

THE SCIENCE OF KAURI DIEBACK DISEASE

WHAT WE KNOW

During our first consultation round in July 2018, you told us you wanted more information about current science evidence and knowledge in terms of managing kauri dieback. We spoke with top researchers from a number of organisations who have expertise in both Western science and mātauranga (Māori knowledge) and this is what they told us. We used this information to help us develop the National Kauri Dieback Management Plan. Your comments are welcome on this draft information.

What's causing kauri dieback?

The primary cause is the pathogen *Phytophthora agathidicida* (PA) that lives in the soil and infects kauri roots. It damages tissues that carry nutrients and water within the tree, eventually starving it to death.

There is no cure for the disease and little is known about how it spreads. We do know that the long-term survival of kauri depends on stopping the spread of PA to forests that are not contaminated.

Current evidence suggests that most infected trees die prematurely.

How does it spread?

Zoospores are the reproductive stage of PA and they spread by swimming through soil towards kauri roots. Any movement of PA-infected soil or plant material has the potential to spread the disease.

The main way PA spreads is via human activity – for example the movement of soil on hikers' boots or on vehicles, machinery and tools.

Naturally, PA is estimated to spread at an estimated rate of between one and five metres per year on uphill or flat sites, and probably faster when going downhill.

Its spread and impact is happening faster than the time kauri needs to regenerate. However, some sites where kauri dieback has been present for 30 years still have trees regenerating – for example on Great Barrier Island.

The full distribution of PA is not known but recorded infections cover much of the natural range of kauri from Northland to Auckland and Coromandel. Infection is usually patchy and sporadic, but often consistent with human movement (e.g. associated with track networks).

Can it be eradicated?

Eradication of the pathogen PA is practically impossible, except possibly for very small infections, which is why stopping the spread to uncontaminated forests is critical. Once a forest is infected, it is likely to stay that way for the foreseeable future.

Without intervention, kauri dieback will continue spreading. Effective intervention will not stop it spreading but it will slow it down and limit how far the disease gets.

Tangata whenua (local people) believe the whole kauri ngahere (ecosystem) needs to be considered when looking at the tree's health. Appropriate protocols must be put in place to ensure mātauranga is protected when implementing long-term strategies to treat kauri dieback.

Are some forests and trees more resilient than others?

We assume that healthy, less disturbed, kauri forest ecosystems are more resilient to the impacts of PA than a forest with a long history of disturbance. This is because the soil condition is generally better and the trees healthier – making them more able to fight the pathogen. However, more research is needed in this area.

There are at least six kauri forest associated tree species that may be sensitive to PA.

Treatment will take time

Because it takes so long for kauri dieback symptoms to become visible above-ground, it is likely to be our children or grandchildren who see evidence of how our changed behaviours positively impact kauri survival.

Communities will need to approve potential new treatment technologies before they are implemented.

We need to find out a lot more

Treatments or systems, including chemicals, biological control and mātauranga Māori, could potentially be available in the future but their effectiveness is yet to be proven.

Rongoā (traditional remedy) interventions and cultural health indicators are mātauranga tools being investigated and trialled by tangata whenua and have potential as treatments and management tools.

We need to find out more about the biology of kauri and their surrounding ecosystems because this will influence the effectiveness of management practices and how they are implemented.

There are many different views on how kauri dieback should be tackled long-term, making it critical to understand the human values and behaviours that surround the disease. Robust research on this is needed if we are to encourage communities to help fight the disease.

How can I recognise it?

Yellowing and leaf loss in the canopy are signs of kauri dieback and these may occur before or after symptoms such as bleeding and lesions on the trunk.

Above-ground symptoms may first appear months, years or even decades after the tree has been initially infected, with longer latent periods for large trees.

What can I do to stop the spread?

The effective use of cleaning stations reduces the risk of spread, while injecting kauri with phosphite is proving to be an effective treatment that temporarily slows down the spread of the disease. You can find out more about phosphite treatment at www.kaurirescue.org.nz.

Respecting rāhui (temporary closures) and using raised boardwalks are other effective ways you can manage kauri dieback because they reduce human contact with soil – minimising long-distance dispersal.

Building good hygiene practices into your business (e.g. cleaning your boots, machinery or equipment if you are a contractor), controlling access or fencing to keep stock from entering your kauri forests, and reporting any symptoms of kauri dieback are also key to protecting kauri.

You can read a number of science papers that have recently been added to the kauri dieback website.