TĀNE'S TREE TRUST
Native Forests for our Future | Hereherea te Wao-nui-a-Tāne

Establishing Native Forests

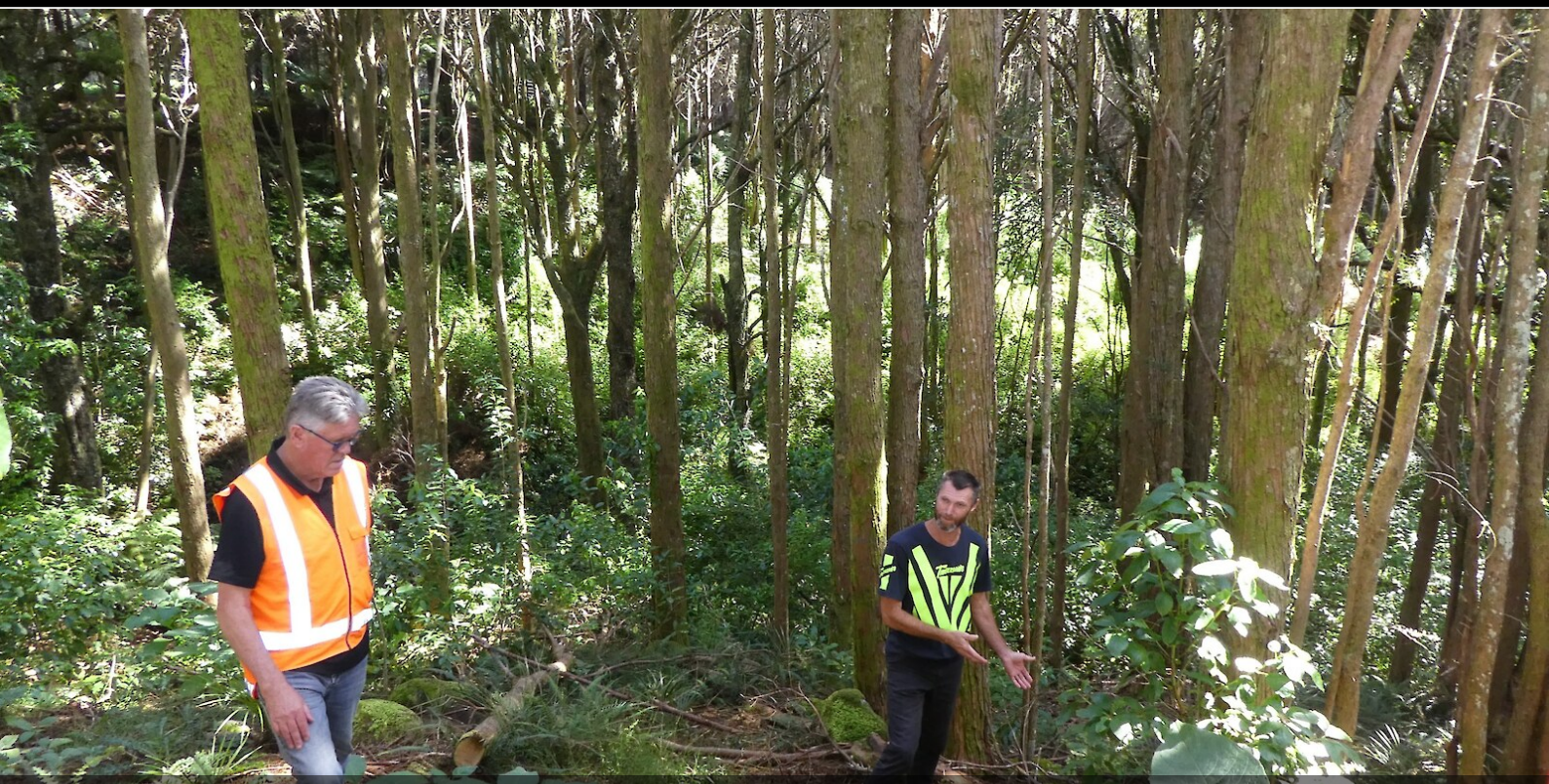
TĀNE'S TREE TRUST FACTSHEET SERIES

Economic potential of native forests

FACTSHEET 12, 2024 – by David Bergin

Refer to the other factsheets in this series for more about successfully establishing native forests.

Online version of this document with clickable links: https://docs.tanestrees.org.nz/1398/



Totara stand in Northland farmland, 14 months after harvest. Management for timber under CCF regimes can be confluent with non-timber values, including biodiversity. Increased regeneration of native species, particularly hangehange, was evident 14 months after light gaps were created after removal of individual stems, in a low-impact harvesting system.

Introduction

Many natives can be planted and managed for a range of productive purposes with many direct and indirect benefits such as:

- supply of high-quality specialty timber;
- carbon sequestration;
- honey production and pollination services;
- production of raw materials, e.g., bark, leaves, and oils used as medicines, herbs, food, and fibre;
- production of seed, seedlings, and cuttings used by the horticultural industry; and
- provision and enhancement of areas for adventure and other tourism opportunities.

It is possible to achieve environmental, social and productive objectives on the same site through planting and managing multiple-use native forest. Industries based on native forest species have been hugely important in the past. There is a resurgence of interest not only in establishing and protecting our native forest, but also in exploring options for sustainable production of a range of products and services that can assist with funding long-term management of a permanent cover of native forest – for all the benefits that this provides.

While over-exploitation of our old-growth native forests has resulted in most of the remaining high forest being protected within the conservation estate, there are still considerable areas of native forest in private and Maori ownership with potential to be managed for an increasing number of economic opportunities. In addition, there are substantial prospects to plant and regenerate new native forests and to integrate native forestry within even our most intensely managed agricultural and horticultural landscapes, as well as within our urban environments.

Opportunities for integrating native forest in our working lands

In a paper by the Parliamentary Commissioner of the Environment (PCE) in 2002, it was noted that our productive landscapes make up approximately 70% of the total land area in New Zealand. As stated these landscapes as such:

"...have the potential to make an enormous contribution to the following goals:

- *protecting indigenous biodiversity;*
- *fulfilling cultural values;*
- *realising new economic opportunities; and*
- *developing greater ecological resilience of the biotic resources that are the basis of the nation's wealth creation.*

There is a broad range of management opportunities for native plants on working lands that will further these goals. The adoption of these management opportunities will extend the presence of native plants on working lands, from permanent reserves through to a diversity of ecologically sustainable production areas. Native plants will then be present in many forms, from near-natural communities to mixtures of native and exotic plant species that are intensively managed."

In line with the recommendations of the PCE, there are many opportunities for landowners, iwi and community groups to consider productive options from established and managed native forest ecosystems on appropriate sites that are complementary with other land uses. Natives integrated into our working lands will enhance existing land uses rather than compete with or replace them. There are multiple substantial benefits derived from the existence of native forests and their management for people living in and around them, and also downstream (particularly in regard to catchment protection).

Sustainable timber production

Through careful choice of species, plant communities can be established and enhanced to provide a sustainable resource of high-quality timber, which can be integrated with conservation and other environmental values as well as social and cultural objectives. Once native forest is established, the adoption of Continuous Cover Forestry (CCF) practices, whereby harvesting is undertaken as single tree or small group felling, will ensure the conservation benefits of the high forest, including biodiversity, soil and water quality values and the landscape, are sustained.

Establishing a wood resource of native trees can serve environmental and cultural objectives as well as production objectives. Many native tree species have excellent potential for sustainable management for timber. Woodlots of key native timber trees can achieve optimum growth as part of single or mixed-species plantations if they are established on sites that suit their ecological characteristics and are managed appropriately.

Planting native trees for multiple reasons establishes a resource where future generations have the option to manage extraction of high-quality, high-value specialty timber. Sustainable harvesting plans can be designed to ensure that the non-timber values of planted native forest will be kept intact using CCF principles, leaving the high forest structure and associated environmental values intact.

As with all forestry, growth can be maintained or boosted by thinning stands and improving tree form by timely pruning. There are increasing numbers of landowners interested in managing their planted and naturally regenerating stands for timber. There are demonstration areas of managed native stands across a range of forest types nationwide including kauri, totara, rimu, matai, kahikatea, puriri and the beeches, some decades old , showing the excellent potential for establishing a native forestry resource.

In addition to the other benefits of planting natives, there are opportunities to establish a long-term resource of native timber trees on appropriate sites that give future generations the option of sustainable management of high-value specialty timber.

Left: Plantation-grown totara used as weatherboards for this office in Northland is an example of the potential to develop a sustainable resource of specialty native timber on appropriately managed sites. Right: Totara is culturally important to Maori. Of all the native timbers, it is revered as being the best for carving. While carvers prefer seasoned heartwood from old-growth trees, they consider farm-grown totara to be a good alternative.

Tāne's Tree Trust Native Forest Toolkit

Tāne's Tree Trust (TTT) has developed the Native Forest Toolkit. This toolkit comprises four calculators that have been developed to assist those planting and managing native trees to meet multiple objectives from environmental restoration to sustainable production. The toolkit draws on scientifically robust data from the Tāne's Tree Trust Indigenous Plantation Database to provide foresters, farmers, iwi, environmental NGOs, community groups and individuals with realistic expectations for their plantings. This includes the option of continuous cover forestry to provide a sustainable supply of specialty timber from appropriate sites planted with natives.

The calculators provide default values based on average costs of most common planting scenarios as well as growth rates based on average performance of planted natives nationwide. Users can elect to enter their own planting prescriptions and growth data in the calculators based on their own site-and species-specific details or requirements.

Developing a business plan for native forestry

For those wanting to develop a business plan for planting a native forest then the TTT Economics Calculator allows them to input the establishment and management costs and can provide an estimated return from potential income streams. Revenue options include carbon sequestration, the long-term potential of sustainable timber production, and also any other forestry related income generated by the landowner such as honey, adventure tourism or other products.

While valuing the non-timber benefits and the wider ecosystem services can be challenging, the Economics Calculator also allows users to input their estimated or actual costs and revenues, or a rating for what they consider a priority. This includes the landowner value on indigenous biodiversity, landscape, cultural and social benefits of establishing and sustainably managing native forests.

Native trees can be grown for wood

- Current research evaluating the growth and wood quality of selected native trees indicates that the timber from fast-growing planted trees can be as attractive as, and have many of the wood characteristics of, timber from old-growth indigenous forest or locally grown and imported exotic species.
- With growth rates in excess of 50 cm in height and up to 1 cm in diameter per year on favourable sites, logs approaching 40 cm in diameter are achievable within 50 years of planting for kauri and totara.
- While development of heartwood is slow, particularly in native conifers, the sapwood of planted kauri and totara trees which are less than 50 years of age contains a range of colours and textures.
- A range of knot sizes in totara enhances its decorative potential.
- Basic density of the sapwood from kauri in a 66-year-old plantation is lower than that of kauri heartwood but higher than radiata pine.
- Wood shrinkage and stiffness testing shows that plantation kauri iss superior to old-growth kauri and commonly used exotic forestry species.
- Similar preliminary results are found with fast-grown planted totara.
- The results suggest that relatively young plantation-grown native conifers have good potential as a solid wood resource.
- Preliminary investigations of some hardwood native tree species in early plantations also indicate fast growth rates and probably faster development of heartwood than in native conifers.
- Such research is providing encouragement to landowners planting native trees on good quality sites, not only for environmental and social objectives, but also for the option of timber production for future generations.

A managed plantation of planted totara in Hawkes Bay, which was planted in the 1960s. It has been pruned, showing the potential to grow potentially high-value timber long term.

Carbon sequestration

Carbon sequestration is the only environmental service that currently is readily monetised via the Emissions Trading Scheme. Expansion of forest resources has been identified as a major means of meeting climate change commitments.

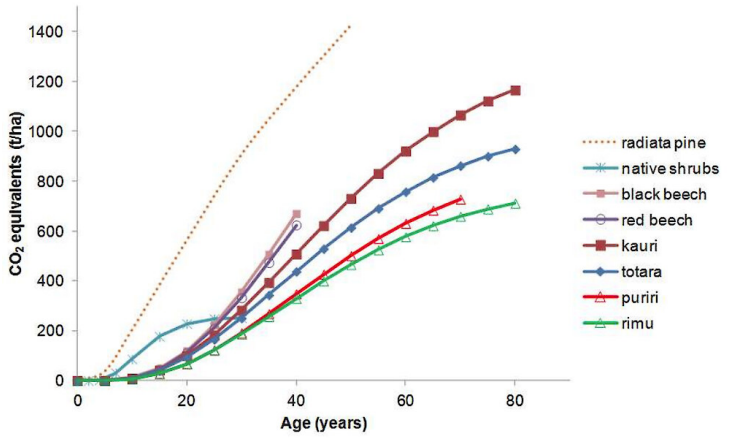
Tane's Tree Trust has developed an indigenous forestry carbon calculator which can help people calculate how much carbon their planted native stands are sequestrating or determine how many native shrubs and trees they need to plant to offset their carbon emissions over a defined period of time.

The Carbon Calculator will assist users to determine how many native shrubs and trees need to be planted over a defined period of time to off-set the carbon footprint determined by the user. It also allows the calculation of how much carbon a planted native forest is storing over a defined period of time. The actual amount of carbon sequestered by a particular stand can vary from the calculator predictions and is dependent on site quality and the stand characteristics and management. Some examples are provided of how many planted native trees are required to offset emissions from common activities such as air travel, household emissions, and average annual use of the family car.

Check out the carbon calculator on the Tane's Tree Trust website to calculate an estimate of how many trees and shrubs are needed to plant to offset emissions elected by users.

Carbon farming and natives

- In 2002, New Zealand ratified the Kyoto Protocol, an international initiative aimed at reducing greenhouse gas emissions and thereby controlling or mitigating the adverse effects of anthropogenic interference with the climate system. The Protocol recognises the ability of trees to remove carbon dioxide from the atmosphere.
- As part of measures designed to assist New Zealand meet these commitments, the Government has several programmes in varying stages of development and/or implementation that are of interest to the production forestry sector, some with relevance to native forests.
- Various initiatives have the potential to encourage the establishment of native forests on an operational scale.
- The carbon accumulated by trees can only be counted in the Emissions Trading Scheme (ETS) if the trees form a 'carbon forest' which must be:
  - a minimum of 30 m wide and cover 1 ha,
  - with the crowns of the trees covering more than 30% of each hectare, and
  - comprise trees with the potential to grow to a height of at least 5 m.
- Both planted and natural regenerating forest can be registered as carbon forest but only forest that has established after 1989; native forest and regenerating vegetation that existed before 1989 are not included.
- Tāne's Tree Trust has estimated the carbon sequestered based on their database of planted native trees and shrubs (see graph).
  - Although native species initially have slower growth rates, they can compete with exotic species in carbon sequestration over the longer term.
  - Carbon sequestration rates for planted native species are highly variable, depending on stand age, stocking, site productivity and level of maintenance after planting. Mean annual increment (CO2 sequestration divided by stand age) for stands over 30-years-old, range from 6 to 20 t/ha/yr and average 13t/ha/yr.



Predicted carbon sequestration rates on average sites for several native tree species, a mixed-species planting of shrubs, and a typical radiata pine stand.

- In addition to long-standing benefits of established native forest, such as biodiversity and soil and water values, the planting of native trees along with managing natural reversion on bare land for carbon storage as part of the Kyoto Protocol is likely to provide further economic opportunities on many sites and lead to increased interest in the establishment of native forest.
- Latest information on native forestry and carbon, including likely future changes to the ETS, is provided by Te Uru Rākau – New Zealand Forest Service on the Ministry of Agriculture and Forestry's website.

Not just planting

For large-scale establishment of native forestry, it will not be economically feasible to rely on planting alone. This includes the often quoted million or more hectares of marginal, steep hill-country pastoral land that is highly prone to erosion and increasingly vulnerable to the more frequent major cyclonic events associated with climate change. This was particularly evident in the destruction wrought by Cyclone Gabrielle in the Tairawhiti and Hawkes Bay regions, with major on- and off-site damage due to landslides, sedimentation of waterways and deposition of large amounts of silt in the valleys downstream.

Planting natives is expensive, estimated at $20,000 per ha on average, which is largely based on planting relatively easy sites unlike much of the marginal erosion-prone steep hill country. For these difficult sites, natural reversion to native forest is the only cost-effective option. It will be a slow process with success highly dependent on a range of factors including proximity to local seed sources of appropriate native species, including high-forest native trees, fencing out domestic stock, control of pest browsing animals such as deer and goats, and selective control of problem aggressive weed species such as wilding pines. In addition, the control of bird and seed predators including mustelids and rodents is likely to boost effective flowering and seed production of key native shrub and tree species to enhance natural succession to native forest cover.

Natural reversion along with supplementary planting to increase locally scarce native canopy species are options for landowners to consider in establishing native forest at large scale, for multiple benefits including carbon sequestration.

However, planting can still be an integral part of assisting natural reversion to native forest by boosting local seed sources of key native canopy species. Refer to other factsheets in this series on the use of “seed islands” planted within the landscape to supplement natural reversion and re-introduce or increase the presence of key native tree species along with bird predator control (see Factsheet 6 and Factsheet 7).

Honey production and pollination services

Native forests provide habitat for native pollinators such as native bees, honey-eating birds, geckos, skinks and native bats. Pollination is important for the horticulture, pastoral agriculture and for supporting the reproduction of many native plants.

Apiculture relies on native forests, particularly for early season nectar flow and pollen which are critical for building up bee colonies. Corridors of riparian planting with a diverse range of shrub and tree species can provide habitat for bees in rural landscapes to benefit agriculture and horticulture, particularly kiwifruit, apples, avocados, stone-fruit and blueberries; as well as pastoral agriculture such as clover. Pollinators are declining in New Zealand and world-wide due to multiple factors, including habitat loss.

In addition to multi-floral honey, apiarists can differentiate between honey made from particular native species, which are dominant in the local landscape and have different flowering times. This includes not only manuka honey but also rewarewa, kamahi, southern rata and tawari.

New Zealand is the world's second largest honey exporter. Honey with high levels of unique manuka factor (UMF) is particularly valuable. Extensive areas of naturally regenerating manuka and more recently established commercial plantations support production of high UMF honey. Economic returns compare favourably with those for alternative land uses. With increased production of manuka honey from large areas, nearby areas of diverse native forest help sustain bee populations either side of peak manuka flowering.

A diverse forest can also provide multi-floral honey from a mix of native and exotic species. Apiarists can differentiate between honey types such as rewarewa, kamahi, southern rata or tawari.

Plant extracts and crops

For hundreds of years, Maori harvested plants from forests for food and for natural healing (rongoā).

There has a resurgence in use of native plant products for medicinal, natural health remedies and skincare. Examples include manuka and kanuka essential oils, kawakawa leaves and totarol from totara with anti-microbial effects or other medicinal properties, and flaxseed oil with high nutritional value.

There has also been a growing profile of indigenous cuisine, which has created new markets for wild foods. For example, tuna (native eel), pikopiko (unfurling fronds of hen-and-chickens fern), horopito (used as a pepper and for hot sauce), kawakawa (used for rongoā and as a condiment), and native mushrooms such as harore and pekepeke-kiore can now be found on menus.

Sphagnum moss is a renewable crop worth millions of dollars annually in exports. As well as investments in plantation-grown manuka and kanuka, for oils and honey, there is also the potential for growing forest understory crops of native species such as kawakawa and native mushrooms for culinary and medicinal purposes.

Interest is growing in using native plants such as kawakawa along with many other native plant species for medicinal purposes.

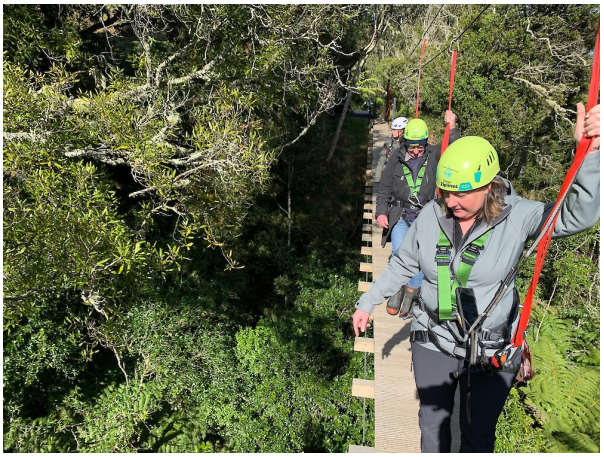
Native forests and tourism

The natural environment is integral to tourism in New Zealand and is a key asset on which the New Zealand tourism industry exists and continues to thrive. While it is difficult to determine the exact economic contribution of native forests, they are undoubtedly a vital component of the tourism industry and also play an important part in the 'clean, green', '100% pure' branding for New Zealand. Native forest provides the ambient environment for tourism activities, as well as environmental and cultural services supporting water quality, scenic values and amenity functions, which are vital for tourism.

Tourism is one of the main economic drivers of the New Zealand economy, employing nearly 10% of the workforce. Nature-based tourism (ecotourism) activities are among the principal attractions for overseas and domestic visitors, creating significant employment in local communities. Many ecotourism ventures have a strong conservation ethos and provide natural heritage education. Nature-based activities and pleasure in supporting conservation efforts are culturally and spiritually important to many New Zealanders.

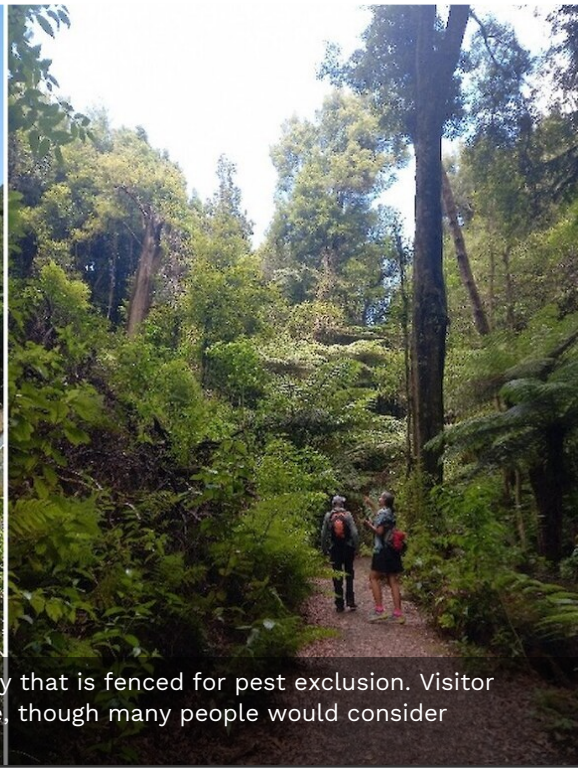
A large proportion of ecotourism ventures in New Zealand are based in native forests, including the following examples:

- Zipline tours through native forest, such as Canopy Tours, near Rotorua, which has won national and international awards. Canopy Tours also funds an extensive conservation project, based largely on pest control to protect the native plants and animals that live in the forest.
- Fenced eco-sanctuaries such as Sanctuary Mountain Maungatautari in the Waikato region; ZEALANDIA, an urban eco-sanctuary in Wellington; and Orokonui Ecosanctuary near Dunedin.
- Outdoor guiding companies that take nature tours in natural areas, and hunting and fishing ventures in remote native forest landscapes.



Adventure tourism and ecotourism such as these zipline tours near Rotorua show that business ventures in native forest can be highly profitable in many parts of New Zealand. They attract thousands of local and international visitors.

All of these ventures have a strong conservation ethos and enable people to enjoy interactions with nature while providing education and opportunities for participation in biodiversity conservation. They demonstrate that viable business models can be based on biodiversity conservation values and ecotourism. The visitor numbers demonstrate willingness-to-pay for biodiversity conservation and experiencing nature, plus the large number of people volunteering or paying for memberships to the three ecosanctuaries, demonstrates the depth of community support.



Sanctuary Mountain Maungatautari in the Waikato is an example of an eco-sanctuary that is fenced for pest exclusion. Visitor numbers, donations, and the large number of volunteers indicate its economic value, though many people would consider conservation of native biodiversity as ‘priceless’, i.e., ‘valuing the invaluable’.

Review of economic potential of native forests

Information in this factsheet comes from several Tane's Tree Trust online publications and other sources on the potential of both timber and non-timber products of New Zealand's native forests - for landowners interested in establishing and managing native forest for multiple objectives. These include:

- Non-timber Values in Native Forest (2021)
- A Practical Guide to Managing Tōtara on Private Land (2022)
- The work of the Northland Totara Working Group
- Other Tane's Tree Trust resources

Native forest factsheets series

These factsheets on establishing native forest have been compiled by Tāne's Tree Trust with funding from Te Uru Rākau's One Billion Tree Partnership Fund with support from The Tindall Foundation and Trees That Count. Others providing information and undertaking peer review include Scion, Auckland University of Technology, Northland Totara Working Group, iwi, landowners and selected local authorities and government departments.

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Te Uru Rākau New Zealand Forest Service

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