Kauri Protection Guidelines for Plantation Forestry

APRIL 2025

forestgrowers levy trust inc

FOREST OWNERS ASSOCIATION

New Zealand Farm Forestry Association
Oranga Rākau Aotearoa

TIAKINA KAURI
KAURI PROTECTION

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Although this is a standalone document, it should be read in conjunction with the operative National PA Pest Management Plan 2022 and in consideration of numerous other kauri management guidelines and documents found at https://www.kauriprotection.co.nz

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Cover photograph: Kauri trees near Mokau Ridge Road, an internal forestry road passing through Department of Conservation and Crown Forest Licence lands, near Kaeo, Northland.
Photo source: K. Lucich, Summit Forestry, October 2023.

Summary

What:

Kauri Protection – these guidelines will assist the plantation forestry sector to minimise the risks of spreading the pathogen ***Phytophthora agathidicida*** (PA) through forestry operations and activities. These guidelines have been developed to minimise the risk of PA spread in consideration of forest operations, with an emphasis on providing cost-effective, high-impact and risk-based solutions.

Why:

Kauri (*Agathis australis*) is an iconic forest tree species endemic to Aotearoa New Zealand. Its existence is threatened by PA, which is readily spread through the movement of contaminated soil, damaging the feeding roots of kauri and causing the tree to starve. Known as 'kauri dieback disease', in most cases when a tree is infected it will die prematurely. The disease kills kauri of any age. There is no absolute cure, however a tree can be injected with phosphite and kept alive.

When:

Act now. The *National PA Pest Management Plan 2022* (NPMP, or the Plan) was enacted specifically to protect kauri and manage the spread of PA. The NPMP contains rules which landowners and managers must comply with.

How:

The best way to protect kauri is by preventing the pathogen's spread, i.e. minimising the movement of PA-contaminated soil. It is important to understand and educate staff, contractors and visitors about kauri dieback, their obligations, the risk of spreading PA, and the principles and hierarchy of hygiene measures. Work with your regional council on PA management in association with your operational activities and associated risks. Plan earthworks to avoid kauri forests where possible or operate to an approved Earthworks PA Risk Management Plan.

Who:

Development of these guidelines is a partnership between the New Zealand Forest Owners Association (NZFOA), New Zealand Farm Forestry Association (NZFFA) and Tiakina Kauri (TK).[1]

Where:

NPMP rules apply in the Northland, Auckland, Waikato and Bay of Plenty regions and relate to the movement of soil and water within kauri forests and kauri hygiene zones (the approximate root zone).

1. Tiakina Kauri is part of Biosecurity New Zealand, a business unit of the Ministry for Primary Industries (MPI) and is the Management Agency tasked with protecting kauri. Other key central and local government agencies include the Department of Conservation and 'Top of the North Island' regional and district councils.

1. Introduction

Kauri – Te Ao Māori.
The Kauri tree is among the most ancient in our part of the Universe. Its predecessors appeared during the Jurassic period, between 135 and 190 million years ago. It is a taonga tuku iho of the ancestral spiritual world of the Supreme Being, Io Matua Kore, followed through aeons to Ranginui and Papatūānuku, Father Sky and Mother Earth, and their child Tāne. All Kauri and other trees attest to the wonder of evolution, the ability of life to adapt to unexpected challenges, and to perpetuate itself over vast periods of time. Rooted securely in the earth, Kauri, like other trees, reaches for the heavens.[2]

2. From the writings of Dr Mānuka Henare (Te Rarawa, Te Aupōuri, Ngāti Kahu). Refer also to https://www.kauriprotection.co.nz/about-kauri/kauri-te-ao-maori/

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These guidelines will help forestry companies, Māori forest owners / managers and farm foresters meet their legal obligations under the NPMP. They are also aimed at forestry operators, silviculture and harvesting contractors, recreational users and pest controllers, and include measures to restrict stock and wild animal movements. They draw on numerous existing PA management procedures for working in areas with kauri, but are written from a plantation forestry sector perspective.

The guidelines are also intended to provide national agencies and councils with insights into the practical implications and workability of risk reduction measures in the plantation forestry context, and to ensure that costs and benefits of measures are considered alongside risk. Plantation forestry owners (via NZFOA and NZFFA) strongly support all reasonable efforts to limit the spread of PA and ultimately its eradication or mitigation of the disease if that becomes possible.

Kauri belong to one of the world's oldest families of conifers, with needle-shaped leaves and separate male and female cones. Kauri are only found in the southern hemisphere. There are 21 species found from South-East Asia to the Western Pacific. All the trees in the *Agathis* genus are generally known as kauri.

New Zealand's kauri (*Agathis australis*) is endemic and grows naturally north of the central Waikato and Bay of Plenty regions. Kauri trees can grow to over 50m tall, with trunk girths up to 16m, and live for over 2,000 years.

The future of this iconic New Zealand tree and the species that have co-evolved to live with it is threatened by a root-rot pathogen called *Phytophthora agathidicida*, or PA for short. PA damages the feeding roots of kauri slowly starving the tree, leading to its death. The pathogen is primarily spread in contaminated soil through human activities and movement (e.g. soil on footwear, equipment and vehicle tyres) and by ungulates (e.g. deer, pigs, goats, cows).

The National PA Pest Management Plan 2022 (NPMP) has been developed to help restrict the movement of PA. Regarding plantation forestry, Biosecurity New Zealand has clarified that the focus of the NPMP is on protecting existing kauri forests within or near plantation forests, not incidental seedlings or individual rickers within plantations. For more details about the NPMP refer to: National Plan | Tiakina Kauri (Kauriprotection.co.nz)

These guidelines will help forestry companies, Māori forest owners / managers and farm foresters meet their legal obligations under the NPMP.

2. Background

Biosecurity is about safeguarding New Zealand from the threats posed by unwanted pests and diseases. These threats could affect forest health, productivity, sustainability, ecosystem services, exports and returns, jobs and the wellbeing of local communities. Being active in biosecurity is all about managing risk to prevent the introduction of unwanted organisms, preventing their spread if they do arrive, and always maintaining vigilance so that unwanted organisms can be detected early.

Biosecurity is everyone's business. In the forestry sector biosecurity includes the actions, practices and rules that are designed to keep out the pests and pathogens that could affect livelihoods, right through the plantation forestry supply chain. While these guidelines have been developed specifically to help minimise the risk of spreading PA, the measures and mitigations outlined have broader biosecurity benefits, particularly for other soil-borne pathogen threats if applied as standard practice.

The pathogen was first recorded killing kauri on Aotea Great Barrier Island in the early 1970s, but has likely been present in New Zealand longer than this. The first detection of PA on mainland New Zealand occurred in 2006 after kauri were observed to be dying in the Waitakere Ranges.

What is PA?

PA is a microscopic, highly virulent soil and water-borne pathogen that causes kauri dieback disease.[3] PA produces oospores (a resting stage of the life cycle) and zoospores which can swim through soil water or in surface water, to a host plant. Zoospores enter a kauri through its roots, damaging them, and affecting their ability to uptake water and nutrients.

The disease effectively starves the tree and can kill kauri in any location and of any age.[4] Infected trees show various symptoms including yellowing of foliage, canopy thinning, branch dieback and base bleeding around the trunk of the tree (Figure 1). Symptoms worsen as the disease progresses towards the death of the tree. https://www.kauriprotection.co.nz/about-kauri/about-the-pa-pathogen/

What causes PA spread?

PA lives in soil and infected trees (trunk and roots), there is no airborne phase. It is spread by the movement of contaminated soil and/or plant material in the form of soil/mud adhering to items and also via surface and subsurface water flow. The main vectors of spread in which soil movements occur are through people (via boots and gear) and their activities, vehicles and equipment brought into kauri forests. PA is also spread through soil sticking to the feet of wild pigs, deer and goats and domestic cattle, through root pieces moved and via water, including soil water.

Human activity is the primary mechanism by which PA spreads to new areas, with key risk factors being activities that occur near kauri trees or forests that:

- Move soil or dirt (with larger quantities resulting in higher risk).
- Occur in or create wet, muddy ground conditions, including in winter and its fringes (May through to September – November) and immediately after rainfall events (approximately 3 days) outside of this wetter period.
- Are carried out at high frequency over time.

Once introduced, PA can survive in soil, away from kauri, for many years. A long lag time between infection and visible symptoms on infected kauri makes it difficult to confirm if an area is free of the pathogen. A precautionary approach to hygiene involving the thorough cleaning and disinfection of footwear, vehicles, tools, equipment and machinery when moving around and working in areas where kauri are present is therefore essential to reduce the spread of PA and preserve kauri for future generations.

3. The pathogen is one of more than 260 species of *Phytophthora* known to cause plant disease and death throughout the world. They require water to complete their life cycle.
4. Kauri life stages and identification images are shown in Appendix 1.
5. Refer to Beever et al., 2009, and Bellgard et al., 2013.

Figure 1: How to recognise kauri dieback: typical trunk and crown symptoms.

IMAGE SOURCE: TIAKINA KAURI. HOW TO GUIDE FOR DEVELOPING AN EARTHWORKS RISK MANAGEMENT PLAN.

Base bleeding – This occurs specifically from the base of the tree as the disease progresses up from the root system.

Canopy decline – Gradual thinning of foliage and decrease of branches across the entire canopy. Decline progresses from minor to severe.

Foliage colour – Severe change in colour of foliage from green to yellow to red-brown as the disease progresses.

Tree death – The tree has succumbed to the disease to its full extent.

3. National plan to protect kauri

The key driver for creating these guidelines was in response to the development of the first National PA Pest Management Plan (NPMP, or the Plan)[6] to manage PA's spread. The Plan became operative in August 2022. It was initiated to specifically protect kauri forests and contains ten rules and obligations that all land owners and managers must comply with.

6. Biosecurity (National PA Pest Management Plan) Order 2022 (SL 2022/208) Contents – New Zealand Legislation.

Definitions

kauri forest

a. means –

i. a forest or bushland ecosystem that contains more than 1 kauri; or

ii. land being regenerated with planting for the purpose of establishing, or revegetating, a kauri forest ecosystem; and

b. includes any land within the kauri hygiene zone of any kauri tree on the edge of the forest or bushland ecosystem.

kauri lands means land within the district or region of Northland Regional Council, Auckland Council, Waikato Regional Council, or Bay of Plenty Regional Council.

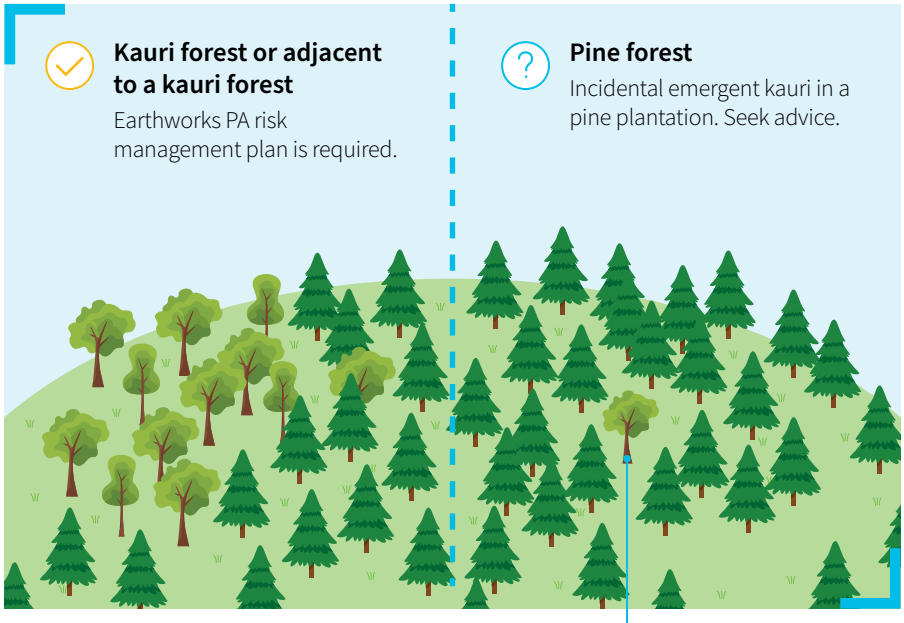
kauri hygiene zone means 3 times the maximum radius of the canopy dripline of a kauri tree (refer to Figures 3 and 4).

Clarification of the above definitions were sought,[7] in the context of commercial forestry, concerning the definition of 'kauri forest':

- includes kauri within indigenous forest enclaves, bushland ecosystems and revegetation projects, but
- does not include incidental kauri (seedlings or individual rickers) that can occur in a commercial forest of a different intended species (Figure 2).[8]

Figure 2: Operational application of the NPMP.

An illustration reflecting the operational application of the NPMP based on the clarifications provided by Tiakina Kauri in the plantation forestry context.



See **Appendix 1** for Kauri life stages and identification images

7. From Tiakina Kauri.
8. However, where this occurs there will likely be kauri forests nearby, where NPMP rules would be applied.

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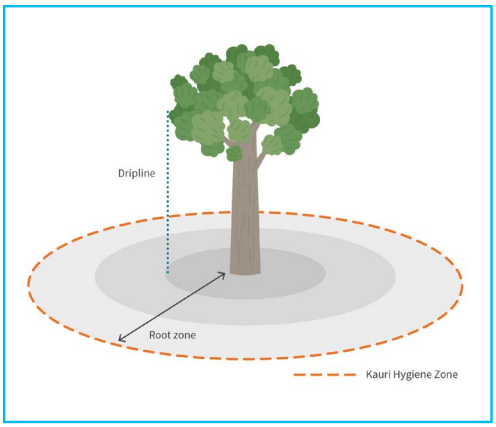
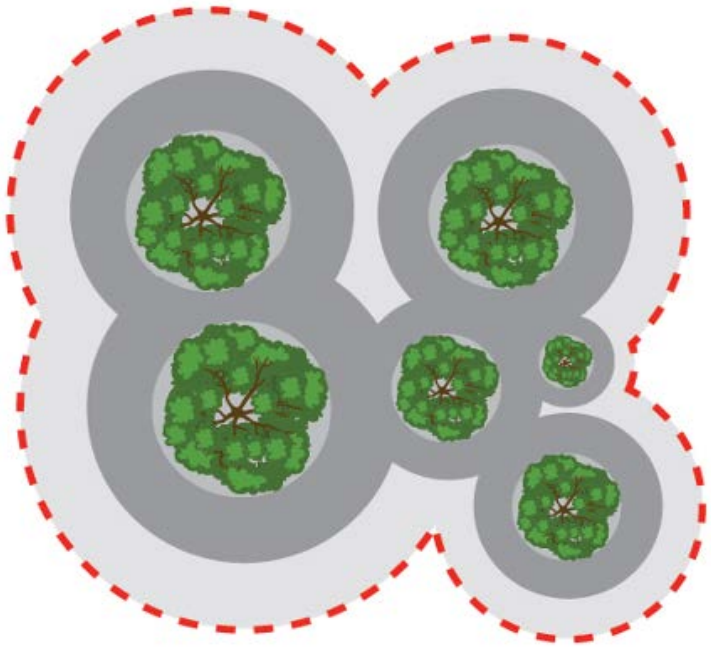
Figure 3: Aerial view of the kauri hygiene zone of a stand of kauri.

IMAGE SOURCE: TIAKINA KAURI. THE IMAGE BELOW HIGHLIGHTS OPERATING DOWNSLOPE FROM HEALTHY KAURI WHEN DEPLOYING TRAP LINES.





Kauri Hygiene Area
Interconnected 3x drip line of kauri stand

Kauri hygiene zone (KHZ)

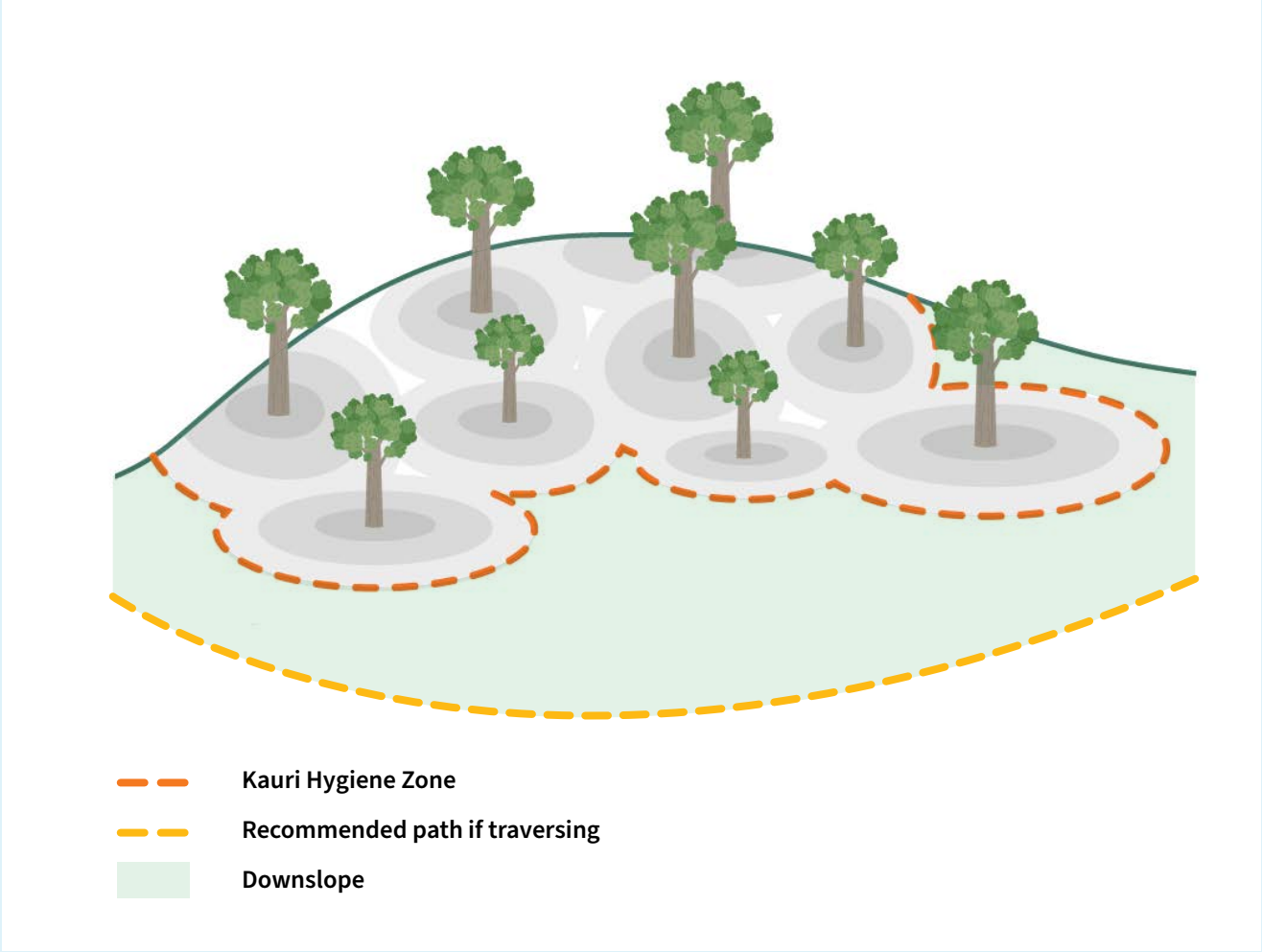
It can be difficult to know whether an area surrounding a kauri tree is contaminated with PA or not because kauri trees can have PA infection years before any disease symptoms begin to show. Therefore, all kauri should be considered as being at risk.

Kauri trees form surface feeding roots and structural peg roots. The surface roots are mostly within the first metre of soil depth and extend well out beyond the canopy. This is where soil is most likely to become contaminated with PA.

The kauri hygiene zone (KHZ) is the immediate vicinity of a tree which encompasses the trunk and the root system of a tree or a stand of trees with overlapping root systems. No soil movement is to occur in or out of this zone. The perimeter of the KHZ is 3 times the drip line of an individual tree canopy, or the most outlying tree's dripline in a kauri stand (Figure 3). A practical example of operating safely in a KHZ is shown in Figure 4.

Figure 4: Operate downslope of healthy kauri.

IMAGE SOURCE: TIAKINA KAURI.



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Rules

NZFOA and NZFFA recognise the importance of the plantation sector working proactively to:

- ☑ Make sure they play their role in kauri protection by understanding the risk of PA and how it is spread;
- ☑ Abide by the National Pest Management Plan requirements; and
- ☑ Ensure that any measures imposed on commercial forestry are workable, cost-effective and are applied consistently across the four kauri land regions.

The graphic on the right summarises the rules of greatest importance for commercial forestry. Appendix 2 explains the rules and their implications in more detail.

NPMP rules plantation forest managers need to know

Applies nationally

Applies within "kauri lands" – Northland, Auckland, Waikato and Bay of Plenty regions

1 Obligation to report

Report any sick kauri on land you manage or own.

2 Provision of information

On request, provide the Management Agency (TK) with information about operations where it aids management of PA spread.

3 Restriction on the movement of kauri

Producers and propagators of kauri cannot move these unless they operate in accordance with a production plan that mitigates the risk of PA spread.

4 Obligation to have PA risk management plans

Work with the Management Agency when given written notice by them that the land is at risk of PA.

Be proactive about planning to protect kauri by following biosecurity hygiene and awareness philosophy. Incorporate kauri protection planning into forestry planning processes.

5 Obligation to have earthworks PA risk management plan in kauri hygiene zone

Develop a Management Agency-approved Earthworks Risk Management Plan when earthworks intersect a kauri hygiene zone.

8 Obligation to clean items

When entering a kauri forest, risk items that contact the ground must be clean on entering and exiting the area. This includes boots, vehicles, machinery and equipment that have direct contact with the forest floor or soil containing kauri roots. This does not include contact with gravel, asphalt or soil outside of a kauri forest.

10 Open tracks and roads in kauri forest

Owners of land with tracks or roads passing through a kauri forest must either:

a. ensure track/road avoids kauri hygiene zone or,

b. install hygiene station(s) or,

c. install track/road surfacing that minimises soil and organic matter movement into a KHZ and contact with feeder roots, and for b and c,

d. ensure ground and surface water drains away from kauri trees.

Does not apply in respect of a track of which the owner is unaware of or that is not intended for public use. Applies to kauri forests and not individual trees.

3

Principles of kauri hygiene and PA spread prevention

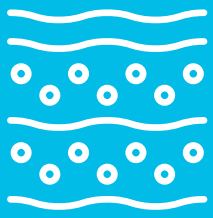
Reducing or preventing the movement of soil and plant material is fundamental to PA management. There are six key hygiene requirements:

Avoid kauri forests

Avoid known PA-contaminated sites and catchments down slope of confirmed sites

If in forests with kauri, avoid kauri and plan activities prior

Keep away from kauri when it's wet



Eliminate soil movement through rigorous hygiene measures

Remove all soil and debris, then disinfect all gear

Risk prevention hierarchy

SOURCE: ADAPTED FROM TIAKINA KAURI

The following hygiene hierarchy prioritises prevention measures and provides the basis of planning all operations and activities undertaken in and near kauri forests.

Refer also to Principles of hygiene | Tiakina Kauri (Kauriprotection.co.nz) which details what items need to be cleaned, and how, and the recommended contents of hygiene kits.

Most Preferred

Avoid

Avoid kauri forests, stands, and kauri hygiene zones (KHZ) where possible. Substitute the location or time of year where practical.

Avoid contaminated sites

If avoiding all KHZs isn't possible, avoid known PA-contaminated sites. Work with the Management Agency on a PA Risk Management Plan. Avoid activities downslope of any PA-positive area.

Avoid activities

Avoid earthworks, where practicable, in and around KHZs. Avoid any activity especially when area is wet/muddy.

Administrative

Administration involves the provision of training, and understanding about kauri dieback, PA, mitigations, and hygiene. Apply this measure in the first instance.

Acceptable

Planning

Consider kauri when planning activities or operations. Source background information on known PA locations. If earthworks cannot be avoided in a KHZ, a Management Agency-approved Earthworks PA Risk Management Plan (refer to section 4) is required.

Hygiene

Follow standard hygiene practices to remove soil from all surfaces that come in contact with the ground. Once soil has been removed, apply suitable disinfectant.[9]

Least Preferred

Hygiene only

Follow the standard of hygiene only without first planning and considering kauri as part of the activity or operation. Practise excellent hygiene at all times.

9. The approved disinfectant is SteriGene at 2 per cent for broad-spectrum use. Methylated spirits (minimum concentration of 70 per cent) mixed with water can also be used for spot treatment and cleaning of small equipment as it dries faster.

4. Operational considerations

Overview

The plantation forestry sector acknowledges the hierarchy of PA hygiene principles developed. These guidelines adopt a similar type of risk prioritisation and management approach. This will help target risk reduction actions appropriate to the level of risk ensuring cost-effective, high-impact and risk-based solutions.

Risk Management

This section focuses on a risk prevention hierarchy relevant for plantation forestry.
Key factors to consider during operational planning are described first:

1. Plan to avoid kauri as much as possible. Obtain kauri location information and establish accurate site maps noting their presence within the landscape. Plan to avoid kauri where possible by ensuring new roads, tracks, skid sites, planting, spraying and pruning avoid KHZ's and kauri forests. Place roading away from kauri as well as planting adjacent to native forest where kauri exist. Avoidance is best for protecting kauri, in line with the above principles. However, areas in immediate proximity to kauri stands are unlikely to be impacted when operating to setbacks regulated under the National Environmental Standard for Commercial Forestry (NES-CF)[10] and most forestry activities can be planned to avoid KHZs.

2. Earthworks that need to be carried out within a KHZ require a National Pest Management Plan Authorised Person (Ministry for Primary Industries) or a district council (where relevant) approved Earthworks PA Risk Management Plan to control soil movement. The soil within a KHZ needs to be contained on site. Machinery needs to arrive clean, on completion of operation remove loose soil, and transport to a washdown facility to clean and disinfect (refer to Tiakina Kauri *Earthworks Risk Management Plan and How to Guide*). Earthworks risk management plan | Tiakina Kauri (kauriprotection.co.nz)

10. National environmental standards for commercial forestry | Ministry for the Environment

3 For kauri adjacent to existing infrastructure (Figure 5) ensure road pavement maintains a physical separation between vehicle wheels and soil and that groundwater and surface water drains away from kauri trees. Once a road is paved the risk of PA spread to kauri forests is significantly reduced. Aggregate sourced from internal forest quarries is best, where practicable. Otherwise, ensure all aggregate carted in is clean and not from a site or catchment that is in or near a kauri forest that may contain contaminated material. Refer to 'useful links' – Quarry hygiene: aggregate handling, transportation and storage.

Figure 5: Kauri adjacent to existing infrastructure on forestry road (left) and district council managed road (right).

PHOTOS SOURCE: K. LUCICH, SUMMIT FORESTRY, OCTOBER 2023.

4 When planting, maintaining, and harvesting forests close to or along the boundary of a kauri forest, avoid KHZs. When harvesting consider either leaving trees planted in this zone wherever possible or felling and leaving unharvestable trees to avoid them becoming problematic in the future. If KHZs cannot be avoided, an Earthworks Risk Management Plan may be required. Engage with the Management Agency or your regional council to determine how best to mitigate any risk while considering the operational implications.

5 If individual rickers or emergent kauri are known to occur within the plantation estate and are likely to be encountered during harvesting operations, consider how best to mitigate the risk at the planning/planting stage. If KHZs cannot be avoided, an Earthworks Risk Management Plan may be required. Engage with the Management Agency or your regional council to determine how best to mitigate any risk while considering the operational implications.

6 Understanding soil and water movement risks for your forest is crucial. When water control maintenance is required within a KHZ, an Earthworks Risk Management Plan is required. Document the recent operational history of any machinery that is to be used and whether additional hygiene measures are required. If the machinery is to come from a known PA-contaminated site, ensure material stays on that site and runoff water is not directed to the kauri root zone.

7 Inadequate boundary fencing and wandering stock from neighbouring properties (Figure 6) are potential issues that forest managers may need to address. Engage with neighbours and ask your regional council for support.

Figure 6: Wandering cattle in a Northland forest (circled) pose risks of PA spread.

IMAGE SOURCE: P. RUSSELL, BBSL, OCTOBER 2023.

Risk assessment

4

Table 1 below summarises risk prevention measures for forestry activities utilising the hygiene hierarchy. Controls can be readily developed, discussed with wider team members and embedded into management plans, as appropriate.

Table 1: Risk Assessment Summary.

Activity	Risk prevention control / action	Vector	Amount of soil movement	Entering KHZ (No / Possible)	Risk of spreading PA	Management responsibility
Earthworks	· Planning (know machinery movements). · Avoid KHZ. · Avoid known contaminated sites. · Avoid wet conditions. · Administration (PA training). · Hygiene if entering KHZ (clean in, clean out). · May require approved Earthworks Risk Management Plan	Bulldozer, excavator, dump trucks, metal trucks, vehicles (crew, service providers, supervisor, visitor)	Moderate to Significant	Possible	Low – outside KHZ and kauri forests. Very high – inside KHZ, until the clean aggregate cover is achieved.	Forest Manager + Management Agency
Quarrying	· Avoid KHZ. · Avoid known contaminated sites. · Source aggregate from within forest if possible (avoiding potentially contaminated areas), and quarries within catchments that have potentially contaminated KHZ's.	Bulldozer, excavator, dump truck, vehicles	Moderate	Possible	Low – if not in proximity to a kauri forest or KHZ Very high – if in proximity to/within a catchment with a kauri forest or KHZ	Forest Manager + Contractor
Harvesting	· Avoid KHZ. · Administration (PA training). · Hygiene if working adjacent to KHZ (create a physical barrier / clean in, clean out). · Minimise the movement of machinery on and off site. · Hygiene – If entering KHZ (clean in, clean out).	Hauler and ground-based harvesting machinery, vehicles, boots	Moderate	Possible	Very – high machinery High – vehicles Low – footwear	Forest Manager + Contractor

Activity	Risk prevention control / action	Vector	Amount of soil movement	Entering KHZ (No / Possible)	Risk of spreading PA	Management responsibility
Cartage	· Avoid KHZ.	Internal forest roads, council roads, State highway – tyres and boots on aggregate (refer to note)	Minimal	No	Low	Forest Manager
Pruning, thinning to waste, manual breaking out	· Avoid KHZ – where possible. · Administration (PA training). · Hygiene – If entering KHZ (clean in, clean out).	Vehicle (on-road), boots, chainsaws, mechanized thinning machine	Minimal	Possible	High – vehicles Low – footwear	Forest Manager + Contractor
Monitoring / surveys	· Avoid KHZ – where possible. · Avoid known contaminated sites. · Avoid wet conditions. · Administration (PA training). · Planning. · Hygiene if entering KHZ (clean in, clean out). · May require following MPI sampling protocols.	Vehicles (on-road), boots, equipment	Minimal	Possible	Low	Forest Manager + Contractor May involve external monitoring contractors.
Weed and pest control	· Avoid KHZ – where possible. · Avoid known contaminated sites. · Avoid wet conditions. · Administration (PA training). · Planning. · Hygiene if entering KHZ (clean in, clean out).	Vehicles (on-road), boots, equipment	Minimal	Possible	Low	Forest Manager + Contractor
Unauthorised forest access	· Administration (signage, lock gates, fencing).	Vehicles, ATVs, boots,	Moderate	Possible	Medium	Forest Manager

Activity	Risk prevention control / action	Vector	Amount of soil movement	Entering KHZ (No / Possible)	Risk of spreading PA	Management responsibility
Feral animals	· Administration (PA training), engage with neighbours, fencing, work with DOC and regional councils. · Planning (keep up to date with kauri dieback disease locations, plan control operations, fencing).	Paws and hooves – ungulates are the main animal vectors of PA (pigs, cows, goats, deer)	Minimal	Possible	Medium	Forest Manager + DOC and/or regional councils
Post-harvest and water control maintenance	· Avoid KHZ – where possible. · Avoid known contaminated sites. · Avoid wet conditions. · Administration (PA training). · Planning (know machinery movements). · Hygiene if entering KHZ (clean in, clean out).	Digger, vehicles	Moderate	Possible	Low – outside KHZ. Medium – inside KHZ, follow hygiene protocols.	Forest Manager + Contractor
On-road recreational activities: walkers, runners, horse riders, dog walkers, mountain bikers, 4x4	· Avoid KHZ. · Administration (signage). · Hygiene If entering KHZ (clean in, clean out).	Boots, paws, hooves, bikes/tyres, vehicles	Minimal	Possible	Low	Forest Manager

Activity	Risk prevention control / action	Vector	Amount of soil movement	Entering KHZ (No / Possible)	Risk of spreading PA	Management responsibility
Apiarists / hunters	· Avoid KHZ. · Avoid known contaminated sites. · Administration (PA training, signage). · Hygiene If entering KHZ (clean in, clean out). · Incorporate risk management/ training into permits or access agreements.	Vehicles, boots, equipment, paws	Minimal	Possible	Medium – if entering KHZ	Forest Manager
Replanting	· Avoid KHZ. · Planning (setbacks from any existing kauri forest). · If planting kauri – only source plants from certified supplier.	Bare-root seedlings, boots, Spades, ATV (off-road) in cutover areas	Minimal	No	Low	Forest Manager + Contractor
Afforestation	· Avoid KHZ. · Planning (setbacks from any existing kauri forest) · Consider sourcing seedlings from a Plant Pass certified nursery.	Bare-root seedlings from *Pinus radiata* nursery, boots, spades, ATV (off-road)	Minimal	No	Low	Forest Manager + Contractor

Note: In terms of plantation forestry roads, operators should always defer to the New Zealand Forest Road Engineering Manual 2020. The objective of this Manual is to ensure roads, water crossings and related infrastructure in New Zealand plantation forests are fit for purpose and meet high environmental standards. Roading Manual V20 Web (correct ISBN) (nzfoa.org.nz).

This Manual went through a rigorous development and recent review process and recommended actions will address most of the roading earthworks issues presented by PA management issues. Additional requirements may be needed for individual situations, on a case-by-case basis. For instance, in places (e.g. KHZs) where roads are being reopened prior to harvest it may not be possible to avoid destroying individual emergent kauri without causing wider and greater damage to indigenous vegetation nearby. Using the kauri prioritisation process (for developing Earthworks Risk Management Plan) outlined will assist with determining a practical way forward.

4

Mitigations

Table 2 below contains various aspects of forestry operations and details mitigations options. Work with your regional council to develop site-specific plans.

Table 2: Example earthworks mitigations.

SOURCE: TIAKINA KAURI, EARTHWORKS RISK MANAGEMENT PLAN TEMPLATE.

Description	Mitigation(s) – following the Principles of Hygiene
Earthmoving machinery operating within KHZ	· Clean in yard or a depot prior to entering KHZ. Remove all soil and vegetative matter taking care to clean the undercarriage and crevices where soil may accumulate. High pressure clean, then disinfect. · Transport to site. · Machinery unloaded clean into KHZ. · Set up physical barrier on boundaries of KHZs. · Machinery remains in the zone for the duration. Avoid crossing boundaries. Separate machinery for separate zones. · After operation, remove loose soil, vegetative matter without water. · Load onto transporter. · Carry out appropriate hygiene at yard, depot or cleaning facility.
Transporters	· Transport vehicles to remain outside the KHZ unless they have arrived clean to site and remained on sealed surfaces (or compacted gravel). · Ensure access and turnaround doesn't impact KHZ.
Overburden, soil	· Material from a KHZ must be contained on site, bund if necessary. · Cover to prevent movement of soil via water. · Excess material can be left in situ depending on the volume and the operation. · Alternatively, potentially contaminated material will need to be transported off-site to a suitable location (e.g. as agreed with your regional council).
Water management	· Limit the risk of water potentially spreading PA into a KHZ or kauri forest or via connected watercourse. · Set up appropriate drainage and bunding on site to capture and hold run off or water flow. · Be prepared for the impact of rainfall events on site and the movement of runoff.
Footwear, tools, and equipment	· Arrive clean and leave clean. Remove all soil and disinfect. · On-site hygiene is easier to achieve and manage for tools, equipment and footwear. · Dedicated pieces of equipment or boots are recommended per KHZ.
Foot traffic off-track	· Set up on boundaries of KHZs. · Must contain minimum standard for temporary footwear and tools hygiene station. · A change in footwear is recommended to minimise hygiene requirements. · Scrub and disinfect on entry and exit.
Dry conditions	· Plan to carry out activity or operation near KHZ in the drier months of the year from late spring to early autumn, avoiding rainfall events.
Understanding of PA risk management	· Staff to be trained in kauri protection and all aspects of hygiene requirements. · Different levels of training may be required for managers compared to staff and on ground managing contractors. · All staff to read and understand Earthworks Risk Management Plans prior to commencement of earthworks operation. · A copy of relevant Earthworks Risk Management Plan is to be made available on site.

Useful links

Best practice guidelines of relevance for foresters when working in and around kauri (as of June 2024) have been developed prior and provide more details around actions contained in Tables 1 and 2. The guidelines are listed below and can also be found at: https://www.kauriprotection.co.nz/resources/best-practice-guides/

Earthworks Risk Management Plan – Mitigating the risk of PA spread through earthworks and 'How to Guide'	kauriprotection.co.nz/resources/best-practice-guides/earthworks-risk-management-plan/
Landfill disposal of contaminated material	kauriprotection.co.nz/resources/best-practice-guides/landfill-disposal-of-contaminated-material/
Quarry hygiene: aggregate handling, transportation and storage	kauriprotection.co.nz/resources/best-practice-guides/quarry-hygiene-aggregate-handling-transportation-and-storage/
Vehicle and heavy machinery hygiene	kauriprotection.co.nz/resources/best-practice-guides/vehicle-and-heavy-machinery-hygiene/
A rural landowner's guide	kauriprotection.co.nz/resources/best-practice-guides/protecting-kauri-a-rural-landowners-guide/
Kauri care guide	kauriprotection.co.nz/resources/best-practice-guides/kauri-care-guide/
Heat treatment protocol to kill PA in soil, plant material, and on inanimate objects	kauriprotection.co.nz/resources/best-practice-guides/heat-treatment-protocols-to-kill-phytophthora-agathidicida-pa-pathogen/
Kauri tree removal or pruning	kauriprotection.co.nz/resources/best-practice-guides/kauri-tree-removal-and-pruning/

Relevant procedures for forest visitors can be found at: https://www.kauriprotection.co.nz/resources/forest-visitor-guides/

Guide – walking, running or tramping	kauriprotection.co.nz/resources/forest-visitor-guides/walking-running-or-tramping/
Guide – mountain biking	kauriprotection.co.nz/resources/forest-visitor-guides/mountain-biking/
Guide – trapping	kauriprotection.co.nz/resources/forest-visitor-guides/trapping/
Guide – hunting	kauriprotection.co.nz/resources/forest-visitor-guides/hunting/
Guide – walking your dog	kauriprotection.co.nz/resources/forest-visitor-guides/walking-your-dog/
Guide – horse riding	kauriprotection.co.nz/resources/forest-visitor-guides/horseriding/

These guidelines will be reviewed, updated and added to by Tiakina Kauri, as applicable.

Please check regularly to ensure you are using the latest guidelines to remain up to date with best practice.

Additional information

5. Contact information

National agencies	
Tiakina Kauri	www.kauriprotection.co.nz/ kauriprotection@mpi.govt.nz
Department of Conservation	0800 362 468 www.doc.govt.nz/nature/pests-and-threats/diseases/kauri-disease

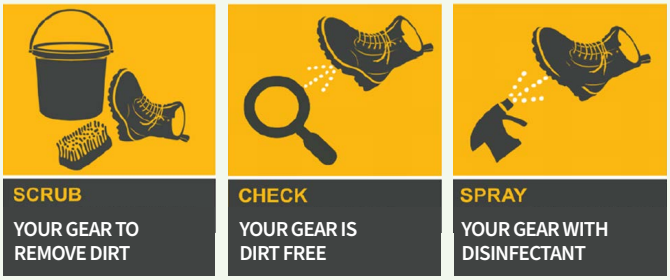
Regional Councils	
Northland Regional Council	0800 002 004 www.nrc.govt.nz/kauridieback kauridieback@nrc.govt.nz
Auckland Council	09 301 0101 www.aucklandcouncil.govt.nz/kauri kauri@aucklandcouncil.govt.nz
Waikato Regional Council	0800 800 401 www.waikatoregion.govt.nz/kauri https://bps.waikatoregion.govt.nz/online-services/new/ReportKauriHealthConcern/step/1
Bay of Plenty Regional Council	0800 884 880 www.boprc.govt.nz/environment/pests/pest-plants/shrubs-and-trees/kauri-dieback-disease https://www.boprc.govt.nz/your-council/contact-us

Forestry sector	
NZ Forest Owners Association	04 473 4769 https://www.nzfoa.org.nz/ Contact: https://www.nzfoa.org.nz/contact2

If you think you have kauri that look unhealthy in your forest or on the wider property you manage, please contact your regional council to report it.

6. Checklist of measures to protect kauri

Kauri forests	**Do you know where kauri are on your property?** Check with your regional council or DOC on their status. Map and prioritise them, survey for kauri dieback disease at least annually and keep records.	○
Overall responsibility	**Do you have someone who is responsible for operational matters and liaison with agencies over kauri protection?** This person needs to keep current on kauri issues, PA and be responsible for kauri management plans where required.	○
Assessing risks	**Do you understand the risks to each kauri area in your plantation forest from forestry activities?**[11] Priorities and risks may differ between forests. Protecting a kauri forest is more important than incidental kauri trees. Assess each risk on its merits, noting that mitigations will vary.	○
Forest access – contractor risk	**Have harvesting, silviculture and logging truck contractors been briefed on kauri management decisions affecting your forest?** This involves holding training sessions and checking in with them during H&S briefings.	○
Forest access – visitor risk	**Do you know who is entering your plantation forest (e.g. for recreation or predator trapping), why and when?** Permits for access fit within health and safety requirements. Ensure all visitors are well briefed. Keep good records and erect signage at relevant places.	○
Practical mitigations	**Do you know the spread risk mitigations required for each site to meet NPMP obligations?** There is a need to agree what must happen on site with relevant personnel present. An internal operational plan of requirements and details will assist.	○
Hygiene standards	**Do you know your hygiene requirements?** Provide hygiene kits for staff, contractors and visitors and require training on their use. Ensure hygiene measures are practised. https://www.kauriprotection.co.nz/resources/best-practice-guides/protecting-kauri-principles-of-hygiene/	○
Machinery and vehicles	**Do you understand the pathogen-spread risks posed by vehicles, equipment and machinery?** Ensure all equipment entering forests is soil free as far as possible, and upon leaving. There is a need to ensure equipment avoids kauri hygiene zones wherever practical.	○
Earthworks and roading management	**Earthworks within kauri hygiene zones (KHZs) require separate earthworks risk-management plans. What mitigations, if any, are required to reduce risks?** Regularly (e.g., quarterly) assess any construction for structural integrity, including drainage at kauri sites.	○
Sourcing materials	**Do you know where to obtain 'clean' roading materials (soil/substrate/aggregate)?** Choose your source carefully – check with your regional council prior to sourcing.	○
Report the unusual	**Help prevent the spread of pathogens, pests and diseases.** Be on the lookout for anything unusual. Catch it, snap it, report it. If in doubt call the Biosecurity NZ pest and disease hotline – 0800 80 99 66. Biosecurity is everyone's business.	○
Key question to ask yourself	**is there any current or new information on PA that changes how I need to operate?**	○



11. Road maintenance, harvesting, logging and other vehicles, planting and pruning, heavy machinery, kauri sampling and general monitoring, pest control, vegetation management, restoration planting, trampers and walkers, recreational hunters, horse riders, mountain bike riders, wild animals, wandering stock, illegal access.

7. Glossary

Drip line	means an approximate line on the ground directly below the outer most branches of the kauri canopy where rain falls from the foliage to the ground.
Earthworks	means a disturbance of soil and earth land surfaces (including by blading, boring, contouring, cutting, drilling, excavating, filling, moving, piling, placing, removing, replacing, ripping, thrusting, or trenching) using tools or machinery.
High-risk site	is a site that contains a confirmed positive tree or is near a positive tree, contains numerous vectors and/or introduction pathways.
Hygiene	means the practice of maintaining soil-free footwear, equipment, vehicles and machinery through cleanliness.
Hygiene management	is a list of recommendations made around the best practice for preventing the spread of soil, contaminated or otherwise.
Hygiene point	is the location on the edge of a forest or Kauri Hygiene Zone where hygiene practices are to be carried out. A hygiene point maybe where a station is established or where hygiene occurs with a personal kit.
Introduction pathway	is a place where a vector is/was most likely to have brought the pathogen to a new place, such as a track, trapline, track entrance, historic disturbance site.
Kauri	means any living kauri plant (*Agathis australis*) in place, or for planting or propagation, including containerised, field-grown, and tissue culture plants, and parts thereof, including seeds and germplasm.
Kauri dieback disease	means a disease having a high death rate in kauri as of a result of infection by a root rot pathogen , specifically *Phytophthora agathidicida*..
Kauri forest (in the context of plantation forestry)	a. means— i. a forest or bushland ecosystem that contains more than 1 kauri; or ii. land being regenerated with planting for the purpose of establishing, or revegetating, a kauri forest ecosystem; and b. includes any land within the kauri hygiene zone of any kauri tree on the edge of the forest or bushland ecosystem, *and* includes kauri within indigenous forest enclaves, bushland ecosystems and revegetation projects, but does not include incidental kauri that can occur in a commercial forest of a different intended species.
Kauri Hygiene Zone	(KHZ) is the root zone area of a kauri that requires protection and hygiene measures. This area encompasses 3 times the drip line of the tree.
Kauri lands	means land within the natural extent of kauri distribution being the district or region of Northland Regional Council, Auckland Council, Waikato Regional Council, or Bay of Plenty Regional Council.
Low-risk site	is a site where there are no signs of diseased kauri, does not contain detected PA sample results and wit low number of vectors and is not adjacent to a PA positive result.
Management agency	means the Ministry for Primary Industries.
Mitigation	is the act of reducing the impacts of Kauri dieback disease through the implementation of appropriate hygiene management techniques.
National Environmental Standards for Commercial Forestry (NES-CF)	refers to nationally consistent regulations to manage the environmental effects of forestry (in effect from 3 November 2023).
Phytophthora agathidicida (PA)	means the primary causal agent of kauri disease.
PA Management	is the prevention of the movement of soil and pathogen using the risk-based approach and mitigations.
Pathogen	means a bacterium, virus, oomycete or other microorganism that can cause disease.
Plan	means the National PA Pest Management Plan made under clause 4 of the Order in Council.
Positive	means a test result that confirms the presence of *P. agathidicida* in a soil or root sample.
Vector	means a method of transferring contaminated soil from one area to another. Vehicles, footwear and non-gravelled roads are examples of vectors.

8. References

Beachman, J. 2017. The Introduction and Spread of Kauri Dieback Disease in New Zealand. Did Historic Forestry Operations Play a Role? A Historical Pathways Project: Forestry. MPI Technical Paper No: 2017/52. Pp 290.

Beever, R. E., Waipara, N. W., Ramsfield, T. D., Dick, M. A., & Horner, I. J. 2009. Kauri (Agathis australis) under threat from Phytophthora. Phytophthoras in Forests and Natural Ecosystems, 74, 74–85.

Bellgard, S. E., Weir, B. S., Pennycook, S. R., Paderes, E. P., Winks, C., Beever, R. E., & Williams, S. 2013. Specialist phytophthora research: Biology. Pathology Ecology and Detection of PTA.

Burns, B., Prime, K., Bellgard, S. and Mejdr, T. 2020. Independent Panel Review of Track Materials Used for Track Stability and Root Protection in Kauri Forests. Biosecurity New Zealand Technical Paper No. 2020/08, prepared for the Kauri Dieback Programme. Pp 30.

Froud, K.J. 2018. Forest Biosecurity Committee Review 2018 Operational Biosecurity: Review of the biosecurity preparedness of the forestry industry to identify opportunities to improve biosecurity outcomes for forestry. A report prepared for the NZ Forest Owners Association by Biosecurity Research Limited. Pp. 45.

Northland Regional Council. 2019. Whanui Kauri Dieback Management Plan. Pp 9.

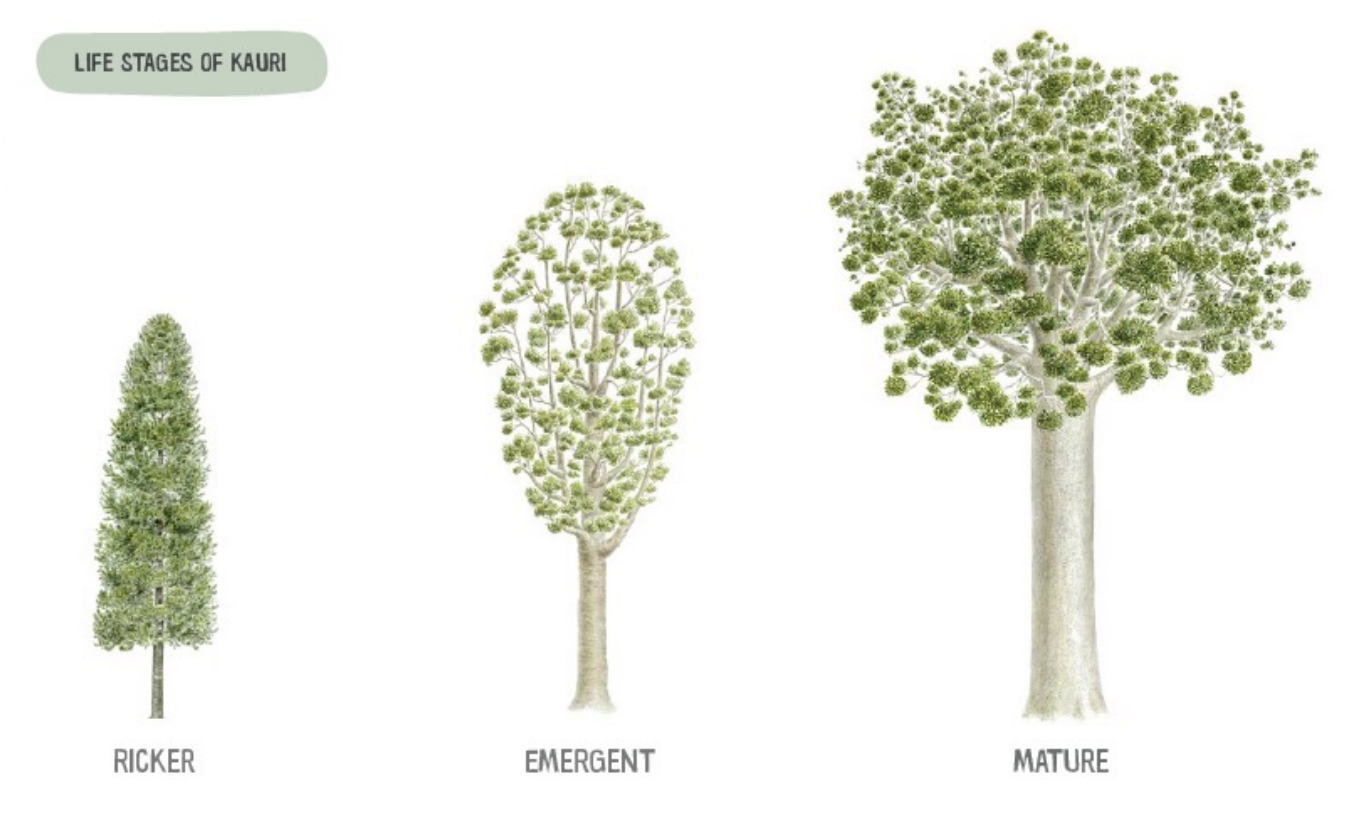
NZ Forest Owners Association 2020. New Zealand Forest Road Engineering Manual. Pp 212.

NZ Forest Owners Association 2020. Forest Practice Guides. Developed in association with the Forest Industry Contractors Assoc (FICA) and New Zealand Farm Forestry Assoc. (NZFFA). Pp 155.

Parker, K and Chew, Y.C. Protecting kauri: Principles of Hygiene. Preventing the spread of K dieback disease with best practice hygiene guidelines. Prepared for the Kauri Dieback National Programme. Pp. 9.

Appendices

Appendix 1: Kauri life stages and identification images



Bark of a kauri

Female seed cone/green foliage

Male seed pod

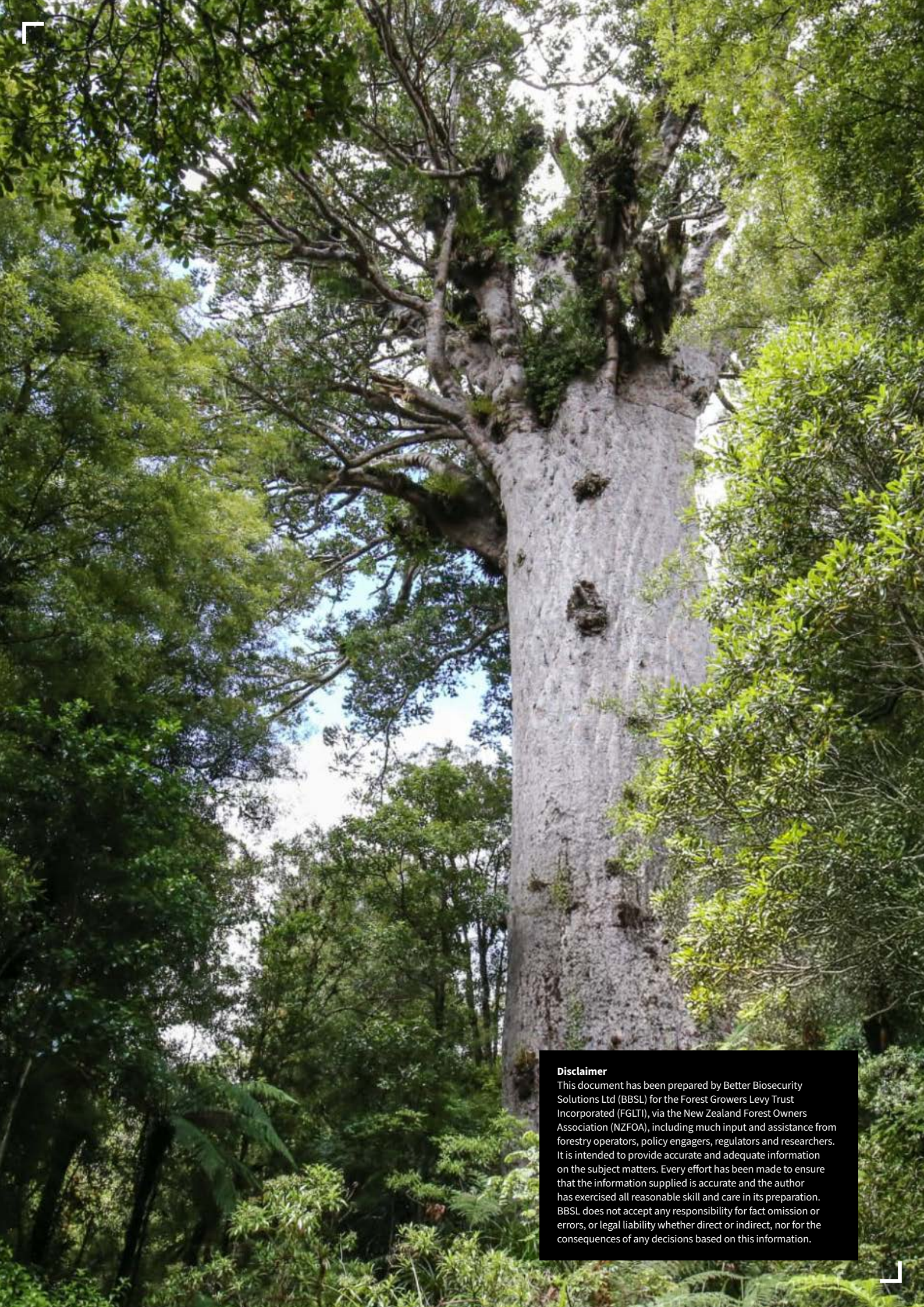
Varying colours of foliage in saplings

Appendix 2: Summary of NPMP rules and implications for plantation forestry

Rule	Intention of the rule	Effects / implications
1. Duty to report any 'sick' kauri	If you notice that a kauri seedling or tree on land you own or lease looks unhealthy you need to advise the Kauri Protection Agency Tiakina Kauri as soon as practicable. https://www.kauriprotection.co.nz/about-kauri/identify-the-disease/	This is a mandatory obligation for all owners and occupiers of forests containing kauri. A likely requirement and likely to become more common over time.
2. Provide information when asked	Tiakina Kauri, or their agents, may ask you for information about kauri on your land, but only where it aids in the management of kauri disease caused by PA. Likely questions will be on the movement of spread risk items (e.g. machinery). You need to provide this information, if asked, or explain why you cannot.	A duty of all owners of forests containing kauri stands regarding the provision of information that is relevant for the management of kauri disease caused by PA (i.e., movement risk from machinery, equipment and people that may have come in contact with PA.).
3. Restriction on the movement of kauri	For growers of kauri plants/trees there are set hygiene practices (e.g. a Production Plan) to follow to ensure that the disease isn't inadvertently spread through propagation activities.	While not applicable for exotic plantation forestry, if growing kauri it is. Producers and propagators of kauri cannot move these unless they operate in accordance with a production plan that mitigates the risk of PA spread. If sourcing kauri seedlings, you must use a PlantPass provider with the Kauri Schedule completed (https://www.plantpass.org.nz/biosecurity/participatingproducers)
4. PA risk management plan requirement	Areas that are particularly at risk of becoming contaminated or creating a risk of spread to other properties may need to develop a Kauri Risk Management Plan (KRMP). If so, Tiakina Kauri will advise landowners by written notice.	Applicable for any forests with kauri. A KRMP, addressing set requirements, needs to be submitted within 90 days of notice. Agencies will work with landowners to develop Plans.
5. Obligation to have an earthworks PA management plan	If undertaking earthworks in a 'kauri hygiene zone' you must have an approved Earthworks PA Risk Management Plan (ERMP) from Tiakina Kauri or approved agency. An additional plan isn't needed if local councils already have rules in place to manage the risks of PA spread during earthworks.	Applicable for any forests with kauri. ERMP, addressing set requirements which are more detailed than for a KRMP. Refer to *Earthworks Risk Management Plan template* and accompanying '*How to Guide*'. This requirement may be incorporated into any other council permissions required for earthworks (i.e. resource consent).
6. Farm stock exclusions	This rule requires stock to be excluded from a kauri forest, where the access point is within 500m of a positive PA site (within that forest).	Not generally applicable for corporate forestry companies (unless a farming neighbour has been issued a notice). May be valid for some farm forestry situations where farms may adjoin or contain forests with kauri.
7. Prohibition on release of animals	This rule prohibits the release of animals into kauri forest areas or an area from which the animal could reasonably enter a kauri forest (e.g. a neighbouring property). This rule builds on the existing prohibition on the release of animals into public forests but does not restrict bringing dogs or companion animals into kauri forest areas (although they need to be in close contact with a person), as well as being free of visible soil and organic matter before and after being in the forest.	Not generally applicable for the corporate forestry sector but an issue that managers need to be aware of (e.g. illegal releases of deer and pigs into kauri forests). Is more relevant for farm forest situations and owners need to be aware. Rule 2 is relevant here but foresters in general should be proactive and report any issues as they arise. Possible but generally unlikely unless perpetrators are 'caught in the act'. Report the suspected release of animals to the management agency or regional council.

Rule	Intention of the rule	Effects / implications
8. Obligation to clean items	Means that when you are entering a kauri forest anything that comes into contact with the ground (eg. shoes, walking sticks, dogs paws, tyres) must be clean before you enter and be clean when you exit the area. ***Risk item*** *means an item that may, when in a kauri forest, come into contact with—* *(a) soil, other than gravel; or* *(b) plant matter, other than track surfacing* ***Track surfacing*** *means a substance or structure that prevents direct contact of risk items with soil or kauri fibrous roots, and includes boardwalks, gravel, and asphalt.*	Rule applies to anyone entering a kauri forest to undertake work. It is important to note definitions of 'risk item' and 'track surfacing'. Where vehicles are travelling through areas of kauri forest, and not coming in contact with soil / the forest floor (i.e. are on gravel or asphalt surfaces), there is no requirement to clean the vehicles.[12] Where equipment, shoes or vehicles are coming into contact with the kauri forest floor, they require cleaning. Controlling access doesn't alter this requirement. Activities within specific kauri forest zones within a kauri forest will require general PA hygiene requirements to be adhered with.
9. Obligation to use hygiene stations	A person who uses a track or road in a kauri forest must clean applicable items at each cleaning station they pass. Most commonly, the hygiene station will require you to clean your footwear using items (such as brushes or sprays) that have been provided.	Generally, would occur on a forest by forest basis, depending on the nature of visitor usage and access. Some forests are more remote and privately owned, with no or limited public access. They are unlikely to have hygiene stations located in them. Possible in some farm forest situations on a case-by-case basis. However, where there is public access the forest company should work with regulators to ensure that the risks can be managed (i.e. hygiene stations installed).
10. Open tracks and roads to meet standards (refer definition below)	Roads in kauri forests (regardless of whether they are public or private) need to meet certain standards (e.g. have hygiene stations or track surfacing and ensure water drains away). Tracks that are not open to the public are not affected by this rule.	Forestry roads in kauri stands need to abide by rule 2(c) if (a) and (b) are not practical and ensure all water drains away from kauri. Other measures may consider, for example, re-cambering of the road alignment to alter water drainage and introducing speed limits.
	Rule 10 (1) applies to an owner of land in a kauri forest if **a track or road passes through that land;** but does not apply in respect of a track (i.e a walking track) of which the owner is unaware or that is not intended for public use. 10 (2) Regarding roads, the owner must comply with one or more of the following: (a) ensure all tracks and roads avoid the kauri hygiene zone. (b) install 1 or more cleaning stations to remove visible soil and organic matter from risk items. (c) install track surfacing to minimise the risk of: (i) the spread of soil or organic matter into, within, or from a kauri hygiene zone; and (ii) contact with kauri fibrous roots by risk items. 10 (3) If the owner complies with subclause (b) or (c) the owner must ensure that groundwater and surface water drain away from kauri trees.	

12. NZFOA notes the operational constraints and costs around cleaning of logging trucks and that any decisions to do so would need to be based on risk assessments being carried out (e.g. situations with prior risk exposures to PA would require mitigations to be identified in risk management plans, such as thorough cleaning before entering any KHZ). This approach is advocated to avoid the expectation that all logging trucks are a risk because they are 'dirty', despite the majority never having any exposure to PA situations. If trucks remain on metaled roads in KHZ's the risk of spreading PA is considered low.



Disclaimer

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