TIAKINA KAURI
KAURI PROTECTION

Kauri Ora: Off-Track in Kauri forests

Guidance for off-track activities to prevent the spread of the PA pathogen, which causes kauri dieback disease

BEST PRACTICE GUIDE

KA RAUHĪ TE TUPU O TE KAURI

—

GIVE KAURI SPACE TO GROW

TIAKINA KAURI
KAURI PROTECTION

Tiakina Kauri is an agency based within Biosecurity New Zealand that provides national direction for the achievement of the objectives of the National Plan for Kauri, through active partnership with mana whenua and collaboration with regional councils and the Department of Conservation.

For more information about protecting Kauri, visit **www.kauriprotection.co.nz**

About this guide

This document is a best-practice guideline for people undertaking work off-track in Kauri forests, to mitigate the introduction and spread of *Phytophthora agathidicida* (PA). The key audiences for this guideline include, but are not limited to, monitoring and surveillance and pest control teams, hunters or contractors working for any organisation.

The objectives for this guideline are as follows:

- Hygiene and avoidance practices are maximised when working in Kauri forests, so PA is not spread as a result of off-track work.
- Pre-planning and risk assessment which are essential to protect Kauri is carried out as a fundamental part of the work.
- Standard operating procedures related to off-track work are clear and can be effectively implemented.

The National Pest Management Plan for Kauri

In August 2022, a National Plan was launched to help protect Kauri from the *Phytophthora agathidicida* (PA) pathogen. The National Plan includes 10 rules that apply to anyone who grows Kauri, goes into Kauri forests, or lives or works around Kauri.

By following this guide and the rules of the National Plan, we can all help protect Kauri for generations to come.

For more information about the National Plan, visit **www.kauriprotection.co.nz/national-plan**

Key rules for off-track use

Obligation to clean items

If you are going off track or onto a track where you will touch the forest floor, you must clean all visible soil and organic matter off items that may touch the ground, both before you enter and when you leave the forest. Items considered a risk include tools, cars, bikes, sticks, shoes, gloves etc. **(Rule 8)**.

Obligation to use hygiene stations

You must clean items that come in contact with the ground at each cleaning station you pass.
The hygiene station will require you to clean using items provided, such as brushes and disinfectants. **(Rule 9)**.

About the PA pathogen

Kauri are threatened by a soil-borne pathogen called *Phytophthora agathidicida* (PA). PA infects Kauri through their roots and restricts the trees' ability to transport water and nutrients between the roots and the leaves. This causes the condition known as kauri dieback disease, which eventually starves the Kauri.

There is no proven way to cure an infected Kauri, and there are limited treatment options.

To stop PA from spreading, we must follow correct hygiene protocols when moving and working around Kauri.

The PA pathogen can be spread by:

- vehicles and machinery
- footwear, clothing or equipment that touches the soil
- animals, including wild pigs and stock, that have walked through infected areas.

PA pathogen infection can cause bleeding gum

View of Kauri canopy with dead branches

Recognising Kauri

The below image illustrates the different life stages of Kauri.

Ricker
(<30 years)

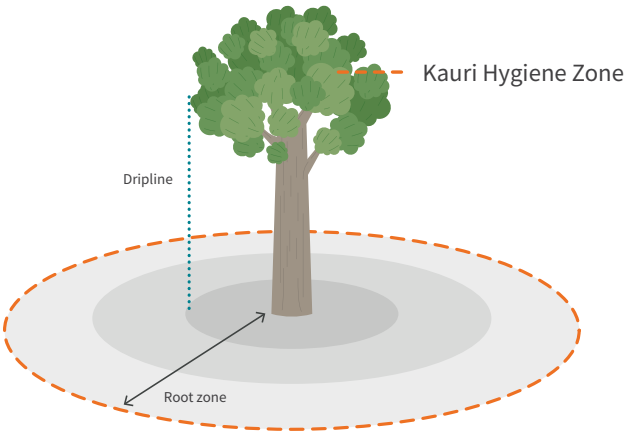
Emergent
(30-80+ years)

Mature
(80-100+ years)

Kauri Hygiene Zone

If you're in a Kauri forest and are moving or working around Kauri, it is important not to damage or disturb their roots. Kauri roots are shallow and fragile and extend outwards about 3x the radius of the canopy of the tree; this area is called the Kauri Hygiene Zone (see figure 1).

Figure 1: The illustration shows the Kauri Hygiene Zone for a single Kauri.



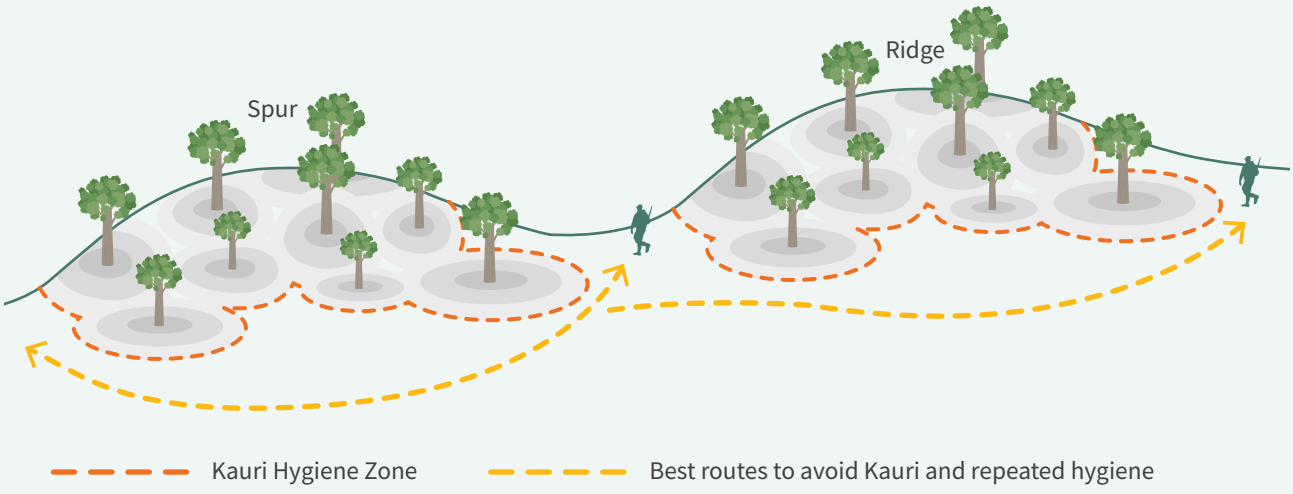
Background

The definition of a track is one that is open and publicly accessible to pedestrians, mountain bikes or horses. Unofficial tracks created in Kauri forests which are accessed by the minority for certain activities are not considered tracks because they don't meet this definition. Therefore, they are considered as being off-track. Activities carried out off-track put Kauri at risk of infection from PA. If left unmitigated, off-track activities can introduce and spread PA across the Kauri forest landscape which puts Kauri in multiple locations at risk.

The off-track activities covered in this guide are those which pose a high risk to Kauri. Activities that occur in a Kauri forest with access through or within Kauri Hygiene Zones require planning, hygiene and mitigations to reduce the risk of spreading PA. Activities covered in this guide include soil and root sampling for PA, on ground pest control and hunting. However, the guide is applicable to any off-track activity even those that occur infrequently in a Kauri forest.

To stop the PA pathogen from spreading, follow the Kauri Ora Hygiene Principles described in this guide when moving and working in a Kauri Forest. It is best practice to evaluate ahead of time whether the risk of introducing PA is outweighed by the potential benefits of your work.

Figure 2: The Hygiene Zone of interconnected Kauri and the best way to avoid them in the forest.



Understanding the risks

Activities such as pest control and PA surveillance, which require human movement off-track within Kauri forests, are high risk for Kauri. The guidelines below will help reduce the risk of spreading PA while carrying out these activities. These hygiene practices should be followed closely and given similar importance as site health and safety:

- Consider developing a risk management plan, standard operating procedure or similar document to detail how you will manage PA during your activity.
- Consider the type of forest you are working in, the density of Kauri, and if the forest has confirmed PA pathogen detection.
- Treat all Kauri forests as if they are contaminated with PA due to the long lag time between infection and when signs and symptoms of the fatal disease it causes can be identified.
- Avoid working within a Kauri Hygiene Zone as this is the best way to protect for Kauri. (See Figure 1 on page 5)
- Avoid working in wet and muddy conditions, regardless of the time of year. PA produces spores when wet, soil is spread more easily, and gear is harder to clean.
- Be aware of rainfall events all year around but particularly through the drier months of the year. Depending on rain volume, surveillance may need to be postponed until dry conditions return. Dry soil conditions reduce the risk of spreading PA.
- Any materials taken into a Kauri forest that might touch the forest floor are assumed to be potentially contaminated with the PA pathogen and must be treated as such (clean and disinfect).
- Be familiar with the symptoms of a PA infection – see **www.kauriprotection.co.nz/about-kauri**
- If you can't avoid areas of Kauri, plan activities so you move from assumed uninfected or low-risk areas to infected or high-risk areas, rather than vice versa.
- For Kauri ground surveillance work specifically, consider how important is it to confirm if a tree is infected with PA:
  - Is it worth the risk to the tree or forest to undertake soil sampling for confirmation?
  - What is the purpose of the surveillance?
- For predator control work specifically:
  - Are there are other alternatives to manage predator numbers that would avoid ground control and soil disturbance?
  - Talk to a predator control expert to consider how these guidelines may affect your predator control objectives.
  - If groundwork is the best option, you must follow the hygiene procedures below to protect the health of Kauri.

If the risks to Kauri are too great, or hygiene measures are not possible, avoiding the area entirely is the best option to protect Kauri.

PA Management

Hygiene principles and key messages

There are six basic principles for protecting Kauri from the PA pathogen, which causes disease. These must be understood prior to any off-track activity in a Kauri forest.

Key message	Hygiene principle	Description
Work off-track only when absolutely necessary	**Stay out of Kauri forests**	Before undertaking any activity in a Kauri forest, consider if ground-based methods are the best option, and whether the risk of introducing or spreading PA is outweighed by the potential benefits of your work.
Avoid winter and wet-ground activities	**Stay away from Kauri forests when the ground is wet**	Dry-soil access activities are always recommended. Plan activities in Kauri forests in the relatively dry period between November and May, particularly summer when its most dry, to best protect Kauri.
Avoid sick-looking Kauri and known PA-positive sites	**Stay away from infected sites**	Staying away from infected Kauri reduces the risk of spreading PA in the forest. All activities, with the exception of PA soil sampling, must avoid known infected sites.
Avoid Kauri, including en route	**Avoid Kauri Hygiene Zones (KHZ)**	Avoid entering Kauri Hygiene Zones. This will also reduce the number of times you need to carry out hygiene requirements. Limit the number of people entering the KHZ to no more than two, where possible. This is particularly relevant to surveillance work - extra people should remain outside of the KHZ.
Stay on track	**Follow National Plan rules**	Stay on tracks wherever possible, especially those that have been upgraded to protect Kauri.
Arrive clean, leave clean	**Follow hygiene protocols**	This refers to arriving with clean footwear, tools and equipment to a forest and or site, and cleaning before you leave a forest and or site. If you can't clean before leaving site, contain dirty items and clean at home or work.
KHZ – clean before entering and exiting		Cleaning (or using overshoe booties for footwear) before entering a KHZ will reduce the chances of PA introduction to a healthy tree. Cleaning after leaving this zone will reduce the chance of spreading PA if you have come in contact with a tree that is infected.
Scrub Check Spray		Scrub to remove all the dirt with a stiff-bristle brush and pick. This is the most important cleaning step. Then check to make sure all dirt is removed. If not, try again. Spray with disinfectant once the physical removal of dirt has been completed. Disinfectant **DOES NOT** work on clumps of dirt.

Hygiene practices apply to all footwear, tools and gear that come in contact with the ground.

Scrub

Remove all dirt from any items that will touch the ground, including footwear, tools and equipment, vehicles, machinery etc. Physically removing dirt is vital.

Check

Check to make sure all items are dirt-free. If they are still dirty, keep cleaning.

Spray

Once all your items are dirt-free, spray them with disinfectant. Note: do not spray disinfectant on animals.

Spray your footwear with disinfectant once it is dirt-free

Disinfectants

The application of disinfectant is an important part of the hygiene process. However, the effectiveness of a disinfectant relies on the removal of dirt in the first instance. Disinfectants do not penetrate large clumps of dirt. They are most effective when sprayed on small particles which cannot be removed by a scrubbing brush or other tools. It is important that all the dirt is removed from footwear, clothing, gear and equipment before disinfecting.

Types and methods of disinfection

Methylated spirits or ethanol:

- Ethanol or methylated spirits at 70% concentration, with 30% water, are effective, but have toxicity issues and are flammable. Methylated spirits also dry quicker and are easily accessible.
- Rates above 80% ethanol are ineffective because the solution evaporates too quickly to be absorbed by spores.
- It is important to check the denatured alcohol content from the manufacturer and that the bottle is well sealed. Some meths is diluted during manufacture and may not need further dilution as a disinfectant.

Bleach at 5% solution with water:

- Fully submerge items for five minutes in bleach solution, rinse in clean water and allow to drip dry if possible.
- Bleach (sodium hypochlorite and hypochlorite) is a good sterilant but breaks down quickly in a container so the concentration may be unknown.
- Bleach is also hazardous, so is not recommended for use in personal cleaning kits.

Sterigene at 2% solution with water

- Sterigene is recommended for use in cleaning stations and hygiene kits because it is stable and non-toxic, but it does not destroy all life stages of the pathogen. Allow to dry particularly if you have used a solution wash.

Heat treatment

- Autoclave or heat at temperatures at or above 55^{0}C continuously for 12 hours, noting that higher moisture levels (such as when using steam heat) will increase the success of killing oospores.
- Submerge in continuously boiling water for at least three minutes and allow to air dry.

DenaX or similar solution

- DenaX is not a disinfectant but must be used in addition to any of the disinfectants listed above to denature DNA, to reduce cross-contamination of tools while undertaking soil sampling if performing molecular tests on soil samples (e.g. LAMP, PCR).
- It is important to remove all DenaX from the tools to avoid degrading the subsequent sample.

Material Safety Data Sheets

- Methylated spirits MSDS DOC-6260653, or download from centralwholesale.co.nz/wp-content/uploads/safety-data-sheets/Methylated-Spirits-SDS.pdf
- Sterigene New Zealand www.bionet.nz/assets/Uploads/sterigene-msds-ea.pdf
- Janola brand household bleach (NaOCl – 43.3% sodium hypochlorite) DOC-6184303, or download from pental.com.au/wp-content/uploads/2020/10/Janola-Premium-Bleach-2.pdf

Hygiene kit for off-track work

Items for a hygiene kit are as follows:

- One or two stiff-bristle brushes
- Other tools to get dirt out of shoe tread
- 500 ml spray bottle with disinfectant
- 1L pump sprayer with water only (optional, but recommended)
- Boot bag
- Overshoe booties
- Storage bag or container for gear that can't be cleaned in the field.

A personal hygiene kit must be carried for use when undertaking activities off-track in a Kauri forest.

Overshoe booties are recommended but may not always be suitable due to health and safety issues when working on uneven terrain. Use one pair of booties per Kauri Hygiene Zone. Appropriately store in a plastic bag and place in your backpack. When you are back at base or home, either dispose of them or sterilise them with a heat treatment before re-use. Do not substitute booties for the act of practising hygiene, removing dirt and disinfecting.

A high level of hygiene is required. The shoes on the right are how clean shoes should look.

Hygiene for soil and root sampling

This protocol is for sampling as part of general surveillance to determine PA presence. The method may change in cases of research and/or validation, or extreme environmental conditions (e.g. a drought year or extended wet/flood period).

Soil sampling – step by step	
Prepare and clean before you go	Clean footwear and tools/sampling equipment using the hygiene protocols described above in section 2.4. before entering a Kauri forest and throughout the sampling day. Ensure you have plenty of disinfectant for multiple cleanings. Ensure your digging tools are easy to clean (e.g. fully stainless-steel trowels). Remove all visible dirt/soil. Disinfectant should be used only on dirt-free surfaces. Prepare your sample bag for sampling, including filling out labels and/or tags before you go out. When labelling, use capital letters, strike through zeroes and sevens, and underline 9s and 6s. Avoid using ethanol near sharpies as the writing will invariably smudge.
Plan your route and avoid Kauri Hygiene Zones (KHZ)	Avoid wet or extremely dry conditions. Wet conditions increase the risk of spreading PA. The test sensitivity is reduced when conditions are too dry and so you are less likely to detect PA if it is there. Route planning is key – err on the side of caution. Avoid Kauri where possible and do not walk through KHZs along the way. Work and walk downslope of Kauri where PA has not been detected, and upslope of Kauri where PA has been detected. Avoid river crossings where possible.
Arrive clean, leave clean	Clean footwear again or put on overshoe booties before entering the KHZ (note that KHZs should be avoided when travelling as much as possible). When sampling, limit the number of people and movement in the KHZ, and have no more than two people in the drip line. Hang backpacks and other equipment off the ground and away from surrounding trees/branches. Anything that contacts the forest floor must be cleaned.
Prepare for sampling	Roll the top of the bag down on itself to reduce spillage and cross contamination. This makes it easier to close again once the sample is taken. Check to ensure your sample tool(s) are clean (i.e. free of all dirt and disinfected). Put on gloves or clean hands thoroughly. Identify your eight sample points. Identify four cardinal points within one metre of the tree, and four further samples guided by qualitative descriptions of where PA is most likely to be. If there are no obvious or likely locations, use cardinal points at the canopy dripline.

Soil sampling – step by step	
Take a soil sample	Squat or crouch to prevent your pants or body from getting dirty and requiring cleaning. Knees and equipment should not touch the ground. Start sampling. Push aside the leaf layer on top, taking the sample from the soil surface to a depth of 10 to 15 cm. Target fine feeder root material, especially nodules and necrotic roots. Do not collect any irrelevant material such as leaf litter, stones or twigs/sticks, but do your best to include root material in the sample. Use your sampling tool to scoop soil and cut root material into your sample bag. Fill the bag to 2/3 filled with loosely packed soil and fine roots. If you have too much material by the last sample point, thoroughly mix up the bag, remove some material and leave it where you originally collected it. Once you have completed your eight sample points, squeeze the air out of the bag, seal properly and double bag. Fill in the residual hole dug with the surrounding leaf litter. If required, take photos of what the root system looks like, and take a photo of the bag and label.
Clean up, pack up and leave the forest	Immediately clean your sample tool(s). Use a clean cloth or paper towel to remove soil and then use 70% ethanol to clean the dirt-free surface. Allow to air dry before re-using. If you are using LAMP to test your soil, apply DenaX or other DNA-denaturing agent after cleaning with ethanol. Allow to evaporate and then wipe dry with a clean paper towel to ensure removal of any excess ethanol and DenaX. Place the soil sample in your backpack. Keep all gear associated with sampling, and the samples themselves, separate from all other field equipment, clothing and materials. Clean footwear or remove overshoe booties before exiting the KHZ. If continuing on to take another sample in the same stand, keep overshoe booties on and carry out hygiene protocols on exiting the stand. Remove your booties and gloves and put all waste into a plastic bag to be disposed of later.

Hygiene for pest control

Before undertaking any pest control activity in a Kauri forest, consider if ground-based methods are the best option and whether the risk of introducing or spreading the PA pathogen is outweighed by the potential benefits of your work. Off-track work such as pest control is deemed high risk for Kauri, so hygiene requirements are to be treated with similar importance as site health and safety. Talk to a pest control expert to consider how these guidelines may affect your pest control objectives.

Key actions for pest control in Kauri forests	
Map the site	Map the site so you know where Kauri are in relation to the pest control area. Install predator control lines to avoid KHZs and minimise stream crossings. If possible, re-route existing pest control lines to avoid KHZs, on a case-by-case basis. Identify on the map where cleaning stations will be located – e.g. when leaving formed tracks, before and after river crossings, and between catchments.
Identify confirmed PA locations	Identity any PA-positive trees or stands in the area and work upslope of any infected trees where possible.
Plan your trip	Plan your sites so you move from assumed PA-uninfected/unknown sites to known infected sites (low-risk to high-risk sites), so you reduce the probability of transferring or introducing PA to new sites. Consider the following tips. • Reduce the frequency of trap and station trapping in winter if you can't avoid completely. • Sequence your trap lines and direction through the forest to avoid Kauri.
Trap, bait station or tracking tunnel placement	Place all new traps, bait stations and tracking tunnels outside of a KHZ. Never attach a trap or bait station to a Kauri tree.
Avoid wet and muddy areas	Only undertake trapping and baiting, and the maintenance of lines, during dry conditions. Always avoid wet and muddy areas or going into Kauri areas soon after heavy rain. Minimise stream crossings.
Carrion disposal	Dispose of dead animals (carrion) outside of KHZs or outside the trapping area to avoid attracting scavenging animals.

Key actions for pest control in Kauri forests	
Arrive clean, leave clean	Ensure that all items have been cleaned of dirt and disinfected before leaving the site and visiting a new site, before and after a stream crossing, and when leaving and re-entering an established track. Keep all equipment off the ground where possible – consider using carabiners or ropes to keep items off the ground.
Kauri Hygiene Zone (KHZ)	If you enter a KHZ, or an identified cluster of Kauri that form a large KHZ, clean overshoe booties should be used while in the hygiene zone and removed and bagged after exiting the hygiene zone. Overshoe booties cannot be reused for other hygiene zones unless they have been cleaned and sterilised.

Relocating trap boxes, bait stations and tracking tunnels

- If you have boxes within a KHZ or near Kauri that are showing disease symptoms, leave the box at that site and remove the trap. Label the box as contaminated and indicate that it cannot be moved to a new location.
- Clean the trap and reposition it in a new box outside the KHZ.
- If you have established lines where plastic bait stations are connected to Kauri trunks, assess the trunk for lesions. If there are any lesions, leave the station in place and stop using it.
- If there are no lesions, carefully remove the station and leave the nail attached to the tree. Use your personal hygiene kit to clean the station at the site and reposition the station outside of the KHZ.
- If you have established tracking tunnels within a KHZ, use your personal hygiene kit to clean the tunnel at the site and reposition the tunnel outside of the KHZ.

Removing waste from trap lines

Waste that needs to be removed from a forest, and that cannot be cleaned to be soil-free, must be doubled bagged or wrapped for transport and disposed in an approved landfill.

www.kauriprotection.co.nz/resources/best-practice-guides

Setting up access to sites with confirmed PA-positive trees

Activities should be avoided in areas where the PA pathogen has been detected. If activities are required within a contaminated area, check with the landowner or manager if there is a PA Risk Management Plan in place for the area **(Rule 4)**. If there is a plan, it must be followed to reduce the spread and effects of PA.

Hygiene for hunters

Before undertaking any hunting activity in a Kauri forest, consider the location and whether the risk of introducing or spreading the PA pathogen is outweighed by the potential benefits of your work or sport. Off-track movement is deemed high risk for Kauri, so planning and hygiene requirements are to be treated with similar importance as site health and safety. Talk to your local Department of Conservation (DOC) office or regional council to consider how these guidelines may affect your hunting practices.

Key actions for hunting in Kauri forests	
Arrive clean, leave clean	Ensure that all items have been cleaned of dirt and disinfected before leaving the site and visiting a new site, before and after a stream crossing, and when leaving and re-entering an established track. Keep all equipment off the ground where possible – consider using carabiners or ropes to keep items off the ground.
Map the site	Map the site so you know where Kauri are in relation to the hunting area. Plan to avoid Kauri as much as possible. For recreational hunting, choose other areas or forest without Kauri to hunt. Where possible, avoid crossing catchments.
Avoiding the forest	Avoiding entering Kauri forests is key to protecting Kauri. Wild animal and pest control involving hunting on the periphery of Kauri forests is recommended and should form part of any wild animal control operation. Aerial hunting is also recommended where feasible.
Plan your trip	Plan your routes to avoid Kauri as much as possible. Desktop planning is essential for contracted hunters. Avoid Kauri not identified from maps but encountered in the forest. Ensure you carry and use a hygiene kit. Apply for a permit. DOC lands require hunters to have permits.
Identify confirmed PA locations	Avoid forests at all times where there is known PA and trees are visibly sick. Plan your trip so you move from low risk to high-risk sites. This way you will reduce the probability of transferring or introducing PA to new areas.
Avoid wet and muddy areas	Hunting is best carried out under dry soil conditions as the PA pathogen spreads more easily in wet conditions. Avoid wet and muddy areas where possible or going into Kauri areas soon after heavy rain and minimise stream crossings.
Carrying out animals	Dead animals should be dirt free as much as possible before being carried out. Use the hygiene kit carried on person. If not carrying animals out, dispose of them away from KHZs.
Use of dogs	Gently remove dirt from dog paws with soap and water and a soft cloth. Use properly trained dogs in a controlled manner where possible.

Rule 7 of the National Plan prohibits the release of animals, including pigs, into Kauri forests. Failure to comply may result in prosecution.

Closed area notices or rāhui

Track closures, closed area notices (CANs) or rāhui are in place for a reason. Often this is because of the heightened risk of PA due to new PA positive sites being discovered. Please respect track closures, CANs and rāhui at all times.

Closed track sign

Glossary

Kauri dieback disease	Disease causing death in Kauri as a result of the root-rot pathogen, *Phytophthora agathidicida* (PA).
Pathogen	A bacterium, virus or other microorganism that can cause disease.
Phytophthora agathidicida (PA)	The microscopic, soil borne pathogen which specifically causes disease in NZ Kauri.
Soil borne	Plant diseases caused by pathogens that infect hosts by way of the soil (as opposed to air).
Positive detection	A soil and root tissue sample that has returned a positive result for the presence of *Phytophthora agathidicida* (PA).
Undetected	A soil and root tissue sample where the result reflects that the pathogen was not found in the soil at that location, at that point in time. It may not be a true reflection of the pathogen or disease status of the surrounding environment.
High-risk site	A site that contains a positive PA test result or is near a site that has returned a positive result, which contains numerous vectors or one or more symptomatic trees that were not sampled.
Low-risk site	Contains undetected sample results with a low number of vectors and is not adjacent to a positive result.
Mitigation	The action of reducing the impacts of a PA infection through the implementation of appropriate hygiene management techniques.
Hygiene management	Recommendations made around the best practice for preventing the spread of soil, infected or otherwise.
Dirt-free	Being 'clean' has a slightly different meaning to different people. An item must be 'soil or dirt-free' as the best method of preventing the spread of the PA pathogen.
PA management	Prevention of the movement of dirt and the pathogen using a risk-based approach and mitigations.
Hygiene	Practice of preventing the transfer of microscopic pathogens by maintaining dirt-free footwear, equipment, vehicles and machinery, and animals through means of dirt removal followed up by spraying with a suitable disinfectant.
Hygiene point	The location on the edge of a forest or Kauri Hygiene Zone (KHZ) where hygiene practices are to be carried out. A hygiene point may be where a temporary cleaning station is established, or where cleaning occurs with a personal hygiene kit.
Kauri Hygiene Zone (KHZ)	The root zone area of a Kauri that requires protection and hygiene measures. This area can be measured as being 3x the canopy (drip line) radius of the tree. See Figures 1 and 2 on pages 5 and 6.
Drip line	An approximate line on the ground directly below the outer-most branches of the canopy where rain falls from the foliage to the ground.
Vector	A method of transferring infected soil from one area to another. Vehicles, footwear and animals are examples of vectors.
Off-track activity	Off-track is an activity that occurs through the forest or native bush area containing Kauri, away from public or purpose-built walking tracks.

Point of interest (POI)	A tree, pre-selected for surveillance.
Sample site	A tree or stand identified for soil and root tissue sampling.
Sample	The soil and root material collected to be sent to the lab. There can be multiple samples at any given site.
Sample point	Is one of eight points around the tree that make up one soil sample.
Downslope risk	The risk posed to Kauri downslope of access route or activity. PA can travel through surface and sub-surface water flow downslope.

Appendix 1: Soil Sampling Pre-Start Checklist

Tiakina Kauri have developed a PA Surveillance Training course. This course is designed to deliver important information about PA, hygiene and risk management as well as how to carry out soil and root tissue sampling for PA and record Kauri tree health data. Anyone planning to carry out soil sampling must have some form of training. The risk to Kauri is very high for unmitigated activities in a Kauri forest particularly those directly within a Kauri Hygiene Zone.

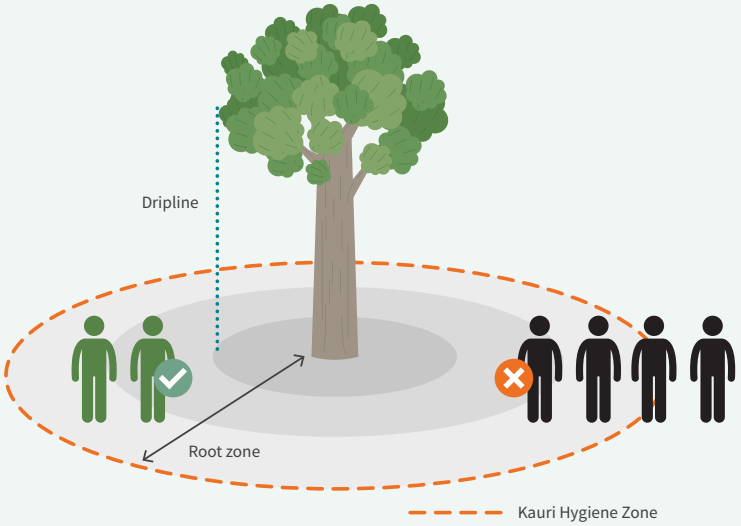
Details	
Surveyors' Names:	
Iwi/hapu/agency/group:	
Background Information	
Have you completed the Tiakina Kauri PA Surveillance Training course?	○
If not, have you completed similar training?	○
Do you understand which national rules apply to PA surveillance?	○
Do you know what is required to satisfy national rules?	○
PA Management	
Do you know what a Kauri Hygiene Zone (KHZ) is?	○
Have you read the Principles of Hygiene document?	○
Do you understand the principles of hygiene and how they apply to PA surveillance work?	○
Do you understand the risks involved with sampling?	○
Do you know how and where to carry out hygiene on footwear?	○
If using them, do you know when best to wear overshoe booties and when to remove them?	○

PA Management continued	
Do all items touching the ground during the sampling process need to be cleaned?	○
Should PA surveillance be carried out winter or after rainfall events?	○

Protocol for Soil and Root Sampling Planning	
Have you obtained background information on the site?	○
Have you completed your health and safety assessment?	○
Do you understand soil sample methodology?	○
Do you know how to plan PA surveillance activities to minimise the risk to Kauri?	○
Have you contacted the lab for details, including analysis time frame?	○
Have you contacted relevant landowners for sampling?	○
Do you have a well-developed surveillance plan?	○
Do you understand what is meant by sample design and sample point method?	○
Have you determined your sample points prior, or will this be done in the field?	○
Have you determined how you will record data for each sample site?	○
How will you record site and Kauri health data?	○
Do you have all the necessary equipment for soil sampling?	○
Do you have your hygiene kit and back-up supplies of water and disinfectant?	○

In the Field	
Do you know how to avoid Kauri enroute to the sample site?	○
Do you know how to correctly label your samples (capitals, strike through zeroes and sevens, and underline 9s and 6s)?	○
Are you aware of the material that needs to be retrieved in a sample, and how to access it?	○
Do you know the required volume needed for each sample?	○
Do you understand the importance of separating dirty and clean samples and equipment in your backpack?	○
Do you know how and when to sterilise sampling equipment?	○
Do you know how and when to carry out footwear hygiene?	○
Storage and Transport	
Do you know how best to store and transport samples?	○
Are you aware of the key information required when transporting samples?	○

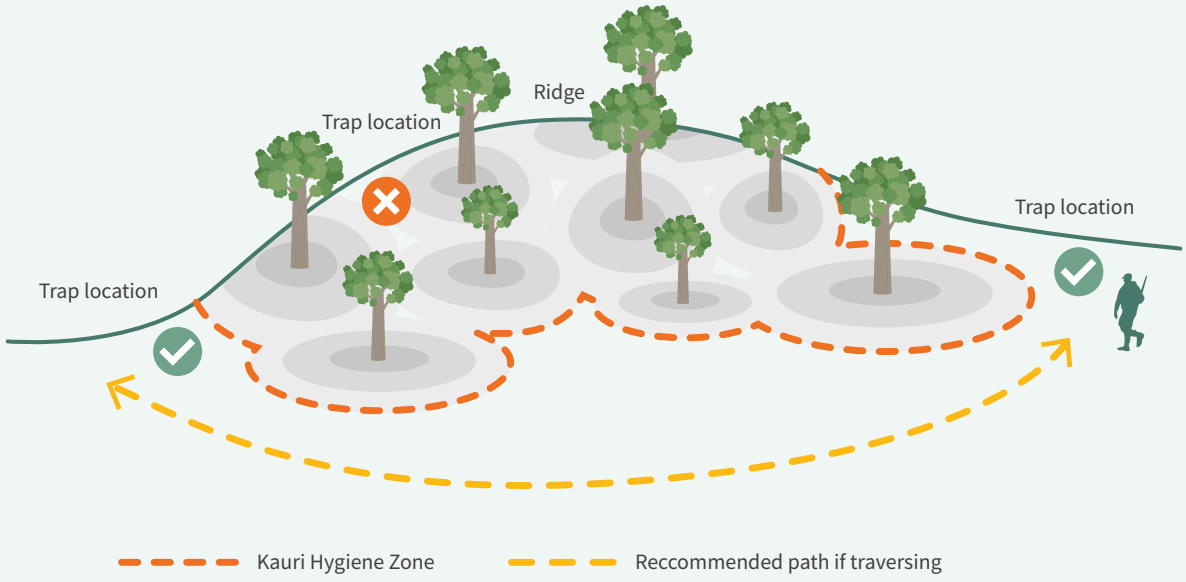
Figure 3: When soil sampling, reduce the risk and need for hygiene by limiting the number of people entering a Kauri Hygiene Zone at any one time.



Appendix 2: Pest Control Checklist

Checklist	Y/N
Do you have a map of the area with Kauri location and pest control lines overlaid?	
Do you have a GPS with Kauri location and pest control lines?	
Have you planned your activity around avoiding Kauri where possible?	
Have you identified and mapped any PA-positive locations?	
Have you identified the best-practice methods for target pests? (The Predator Free Trapping Guide provides information on pest ecology and best-practice control methods.)	
Have you had a discussion with a pest control technical advisor to ensure your traps and bait stations are correctly positioned?	
Have you cleaned before leaving depot or base?	
Do you have your hygiene kit with you?	
Do you know where you need to carry out hygiene (KHZs, leaving tracks, between catchments)?	
Are stream crossings minimised?	
Are GPS locations of traps and bait stations mapped?	
Does the work require leaving formed mitigated tracks? If so, additional hygiene protocols are required.	
Can you avoid winter activities in kauri forest? Consider alternatives.	
Do the pest control lines go through wet and muddy areas? Can you avoid them?	
Are traps, bait stations or trap lines placed outside of all Kauri Hygiene Zones? Make sure nothing is attached to a Kauri tree.	

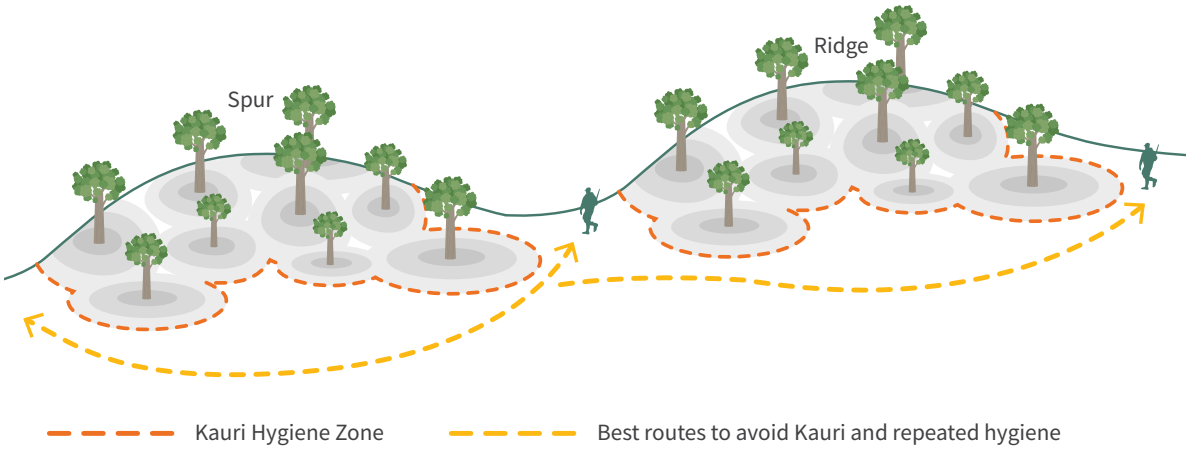
Figure 4: Trap locations in green are outside the Kauri Hygiene Zone. Movement is downslope of Kauri.



Appendix 3: Hunting Checklist

Checklist	Y/N
Do you have a map of the hunting area with Kauri locations?	
Do you have a GPS with Kauri locations and routes marked? Record Kauri as waypoints along the way	
Have you planned your activity around avoiding Kauri where possible?	
Have you identified and mapped any PA-positive locations?	
For contractors, have you considered alternatives to on ground hunting like aerial or perimeter trapping?	
Have you had a discussion with a Kauri protection officer at DOC or regional councils?	
Have you cleaned footwear and gear to dirt free and disinfected before leaving depot or base?	
Do you have your hygiene kit with you?	
Do you know where you need to carry out hygiene (KHZs, leaving tracks, between catchments)?	
Are stream crossings minimised?	
Can you avoid wet ground and muddy areas?	

Figure 5: The Hygiene Zone of interconnected Kauri and the best way to avoid them in the forest



Appendix 4: Temporary hygiene stations

If a temporary station is to be set up on site for the duration of an operation or project, it must be at the appropriate location and fit for purpose. Temporary stations require;

- Fit for purpose cleaning equipment (scrubbing brushes, spray bottles etc)
- A well-defined and signposted entry points on a contaminated side and exit points on a decontaminated side.
- A dry raised surface that allows people to take off footwear and remain dry (raised area, dry mats, seats, etc) to clean footwear effectively and without causing contamination.
- A moveable barrier to prevent easy access from one side of the station to the other.
- A separate container for footwear that are designated for that site and remain there for the duration of the project
- A designated space to contain and dispose of waste into municipal sewerage facilities, or to discharge treated waste at least 30 metres from the nearest Kauri tree where it will not leach into areas with Kauri.

Please note:

- Any soil or organic material you have collected from cleaning stations can be treated by boiling for four minutes. It can then be disposed of into a grassed area that does not drain into Kauri or discharged into a municipal sewerage system or into a landfill. Do not dispose of material with Sterigene into a septic tank.
- Soiled clothing can be machine washed with 50 ml of Sterigene concentrate replacing normal washing detergent per washing load. However, DO NOT use Sterigene if the water waste goes into a septic tank.

Equipment required at a temporary hygiene station

Appendix 5: Contact Information

National agencies	
Tiakina Kauri	kauriprotection@mpi.govt.nz www.kauriprotection.co.nz
DOC	0800 362 468 kauridieback@doc.govt.nz www.doc.govt.nz/nature/pests-and-threats/diseases/kauri-disease
Regional / Unitary Councils	
Northland Regional Council	0800 002 004 protectkauri@nrc.govt.nz www.nrc.govt.nz/kauridieback
Auckland Council	09 301 0101 kauri@aucklandcouncil.govt.nz www.aucklandcouncil.govt.nz/kauri
Waikato Regional Council	0800 800 401 kauri@waikatoregion.govt.nz www.waikatoregion.govt.nz/kauri https://bps.waikatoregion.govt.nz/online-services/new/ReportKauriHealthConcern/step/1
Bay of Plenty Regional Council	0800 884 880 info@boprc.govt.nz www.boprc.govt.nz/environment/pests/pest-plants/shrubs-and-trees/kauri-dieback-disease

TIAKINA KAURI
KAURI PROTECTION

This guide was updated in 2025 by Tiakina Kauri with the help and advice of:

- Gavin Clapperton (Kauriology) – Chair of review group
- Ashley Davenport (Te Roroa)
- Stuart Leighton (Auckland Council)
- Mihi McMahon (Te Kawerau ā Maki)
- Tracy Mezger (Department of Conservation)
- Roanne Sutherland (Department of Conservation)
- Nari Williams (Plant and Food Research)

The original version of this guide was prepared by by Lauren Waller (Tiakina Kauri Science Lead MPI) Roane Sutherland (DOC) Gavin Clapperton (Kauriology) and endorsed by:

- Kauri Dieback National Programme
- Auckland Council
- Waikato Regional Council
- Northland Regional Council
- Bay of Plenty Regional Council
- Department of Conservation

For more information about protecting Kauri, visit **www.kauriprotection.co.nz**

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