



Trees for the future

A fact sheet for long-lived trees in native forest regeneration

1.1. Native planting for long-term restoration success

The goal for ecological restoration projects is typically to restore land as close as possible to what would have naturally occurred there. For the most part in the Waikato, historical vegetation within the region was a range of different rainforests dominated by podocarp and broadleaved trees such as kahikatea, tōtara, mataī, rimu, pukatea, and tawa.

Many of the trees and shrubs that make up our local rainforests are unable to tolerate the open conditions common at revegetation sites due to environmental conditions such as frosts, too much sunlight, and/or too much wind. Pukatea and tawa are two good examples of such species as they both require shelter from the elements to survive.

Native planting projects therefore need to re-introduce native plants back into the landscape strategically to encourage the land to return to a native rainforest.

1.2. From open field to closed forest – forest succession

In nature, vegetation goes through a series of changes over time as conditions within a site change to suit different plant species – a natural process known as succession.

In the warm, wet climate of the Waikato, plants can be identified within this process as either colonisers, pioneer species, or climax species.

Colonisers are species that form the initial 'scab' on the land and tend to be fast-growing native ground ferns, herbs and grasses, tree ferns, vines, and scramblers.

Pioneer species are typically fast-growing trees and shrubs that replace colonisers. In a local restoration context, pioneer species can be split into **early-phase pioneers** and **late-phase pioneers** based on when they can be reintroduced to a site.

Early-phase pioneers are species that can be reintroduced to open sites to create an initial canopy and begin to establish a forest microclimate for more sensitive plant species. Early-phase pioneers include species such as mānuka, kānuka, karamū and fivefinger/whauwhaupaku.

Late-phase pioneers are species that grow quickly and perform the same functions as early-phase pioneers but are less tolerant of extreme environmental conditions than early-phase pioneers. Late-phase pioneers need a bit of shelter from harsh conditions such as frosts, wind, draught, and/or direct sunlight. Late-phase pioneers include species such as kawakawa, rangiora, tītoki, putaputaweta, and rewarewa.

Climax species are those that exist within a climax forest – the latest stage of the forest successional process i.e. old growth forest. A peculiarity of New Zealand rainforests is that some climax species are robust enough to be grown in the open with early-phase pioneer species e.g. kahikatea, tōtara, mataī, and kauri. Many climax species, however, require a forest microclimate to be well-established for them to be able to thrive e.g. tawa, pukatea, swamp maire, pigeonwood, and patē.

1.3. Exploiting the successional process in restoration projects

In restoration projects, we can use our knowledge of plants to accelerate the successional process to recreate a climax forest by:

1. Skipping the first phase of successional plants (colonisers) entirely.
2. Planting a mix of early-phase pioneer species, robust climax species, and late-phase pioneer species (depending on site conditions) to:
 - a. Rapidly establish a canopy and create a microclimate for more sensitive species.
 - b. Provide an early foundation of long-lived species.
3. Further enhance plant communities with enrichment planting of more sensitive species once a canopy is established and plants are better sheltered from the elements.

1.4. Importance of including climax and long-lived species in native plantings

Many early-phase pioneer plants are short-lived. Plants such as mānuka, karamū, and houhere/lacebark generally only live for two to three decades.

In most of the Waikato, particularly lowland Waikato, landscapes have often had native vegetation almost completely removed. This means the potential for natural seeding of native plants into revegetation sites is low.

When short-lived, early-phase pioneer plants begin to die off a couple of decades after planting, they will be replaced by other plants. If there is no substantial local source for native seeds, the replacement vegetation is likely to be dominated by invasive exotic plants such as inkweed, privets, blackberry, and woolly nightshade.

Including longer lived native species in your revegetation planting helps to increase the long-term resilience of a native revegetation planting by:

1. Ensuring plantings will persist for more than two to three decades.
2. Providing a foundation for later successional forest.
3. Providing a local seed source of long-lived native trees and shrubs to encourage landscape-level ecological restoration.

1.5. Long-lived trees suitable for native revegetation sites in the Waikato

There are a variety of long-lived native trees that are commonly available in nurseries around Waikato and are suitable for native revegetation projects. These include some early-phase pioneer trees, robust climax trees and, depending on the environment of the revegetation site, some late-phase pioneer trees can also be included in initial revegetation plantings.

Tree species suitable for any particular revegetation site is influenced by the location and local conditions of the site e.g. topography, aspect, drainage, and soil type. This is particularly important for any robust climax species because they will persist

on the site for several hundreds of years if planted in appropriate locations. For example, kauri is typically found on hillslopes and ridges, whereas kahikatea was the dominant tree across lowland Waikato and is better adapted to growing in wet conditions than other early-phase climax species.

The table below provides a list of plants that can be expected to live for more than 50 years, are often available in local native nurseries, and can be included in the initial planting of revegetation projects around the Waikato.

Botanical name	Common name	Successional phase	Comment
<i>Cordyline australis</i>	Ti kōuka/ Cabbage tree	Early-phase pioneer	
<i>Kunzea robusta</i>	Kānuka	Early-phase pioneer	
<i>Myrsine australis</i>	Māpou/ Matipo	Early-phase pioneer	
<i>Pseudopanax crassifolius</i>	Horoeka/ lancewood	Early-phase pioneer	
<i>Sophora microphylla</i>	Kōwhai	Early-phase pioneer	
<i>Melicytus ramiflorus</i>	Māhoe	Early-phase pioneer	Young plants sensitive to frost
<i>Agathis australis</i>	Kauri	Robust climax	Naturally uncommon in lowland Waikato and not found south of Pukenui, near Kawhia.
<i>Dacrycarpus dacrydioides</i>	Kahikatea	Robust climax	
<i>Dacrydium cupressinum</i>	Rimu	Robust climax	
<i>Phyllocladus trichomanoides</i>	Tanekaha/ Celery pine	Robust climax	Prefers partial shade
<i>Podocarpus totara</i>	Tōtara	Robust climax	
<i>Prumnopitys taxifolia</i>	Mataī	Robust climax	
<i>Alectryon excelsus</i> subsp. <i>excelsus</i>	Tītiki	Late-phase pioneer	Young plants are frost intolerant
<i>Carpodetus serratus</i>	Putaputaweta/ marbled leaf	Late-phase pioneer	Needs some shelter but is frost hardy
<i>Knightia excelsa</i>	Rewarewa	Late-phase pioneer	Requires some shelter
<i>Pennantia corymbosa</i>	Kaikōmako	Late-phase pioneer	Vulnerable to smothering from vines
<i>Rhopalostylis sapida</i>	Nīkau	Late-phase pioneer	Sensitive to frost. Very slow growing.

Pot size

Early-phase pioneer plants can be planted in 0.5 litre pots (e.g. 28 cell trays) or larger. Late-phase pioneer plants can be planted in 14 cm pots (1.5 litre) and there is no real need to plant larger stock. Māhoe can be planted in 1 litre pots and also grown from cuttings.

Some of the climax species require a year or two longer in the nursery than the pioneer species. This may require them to be potted up into larger pot sizes e.g. 17 cm (2 litre) pots.

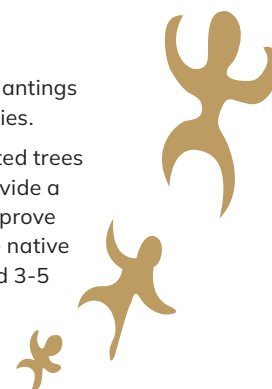
Pot size can significantly influence the cost of a planting project. Plants in smaller pots are typically cheaper to buy and easier to plant. However, they may require a greater post-planting maintenance effort to protect plants from weeds and browsers so costs should be weighed up based on the specific characteristics of revegetation sites e.g. if there is considerable risk of weed competition, larger plants in larger pots may be more economical.

Generally speaking, planting success comes down to the quality of the work on the planting day (e.g. plant placement, plant hole depth, and watering-in of plants) and the on-going maintenance regime.

Planting rate

It is recommended that revegetation plantings consist of at least 20% long-lived species.

It is good if around 12.5% (1 in 8) planted trees are robust climax species. This will provide a long-term canopy (200+ years) and improve the long-term survivability of a diverse native habitat. Climax trees should be planted 3-5 metres apart from each other.



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