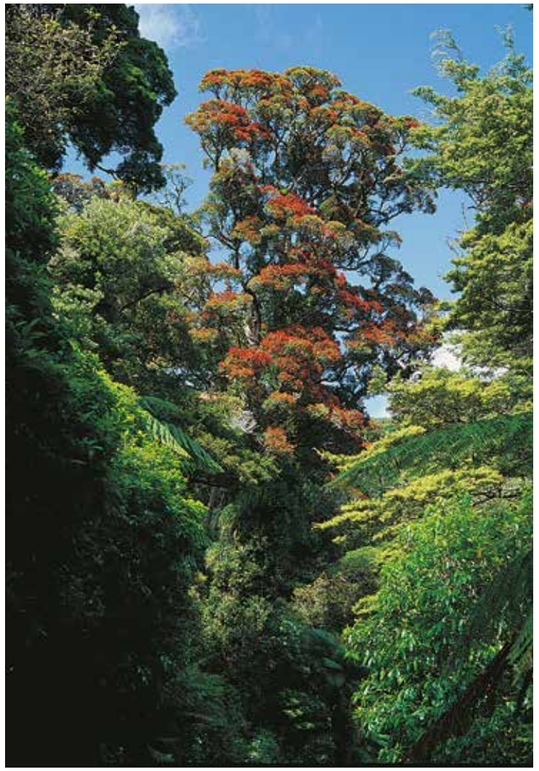
Juvenile forms and divarication

A number of species of New Zealand trees have a distinctive juvenile form. Perhaps the most remarkable of these are the lancewoods (*Pseudopanax crassifolius* and *P. ferox*), in which the juvenile form has long, narrow leaves that are angled downwards around a slender stem, but the adult form has much shorter, broader leaves and a densely branched, broadly rounded crown.

Other remarkable examples of juvenile forms are those that are termed divaricating. Divarication is usually associated with shrubs, and New Zealand has many examples of this growth form in a variety of different families. Divaricating shrubs occur in various open habitats and some forest types. They have a densely twiggy form, with very small leaves, and slender, wiry interlacing stems with wide-angled

OPPOSITE: The similarities between New Zealand's conifer–broadleaf forests and tropical rainforests include the presence of many conspicuous, woody vines, and plank buttresses, which provide support for the tree in swampy or unfirm ground, as on this trunk of pukatea (*Laurelia novae-zelandiae*) in Whanganui Inlet in the northern South Island (Craig Potton).

branching. However, some tree species, including mātaī (*Prumnopitys taxifolia*) and kaikōmako (*Pennantia corymbosa*), have shrubby, tangled, divaricating juveniles that grow into tall, single-trunked adults.

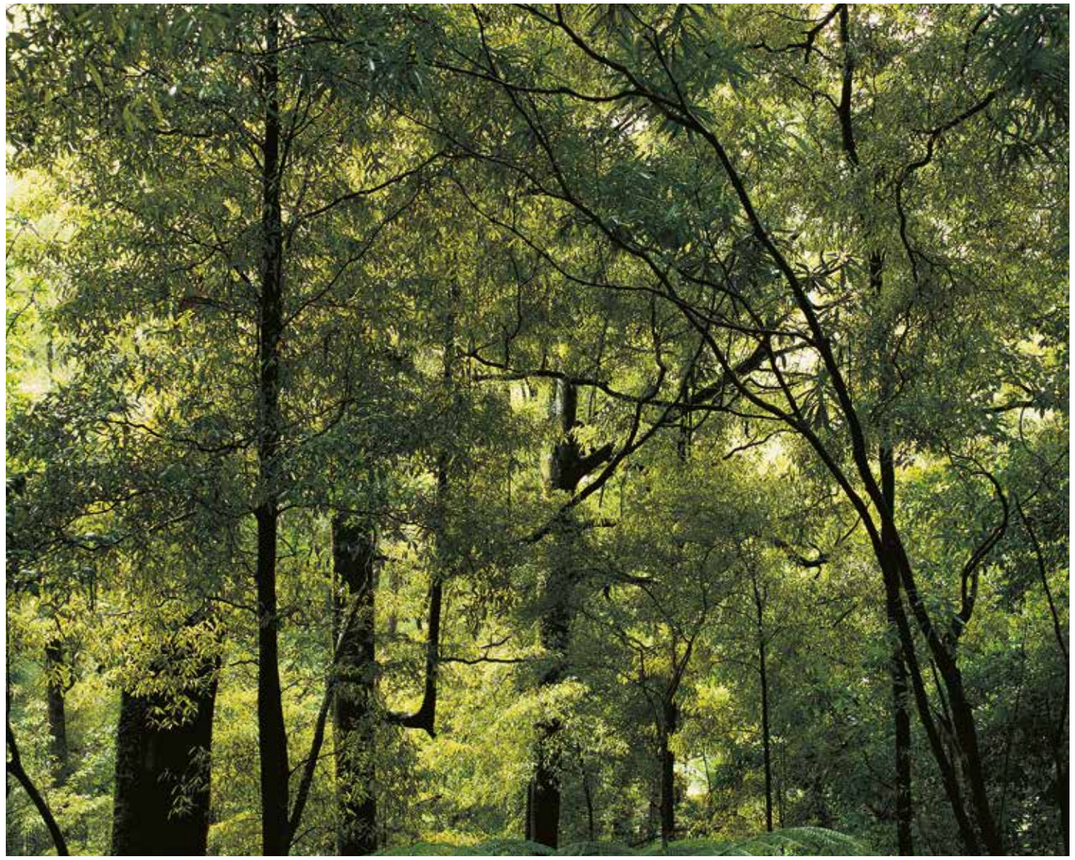


CONIFER–BROADLEAF FORESTS

Conifer–broadleaf forest is one of the two main forest types in New Zealand; the other is southern beech (*Fuscospora* spp., *Lophozonia menziesii*). Conifer–broadleaf forest is a mixture of conifers, whose seeds are formed in cones, and broadleaf or flowering plants, whose seeds are formed in flowers. This type of forest in New Zealand is generally referred to as the bush, a modest name for something very remarkable.

Conifer–broadleaf forest is more complex than beech forest, with a greater range of species and a rich diversity of plants in the lower levels of the forest and on the forest floor. The forest canopy is usually a continuous layer of broadleaf trees, with tawa often dominant, interrupted at intervals by very tall, emergent conifers. The most common emergent species is rimu (*Dacrydium cupressinum*), but the flowering northern rātā (*Metrosideros robusta*) is also one of these tall trees by virtue of starting its life as an epiphyte on a tall conifer.

Conifer–broadleaf forest extends throughout New Zealand, preferring warmer lowland and low-altitude habitats and fertile soil. This forest type north of about 38°S is rich in species, but south of that latitude, a number of species drop out, including the kauri, pōhutukawa and pūriri (*Vitex lucens*). At about 42°S, in the northern South Island, further species disappear, including tawa, kohekohe (*Dysoxylum spectabile*) and rewarewa (*Knightia excelsa*).



Where conditions are swampy, rimu is replaced as an emergent by the even-taller conifer kahikatea (*Dacrycarpus dacrydioides*), which is often associated with the flowering tree pukatea. Pukatea has two special features, shared with some tropical trees, that allow it to succeed in swampy conditions: at the base of the trunk there are a number of thin, triangular buttresses (plank buttresses) for additional support in the unfirm ground; and it forms breathing roots (pneumatophores) to supply air to the waterlogged root system. A smaller tree in swamp forests is the maire tawake or swamp maire (*Syzygium maire*), which also has pneumatophores.

On Mt Taranaki, at about 700 m altitude, the rimu and northern rātā characteristic of lowland conifer–broadleaf forest drop out, and the montane forest is dominated by kāmahi (*Weinmannia racemosa*), with some mountain tōtara (*Podocarpus laetus*) and bright-green broadleaf (*Griselinia littoralis*). Higher still, kāmahi diminishes and eventually disappears, while mountain tōtara and broadleaf increase and are joined by the attractively conical pahautea (*Libocedrus bidwillii*). The larger vines and epiphytes are uncommon in montane forest, but, especially in its upper parts, there is an astonishing abundance of smaller epiphytes—mosses, liverworts, filmy ferns and lichens—that flourish in the cool, misty climate. Every branch is engulfed by sleeves of these small plants, and they also drape the tips of every twig.

OPPOSITE ABOVE: Northern rātā (*Metrosideros robusta*) is a common emergent species in conifer–broadleaf forests. OPPOSITE: Rimu (*Dacrydium cupressinum*) dominate as emergents in this West Coast forest. ABOVE: Tawa (*Beilschmiedia tawa*) is a distinctive component of conifer–broadleaf forest (Craig Potton).

BEECH FORESTS

On most New Zealand mountains, as temperatures decrease with altitude, conifer–broadleaf forest gives way to more cold-tolerant beech forest. In comparison to conifer–broadleaf forest, beech forest has fewer species, predominantly *Fuscospora* spp. and/or *Lophozonia menziesii*, and a smaller range of plant lifestyles. Of the surviving native forest in New Zealand, beech forest is better represented than conifer–broadleaf forest, particularly in the South Island. This is partly due to the fact that the beech species grow mostly on steeper, cooler mountain slopes on thin, infertile soils so were less likely to have been cleared for farmland.

Even though the trees are not leafless in the winter, beech forest is more like a temperate forest of the Northern Hemisphere. While walking through untracked conifer–broadleaf forest can be a chal-

lenge, the more-open beech forest affords a much easier passage, and there is even a deep carpet of fallen leaves to walk on. The sparse undergrowth allows the columns of the tree trunks to be seen, and they provide an almost cathedral-like atmosphere. The crowns of one or more of the beech species form the roof of the forest, and the small leaves, on branches often attractively arranged in horizontal layers, allow dappled sunlight through to the forest floor.

The shrubby undergrowth involves species that are mostly restricted to the beech forests—the soft and prickly mingimingis (*Leucopogon* and *Leptecophylla* spp., respectively), a few species of small-leaved coprosmas and pittosporums, a few small hebes and, in the northern South Island, at higher altitudes, the small, prickly tōtara relative *Podocarpus acutifolius*. Where there is a gap in the canopy as a result of tree fall, the increased light leads to dense thickets of beech seedlings.

Conspicuous, non-woody, forest-floor species include scattered clumps of *Astelia fragrans*, and at drier sites, there may be dense stands of the handsome crown fern (*Blechnum discolor*). Some mosses and lichens are present too, the most notable being the milk moss (*Leucobryum javense*) that forms small cushions in the leaf litter carpet; when wet, these are green, but when dry, they become whitish.

New Zealand's southern beeches are notable for hosting colourful mistletoe parasites, which, when in flower, stand out against the sombre green foliage. *Peraxilla tetrapetala* and *P. colensoi* have bright-red flowers, and *Alepis flavida*, yellow flowers. Possums like eating them, so they are not as common as they once were.

As well as the species that are visible all the time, there are quite a number that emerge from the forest floor seasonally. In the spring, native orchid species appear, and autumn is the time for the spore-producing fruiting bodies of fungi of many forms, some with strikingly attractive colours.

On wet mountains near treeline, beech forests are often swathed in mist, and with the constant high humidity, water drips from every twig. With such conditions, lichens, mosses and other small plants grow abundantly on tree trunks and branches, often completely hiding them from view. At these high altitudes, the trees are often stunted and contorted, giving these subalpine beech forests, often referred to as cloud forests or goblin forests, an otherworldly feel.

BELOW: The fewer species and sparse undergrowth in beech forests, such as this hard beech (*Fuscospora truncata*) forest at Te Marua, create a more-open feel than that in conifer–broadleaf forests. OPPOSITE: High-altitude mountain beech (*Fuscospora cliffortioides*) forest on Panekiri Bluff, Te Urewera National Park (Craig Potton).

BEECH GAPS

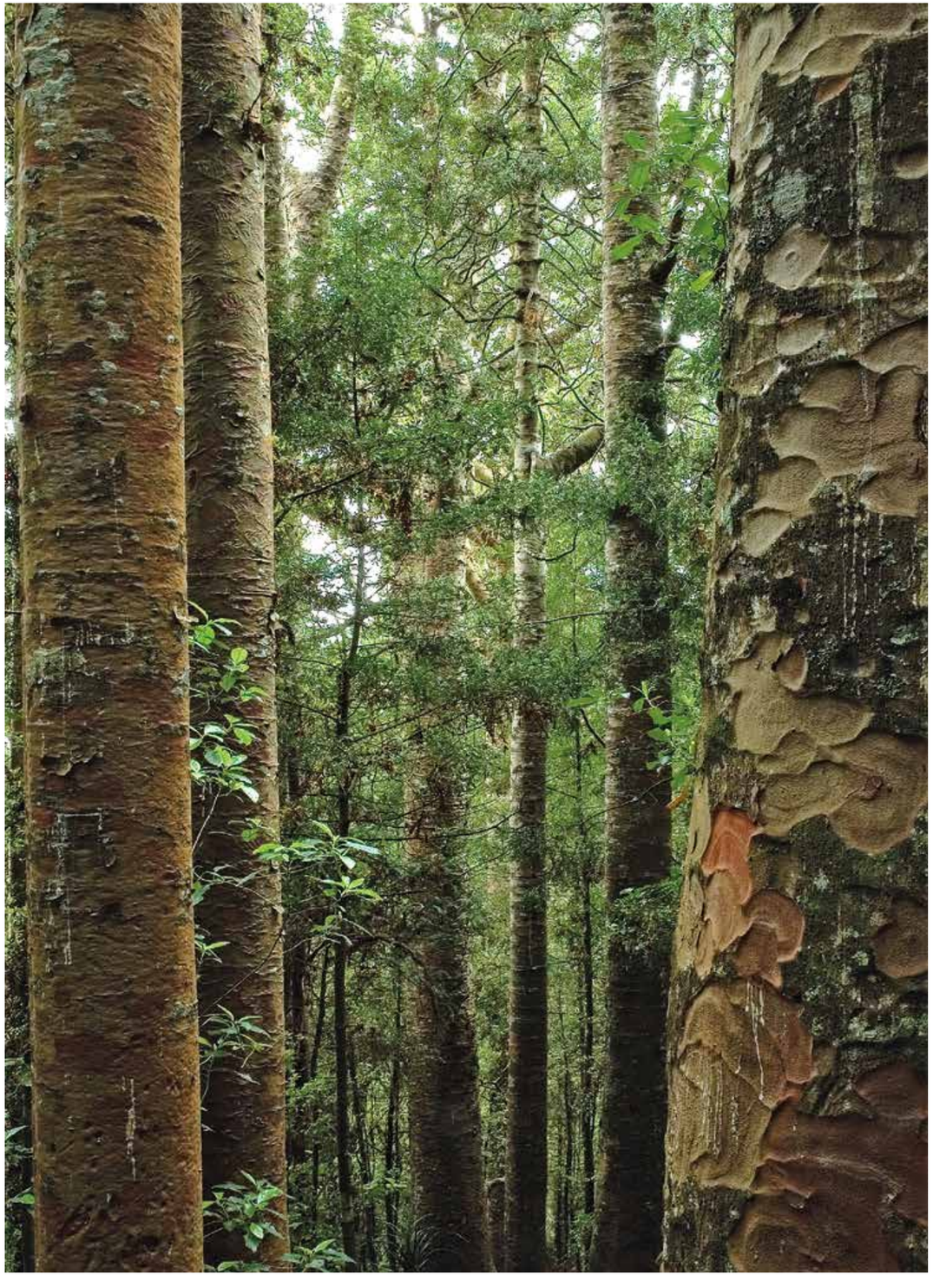
There are some parts of New Zealand where there is no beech forest where it could be expected to occur; these are known as beech gaps. Beech forest is absent from Mt Taranaki; the northern Tararua and southern Ruahine ranges (the Manawatū gap); central Canterbury; central Westland; and Stewart Island.

The patterns and distribution of New Zealand's two forest types are temperature-dependent: conifer–broadleaf forests need warm conditions to thrive, whereas beech forests are much more cold-tolerant. However, even beech forests cannot survive the low temperatures associated with glaciation.

During the last glacial period, the forest cover of the South Island was largely replaced by grasslands, with small refugia of beech remnants surviving here and there. In the North Island, the conifer–broadleaf forests retreated to the far north, where conditions remained warm enough for their survival. Most of the lowland North Island areas were covered in beech forest. Evidence suggests that as the glacial period came to an end, temperatures warmed relatively quickly, allowing the conifer–broadleaf forest element to displace the beech forest throughout much of the North Island and to spread back into the South Island.

Since then, evidence from plant fossils suggests that the peak warmth period of the interglacial occurred a few thousand years ago and that temperatures are now cooling, perhaps leading towards another glacial period. These cooler conditions favour beech forests, which now appear to be moving back and replacing the conifer–broadleaf forest, except in the warmer northern North Island areas.

If this pattern is correct, then the beech gaps may be explained as areas where the beech forest has not yet returned. However, beech seed spreads short distances only, and the seedlings cannot thrive unless mycorrhizal fungi are present in the soil, so the beech gaps may remain for a considerable time yet. Alternatively, if the recent trend to global warming continues, it may cause the conifer–broadleaf forests to expand their range as the beech forests once again retract.



KAURI FORESTS

A distinctive feature of the northern North Island flora is the kauri forests, now largely restricted to the Northland and Coromandel peninsulas. Immense at maturity, kauri favours poor soils, such as ridge crests and the leached soils of upland plateaus. On the thin, stony soils of ridge crests, kauri may form a continuous canopy, with rather spindly, smaller conifers and broadleaf trees below them. On the plateaus, where the soils are deeper but still infertile, kauri are more scattered, although still massive.

Underneath kauri is a layer of smaller conifers, such as rimu, miro (*Prumnopitys ferruginea*) and mountain tōtara, and beneath these are broadleaved trees and shrubs. The floor of kauri forests may be dense with kauri grass (*Astelia trinervia*) and other long-leaved plants, such as *Gahnia xanthocarpa* and kiekie (*Freycinetia banksii*). The spindly neinei (*Dracophyllum latifolium*) is a common sight in kauri forests.

OPPOSITE: Mature kauri, with substantial trunks, and young kauri, which are termed rickers, grow together at Kauri Park on Auckland's North Shore. BELOW: A lush stand of nīkau (*Rhopalostylis sapida*) on Raoul Island in the Kermadec group (Craig Potton).

NORTHERN COASTAL AND OFFSHORE ISLAND FORESTS

In the northern half of the North Island, there is quite well-defined coastal forest. This has a dense canopy but is not very tall because of the inhibiting effect of salt-laden winds from the sea. The most eye-catching tree, with masses of bright-red flowers almost obscuring the foliage in season, is the pōhutukawa. This can often be seen overhanging the sea where it can be splashed by waves, so it is very salt-tolerant. Smaller, salt-tolerant trees associated with the pōhutukawa are karo (*Pittosporum crassifolium*), ngaio (*Myoporum laetum*) and taupata (*Coprosma repens*). In the most exposed places, the taupata crouches close against the rocks, but with a little shelter it becomes an erect shrub.

Karaka is a common coastal tree, with dark-green leaves and clusters of bright-orange fruits the size of olives. Taraire (*Beilschmiedia taraire*), an imposing component of northern coastal forests, has thick, 'quilted' leaves and dark-purple fruits similar in size to those of karaka. A distinctive coastal tree of very different form is the sole native palm, the nīkau, with its unbranched trunk ringed with leaf scars, crown of enormous compound leaves, and abundant pink flowers and red berries.

Notably absent from the coastal forests are any of the conifers, which do not seem to tolerate salt-laden winds.

Mangrove forests are restricted to the northern region, mostly in estuaries. The mangrove or mānawa (*Avicennia marina* subsp. *australasica*) is virtually the only plant present and is notable for having countless finger-like pneumatophores that are exposed at low tide.

NORTHWEST NELSON

The northwestern corner of the South Island contains some of the largest areas of wilderness remaining in New Zealand, including Kahurangi, Nelson Lakes and Abel Tasman national parks, and Mount Richmond Forest Park. The area has an extraordinary level of endemism in both its flora and fauna, as a result of its tectonic history and its role as a refuge for isolated local plant and animal communities during the Ice Age glaciations.

All five species of southern beech occur in the Northwest Nelson area, and in the Richmond Range, the beech forest treeline is exceptionally high, almost the highest in the country at more than 1500 m.

Several northern species, in particular kohekohe, tawa, tanekaha (*Phyllocladus trichomanoides*) and kawaka (*Libocedrus plumosa*), reach their southern limits here. A number of subcanopy species are endemic to the area, including *Pittosporum dallii* and *Myrsine argentea*. Below the treeline, the forest is dominated by mountain beech (*Fuscospora cliffortioides*) and silver beech (*Lophozonia menziesii*), with scattered pahautea and, especially on the shallow, leached soils of ridge crests, mountain neinei (*Dracophyllum traversii*), with its striking candelabra-like branches. Mountain ribbonwood (*Hoheria glabrata*) is a common feature of slips. Red beech (*Fuscospora fusca*) and silver beech occur on slopes at lower altitudes, and conifers and broadleaf species, including southern rātā (*Metrosideros umbellata*), tāwheowheo (*Quintinia serrata*), kāmahi and pōkākā (*Elaeocarpus hookerianus*), become more numerous towards the coast.

An interesting feature of the Northwest Nelson area is the Nelson Mineral Belt, which is notable for its unusual flora and the absence of forest. The soils in this belt contain high levels of magnesium and tend to be toxic to most plants. The so-called serpentine soils are instead colonised by shrubs normally found in the harsh subalpine environment.

CANTERBURY AND THE MAIN DIVIDE

Much of the forest cover of the rain-shadow, drought-prone and windy eastern South Island had been destroyed by fire before the arrival of European settlers, and so the original forest composition has to be inferred from logs and charcoal evidence upon and within the soil. This suggests that Canterbury had a complete forest cover

BELOW: Mountain neinei (*Dracophyllum traversii*) is a distinctive component of the vegetation on Mt Arthur in Kahurangi National Park in Northwest Nelson. OPPOSITE, ABOVE: Matagouri (*Discaria toumatou*) along the alluvial plains of the Waimakariri River in Canterbury. OPPOSITE, BELOW: Southern rātā (*Metrosideros umbellata*) in full flower in the Otira valley, on the western side of the Main Divide.