

7. KEI KONEI TONU TE MAIRE TAWAKE KEEPING THE KETE FULL FOR THE ULTIMATE SWAMP TREE

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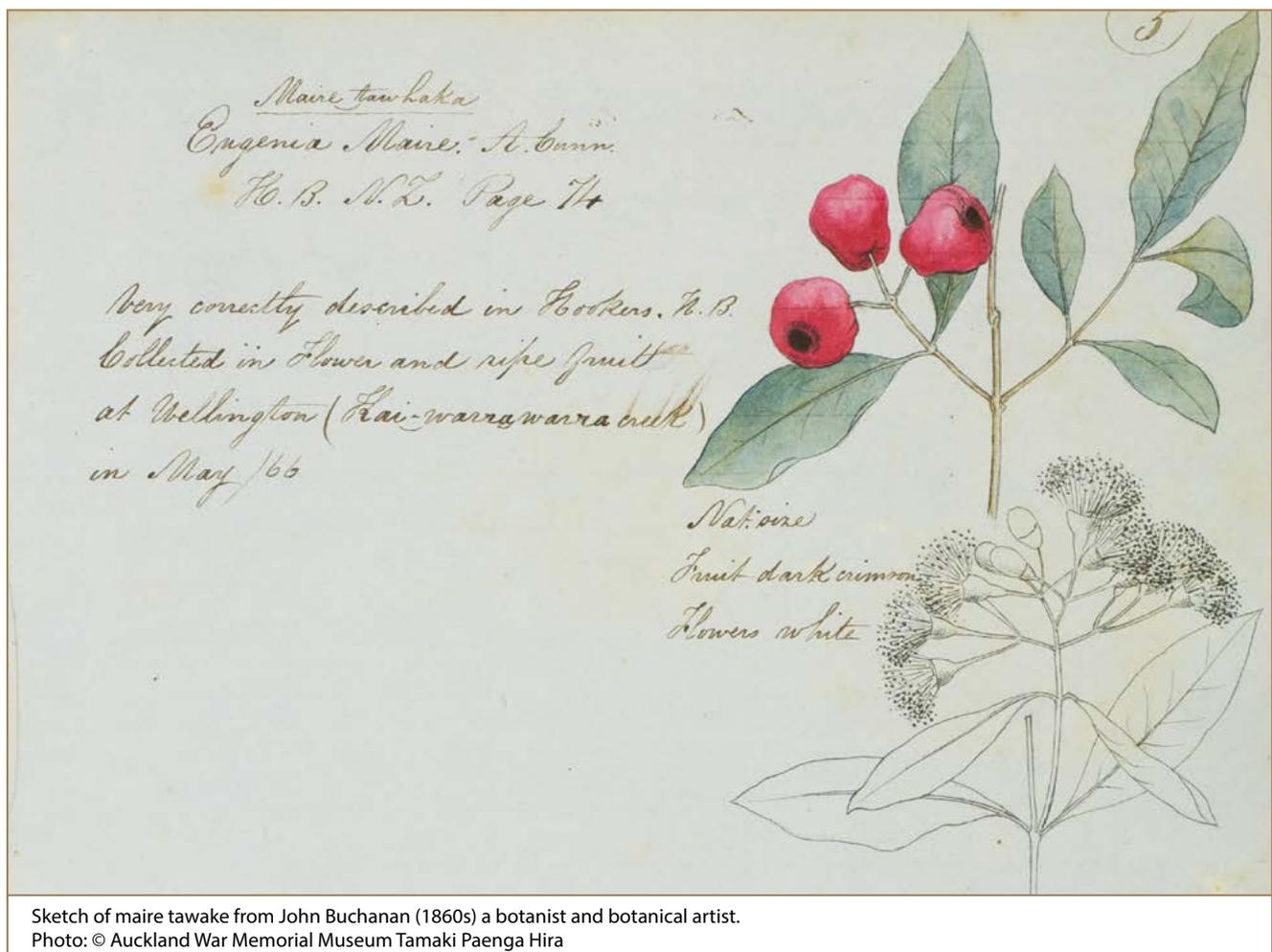
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*Maa te rongo, ka moohio;
maa te moohio, ka maarama;
maa te maarama, ka maatau;
maa te maatau, ka ora*

**Through awareness comes wisdom;
through wisdom comes understanding;
through understanding comes knowledge;
through knowledge comes well-being**

We would like to express our thanks to Graeme Atkins (Ngaati Porou) and the whaanau from the myrtle rust and East Coast native plant groups who provide constant injections of inspiration and knowledge to the myrtle rust and native plant protection space. Their determination and passion keep our valued Myrtaceae (myrtle) family on the national radar. Many thanks also to our colleagues from Te Tira Whakamaataki (Maaori Biosecurity Network), Dr Melanie Mark-Shadbolt, Alby Marsh, and Dr Nick Waipara, for supporting whaanau in pursuing aspirations for our taonga species. Thanks also to our whaanau at the coal face – we see you fighting the big fight, and we recognise and tautoko the valuable contributions you all make to protecting our taonga. Ngaa mihi nui ki a koutou.

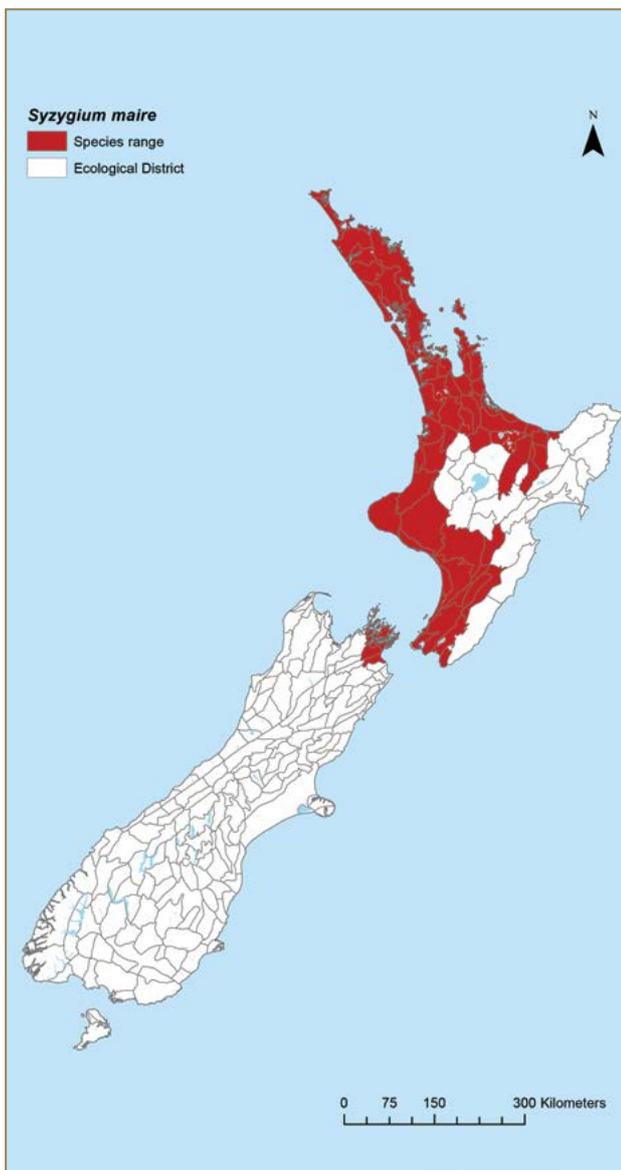
– Ngaa mihi, naa Rangi maatou ko Cheri,
ko Antoinette



Sketch of maire tawake from John Buchanan (1860s) a botanist and botanical artist.
Photo: © Auckland War Memorial Museum Tamaki Paenga Hira

As the authors of this chapter, we each have memories of when we first learned about maire tawake – also known as maire tawhake, tuhuhi, waiwaka, and whaawhaakou (swamp maire; *Syzygium maire*). Despite it having featured in the diets of our tuupuna (ancestors), many New Zealanders are not aware of this tree or of its importance in the thousands of hectares of swamp forest that once covered many parts of Te-Ika-a-Maui (North Island of Aotearoa) and the top of Te Wai Pounamu (South Island of Aotearoa) (Fig. 1).

It's the typical story of wetlands in the mid-19th Century, being drained and converted either to farming or large settlements, which leads to species declining



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Figure 1. Map of the presence of maire tawake (*Syzygium maire*) in Ecological Districts in Aotearoa New Zealand. Adapted from Wiser et al. 2017, Manaaki Whenua – Landcare Research

or becoming locally extinct. Over time, because they're no longer in sight, people stop talking about these species. They stop using or referring to them, and finally, they are forgotten. If maire tawake had not reappeared on our radar – the reasons being diverse – we might have continued to remain oblivious. We are no longer oblivious!

This chapter aims to share the best information we can find about this remarkable tree, as our contribution to the kete (baskets) of knowledge. As with many rare species throughout Aotearoa New Zealand, there are gaps in our mātauranga (knowledge), but we try to give prompts for whaanau (families) to help trigger 're-memorying' of our swamp tree and the landscapes that it did – and indeed still does – inhabit. Most important, this is about making sure the kete of our mokopuna (grandchildren) and their mokopuna are never emptied again.



Maire tawake seedling.
Photo: Cheri van Schravendijk-Goodman

THE ULTIMATE SWAMP TREE

Maire tawake is an endemic species (only found in Aotearoa) and is one of the very few native trees that can live very happily in a repo (swamp). Next to the familiar kahikatea (*Dacrycarpus dacrydioides*) and pukatea (*Laurelia novae-zelandiae*), maire tawake is the ultimate swamp tree because it has the following key features:

- **A root system that can handle being covered in water.** Maire tawake does this through the development of pneumatophores – aerial roots that appear like bunches of short straws at the base of the tree when in flooded areas. These grow up over the water surface and when waterlogged, the tips of the aerial roots become spongy, and 'breathe in' oxygen that is unavailable in the waterlogged root zone.
- **A flower that stands out among the others to attract insect and bird pollinators.** Maire tawake flowers have bright white stamens (thin filaments appearing above the flower) creating a bristly appearance. These flowers appear in bundles of up to 20 individual flowers, sitting at the ends of branches and making them appear like snow across the tree from November to July. Scientifically, maire tawake belongs to the Myrtaceae family, like poohutukawa (*Metrosideros excelsa*) and raataa (Northern raataa; *M. robusta* and Southern raataa; *M. umbellata*), which all have very similar flowers.
- **A bright red, fleshy fruit that looks tasty to disperser birds.** One of the most obvious bird visitors to a swamp forest is the native kereruu (*Hemiphaga novaeseelandiae*), which can travel up to 65 km a day. As kereruu love to munch on the fruit of kahikatea, it makes sense that maire tawake, a swampy counterpart, would evolve a means to attract kereruu and other birds to eat their fruits and carry the seeds away to another site. Maire tawake is not wholly dependent on our birds, though – the seeds also germinate readily without the assistance of moving through the digestive tract of a bird.
- And most important of all, ***you need swamps – and lots of them.***

The fact that maire tawake has evolved so successfully in waterlogged soils of swampy environments has also contributed to its decline. As swamps have been drained across the motu (country), maire tawake also disappeared across several culturally and ecologically important landscapes. More recently, a new threat has pushed maire tawake even closer to the brink of extinction – a fungal pathogen known as **myrtle rust** (*Austropuccinia psidii*).



Breathing roots of maire tawake. Photo: Bruce Clarkson



White flowers of maire tawake. Photo: Bruce Clarkson



Bright red, fleshy fruit of maire tawake. Photo: Bruce Clarkson

Our tuupuna were on to something! Recent nutritional investigations specifically highlight the high antioxidant value of the maire tawake berries as being up to 18 times that of the famed 'superfood', blueberries (*Vaccinium corymbosum*).

MAIRE TAWAKE ARE STILL HERE RE-EDUCATING OUR EYES

As noted earlier, the major decline in maire tawake populations following colonisation resulted in its disappearance from the wider national community. Persistent attempts to keep propagating and

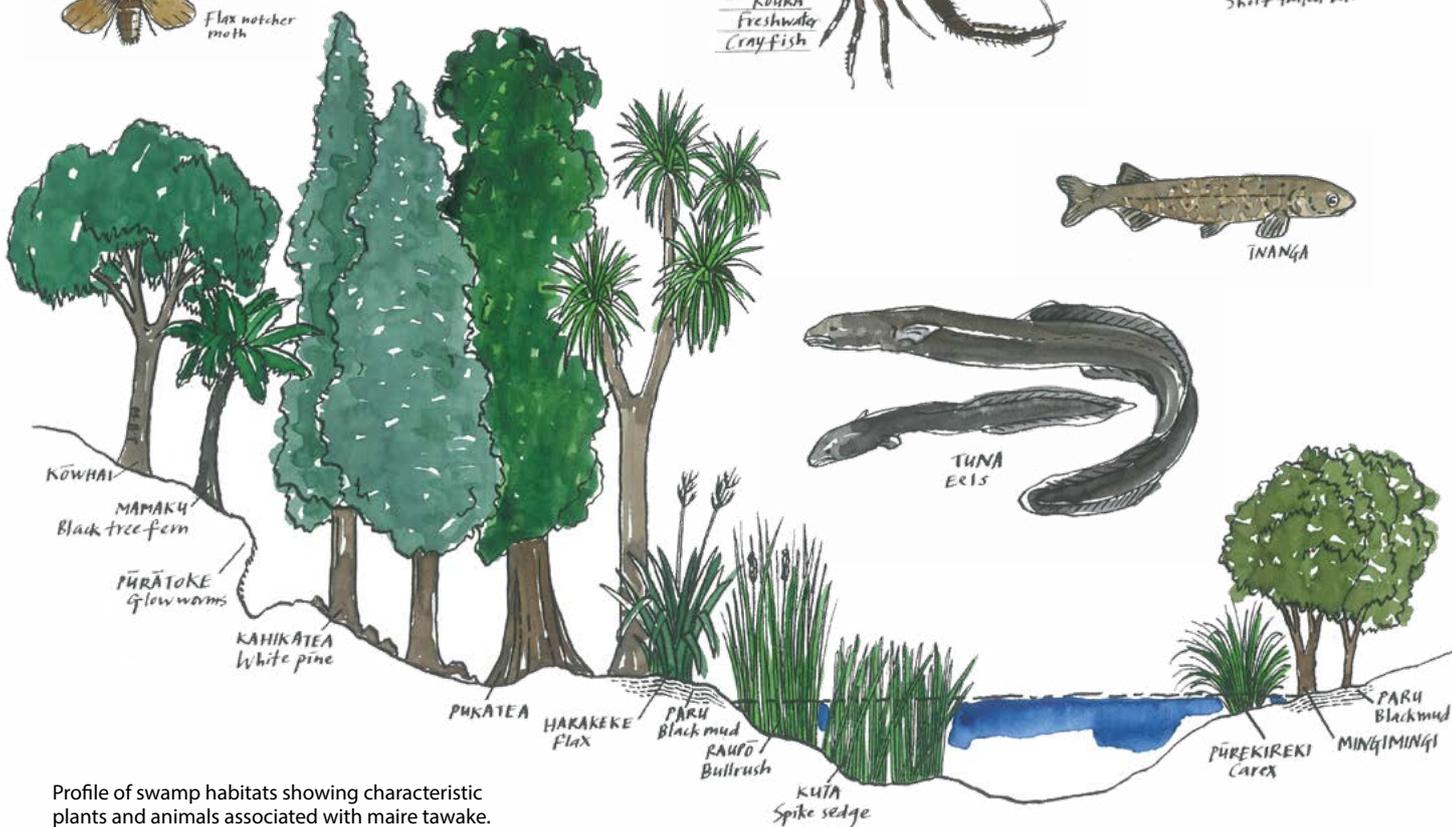
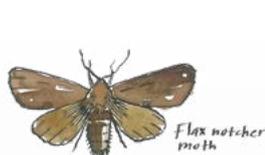
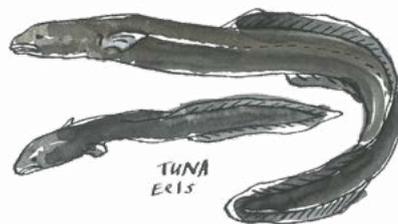
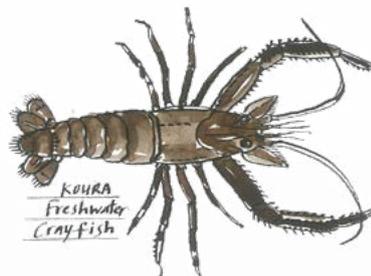
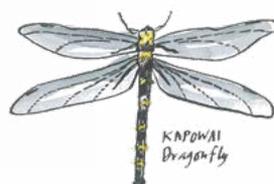
promoting maire tawake populations diminished. Only a handful of native plant nurseries, wetland ecologists, conservation rangers, and communities (including hapuu (sub tribes) and iwi (tribes)) still had remnant populations and recognised the significant value of the tree. As a result, for many New Zealanders, knowing what the tree looks like – its form, leaves, trunk – is a distant memory. We need to retrain our eyes to see the bigger picture and the place of maire tawake in it.



Can you see it? A maire tawake sapling in a wetland-themed garden, Auckland Botanical Gardens, Auckland.
Photo: Cheri van Schravendijk-Goodman.

For Maaori, maire tawake was valued for its use as a natural dye, and kai (food source). The bark produced a blue-black dye for items made from harakeke (NZ flax; *Phormium tenax*), and kai such as 'waiwaka puddings' made from the berries formed part of the rich and diverse diet offered from the repo with which tangata whenua (Indigenous people of the land) interacted. The wider genus of *Syzygium* includes other trees and shrubs across the Southern hemisphere also valued by indigenous cultures for their medicinal properties and kai.

Maire tawake formed part of a broader whakapapa where other resources used by our tuupuna lived. Trees that were valued for building materials, and sources of kai and rongoaa (medicines) – kahikatea, pukatea, tii-koouka (cabbage tree; *Cordyline australis*), and mamaku (black tree fern; *Cyathea medullaris*) – form part of the whare-repo (swamp home) embracing maire tawake across the motu (country). These whare-repo also contain other important cultural materials like paru (muds), which were highly valued for their properties in the arts, rongoaa, and important cultural indicators of environmental health. Ultimately, the whare-repo of maire tawake were home to a rich diversity of birds, fish, and insects. As a collective and healthy 'whole', this spiderweb of connections ensured the resilience of our tuupuna and culture.



Profile of swamp habitats showing characteristic plants and animals associated with maire tawake. Illustrations: Monica Peters

SYZYGIUM MAIRE WHAT'S IN A SCIENTIFIC NAME?

While the use and recognition of kupu Maaori (Maori terms) for native plants and animals are increasing, globally, all living organisms on Earth are given a scientific name, based on the Latin language. This classification system provides consistency in communication about flora and fauna across scientific communities. Living organisms are categorised into a **Genus** – the first part of the scientific name, and a **Species** – the second part of the scientific name, based on shared characteristics or traits such as physical appearance. For maire tawake, *Syzygium* is the **genus**; and *maire* is the **species**. Of interest, the species name is a kupu Maaori (indigenous word), deviating from the typical reliance upon Latin as the descriptor language, and highlighting the uniqueness of maire tawake compared with other *Syzygium* species in Australasia.

The name *Syzygium* comes from the Greek word *syzygos*, meaning 'paired'. *Syz* means 'with', and *zygon* refers to 'yoke' or 'embryo'. Together, it means a 'union of two'. *Syzygium* therefore refers to the paired leaves and branches of maire tawake that sit opposite each other at the node (Fig. 2). Before this classification (1979), the genus of maire tawake was *Eugenia* – named after a prince in Savoy, France, in the 18th century.

Importantly, the use of kupu Maaori by our tuupuna also provided a valid means of classification and understanding of the natural world (and sometimes a form of understanding whakapapa (connections)). For over a century, however, this indigenous nomenclature was largely disregarded by non-Maaori (post-colonisation). More recently, studies and papers by



Figure 2. Bright green new growth clearly showing the way pairs of leaves grow out of the stem opposite each other. This growth pattern is echoed across all plants in the genus *Syzygium*. Photo: Cheri van Schravendijk-Goodman

Maori and Indigenous authors and academics have successfully argued for their recognition and value for a more 'whole-istic' and informed understanding of the world.

Fully understanding what our kupu mean in relation to trees like maire tawake is an area that deserves more discussion with our people at the flax roots. Better understanding of traditional classification systems could help support restoration and protection of these valued trees. The 'Want to learn more' section provides resources to help discussions with your kaumaatua (elders) and whaanau about any unique names and understanding of whakapapa.

A review of ingoa raakau (tree names from the Maori language) in an online Maori dictionary highlights the importance of understanding local dialects, and how names are applied to our species through a Maori worldview. Table 1 demonstrates the dialectical differences of maire species. Note that we cannot say with confidence where these names are more commonly used, hence the importance of always talking to hau kaainga (home people) to find the correct name used in each rohe (tribal region).

Table 1. Maaori names for swamp maire

| Maaori name referring to multiple species | Maaori name of individual species with dialectical differences | Common name | Scientific name |
|---|--|----------------------------|--------------------------------|
| Maire | Maire kootae, maire roororo | Narrow-leaved maire | <i>Nestegis montana</i> |
| | Maire raunui | Black Maire | <i>Nestegis cunninghamii</i> |
| | Maire rauriki | White maire | <i>Nestegis lanceolata</i> |
| | Maire taiki | NZ sandalwood | <i>Mida salicifolia</i> |
| | Maire tawake, maire tawhake, tuhuhi, waiwaka | Swamp maire | <i>Syzygium maire</i> |
| Puka | Maire tawake, maire tawhake, tuhuhi, waiwaka | Swamp maire | <i>Syzygium maire</i> |
| | Pohuehue | Large-leaved Muehlenbeckia | <i>Muehlenbeckia australis</i> |
| | Puka, akapuka | Shining broadleaf | <i>Griselinia lucida</i> |
| | Puka, pukanui | | <i>Meryta sinclairii</i> |
| Whaawhaakou | Maire tawake, maire tawhake, tuhuhi, waiwaka | Swamp maire | <i>Syzygium maire</i> |
| | Taawari | Taawari | <i>Ixerba brexioides</i> |

MYRTLE RUST WHAT CAN THAT MEAN FOR RESILIENCE OF MAIRE TAWAKE?

In May 2017, myrtle rust was first discovered decimating poohutukawa forests on Raoul Island (Kermadec Islands) and was traced to nurseries in Kerikeri (Northland) and Taranaki where it possibly was wind-blown across from Australia (although it is hard to pinpoint where it first landed on the mainland). Attention focused very quickly on maire tawake and its Myrtaceae cousins, and by mid-2021, the true severity of the impact of myrtle rust on the native Myrtaceae trees was realised. This was particularly evident on the East Coast of the North Island, where mature ramarama (*Lophomyrtus bullata*) were found dead or dying by the local hapuu monitoring team. Myrtle rust was also found on infected maire tawake in Auckland and its susceptibility to the fungal pathogen, along with the susceptibility of ramarama and rohutu (*L. obcordata*), caught media attention.

Myrtle rust attacks the new growth, flowers, and fruit of an infected plant. By knocking out the reproductive system (the flowers and fruit), the fungal pathogen limits the potential of an individual tree to send its offspring and genetic material into the world. It also means the tree may 'suffer from starvation'. As trees

rely on their leaves for photosynthesis, and thus, food production, their ability to produce energy declines as their leaves age and fall away. These trees may not be able to produce new leaves due to myrtle rust infection, then they (and affiliated Indigenous peoples and anxious caretakers) are essentially caught in a waiting game for when infected trees will finally expire. Because of this risk, the conservation status of our plants become a major concern.

Before May 2017, the conservation status of maire tawake was '**Not Threatened**'. With the presence of myrtle rust, by 2018, its status had changed to '**Threatened – Nationally Critical**'.

As a result of historical habitat clearance, and the recent myrtle rust incursion, maire tawake – along with ramarama and rohutu – now sits in the same category as rare and threatened native wetland birds like the matuku (Australasian bittern; *Botaurus poiciloptilus*) and paarera (grey duck; *Anas superciliosa*).



Myrtle rust infection on the underside of a ramarama leaf, showing the distinctive bright yellow spores, found on Mount Karioi summit, Waikato. Photo: Scott Bartlam



Poohutukawa



Maanuka



Kaanuka



Raataa (Southern)



Maire tawake



Ramarama

Myrtle family species native to Aotearoa. Photo: Science Learning Hub

There are 37 native myrtles in Aotearoa, including poohutukawa (*Metrosideros excelsa*), maanuka (*Leptospermum scoparium*), kaanuka (*Kunzea ericoides*), raataa (*Metrosideros umbellata*), maire tawake (*Syzygium maire*), and ramarama (*Lophomyrtus bullata*).



The trunk of mature maire tawake, Waikato region. Photo: Karen Denyer

IS IT ALL DOOM AND GLOOM?

At no stage should we underestimate the risk myrtle rust poses to the Myrtaceae family. The surveillance and monitoring mahi (work) of the hapuu from the East Coast, Northland, and Taranaki (North Island) has guaranteed the devastation of myrtle rust remains in our consciousness. More important, we should not continue the 'myrtle rust amnesia' that followed the 2018 announcement from the Ministry for Primary Industries (MPI) about the government's move away from eradication to long-term management. However, it is important to remember that not all trees in the Myrtaceae family will succumb to myrtle rust, and that there may be a form of natural resilience, just as we humans build a resilience to the common cold or flu. Cutting down every tree that shows an infection does not allow this resilience to occur, although not cutting down every tree puts other, more susceptible trees at risk.

How do we re-establish maire tawake in repo with areas of myrtle rust infections – particularly in regions like Auckland and Waikato where huge tracts of wetlands have been drained, and less than 5% remain in some areas?

This issue isn't easily resolved, but such considerations have influenced a large programme of work being led by Ngaa Raakau Taketake – Saving our Iconic Trees, which focuses on resilience for Myrtaceae species. There are some actions we, as taangata tiaki (guardians) of our trees and repo, can take to empower our communities to respond to myrtle rust:

1. **Talk to kaumaatua, whaanau and others in your community about the plants, fish, and birds that used to be and are still in your repo.** Be sure to record your practices associated with those species as they might provide clues for their restoration and monitoring from within your worldview.
2. **Collect information about where your repo used to be and map them** – do you have some remnants still in your rohe that could be restored or buffered? Is maire tawake a tree that could be returned?
3. **Identify whaanau or community members** who have either the skills or the passion you need to lead native plant restoration.
4. **Consider the roles needed as taangata tiaki in biosecurity monitoring and surveillance.** While myrtle rust is a serious plant disease impacting the Myrtaceae family in Aotearoa, there are other pathogens on the horizon. The more eyes we have on the ground searching for unusual activity in our repo and ngahere (forests), the better.
5. **Consider other options for supporting our native species** – particularly those that are at risk like maire tawake. Seed banking – collecting, curating, and storing seeds – is one way to protect the whakapapa of our repo and ngahere. While the seeds of many native trees can be easily stored in banks with the appropriate training, others like maire tawake with 'fleshy fruits' might require more specialist storage and technical skills. Te Tira Whakamaataki (Maori Biosecurity Network) can provide some guidance and further information on seed banking.
6. **Once you have planned your priorities, seek the advice and guidance of people who can help you:**
 - Kaimahi (staff) at Te Tira Whakamaataki and rangers at Te Papa Atawhai (Department of Conservation) can provide guidance, advocacy, and connection
 - Scientists at Crown Research Institutes like Rangahau Ahumaara Kai (Plant and Food Research), SCION, and Manaaki Whenua – Landcare Research can provide advice about maire tawake and restoration efforts in the light of myrtle rust
 - The natural heritage teams at Te Kaunihera aa rohe (district and regional councils) and advisors at botanical gardens such as the Auckland Botanic Gardens, and Ōtari Native Botanic Gardens, Wellington, can help with better understanding of seed collection, propagation, and maintenance.

WANT TO LEARN MORE?

Note: If you are having problems with the hyperlinks below try copying and pasting the web address into your browser search bar.

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Useful websites

Antioxidants
<https://nutritionfoundation.org.nz/nutrition-facts/nutrition-a-z/Antioxidants>

App for identifying Myrtaceae (trees and shrubs susceptible to myrtle rust)
<https://bioheritage.nz/need-help-to-identify-a-myrtle-theres-an-app-for-that>

Botanical Gardens

Auckland Botanic Gardens, Auckland
<https://www.aucklandbotanicgardens.co.nz>

Ōtari Native Botanic Gardens, Wellington
<https://wellingtongardens.nz/our-gardens/otari-wiltons-bush>

Maire species
<https://maoridictionary.co.nz/search?idiom=&phrase=&proverb=&loan=&histLoanWords=&keywords=maire>

Maaori TV – Myrtle rust devastates native rākau on the East Coast
<https://www.youtube.com/watch?v=Y8QxuMFaRhY>

Myrtle rust
<https://www.myrtlerust.org.nz>

Ngaa Raakau Taketake – Saving our Iconic Trees programme
<https://bioheritage.nz/research/saving-our-iconic-trees>

Science Learning Hub – Pokapuu Akoranga Puutaiao
<https://www.sciencelearn.org.nz/resources/2650-myrtle-rust>

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Te mara reo – Information about maire tawake
<http://www.temarareo.org/TMR-Oriwa.html>

Te Papa Atawhai – Department of Conservation

Myrtle rust work on Raoul Island, Kermedec Islands
<https://www.doc.govt.nz/nature/pests-and-threats/diseases/myrtle-rust/our-work-on-raoul-island>

Te Tira Whakamaataki – Māori Biosecurity
<https://ttw.nz>

The race against myrtle rust
<https://www.youtube.com/watch?v=TDv7pzM3Ps>

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