

## Auckland Council 2021 Kauri Dieback Monitoring Webinar.

### Supplementary Q&As

June 2021

#### General questions about kauri dieback disease

*Q. Is kauri dieback disease the only thing that can make kauri ill or kill it?*

A. No, there are many factors that can cause ill health or death of kauri, such as poor environmental conditions like drought, flooding, and mechanical damage of roots. Over the last two years we have seen many kauri planted as amenity trees in parks and gardens succumb to effects of drought. The symptoms shown by these trees are generally different to the symptoms of kauri dieback disease caused by *Phytophthora agathidicida*.

*Phytophthora* is a genus of plant pathogen causing dieback and root rot diseases across the world, and there are other *Phytophthora* present in New Zealand's forests that can cause problems, such as *Phytophthora cinnamomic*, which has also been associated with tree death. However, we have seen that *Phytophthora agathidicida* is highly pathogenic to kauri - much more so than *Phytophthora cinnamomic* - and can cause significant mortality in stands of healthy kauri.

*Q. Due to climate change and global warming, is it inevitable that kauri will become extinct?*

A. No, it is not inevitable that kauri will eventually become extinct. There is currently a lot of work underway by many New Zealand agencies to protect kauri, for example: building more fencing to protect kauri forests from grazing stock, implementation of pest management controls, and the creation of new walking tracks. We are also looking forward to seeing further scientific work progress on resistance and tolerance programmes where seed lineages that demonstrate a level of disease tolerance can be incorporated into these programmes. Kauri grow in areas of differing geology and topography, which are not likely to all be impacted by climate change in the same way.

*Q. Are wasps a potential vector for transferring kauri dieback disease?*

A. Wasps may be contributing to tree stress by nesting in soil near kauri, but evidence suggests they are unlikely to be a significant vector of kauri dieback disease because they are relatively localised.

*Q. How is the development of a vaccine against kauri dieback disease progressing?*

A. At present there is no study into the development of a vaccine against kauri dieback disease. However, there are trials underway that look at injecting phosphite to treat diseased trees to reduce disease progression. For more information on the research led by Dr Ian Horner at Plant and Food Research, you can read [this article](#).

## **Questions about Auckland Council's approach to managing kauri dieback disease**

*Q. Why is the council keeping people out of the centre of the forest and away from immersive bush experiences?*

A. We are limiting access to certain kauri areas in parks across the Auckland region to protect one of New Zealand's most treasured tree species from the spread of a disease known to be moved from place to place in soil, which can result from people's recreational activities. There is a significant amount of work being undertaken to upgrade walking tracks to enable access to a range of recreational opportunities to forest environments. For information on the status of tracks across the region, [visit Protect Our Kauri Trees](#).

Information from our latest kauri dieback monitoring survey will provide a more granular level of information around prevalence of disease for individual catchments and stands of trees. We will use this information, in conjunction with cultural, recreational, biodiversity and heritage considerations to inform future track re-openings.

*Q. How do you assess the effectiveness of track closures and upgrades?*

A. We will be establishing a baseline prevalence of disease both close to, and away from, the track network. We will also establish a baseline for tracks that remain closed for now, but which are in the pipeline for future upgrades, and we will then be able to measure disease prevalence once those track upgrades have been made. We need to take a long-term management approach because the host pathogen lives for a very long time, and it will take some time to gather enough data to make these comparisons. The key thing now is to set this baseline prevalence so that we can measure efficacy of management strategies in the future.

*Q. Beech tree dieback is described by the Department of Conservation as a natural process, yet public access to beech forests remains open. Both kauri conifers and beech trees need a gap to regenerate. Why is there a difference in approach?*

A. We know that the pathogen causing kauri dieback disease spreads via soil and water. This knowledge means we can manage the spread to some extent through practical and effective measures, such as access restrictions and by installing footwear cleaning stations.

The causes of beech dieback are less clear and appear to be a combination of environmental disturbances along with insect and pathogen attack, which are factors that could not be reduced by the interventions that assist against kauri dieback.

*Q. Is there a timeframe for the rāhui to be in place?*

A. Te Kawerau ā Maki are mana whenua of Te Wao Nui a Tiriwa (the Waitākere Ranges forest) and in December 2017 placed a rāhui over this area. As Te Kawerau ā Maki initiated the rāhui, only they can make decisions relating to its conditions and timeframe.

Q. What does 'mātauranga Māori' refer to in the context of how the council manages kauri dieback disease?

A. You can read about our current technical approach to 'Mātauranga Māori' and what it encompasses on page 47 of the [National \(Kauri Dieback\) Pest Management Plan Proposal](#).

Q. Has the kauri dieback pathogen spread been slowed down or is it still spreading?

A. As a result of the various management interventions we have put in place - including track upgrades and the installation of cleaning stations - we are reducing the risk of spreading the pathogen. It is difficult to quantify to what extent we have 'slowed down' the spread of the pathogen and these questions can only be answered over the long term using a science-based approach. The Waitākere Ranges monitoring survey has put in place a survey design that will help to answer these questions in the future. We are also investigating landscape-scale monitoring of kauri health using new techniques such as remote sensing, which may help us understand changes in kauri health over time.

Q. Do you think there are significant areas of forest without the disease?

A. Earlier monitoring work at a regional level to determine the distribution of the pathogen would suggest that at this point in time: the Hunua Ranges, a number of the Hauraki Gulf Islands (including Waiheke Island) and McElroy Scenic reserve in northern Rodney are all areas of significant kauri stands where *Phytophthora agathidicida* remains undetected.

Q. Why is there no kauri dieback in the Hunua and Kaimai Ranges?

A. To date, our monitoring has not detected *Phytophthora agathidicida* in the Hunua Ranges. It is difficult to say why kauri dieback disease has not been detected in the Hunua Ranges. It could be that the pathogen is not present, or it could be due to a combination of factors controlling disease expression. The Waitākere Ranges survey will improve our understanding of risk factors correlated with the disease and will give us a good basis on how and where best to undertake surveillance of *Phytophthora agathidicida* in the Hunua Ranges.

The Ministry for Primary Industries (MPI) is the agency responsible for monitoring Kauri Dieback in the Kaimai Ranges as it is outside of the Auckland region. Please contact [kauriprotection@mpi.govt.nz](mailto:kauriprotection@mpi.govt.nz) for more information.

Q. What evidence is there that shows that kauri dieback is an epidemic, caused by a recent incursion and spread by people?

A. This is a question in two parts, and one is not dependent on the other.

Auckland Council has adopted a precautionary approach to managing the spread of kauri dieback disease in accordance with the national kauri dieback programme. This is not an incursion response based on the recent introduction of an exotic disease but is a sustained management response, the

effectiveness of which can only be achieved over time. This approach is based on managing pathways between sites and designing interventions that tip the scales back in favour of kauri health. Track upgrades effectively achieve both, by protecting the sensitive root systems of kauri and reducing soil movement.

There have always been two schools of thought in terms of origin of the pathogen and the disease, one being a relatively recent incursion (within the last 100 years) and the other a more long-term arrival. A paper has been recently published by Winkworth et al. (2021) 'The mitogenome of *Phytophthora agathidicida*: evidence for a not so recent arrival of the "kauri killing" *Phytophthora* in New Zealand'. The conclusion, while noting a number of assumptions, is consistent with the emergence of kauri dieback disease being a consequence of recent changes in the relationship between the pathogen, host, and environment rather than a post-1945 introduction of the causal pathogen into New Zealand.

Additional information around when the pathogen was likely to have first arrived on our shores is useful but does not have a great bearing on the fact that we continue to be in a sustained management scenario instead of managing our borders. Whether *Phytophthora agathidicida* arrived on our shores 100, 500 or 1000 years ago, the fact remains that this timescale is still within the lifespan of a number of our Rakau Rangatira (chiefly trees), which have not had the chance to evolve a response over time. The fragmentation of landscape, decimation of the kauri population as result of land clearance and logging (reducing genetic diversity) and the tree's own longevity all contribute to challenges around the development of natural resistance in the population.

Finally, questions still remain around how widespread *Phytophthora agathidicida* is across kauri lands and why in some areas, the pathogen remains undetected. We do know that environmental factors are an important part of the disease triangle although there remains uncertainty around the extent to which emerging climate change and/or other recent anthropogenic changes to the environment might be contributing to the emergence of disease symptoms in recent times. We don't know how big a part it plays in comparison to other factors.

*Q. In council's 2017 report it says kauri dieback is a new disease discovered in 2009, but I understood it was discovered in 1972?*

A. The 2017 Kauri Dieback Report states: "The causal agent has been commonly referred to as *Phytophthora taxon Agathis* (PTA) since its discovery in 2008 (Beever et al., 2009) but is now formally named *Phytophthora agathidicida*, an oomycete chromist belonging to *Phytophthora* Clade 5 (Weir, et al., 2015)."

The confusion over the timeline occurs as the first reports of a disease affecting kauri came from Aotea/ Great Barrier Island in 1972, however the pathogen responsible was misidentified as *P. heveae*. It was only after similar symptomology was noticed in the Waitākere Ranges in 2006 that the pathogen was confirmed as new to science. This was temporarily named *Phytophthora Taxon Agathis* (PTA), then subsequently described and named as *Phytophthora agathidicida*.

## **Auckland Council 2021 Kauri Dieback monitoring survey**

*Q. Will the survey results be shared with the public?*

A. Yes. After peer review, we are looking to publish the results through Auckland Council's [Research and Evaluation Unit- RIMU](#) as well as publish through scientific journals. We will ensure that we make the reports publicly available by communicating these through Our Auckland and the Keep Kauri Standing Newsletter.

*Q. Are you surveying away from the track network?*

A. Yes- the selection of trees for inclusion in the survey is completely random and will include trees that are away from the track network as well as a mix of healthy and unhealthy trees as would be found in a kauri population.

*Q. Will you look to do a new survey every five years, or will you monitor more regularly?*

A. We are still considering the frequency of our long-term monitoring survey, but it is likely to be more regular than every five years.

*Q. Do you predict the surveys will need to occur over a number of years to build a good picture of kauri dieback behaviour on the original baseline survey?*

A. Yes, this will be a long-term monitoring project.

*Q. Is a possible outcome of the new survey that people walking the tracks are not a risk factor?*

A. Understanding the correlation between the track network and the prevalence of disease is an objective of this survey. A key outcome will be to quantify the association between tracks and disease, and this may or may not be a significant factor.

*Q. Is the impact of track closures on people considered at all?*

A. The work that we are describing here is focused on monitoring the health of our kauri and will help inform future management decisions.

*Q. If you are establishing a baseline would it not be sensible to follow up with further surveys?*

A. Yes, this is a long-term monitoring programme which will continue to have repeated monitoring of some of our selected trees to understand the rate of new cases of disease occurring over time (incidence), which will continue to inform adaptive management strategies.

*Q. How and when will the 2021 kauri dieback monitoring survey influence access decisions?*

A. Information from the latest survey will provide a more granular level of information around prevalence of disease for individual catchments and stands of trees. This information, in conjunction with cultural, recreational, biodiversity and heritage considerations will be used to inform future track opening decisions.

*Q. Given that we know non-kauri can be hosts to *Phytophthora agathidicida*, and it can persist in soil away from kauri, how important do you think it is to sample away from kauri too?*

A. Our programme is moving from a focus on delimiting the extent of the pathogen to focusing on diseased kauri trees to inform future management strategies to keep kauri protected.

We know that *Phytophthora agathidicida* has been found in soils away from kauri. There are additional research projects underway by other agencies that are determining information around alternative hosts. This will help shape any ongoing development or expansion of our surveillance and monitoring efforts, particularly where pathogen freedom is thought likely to exist.

*Q. Will random soil samples following the MPI workshop protocol be taken within the Waitākere Ranges in locations not associated with either a symptomatic or non-symptomatic kauri?*

A. The randomised approach selects kauri from the total kauri population, independent of health status and is consistent with the Stevenson and Froud case definition and baseline monitoring recommendations. As we are establishing prevalence of disease in kauri, we are not randomly sampling outside of that frame (to include areas of exotic forest, pastureland or non-host species). The alternative host work is a separate research stream being funded through Nga Rakau Taketake.

*Q. Will the soil samples taken during the survey 2021 be analysed by an Auckland Council Laboratory or an independent laboratory? If not Auckland Council, who is the Laboratory(s) charged with analysing the soil samples?*

A. Auckland Council does not have its own laboratory services for plant pathogens. As with previous surveys, the samples will be analysed through independent providers. These include Plant and Food Research and Massey University of New Zealand.

*Q. Given the assumption that footfall moves the soil borne pathogen, will you open a major track to foot traffic to validate or invalidate this theory?*

A. The epidemiological approach we take in our monitoring survey is to use an observational study to make comparisons between diseased and non-diseased trees to find associations between potential risk factors, management interventions and disease outcomes. This avoids the need to undertake risky experiments where risk factors (e.g. walking on muddy tracks) are not easily manipulated in the field for practical or ethical reasons.

*Q. Council appears to be changing the established five-year survey phase for forest health/succession, which has been used for decades by LCRs National Vegetation Survey (NVS)? Beever et al. Is this correct?*

A. We have come to the end of the delimitation phase and have determined that kauri dieback disease is geographically widespread across the Auckland region. Therefore we are now looking to gather additional information that will assist us with the management of the disease.

*Q. Why is the 2021 monitoring work limited to three Crown Research Institutes? Is Scion still involved?*

A. We have collaborated and are continuing to develop ongoing collaborations with a large number of research organisations, including Scion. Several of the Scion staff that have historically been involved in kauri dieback are now carrying on their research with Plant and Food Research.

### **Funding**

*Q. As a concerned rate payer how much does this project cost?*

A. This project has included both the development of the design framework which will be applied to monitoring at other priority sites as well as the first year of field delivery work, testing and analysis within the Waitākere Ranges. The combined cost is expected to be approximately \$700,000. Monitoring other sites in the future will be less than this due to the monitoring framework having been developed as part of this work and a transition from undertaking surveillance across the entire Auckland region to delimit where pathogen is in the soil to long term-monitoring of representative sites to inform management activities

*Q. Do you think the approach might be applied across the entire kauri range, cost-effectively? And what might you do differently?*

A. The field survey approach has been designed to undertake long term monitoring at key strategic sites to provide more information about risk factors and impacts of disease. It was designed to be applicable across different sites and at different times. The landscape whole forest level monitoring using remote sensing may be applied at a broader scale and is useful for both mapping of kauri as well as change detection in canopy health across an entire forest. But this approach is new technology and still needs validation across other ecosystems beyond the Waitākere Ranges, where different tree species may make host detection harder.

*Q. Is the present Waitākere Forest Survey solely funded by Auckland Council?*

A. In parallel to the standard soil sample analysis, a sub-set of the soil samples collected will be evaluated using a new surveillance diagnostic tool called the LAMP assay. As this tool has the potential to be adopted into the national programme toolkit, its test performance will be evaluated during this process. This work will be funded through Ministry for Primary Industries, but the remainder will be funded through Auckland Council. We have collaborated with a large number of

research organisations and the Ngā Rakau Taketake project, which have generously provided in-kind support and advice to our survey design team.

*Q. Council's 2017 report soil tests showed it was Phytophthora cinnamomi under dieback looking trees. Why did they say it was Phytophthora agathidicida?*

A. The 2017 report did not show that it was only *Phytophthora cinnamomic* under dieback trees. We have taken many soil samples around symptomatic trees. Sometimes only *Phytophthora agathidicida*, sometimes only *Phytophthora cinnamomi/multivora*/other *Phytophthora* species, sometimes a combination of all of these or nothing was found. This points to the heterogenous nature of soil and is generally an expected result.

*Q. The Government recently announced funding to prevent kauri dieback disease in its annual budget, how will this be used?*

A. This budget allocation is managed by the Ministry of Primary Industries, which is due to announce more information about their plan in the coming months. We understand The National Pest Management Plan and its operational delivery plan will form part of these activities.

*Q. I carry out conservation work at Anawhata. Where can I get information on soil testing results to help with our land management and communicate to other private landowners?*

A. Auckland Councils' public geomaps system [GeoMaps mapping service \(aucklandcouncil.govt.nz\)](https://www.aucklandcouncil.govt.nz/GeoMaps) has information related to Kauri Dieback disease on public land. If you have questions about specific areas, please contact [kauri@aucklandcouncil.govt.nz](mailto:kauri@aucklandcouncil.govt.nz) for more information.