

28 NOV 2018

OIA18-0752

Reuben Tilley
fyi-request-8972-bd0e38a4@requests.fyi.org.nz

Dear Reuben Tilley

OFFICIAL INFORMATION ACT REQUEST

I refer to your official information request on 31 October 2018, relating to research on potential causes of kauri dieback disease and the probable hypothesis for its occurrence. The Ministry for Primary Industries (MPI) is providing to you some rationale behind potential causes, research information and papers and some further reading regarding possible links between kauri swamp digging in Northland and the location of where the disease was first documented.

Cause of kauri dieback

The Kauri Dieback Programme (the programme) has responsibility for managing and responding to the spread of kauri dieback in New Zealand. The programme is a collaborative partnership between MPI, regional councils, the Auckland Council, Department of Conservation, Te Roroa and the Tangata Whenua Roopu on behalf of mana whenua and tangata whenua in the kauri rohe.

Research undertaken by the programme has shown that kauri dieback is caused by the water mould *Phytophthora agathidicida*, formerly known as *Phytophthora taxon Agathis* or *PTA*. This fungus-like pathogen infects the roots of kauri, damaging the tissues that carry important nutrients and water, effectively starving the trees to death. The enclosed paper, *Kauri (Agathis australis) Under Threat From Phytophthora*, by Beever et al. 2009, is one of the first scientific papers that links *Phytophthora agathidicida* as a threat to kauri.

The paper '*Pathogenicity of four Phytophthora species on kauri: in vitro and glasshouse trials*' identifies *Phytophthora agathidicida*, as a significant pathogen on kauri. A link to the paper can be found here:

https://www.kauridieback.co.nz/media/1541/13-horner-hough-2014-pathogenicity-of-four-phytophthora-species-on-kauri-in-vitro-and-glasshouse-trial-nzpp-67_54-59.pdf.

Individual trees can become more susceptible to a pathogen through factors that compromise tree health, such as:

- climate change;
- temperature;
- soil moisture;
- drought;

Biosecurity New Zealand

Readiness and Response Services

Pastoral House, 25 The Terrace Wellington 6011, New Zealand

PO Box 2526 Wellington 6140, New Zealand

Telephone: 0800 00 83 33, Facsimile: +64-4-894 0300

www.mpi.govt.nz

- excess water;
- pests; and
- the use of herbicides.

It is not certain what factors enable some trees to yield more quickly to the disease than others. Other *Phytophthora* species may influence the decline of kauri and further work is required to fully understand what this may be.

Ongoing research

Within the programme there is a workstream dedicated to ongoing research. In addition to carrying out research into a range of tools and treatments to fight kauri dieback, which at present has no cure, the programme continues to research the disease to better understand the pathogen's biology and its impact. A long term research goal is to find trees with genetic resistance to Kauri dieback, and this is part of the Healthy Trees Healthy Future research project.

You may be aware of the new funding announced recently by the Government for kauri dieback research. This additional funding is in support of a science plan being developed by the Kauri Dieback Strategic Science Advisory Group (SSAG) that outlines critical research needed to combat kauri dieback. The SSAG was established earlier this year as a key initiative to deliver stronger protection for kauri and provides the programme with independent scientific advice.

Kauri Swamp

Research has not as yet been carried out to see if there is a correlation between swamp kauri operations and where the disease is located. The programme has however researched the role historical forestry operations play in the introduction and spread of kauri dieback. The results of this research is available via this link:

https://www.kauridieback.co.nz/media/1487/2017-52-the-introduction-and-spread-of-kauri-dieback-disease-in-new-zealand_final.pdf.

Research papers

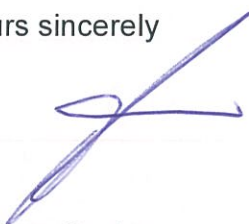
Information on past and ongoing research on kauri dieback is publicly available on the Science and Research section of the programme's website:

<https://www.kauridieback.co.nz/science-and-research>.

Enclosed is a table that lists the research papers available on the website along with web links to their location. Reports that are still to be published are indicated in the table and will be available from the website in the near future.

Under section 28(3) of the Official Information Act 1982 you have the right to request the Ombudsman to investigate and review this response.

Yours sincerely



Andrew Spelman
Acting Director, Readiness and Response Services

Title of Report	Link to report on Kauri Dieback website
Specialist Phytophthora Research: Biology, pathology, ecology and detection of PA	https://www.kauridieback.co.nz/media/1618/2013-11927-specialist-phytophthora-research-ecology-and-pathology-final-report.pdf
Phytophthora agathidicida – An overview	https://www.kauridieback.co.nz/media/1539/10-bellgard-et-al-2016-phytophthora-agathidicida-forest-phytophthoras.pdf
Approaching the origins of PTA	https://www.kauridieback.co.nz/media/1375/bellgard_et-al-2011.pdf
Pathogenicity of four <i>Phytophthora</i> species on kauri: in vitro and glasshouse trials	https://www.kauridieback.co.nz/media/1541/13-horner-hough-2014-pathogenicity-of-four-phytophthora-species-on-kauri-in-vitro-and-glasshouse-trial-nzpp-67_54-59.pdf
The effects of PTA on kauri forest ecosystem processes	https://www.kauridieback.co.nz/media/1385/ecosystem-effects-poster-donald-van-der-westhuizen.pdf
What is the host range of PA in NZ.	https://www.kauridieback.co.nz/media/1630/2016-undertake-taxonomic-and-ecological-assessments-to-determine-presence-of-bioindicators-of-forest-health-jess-ryder-nzpps.pdf
The arbuscular mycorrhizal fungi colonising kauri	https://www.kauridieback.co.nz/media/1816/padamsee-et-al-2016.pdf
Epidemiology Scoping Exercise	https://www.kauridieback.co.nz/media/1538/6-kauri-dieback-epidemiology-scoping-report_final.pdf
Assay of historical soil samples	https://www.kauridieback.co.nz/media/1515/4-assay-of-stored-soils-for-presence_final.pdf
A taxonomic revision of <i>Phytophthora</i> Clade 5 including two new species, <i>Phytophthora agathidicida</i> and <i>P. cocois</i> .	https://www.kauridieback.co.nz/media/1371/weir-paper-2015.pdf
Identify the role, diversity and impact of kauri mycorrhizae on PA infection.	Pending publication.

Ecological Impacts / Stuff in Duff	Pending publication.
Undertake taxonomic and ecological assessments to determine presence of bioindicators of forest health	https://www.kauridieback.co.nz/media/1630/2016-undertake-taxonomic-and-ecological-assessments-to-determine-presence-of-bioindicators-of-forest-health-jess-ryder-nzpps.pdf
Ecological impacts	https://www.kauridieback.co.nz/media/1385/ecosystem-effects-poster-donald-van-der-westhuizen.pdf
PA Response Research Projects - Detection of <i>Phytophthora taxon Agathis</i> (PTA)	https://www.kauridieback.co.nz/media/1640/11213-11215-12093-detection-of-phytophthora-taxon-agathis-pta-beever.pdf
Diagnostic tools to detect PA in soil	https://www.kauridieback.co.nz/media/1524/8-auckland-council_tr2017-019-comparison-of-methods-kauri-diebackpd.pdf
Development of sample protocol for field collection of soil samples for detection of PA	https://www.kauridieback.co.nz/media/1619/2010-11895-development-of-sample-protocol-for-field-collection-of-soil-samples-for-detection-of-pa-preliminary-survey-for-phytophthora-taxon-agathis-client-maf-biosecurity-new-zealand.pdf
Aerial Surveillance to detect kauri dieback in New Zealand	https://www.kauridieback.co.nz/media/1387/aerial-surveillance-jamieson-et-al-2014.pdf
Surveillance methods to determine kauri dieback distribution	https://www.kauridieback.co.nz/media/1380/063_waipara.pdf
Analysis of kauri dieback soil and tissue samples	https://www.kauridieback.co.nz/media/1623/2012-12239-analysis-of-kauri-dieback-soil-and-tissue-samples-pta-soil-detection-plan-moehau-range-coromandel-forest-park-puketi-herekino-and-waipoua-forests.pdf https://www.kauridieback.co.nz/media/1627/12239-analysis-of-kauri-dieback-soil-and-tissue-samples-phase-1-final-report_rotated.pdf
Detection of PA in kauri wood	https://www.kauridieback.co.nz/media/1621/2012-detection-of-pa-in-kauri-wood-characterising-the-distribution-of-pta-in-bark-cambium-and-wood-of-diseased-new-zealand-kauri-iufro-posterwheat-bellgard-waipara-2012.pdf
Stream-based surveillance	https://www.kauridieback.co.nz/media/1372/fishing-for-phytophthora-in-the-waitakere-ranges.pdf

Real-time PCR as a diagnostic tool.	https://www.kauridieback.co.nz/media/1628/2013-real-time-pcr-as-a-diagnostic-tool.pdf https://www.kauridieback.co.nz/media/1632/2014-17101-real-time-pcr-as-diagnostic-tool-comparison-of-a-real-time.pdf
Detector Dog Research	https://www.kauridieback.co.nz/media/1639/sniffer-dog-progress-report-april-2016.pdf
Risk posed by different vector types for the spread of kauri dieback	https://www.kauridieback.co.nz/media/1522/17-kauri-dieback-risk-analysis-report-final-3_3_17.pdf
Historical Forestry Pathways Project	https://www.kauridieback.co.nz/media/1486/2017-52-the-introduction-and-spread-of-kauri-dieback-disease-in-new-zealand_final.pdf
Whangapoua Vectoring Report	https://www.kauridieback.co.nz/media/1370/beachman-whangapoua-historic-vectoring-report_final_june-2015.pdf
Ingestion of infected roots by feral pigs	Pending publication.
PA Response Research Projects - Detection of <i>Phytophthora taxon Agathis</i> (PTA)	https://www.kauridieback.co.nz/media/1640/11213-11215-12093-detection-of-phytophthora-taxon-agathis-pta-beever.pdf https://www.kauridieback.co.nz/media/1809/0810-ecology-of-pa-control-tools.pdf https://www.kauridieback.co.nz/media/1810/0810-ecology-of-pa-control-tools-02.pdf
Phosphite Research Part 1: Phosphite Injection trials in kauri forest	https://www.kauridieback.co.nz/media/1379/8653-ian-horner-phosphorous-acid-for-controlling-pta-in-kauri-pfr-2013-47652-final.pdf https://www.kauridieback.co.nz/media/1694/2014-15636-phosphite-research-part-1-phosphite-injection-trials-in-kauri-forest-phosphorous-acid-for-controlling-phytophthora-taxon-agathis-in-kauri-field-trials-2-years-on.pdf https://www.kauridieback.co.nz/media/1811/phosphite-research-part-1-phosphite-injection-trials-in-kauri-forest.pdf
Phosphite Research Part 2: Large Tree Treatments	https://www.kauridieback.co.nz/media/1695/2017-18061-phosphite-research-part-2-large-tree-treatments-initial-observations-brief-report-horner-i-hough-e-horner-m.pdf https://www.kauridieback.co.nz/media/1696/2017-18061-phosphite-research-part-2-large-tree-brief-report-treatments-horner-i.pdf
Phosphite Research Part 3: Trunk Sprays and Lower Injection Rates	https://www.kauridieback.co.nz/media/1697/2017-18062-phosphite-research-part-3-trunk-sprays-and-lower-injection-rates-kd-brief-update-horner-i.pdf https://www.kauridieback.co.nz/media/1698/2017-18062-phosphite-research-part-3-trunk-sprays-and-lower-injection-rates-horner-i-hough-e-horner-m.pdf

	https://www.kauridieback.co.nz/media/1812/phosphite-research-part-3-trunk-sprays-and-lower-injection-rates.pdf
Phosphite Barriers	https://www.kauridieback.co.nz/media/1699/2016-1782-phosphite-barriers-kauri-dieback-scoping-exercise-horner-i.pdf
Phosphite Toxicity & Impact - Water Injections (Phase 1)	https://www.kauridieback.co.nz/media/1700/2016-17803-phosphite-toxicity-impact-water-injections-phase1-interim-report-horner-i-october-2016.pdf https://www.kauridieback.co.nz/media/1701/2017-17803-phosphite-toxicity-and-impact-water-injections-phase1-horner-i.pdf
Phosphite Twig Assay	https://www.kauridieback.co.nz/media/1702/2017-17850-phosphite-twig-assay-twig-assay-refinement-for-use-in-phosphite-trials.pdf
Oospore Deactivation - Desktop Review: Alkaline-based solution	Final report currently under review
Deactivation of Oospores of Phytophthora Taxon Agathis - Phase 2	https://www.kauridieback.co.nz/media/1634/2015-17100deactivation-of-oospore-of-phytophthora-taxon-agathis-phase.pdf
Deactivation of oospores of <i>Phytophthora taxon Agathis</i> - Phase 1	https://www.kauridieback.co.nz/media/1633/2013-15775-deactivation-of-oospores-of-phytophthora-taxon-agathis-dick.pdf
Hygiene methods to limit PA spread	https://www.kauridieback.co.nz/media/1526/9-bellgard-et-al-2009-kauridieback-kauri-hygiene-a-small-project_final.pdf https://www.kauridieback.co.nz/media/1373/comparative-efficacy-of-disinfectants-against-pta.pdf
Healthy Trees Healthy Future	For updated reports refer to: https://healthytrees.co.nz/publications-and-resources/
Trees and disease protection	https://www.kauridieback.co.nz/media/1631/2016-17520-visualizing-the-early-infection-of-agathis-australis-by-pa-using-microscopy-and-fluorescent-in-situ-hybridization-bellgard.pdf https://www.kauridieback.co.nz/media/1815/bellgard-et-al-2012.pdf

KDP Research Projects Alternative Treatments	Final report currently under review
Factors influencing public responses to kauri dieback control measures	https://www.kauridieback.co.nz/media/1388/kauri-dieback-forest-visitor-report-simon-wegner.pdf
Kauri dieback survey report	Pending publication.
Kauri dieback formative research report	https://www.kauridieback.co.nz/media/1531/1-2010-kauri-dieback-formative-research-report-synovate_final.pdf
Evaluation of Kauri Dieback Signage	Pending publication.
Cultural Health Indicator Pilot Project - Phase 3	https://www.kauridieback.co.nz/media/1534/16-kauri-dieback-cultural-health-indicator-pilot-2017_final.pdf
Cultural Health Indicator Pilot Project - Phase 2	https://www.kauridieback.co.nz/media/1533/15-kauri-cultural-health-indicators-monitoring-framework-2013_final.pdf
Cultural Impact Assessment of Kauri Dieback	https://www.kauridieback.co.nz/media/1813/shortland-wood-2011.pdf
Cultural Effects Assessment (Te Roroa)	https://www.kauridieback.co.nz/media/1814/ngakuru-marsden-nuttall-2010-te-roroa-effectes-assessment-kauri-dieback-disease-june-2010-te-roroa.pdf
Rongoa Scoping Exercise	Pending publication.
Prioritisation & Optimisation Intervention Framework	https://www.kauridieback.co.nz/media/1536/5-oconnor-sinclair-2015_kauri-dieback-decision-making-framework_final_dec-2015.pdf
Waitakere Surveillance Analysis	https://www.kauridieback.co.nz/media/1516/7-auckland-council-waitakere-ranges-report-v2-final-aug17.pdf
Human vectoring and PTA hygiene treatments	https://www.kauridieback.co.nz/media/1499/kauri_killer_on_the_loose_-_study_of_human_vectors.pdf
Historical Forestry Pathways Project	https://www.kauridieback.co.nz/media/1487/2017-52-the-introduction-and-spread-of-kauri-dieback-disease-in-new-zealand_final.pdf https://www.kauridieback.co.nz/media/1370/beachman-whangapoua-historic-vectoring-report_final_june-2015.pdf
Absence of evidence is not evidence of absence: Feral	https://www.kauridieback.co.nz/media/1377/krull-et-al-2012.pdf

pigs as vectors of soil-borne pathogens	
Iconic Kauri Tree Project	https://www.kauridieback.co.nz/media/1799/17826-iconic-kauri-project-report.pdf https://www.kauridieback.co.nz/media/1800/17826-iconickaurioverview.pdf
Independent review of the state of kauri dieback knowledge	https://www.kauridieback.co.nz/media/1537/14-independent-review-of-the-kdb-programme-a_black_-_i_dickie-2016.pdf