PROJECT CRIMSON

MYRTLE RUST REPORT

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MYRTLE RUST: IMPLICATIONS FOR PLANTING AND MANAGEMENT OF MYRTLE SPECIES

A collaboration between Project Crimson Trust and Tāne's Tree Trust

Introduction

In 1990 the future of pōhutukawa was uncertain. Project Crimson was established to protect and restore these beloved trees to New Zealand's forests and coastlines. Such was the success of that initial work, the Trust's mandate broadened to a national focus, to include rātā, and now to champion the planting of all native tree species.

Over the last three decades, and now through the Trust's flagship programme Trees That Count, Project Crimson has been promoting the planting and management of millions of native trees, of all species, as a way to fight climate change, strengthen ecosystems and grow healthier communities everywhere.

Project Crimson has played a major role in turning around the health of the Metrosideros species. However, pōhutukawa and northern and southern rātā remain under threat today from myrtle rust and the ongoing impact from possums. Work also remains to be done to restore Bartlett's rātā, a species with very few adult trees known to be in survival.

This report is a preliminary compilation and interpretation of the latest information available from key sources on the threat, identification, actions required to reduce the myrtle rust threat as well as the latest research, planting and management guidelines. It will be updated as new information becomes available from various agencies collecting data and undertaking research on the myrtle rust threat.

THE THREAT OF MYRTLE RUST

Myrtle rust (Austropuccinia psidii) is a direct threat to our myrtle species. It is a serious fungal disease which affects plants in the myrtle family. In New Zealand, native myrtle species include the iconic native pōhutukawa, manuka, rātā and ramarama as well as common exotic garden plants such as lilly pilly, horticultural plants like feijoa and exotic forestry species such as eucalypts. Native myrtle species are a significant component of our native forest and shrublands. They are ecologically important, providing habitat and food for a wide range of species. They provide nectar and pollen, and some species provide fruit - for insects, native birds, and other native fauna.

Myrtle rust was first detected in Aotearoa New Zealand in May 2017 and, with the wind-borne nature of the disease and the abundance of suitable plants, it has rapidly spread and is predicted to continue to spread through much of New Zealand. It is now found throughout most of the North Island, and across the top of the South Island and in Westland.

Following the discovery of myrtle rust, the Ministry for Primary Industries (MPI) and the Department of Conservation, with the help of iwi, the nursery industry and local authorities, attempted to contain and control the disease and determine the extent of its spread. Within months it became apparent the disease had spread rapidly and MPI has recently moved the focus to finding ways to manage the disease in the longer term. There is now a strong focus on scientific research to find ways to mitigate its impact.

Myrtle rust will have a variable impact across the 27 native Myrtaceae species in New Zealand, so it is important to formulate strategic responses on a case-by-case basis and be prepared to quickly review and modify these strategies as new information becomes available. Most of our myrtle species are endemic, which means they cannot be found anywhere else in the world.

We can learn lessons from Australia, where myrtle rust was first detected in 2010 and has subsequently caused the localised extinction of some myrtle species and had a significant impact on native plant communities. Wider-scale species extinction is a distinct possibility as the pathogen continues to spread in Australia, and more recently, in New Zealand. We need to do all we can to prevent this from happening.

SUSCEPTIBILITY TO MYRTLE RUST

The most susceptible native myrtle species in New Zealand is ramarama (Biosecurity New Zealand 2018). Ramarama is used widely in large-scale plantings, is an important understory shrub in native forest and is used for hedging in residential areas.

Relatively high levels of infection have also been found in the iconic Metrosideros species - pohutukawa and rata - (Biosecurity New Zealand 2018). Rata species are important components of our native forests and pohutukawa is ecologically important in coastal areas and is widely planted. Manuka and kanuka, which are commonly used in large-scale plantings, have shown very low levels of myrtle rust infection (Biosecurity New Zealand 2018).

Genetic testing of provenances of myrtle species to identify variability in susceptibility to myrtle rust (and, hopefully, resistance) will help inform strategic planning for individual species.

IDENTIFYING MYRTLE RUST

The disease generally attacks soft, new growth, including leaf surfaces, shoots, buds, flowers, and fruit. Symptoms to look out for on myrtle plants are:

- bright yellow powdery eruptions appearing on the underside of the leaf (young infection)
- bright yellow powdery eruptions on both sides of the leaf (mature infection)
- brown/grey rust pustules (older spores) on older lesions
- Some leaves may become buckled or twisted and die off

Yellow bumps and brown patches typical of myrtle rust

Manaaki Whenua Landcare Research recently launched a new app, in partnership with Ministry for Primary Industries (MPI) Biosecurity New Zealand, to help people accurately identify myrtle rust on susceptible plants to make it easier to monitor and report cases of the disease. The NZ Myrtaceae Key (https://www.landcareresearch.co.nz/tools-and-resources/identification/key-to-the-myrtaceae-of-new-zealand/) includes factsheets and images for 97 exotic and native myrtle species, subspecies, hybrids and cultivars.

REPORTING MYRTLE RUST

If you think you see the symptoms of myrtle rust:

- **Don't touch it!**
- Take photos, including the whole plant and a close-up of the spores or affected area of the plant, and submit it to the iNaturalist website (https://inaturalist.nz/) where experts can check to confirm whether your identification is correct.

Capturing this information through iNaturalist means it will be available to agencies and scientists in future to analyse the rate of spread and observed impacts. More instructions, tools, and training videos are available on the myrtle rust website: Myrtle Rust in New Zealand

ACTIONS TO REDUCE THE RISK OF MYRTLE RUST SPREADING

Follow the advice on the Myrtle Rust in New Zealand website and Biosecurity New Zealand:

- **Arrive clean, leave clean.** The forest you visit could be infected with myrtle rust without you knowing it. Before entering forest, you should minimise the risk of spreading the rust by ensuring your equipment, clothing and tools arrive clean and leave the area clean.

- **Follow recommended hygiene procedures** (Planting-and-managing-native-myrtle-species-Landowner-advice-PDF-July-2018.pdf).

- **Safely dispose of infected material**, e.g., bury it at a minimum depth of 50 cm and do not burn it as spores can be dispersed via smoke (Planting-and-managing-native-myrtle-species-Landowner-advice-PDF-July-2018.pdf).

- **Avoid moving susceptible myrtle species around New Zealand**, and also check and wash plant and equipment when moving from possibly infected sites to areas free of myrtle rust.

- **Buy healthy plants**. Ask your chosen nursery questions about their biosecurity protocols - do they follow the hygiene protocols of the New Zealand Plant Producers Incorporated (NZPPI)? Inspect the leaves and stems of plants before you buy them.

- **Only plant exotic myrtles which are resilient to myrtle rust**. And consider replacing lilly pilly hedges with alternatives which are resistant to myrtle rust, as hedging increases the risk of infection in this highly susceptible species.

- **Avoid heavy pruning of any susceptible myrtle species**, as this will encourage susceptible new growth. If you must prune, time it for late autumn and early winter to avoid encouraging new growth during warm weather when myrtle rust spores are more likely to be present.

- **Monitor your myrtle plants regularly** (every few weeks) for any sign of myrtle rust, particularly new, young growth, shoots and seedlings.

- **Fungicide treatment could help on a limited scale**. However, it will probably be impractical at a landscape scale. There are currently no fungicides that specifically target myrtle rust, and no recommended protocols for wide-scale use but this is a key area of research. Fungicides need to be applied regularly to prevent infection, but this may be an option for notable, taonga trees (Biosecurity New Zealand 2018). Many plant nurseries follow preventative spray regimes to reduce the likelihood of plants becoming infected by fungal pathogens (see NZPPI website for regimes).

RESEARCH AND OTHER INITIATIVES FOR MANAGING MYRTLE RUST IN NEW ZEALAND

Currently, there are significant knowledge gaps. However, a research programme is underway, with multiple organisations investigating and developing potential solutions and new approaches to help control or lessen the impacts of myrtle rust.

Information on research programmes is provided on the Myrtle Rust in New Zealand website.

Genetic differences

Initial research results have revealed resistance to myrtle in mānuka, kānuka and rawiri mānuka seedlings, whereas pōhutukawa, ramarama and rohutu seedlings were highly susceptible. However, from what has currently been reported, only a limited number of genetic sources of ramarama and rohutu have been tested to date.

A regional effect was found for mānuka, the most extensively screened species, i.e., higher levels of resistance were observed in mānuka seedlings from some provenances (geographic origin) (Smith et al 2019).

Australian studies of susceptibility levels of various Myrtaceae species also found variability in susceptibility at the provenance level and some studies indicate that provenances which have evolved in lower rainfall areas may generally have higher levels of resistance (Carnegie and Pegg 2018).

Genetic testing of provenances of susceptible myrtle species to identify variability in susceptibility to myrtle rust (and, hopefully, resistance) will help inform strategic planning for individual species. This research is underway but it will be some time before enough genetic sources have been assessed to determine the degree of resistance or susceptibility in our native myrtle species.

It is imperative that all genetic provenances of all susceptible species are screened – this includes native myrtle species that are ecologically important but do not necessarily have a commercial market value. Species such as ramarama, rātā and pōhutukawa are critical to ecosystem function and the ecology of regions, i.e., local extinction is likely to have implications for other species. A range of native plants, reptiles, birds and insects depend on our native myrtles (Biosecurity New Zealand 2019).

There are more virulent biotypes of myrtle rust identified in other parts of the world that are yet to establish in Australia and New Zealand (Carnegie and Pegg 2018, Biosecurity New Zealand 2019). And there are other significant emerging diseases of myrtle species overseas that could threaten our native species, such as Ceratocystis wilts of Metrosideros polymorpha in Hawaii (Mortenson et al. 2014). Every effort must be made at the border to keep these pathogens out of New Zealand. It is important to invest in ongoing research to monitor and identify new strains of the pest, whilst encouraging New Zealanders to remain vigilant and report anything of concern.

The New Zealand Myrtle Rust Strategy 2019 - 2023 produced by Biosecurity New Zealand and DOC provides the framework for dealing with myrtle rust over the next 5 years, with a vision that the mauri of myrtle plants and dependent ecosystems are safeguarded and sustained. The strategy focuses on:

- growing knowledge of myrtle rust behaviour and impacts;
- identifying options for its future management and minimising impacts;
- identifying ways to conserve genetic material of myrtle species; and
- supporting tāngata whenua, partners and stakeholders as they make decisions about their plants and the places affected by myrtle rust that are important to them.

Refugia for myrtle species

Scientists at Manaaki Whenua Landcare Research have identified areas, known as 'refugia', where Myrtaceae may be able to ride out the threat of myrtle rust.

Of the 27 Myrtaceae trees, shrubs and vines native to New Zealand, the team gathered enough data to establish comprehensive species range predictions for 13 species. Then, they compared how the habitat range of each species overlaps with the likely range of myrtle rust in New Zealand under two scenarios – one less severe, one more severe.

They have found some species have adequate refugia such as southern rata, which are almost entirely outside of the predicted range of myrtle rust. However, several species have little or no areas of refugia, such as ramarama, which has only 15 km2 of refugia, and swamp maire, with only 1.4 km2 of refugia.

These results will help inform conservation efforts, including maintaining currently protected refugia, restoring potential refugia, and coming up with alternative conservation methods for species with few refugia options. These efforts will also underpin future work to establish how stable these refugia might be in the face of future climate change.

Where there is limited or no identified refugia for susceptible species, ex situ germplasm conservation needs to be considered, i.e., planting outside the natural habitat range in climates where they are likely to thrive and where myrtle rust is less likely to successfully establish. However, full consideration of ecological parameters of the species will be needed. This needs further research and consultation but should be considered as an option to prevent the extinction of susceptible species.

Seed bank for our myrtle species

The Department of Conservation (DOC) is leading work to safeguard the long-term future of our myrtle species by seed banking. Seed has been collected from our native myrtles as an insurance policy - preserving the genetics of our myrtle species in the event of myrtle rust spreading throughout New Zealand and possibly causing extinctions.

This is the largest targeted seed collection ever undertaken in New Zealand. The seed DOC has collected has been sent to the NZ Indigenous Flora Seed Bank in Palmerston North, for long-term storage. Seed has been collected throughout New Zealand and its associated islands for banking.

REDUCING RISK OF MYRTLE RUST IN RESTORATION PLANTINGS

Biosecurity New Zealand provides information to consider when planning, planting and maintaining myrtle plants as part of municipal gardens, large-scale landscaping and habitat restoration planting, riparian planting, and shelter belts.

The Project Crimson Trust is encouraging all those involved in planting and managing pōhutukawa, rātā and other native myrtle species to follow these recommendations and instructions to identify and report any incidence of suspected infection of the disease.

This also includes following the advice on the Myrtle Rust in New Zealand website of minimising spread of the disease by adopting good hygiene practices, checking plants in the Myrtaceae family are free of infection before purchasing them, undertaking regular monitoring, and following advice from Biosecurity New Zealand for restoration plantings.

This advice includes:

- Biosecurity New Zealand (2018) advise that "It is generally considered that prohibiting or avoiding the planting of all native myrtle species to try and avoid myrtle rust infection is not the best approach."
- However, adjusting planting decisions makes sense, at least in the short term: e.g., avoid planting large numbers of the highly susceptible species in the most affected regions.
- Mānuka and kānuka are important restoration species that have so far shown very low levels of myrtle rust infection and should continue to be planted.
- Check that the plants are ecosourced (seeds collected close to where they are to be planted) as they will be better adapted to site conditions and less susceptible. Also, check that the seed is collected from a wide range of parents to maintain genetic diversity and adaptive fitness, which will increase the chances of disease resistance developing in populations. Avoid use of cuttings as this reduces the genetic variability.

- Carry out a site assessment – myrtle rust often occurs in warm and moist locations, such as swampy locations, so avoid planting susceptible species in these areas.

- Edge effects – observations from scientists indicate that susceptible myrtle species on the 'edges' of bush remnants and along roadsides appear to be particularly vulnerable to myrtle rust, whereas presently, there are no reports of myrtle rust within intact, healthy forest. Susceptible myrtle species on edges of forest or shrublands are, therefore, probably more likely to get infected and increase the spore load, leading to less susceptible species succumbing. This potentially has implications for planting plans but needs to be further investigated. It may be better to plant susceptible species later in planting programmes, after the canopy starts to close, and avoid planting near the edges.

FOR FURTHER INFORMATION

- Myrtle rust in New Zealand: https://www.myrtlerust.org.nz/ - note this website is regularly updated, providing the latest advice and research information.

- Biosecurity New Zealand (2018). Managing native plants susceptible to myrtle rust. Guide for large-scale planting and restoration programmes: https://www.myrtlerust.org.nz/assets/Uploads/Planting-and-managing-native-myrtle-species-Landowner-advice-PDF-July-2018.pdf

- Seed banking (DOC): https://www.doc.govt.nz/nature/pests-and-threats/diseases/myrtle-rust/our-safeguard-seed-banking/

- https://www.myrtlerust.org.nz/news-and-media/

- https://www.mpi.govt.nz/biosecurity/long-term-biosecurity-management-programmes/myrtle-rust/

- Key to the Myrtaceae of New Zealand: https://www.landcareresearch.co.nz/tools-and-resources/identification/key-to-the-myrtaceae-of-new-zealand/

- Project Crimson Trust: https://projectcrimson.org.nz/

- Trees That Count: https://www.treesthatcount.co.nz/planters

- Tāne's Tree Trust: https://www.tanestrees.org.nz/

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