

Pest animal control guidelines for the Auckland region

Best practice techniques to ensure success







A Short Guide

It's quite easy to learn to identify animal prints. Read our notes then study your prints.

Rats leave 3 toes on the front feet and five on the back. They have bumps on the underside of their feet that leave clear marks.



Mice scratch down as they walk. Their prints are very similar to those of rats.



Mustelids If you draw a line between toes 3 and 4, the foot pad will be inside this line.



Hedgehogs Both feet are similar to the human hand with 5 digits each, with a central pad on both feet. The central pad is closer to the toes than that of a rat print.



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Foreword

Auckland's natural environment is an essential part of our identity, economic prosperity, health and wellbeing. We have a great diversity of native species and ecosystems, but unfortunately many are under threat.

Pest animals have a major impact on many of our treasured species and places. Between species like possums browsing on our native plants, stoats and cats eating our native birds and lizards, goats, deer and pigs damaging the understory and rats impacting on pretty much everything, our native biodiversity is in for a very hard time. Pest animals can also impact heavily on primary productivity – for example six or seven possums can eat as much grass in a night as a sheep!

Luckily in many cases it's in our power to manage these pests down to low levels in many places, especially if we band together to bring consistent control across larger areas.

Council has produced this guide to give you the information you need to humanely protect our special places, be they the local bush, around your house or your local community. We've tried to strike a balance between keeping the information simple and providing enough information for you to be successful. We hope you find it useful.

Phil Brown

Head of Natural Environment Delivery, Auckland Council

The seven key principles of predator control

One – do it safely

Be sure to follow the product label, safety data sheet and manufacturer's instructions regarding signage, and always use personal protective equipment. If you are unsure of how to safely and effectively use the toxin, ask the supplier or contact Auckland Council's Natural Environment team on (09) 3010101 or pestfree@aucklandcouncil.govt.nz

In more populated areas, use traps in place of toxins, to reduce the amount of toxins being used in the environment. Traps will often not completely remove a population from an area, so toxins can be pulsed (explained below) to control any remaining animals. All toxins should be contained within a housing/station and along with all traps, positioned to reduce risks of harming non-target species.

Where toxins are required, pulse their use, limiting the pulses to four per year, aiming for each pulse to be between two and four weeks long. The best months are August, November, January and April. Always remove all remaining toxins from stations at the end of a pulse, this reduces the availability in the environment and removes bait before it gets degraded.

Two – know the home range of the target animal

The home range of the target animal will help determine the distance between tools (your traps and bait stations).

Knowing an animal's home range will also help determine the distance an animal would have to travel to re-invade an area, so will help you determine the shape and size of a control area. Long thin areas are less viable than rounder areas as pest animals can more easily re-invade.

Three – use favoured habitat to choose tool placement

Placing control tools in favoured habitat areas of the target animal will increase the chance of that animal encountering the tool, leading to a better likelihood of successful control.

If a control area does not have suitable favoured habitat for the target animal there may be no need to place tools there.

Four – frequency of breeding guides the frequency of control

This helps guide how often your tools need to be activated to keep up with the target animal population – matching the rate of control with the target animal rate of breeding. Control is best carried out before a pest animal breeds and during fledging time to reduce the rate of increase of the pest population and increase benefit to biodiversity.

Five – time your control to be the most cost effective you can

Control needs to be applied over both winter and spring. There are two aspects to this timing:

- Pest animal control is often most effective in the winter months. During winter there is less food available in the environment and target animals have higher energy requirements to keep warm, making bait more attractive.
- Having pest animal numbers low in spring will help protect native species populations. This is because spring is when bird species are breeding, spending more time on the nest or in burrows, with chicks on the nest or in burrows and are more vulnerable.

Six – use the animal's behaviour traits against them

When controlling pest animals, it is important to remember that one reason why they are successful predators is their ability to quickly adapt to new situations and features in their environment.

To maintain effective control, project managers should ensure a variety of tools are used when targeting pest animals. This can involve not only activating and deactivating existing deployed tools in pulses, but also using different tools, such as alternative bait or traps.

Doing so will help counter the adaptability behaviour of pest animals, and in combination with implementing the other key principles of pest animal control, will help deliver lasting effective pest animal control to a project.

Seven – do it humanely

While the animal species outlined in this guide can impact heavily on our native species, they still need to be treated with respect. Where possible, NAWAC¹ approved traps should be used in the prescribed manner, as they have been through a thorough testing process.

When euthanising animals caught in live-capture traps, the standard that must be met is that the animal must be controlled in a way that achieves the following two elements:

- a) rendered insensible (unconscious)
- b) death immediately follows

Please refer to the section *Euthanising live pest animals* on page 67 for more information.

When using toxins to control pest animals, use the most appropriate one for your target species, to prevent prolonged suffering. Use them specifically as directed to also reduce welfare impacts on non-target species.

¹ NAWAC - National Animal Welfare Advisory Committee. Part of their role is to test traps for welfare performance.
<https://www.landcareresearch.co.nz/science/plants-animals-fungi/animals/vertebrate-pests/traps>

Planning considerations

Before starting a pest control program, it is useful to consider:

- What native plants and animals are present.
- What pest species are present.
- The levels to which pests must be reduced to, and for how long, to make a difference.
- What monitoring needs to be done in order to determine if the pest control is working and the desired results are being achieved.
- Ripple effects or side effects that might occur and how to minimise these e.g. how will stoat control affect a rabbit population in the same area?
- The management of kauri dieback.
- What other control is being done nearby?
- Will you need signage?
- If you are planning to work on public land, have you got permissions from the land manager (e.g. Council or DOC)?

What are the beneficial and the harmful species in your area?

If you need help identifying the native flora and fauna in your area, and you don't have access to an expert's knowledge, there are several online tools to help.

iNaturalist - upload photos of plants, animals, insects and more, then have them identified. You can learn in more depth about a species and look at other projects people around New Zealand are involved in:
<https://inaturalist.nz/>

Landcare Research - find results of research and more extensive descriptions of plants, animals and fungi in New Zealand:
<http://www.landcareresearch.co.nz/science/plants-animals-fungi>

They also have a search tool called "What is this bug". The presence and change in density of certain types of ground invertebrates such as ground wētā and ground beetles can be another sign of pest animal control efforts: <http://www.landcareresearch.co.nz/resources/identification/animals/bug-id/what-is-this-bug>

Pest Detective - To help determine which pests you may have at your place check out this website:
www.pestdetective.org.nz

It contains information on the regular culprits, the damage they cause and the clues they leave behind.

Or, check out the **Tiaki Tamaki Makaurau** website for more links and information
<https://www.tiakitamakimakaurau.nz/>

What monitoring should be done?

Monitoring your target pest animals over time will help you understand if you are making the difference you intend to and can help guide your control work.

Ideally you should do your first round of monitoring before you start your project or place your control tools in the project area – this gives you a baseline to compare results with.

Auckland Council has created a detailed community monitoring guide to help you design this aspect of your project. You can find it at <https://knowledgeauckland.org.nz/publications/auckland-community-ecological-monitoring-guide-a-framework-for-selecting-monitoring-methods/>

There are several apps we recommend that you can input your data into – Trap.nz (<https://trap.nz/>) or CatchIT (<https://www.stat.auckland.ac.nz/~fewster/CatchIT/>) being the main two.

We have a basic summary of recommended monitoring methods at the end of these guidelines.

What pest control is being done nearby?

While doing pest control is important, it is equally important not to do it in isolation from the rest of landscape around you.

We encourage you to work with your neighbours and people in your neighbourhood – this minimises the chance of reinvasion into your area. Also, the wider an area of control, the more chance there is for species and habitat recovery.

Will you need signage?

Signage is necessary when using vertebrate toxins, especially if you are working on public land, and should be placed at all normal entrances to the site. The type of signage, and the duration it should be present, may vary depending on the toxin used.

This guide explains the minimum requirements and rules, and gives some practical advice on applying them <https://www.bionet.nz/assets/Uploads/B7-Signage-2018-04-LR.pdf>

For further information on signage requirements, see WorkSafe's guide – <https://worksafe.govt.nz/laws-and-regulations/signage-requirements-for-vertebrate-toxic-agents/>

Signage for traps is also recommended in some situations – this is not compulsory, but warning the public that traps are present in the area is a good safety measure.

Minimising side effects and ripple effects

Consideration should be given to what the side-effects and ripple effects may be and minimising them. Side-effects include direct impacts, e.g. the accumulation of toxins in the environment and the trapping of non-target species. Ripple effects are undesirable biological responses to pest control such as the increase of rats once stoats are controlled, which in turn could lead to increased predation of insects and seeds. Where possible, try to implement an integrated pest management programme targeting all serious biodiversity pests and potential problem species.

Kauri dieback

Kauri dieback disease (*Phytophthora agathadica*) has been identified as a serious threat to kauri and kauri ecosystems and has been identified in various sites throughout the Auckland region (including Great Barrier Island, the Waitākere Ranges and surrounds, the Awhitu Peninsula, Birkenhead, and areas within the northern part of our region). There are still many discrete areas and localised sites that remain free of kauri dieback disease symptoms at this stage.

A microscopic soil-borne disease, kauri dieback can spread through movement of soil or water. Consequently, containment and hygiene measures to reduce the spread are essential to preserving kauri for future generations. Any movement of soil (on footwear, vehicles, machinery, equipment and tools) has the potential to spread kauri dieback disease. The risk of spreading the disease both within an area and introducing it into healthy areas of kauri should be addressed by anyone working in areas with kauri present.

There are currently no approved tools for the treatment of kauri dieback. Cleaning footwear, vehicles, tools, equipment and machinery is the single most important management action available apart from avoiding infected areas.

Hygiene protocols must be followed to limit the human-assisted spread of kauri dieback.

The procedures shown here must be followed at all times:

A phytosanitary kit (consisting of a spray bottle of Sterigene disinfectant and a brush) needs to be carried by every member of the group at all times during their work.

Prior to starting your day, ensure that all footwear, gear and equipment are soil free. As an added precaution spray Sterigene on all footwear, gear and equipment before entering the areas where kauri are present. Cleaning of footwear and equipment is carried out by removing all soil and debris using the brush and then applying Sterigene. It is important that every effort is made to remove all soil prior to applying Sterigene, as it cannot penetrate caked on soil.

If travelling between healthy kauri areas and confirmed infected areas, plan your day so you work in healthy areas first. Avoid working in kauri areas in wet weather if possible, as this increases the risk of soil movement.

Having a spare pair of footwear that is used in vehicles (put boots used in the field in the back cab) can help reduce the spread of dirt via vehicle footwells between sites and drivers.

Footwear and equipment must be cleaned:

- At the start and end of each day.
- At all fixed phytosanitary stations along the track network.
- Every time track networks are exited and re-entered.
- Before entering and after exiting a kauri area (defined as a continual stand of kauri or within three times the dripline of individual kauri).

Visit the national programme website for more information www.kauridieback.co.nz.

Image opposite - Kauri trees in Parry Kauri Park. Source: J Farnworth



Writing your pest management plan

A project plan can be anything from a simple one pager to a detailed restoration plan. For most community groups, a simple plan should suffice, however it's essential to have one so that you know and remember what it is you want to achieve, and how you're getting there. For larger projects we recommend seeking the advice of a Conservation Advisor or Park Ranger.

Spending time considering the impacts of your actions in the initial phase of your project can save huge amounts of time and effort once the project commences. It can even make the difference between success and failure. Regardless of the size of your project, there's quite a bit to think about.

Points to include in your plan

Goal or vision

what do you want to achieve? What is the outcome that you want?

What will success look like?

These are the outcomes that will ensure your overall goal is met.

How will these outcomes be met?

What are the tasks that will need to happen to achieve the above outcomes? Will these tasks need to happen all year round or just during specific seasons?

What will these tasks cost and how will you fund them?

Will the group supply all the labour, or do you need some contract help? Will you fundraise yourselves or apply for funding to organisations?

Do you need to break the project up into stages and state what you will do each year?

You may need to work progressively towards a larger goal. Be realistic and set achievable yearly targets.

How will you measure success?

What will you do to measure the results of your efforts and monitor the effect on the outcome of those efforts?

Training

Do members of your group require any specialist training to undertake the tasks safely? Do you need a Health and Safety plan in place to ensure that volunteers and private landowner's interests are protected?

Group structure

Do you need a structure of some kind or will you just appoint a co-ordinator? Is it useful to become a registered society or similar? Will you have formal regular meetings or informal get-togethers? Will you need a bank account? Or will another organisation be an “umbrella organisation” for you?

Recruiting others

Do you have enough people to undertake the tasks?

Communication

Will you communicate regularly with the group and neighbours? It helps to think about how you will publicise your project, attract volunteers and let funders know what you’ve been doing.

Maintaining what you have started. How long will this take, and how often will you have to do it?

Progressing a project without maintaining what has been done already is counterproductive.

We can help with a template for writing your plan whether your project is large or small; just contact us on 09 301 0101 or pestfree@aucklandcouncil.govt.nz



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Controlling pest animals

The following sections contain advice specific to several pest animal species – signs of their presence, impacts on the environment and best practice advice on controlling them with methods such as traps and toxins.

The animals featured in this guide are:

Possums

Mustelids (stoats, weasels and ferrets)

Rats

Mice

Unowned cats (feral and stray)

Hedgehogs

Rabbits and hares

Goats

Deer

Feral pigs

Wasps

Pest birds (e.g. magpies, mynas)

Some control methods are not suitable for every type of site; we will indicate which method is best suited to the location you are working in. This is a general guide, as each site is different it is important to consider the specifics of each site before using traps or toxins. e.g. **Yes** **Varies** **No**

Parks and Reserves: **Yes**, **Private Property:** **No**



Possums

Why are they a threat to native wildlife?

Possums can devastate forests and their fauna. They alter the composition of the forest by heavily browsing their favoured food trees which can disrupt vital ecological processes such as flowering, fruiting, seed dispersal and germination.

For native wildlife, the possum is both a food competitor and a predator. “Nest cam” video has confirmed that possums eat eggs, chicks and adult birds. Autopsies have revealed that they also munch through a wide range of invertebrates.

Possums:

- Feed at night and sleep during the day.
- Are good communicators and are known to make 22 different calls/sounds.
- Sometimes live in trees, but commonly dens are underground in culverts, tree roots at base of trees etc. Also move across open country and graze on pasture.
- Often follow the same track, forming flattened paths about 20 cm wide.
- Have an average home range of 200m in forest but will travel 15 times this length for seasonal food resources and have multiple nest sites.
- Have favourite trees that are visited regularly, often recognised by extensive scratch marks in their bark, and heavy browsing of leaves and fruit.
- Are very curious and will investigate new objects in their territory. Use this to your advantage!

Their dislike of wet weather – although they can swim – makes possum control much more successful in periods of fine weather. Colder temperatures are better as well. Possums have seasonal preferences and are opportunistic feeders. Traps or bait stations can be moved to target seasonal food supplies such as:

- Pine pollen in July- August.
- Willow-poplar budding in October-December.
- Kareao (supplejack), taraire, hīnau, tawa fruiting in May-August.
- Late summer podocarp fruit such as tōtara.
- Various orchard trees when in fruit throughout the year.
- Agricultural crops – swedes, kale, fodder beet, young grass/clover. Damage to these crops will cause a feed budget loss to landowners/farmers.

Targeting fresh possum sign can also be effective. Presence of possum trails, extensive browse and fruit damage, scratching on territorial and play trees, faeces etc can indicate where possums are present.

Image opposite - A possum taking a chick from a Song Thrush nest. Rats may sometimes follow a predatory possum around. Source: Ngā Manu Nature Images



Toxins

Which Toxin is best for your programme?

There are multiple toxins registered for possums control in New Zealand, including cyanide paste and encapsulated cyanide, cholecalciferol, 1080, brodifacoum, and pindone.

In urban areas, toxins should only be used on private property. This is because there are no lockable bait stations available for possums. Therefore, it is not appropriate to use toxins in non-lockable stations in areas accessible by the public.

Brodifacoum, cholecalciferol and pindone are the only possum baits that do not need a CSL², as long as they are contained within bait stations. There are other toxins, such as cyanide, which require a CSL.

For large areas (in excess of 50 hectares), when possum density is moderate to high or they need to be controlled to very low levels for long periods (e.g. during kererū or kōkako nesting), Feratox is a useful tool. Feratox (encapsulated cyanide) is often used for an initial 'knockdown', and then possums can be controlled to maintain low levels with trapping or other toxins.

It is important to note that rats need to be controlled to moderate to low levels to enable the use of Feratox for possum control. The use of Feratox is best delivered by a contractor. Feratox should be laid at least twice, around 7 days apart, and all bait should be pulled in at the end of a control period.

Some toxins (1080, Cyanide, high strength Brodifacoum (0.005%)) may only be used by a person holding a Controlled Substances Licence (CSL) and additionally need the approval of the Regional Public Health Service. This certification is commonly called an MOH and is given by the Regional Public Health Service on behalf of the Environmental Protection Authority (EPA).

Some toxins deliver the best results with pre-feeding of a non-toxic bait. These include 1080, Cyanide paste (not Feratox) and some Diphacinone paste formulations.

Locations

Toxin in bait stations works best when placed 1.5m off the ground attached to a tree; they should be a minimum of 10 metres back from road or track edges and out of sight.

Permission is required from land managers on Auckland Council parkland or Department of Conservation land before any bait is placed at these locations.

No stock must be able to access bait.

Further information about the multiple toxins available for possum control is available from Auckland Council's Natural Environment team 09 301 0101 or pestfree@aucklandcouncil.govt.nz

² Controlled Substances License

When should you use the toxin?

For the maximum benefit to birdlife, possum poisoning is best concentrated just before and during the bird breeding season, which for most species runs from August to January.

Possums will eat almost anything, so they are attracted to a variety of baits. However, they learn quickly. Sub-lethal poisoning can result in possums becoming bait shy. This is often the result of using low quality or degraded poison baits, lack of pre-feeding or continual baiting year-round by not pulsing.

What is pulsing?

Pulsing of baiting and trapping means placing bait in bait stations for specified periods of time throughout the year, as opposed to all year round. There are several reasons for doing this;

- It reduces the labour component required to achieve effective control of the target species.
- Targets pest animal species at times when they are most accessible for control.
- Targets pest animal species at key times of the year when native species are breeding and are more vulnerable.
- Keeps the control tools new and interesting; as a result more effective than if kept set/ baited all the time.
- Reduces the amount of toxin in the environment over the course of the year.



Possum scavenges abandoned kererū nest. Source: Ngā Manu Nature Images

Single feed pulsing example: **Brodifacoum**

Parks and Reserves: No, Private Property: Yes

- For a second generation toxin such as brodifacoum, which is a single feed anti-coagulant, it only needs to be pulsed twice a year (June and October).
- In this pulse, you fill the bait station on day one, refill on days five and 14. Remove the bait at the end of week four to end the pulse (as below).
- When ending the pulse, make sure you remove all bait in stations and dispose of it correctly; degraded bait can make animals bait shy as it is not as effective.
- Because it is a single feed toxin, it has a higher chance of a lethal dose being consumed, as whatever eats it will die.
- The antidote is vitamin K1, available from vets

Table 1: Brodifacoum baiting programme for possums

Month	April				May				June				July				August				September				October				November				December			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Fill bait on day 1 and 5																																				
Refill bait on day 14																																				
Remove bait on day 30																																				

Avoid prolonged use of brodifacoum (e.g. Talon and Pestoff) because it is persistent in the environment and has secondary poisoning effects which can be detrimental to many species in the food chain. Use such poisons when necessary, but be aware that over time these toxins can build up in birds such as ruru (morepork) and kiwi to lethal levels.

Multi feed pulsing example: **Pindone**

Parks and Reserves: No, Private Property: Yes

- For the use of first generation bait such as pindone, which is a multi-feed anti-coagulant toxin, it only needs to be pulsed twice a year (June and October).
- In this pulse you fill the bait station on; day 1, day 3 and day 5. Then refill day 14. If less than half the bait from the previous fill is present on the day 14 fill, consider filling again on day 17. Remove bait end of week 4.
- As is it a multi feed poison, it is very important that it is available for 5 nights (by filling 3x) for the possum to be able to consume a lethal dose. If bait is not available for this length of time, control will not be effective, and may result in possums receiving a sub lethal dose and becoming bait shy.
- The antidote is vitamin K1, available from vets.

For more information on pulsing for toxins contact Auckland Council's Natural Environment team for private property, or Park Rangers for parks and reserves.

Table 2: Pindone baiting programme for possums

Month	April				May				June				July				August				September				October				November				December			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Fill bait on day 1 and 5																																				
Refill bait on day 14																																				
Remove bait on day 30																																				

Further Toxin Considerations:

- There is a legal requirement that bait is distributed in bait stations and not spread on the ground, which requires a Controlled Substances Licence, and approval from the local Medical Officer of Health.
- Ensure appropriate signage is displayed and information correct.
- Always read the toxin's label and safety data sheet before distributing. If toxins are split into smaller quantities from the original container, a product label and Safety Data Sheet is required to accompany the toxin until its use.
- Ensure stock and domestic animal precautions are followed. Grazing stock should not have access to bait, even if spilled from a bait station.
- Ensure you know the antidote, and if you suspect poisoning in non-target animals or yourself contact your vet or doctor immediately.

For more information on toxins available for your project see the 'Toxin Matrix' in the appendices.

What bait stations should I be using?

Philproof bait stations are recommended when using toxin for possum control. They are mounted to a tree with a top and bottom nail and have a removable bottom plate for refilling the toxin during each pulse. Height recommendations are to install bait stations 1.5m above ground and mounted side on to the tree. Bait stations should be placed 10 metres off track edges, or where they are not easily seen by passers-by. Another bait station option is the Sentinel possum bait station. This has a lid on the top that possums can open. It however does not last as well in sunny conditions, as the plastic deteriorates.



Philproof bait stations for possum control. Source: <http://www.pestcontrolsolutions.co.nz/TrapsBait.html>

How many bait stations do I need?

You should aim to have 1 bait station per hectare for possums to achieve effective control. This can be achieved by having bait station lines 100 metres apart, and a bait station 100 metres down each line.

Trapping or shooting

Trapping or night shooting using a spotlight is most effective when possum numbers have been reduced to low levels by poisoning, or an area is small (under 50 hectares), and control is aimed at minimising reinvasion. Shooting is only suited at very large rural areas and with a low powered firearm or shot gun.

Traps placed on the ground work best, but they should be a minimum 10 metres back from road or track edges and out of sight. If these two points (distance and out of sight) are not possible, then traps should be raised to 1.5 metres above the ground. If ground dwelling native birds are present at the control site, trap sets should be raised 700mm off the ground. If Weka are present, traps should be raised 1.5 metres off the ground.

In a dog off-leash area, or other site where there is a higher than normal likelihood of pets or children encountering the traps, traps should always be raised, even if they are well off track.

Permission is required from land managers on Auckland Council parkland or Department of Conservation land before any trap is placed at these locations.

When can I use shooting for possum control?

Parks and Reserves: No Private Property: Yes (Need to have a firearms license)

Shooting for possum control should only be undertaken on very large private property and is not permitted on public parks and reserves. Trapping should be preferentially considered before shooting is used as a control option. Night shooting with spotlights can sometimes be effective in more open terrain, around the margins of small forest blocks and in isolated trees. Regular night shooting is a useful gauge on the number of possums in an area but is never likely to control possums down to very low levels across a whole bush block.

When using firearms, all users must have a firearms licence. The seven rules of firearm use must be observed at all times. These rules can be viewed at: <https://www.police.govt.nz/advice-services/firearms-safety/safety/seven-firearms-safety>

When should I use trapping for possum control?

Trapping is a viable option for possum control if you are looking to reduce the amount of toxins used in the programme, have a small area you are controlling, or want to continue control between pulses (year-round). It is also useful if toxins have been used to control possums for a long time an area as it is a different option and can catch potentially bait shy possums.

Trapping should also be pulsed to target control prior and over the bird breeding season. For possum control on smaller parks and reserves, trapping is the preferred method. For further information contact your local Park Ranger on (09) 3010101

Table 3: Trap pulsing programme for possums

Month	April				May				June				July				August				September				October				November				December			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Check Once																																				
Check Twice																																				

Pulsing with traps:

Parks and Reserves: Yes, Private Property: Yes

- Trapping should be pulsed twice per year, with each pulse being two weeks consecutive.
- Traps should be checked 2x in the first week and 1x in the second week as a minimum. If capacity allows additional checks within the first 4 nights this will be beneficial.
- An exception for a pulse to be longer than two weeks can be made if the area is relatively small (<10 hectares) and is surrounded by some possum habitat. Due to the small nature of such areas, reinvasion is high compared to the population of possums within the control area. As a result, catches may continue for longer than expected for small reserves.
- Traps should be secured so that when sprung they will remain in position.
- Possum specific lure should be used e.g. apple with cinnamon, icing sugar and flour. No meat or fish due to risks for non-target animals.
- In parks and reserves, traps should be placed 10 metres off track edges, where they are not easily seen by passers-by. If this cannot be achieved, traps should be installed 1.5 metres off the ground on a wooden stand to reduce risks to non-target species and children.

What traps are available?

The most commonly used traps in Auckland are the single kill Trapinator and Timms traps. Of these, Trapinators are the more humane option and are therefore the best choice in any situation where it's possible to elevate the trap off the ground. There are other traps available on the market. Contact Auckland Council's Natural Environment team (09) 3010101 or pestfree@aucklandcouncil.govt.nz for further information.

Trapinator

Parks and Reserves: Yes, Private Property: Yes

Trapinator possum traps are humane, easy to set and great for projects where volunteers assist with trapping. They are tree mounted which means they are out of harm's way for inquisitive kiwi and weka if they are installed 1.5 metre off the ground. This also makes them the best choice on public parkland if there's a higher than normal risk of pets or children encountering the trap (e.g. dog off leash areas or where traps cannot be hidden 10m off track). Trapinators are simple to use with a side lever that is pushed forward to arm the trap. A bait bar inside the trap is commonly smeared with peanut butter to lure in possums. Detailed setting instructions can be found at www.cmisprings.com/trapinator_instruction.html.

Timms traps

Parks and Reserves: Yes, Private Property: Yes

Timms traps are a common, easy to use trap. However, independent testing shows there's a small risk of animals escaping rather than being killed immediately. This means they may be slightly less effective and humane than a Trapinator.

As with all traps, Timms traps need to be stable, not rock around, and be secured to the ground, a tree or a wooden platform. Traps on public land should be placed at least 10m off track and hidden from public view if at all possible. If the above is not possible, or weka are present, the trap should be raised 1.5m off the ground to reduce risk to children and pets.

Raised Timms traps must sit at the same angle that they would if placed flat on the ground. This requires a flat platform (see photo below); do not attach Timms traps directly to the side of a tree. Because of this, Trapinators are a better choice where a raised trap is required (see above for more information on Trapinators).

Traps should only be baited when they are unset and should be kept clear of debris to allow correct function and not discourage pests from entering the trap. Setting off your trap when re-baiting also allows you to check it is functional.

Timms traps are best baited with a piece of fruit such as an apple sprinkled with cinnamon, lemon or orange peel. If using citrus fruit, be sure to remove any fruit flesh, and only use the actual peel so that the bait pins in traps do not corrode from the acids in the fruit. Use medium sized pieces of fruit (e.g. 1/8th of an apple) to encourage possums to reach into the trap with their mouths instead of hands.

Do not be tempted to use large pieces of fruit, as this can affect the trigger mechanism and make it harder for the possum to set the trap off. Additional lure on the bait can increase trap catch.

The sensitivity of Timms traps can be altered by bending the bar backwards or forwards. If using Timms traps in kiwi areas, mount them on the end of a 6 x 1 piece of timber, screw this into the tree at a height of 700mm off the ground and use as a ramp. Cut a small channel at the bottom of the Timms keyhole shaped trap entrance to allow the bait spike to be pulled outside the trap. This will allow re-baiting while the trap is attached to the platform.

To attract possums to the trap, make up some 'blaze' and throw a handful of this outside the trap. 'Blaze' can be made from mixing one part icing sugar to four parts white flour, with a good dash of spice such as cinnamon. This will help to attract animals by sight, smell and taste. This is best used during dry weather.

Tips and tricks

- Well cared for Timms traps can last for over 10 years. To prolong their life, do not set them off empty as the force of this can crack the top.
- Use a cube of polystyrene smeared with peanut or plum jam as a long-life lure.
- If your trap has stopped catching, change its shape by placing a rock or branch on top, or move it a few meters. This may cause a curious possum to investigate this 'new' object. Or pulse the setting and baiting of the trap.
- Placing traps out of view will reduce tampering risks.
- Make sure the trap is securely fastened to the ground or platform to avoid it being set off by possums before entering the trap.
- If you are worried about children or pets around, you can place the traps on a platform approximately 1.5 meters off the ground as shown in the above photo.



Elevated platforms 1.5m off the ground.

Timms traps are available online and in farm stores. For further information contact Auckland Council's Natural Environment team (09) 3010101 or pestfree@aucklandcouncil.govt.nz.

Leg-hold and cage traps

Parks and Reserves: No, **Private Property:** Varies

It is recommended that only contractors or experienced rural community groups use leg hold traps. Live capture traps, such as leg holds and cage traps, can be effective for those who don't mind humanely killing live animals and can check the trap daily within 12 hours of sunrise, as this is legally required. Leghold traps are not legally allowed to be used within 150m of any dwelling house unless permission has been obtained from the occupier. They also legally must not use them where there is a probable risk of catching a companion animal, which makes them unsuitable for most urban situations. Hard terrain with dense vegetation is ideal place for leghold traps as they are easy to carry in.

Remember that all leghold traps need to be raised 700mm of the ground in kiwi zones and 1.5m in weka zones. Kiwi and weka have died after being caught and injured in these traps. Whichever height a leghold trap is set, the chain must attach to the trap so it can't be removed, and the length of the chain must allow the animal to reach the ground when trapped.

Self-resetting possum trap – Goodnature

Parks and Reserves: Yes, **Private Property:** Yes

The Goodnature self-resetting possum trap is another tree mounted kill trap that is designed to work all year round.

The trap is powered by a CO₂ cylinder which can 'fire' approximately 12 times. A long-life lure comes with this trap. Traps need to be checked monthly to replace the lure. Lure should be placed at the base of the trap to help lure the possum.

An additional trap counter can be purchased with this trap. It is strongly recommended you buy this counter also. Without the counter you will not know how many strikes the trap has left from its gas cylinder, or how many kills the trap has made as many kills get scavenged by other pest animals.

At this stage we only recommend these traps for urban areas where a small number of traps are required. Larger projects should consider using other methods such as bait in bait stations.

See www.goodnature.co.nz for more details.

Tips for Possum Traps:

- All possum traps in public parks or reserves should be at least 10m away from the track, out of sight. If this is not possible, or if there is a higher than normal chance of pets or children encountering traps (e.g. off-leash dog parks), elevate traps 1.5m.
- Good lures for possums are fruit, citrus peel, vegemite and carrots.
- Placing a "blaze" of flour above the trap on a tree and in front of the trap entrance will make the trap more effective.
- Set possum traps near mustelid traps to reduce labour. These predators will be attracted to any dead animals caught in the possum trap and then may also be caught in the trap nearby.
- Kiwi and weka have occasionally been caught by their bills in Timms traps so it is necessary in kiwi areas to firmly mount them well off the ground (700mm in kiwi areas, 1.5m in weka areas).

- Leave freshly killed possums next to the trap, as this will attract further possums and predators.
- Possums are very curious – this is why the Timms trap is yellow. Bright tape, luminescent products or even something that moves in the wind may activate the possum's curiosity.
- When using spices on fruit or in 'blaze' consider that cinnamon is considered to be the scent that travels farthest in the forest. Other spices proven to work include aniseed, curry and raspberry.
- Use galvanized nails when mounting traps on trees – they last a lot longer.
- Use Sentinel bait clips (which can be bought separately) in Timms traps and hook them above the S bend. These lures will last a lot longer than fresh fruit.
- Possums prefer to travel along fallen logs rather than over ground. Take advantage of this by securing traps on logs.

How many traps will I need?

The home range for possums is two hectares which helps to determine distances between control tools. The general rule is one kill trap per hectare for effective possum control. So, for example, if you have 20 hectares of possum habitat in your programme you should use 20 kill traps.

Spacing

Keeping with the one trap per hectare rule, spacing of control tools should be 100 x 100m.

Where should the traps be located?

Traps should be in possum habitat areas; ridges, tracks, road edges, near prominent trees especially kohekohe, tōtara, pōhutukawa, pine and macrocarpa. Targeting fresh possum sign can also be effective. Presence of run pads, extensive browse and fruit damage, scratching on territorial and play trees, faeces, etc can indicate where possums are present.

What if I want to use toxin and traps together?

You can combine the use of toxins with trapping. This is a great way to supplement your toxin programme in between pulses, especially if you have reinvasion from surrounding habitat as discussed above. Trapping following a pulse with toxins should ideally start three weeks after the final fill in the pulse.

This is to allow the possums which have consumed the toxin time to die before you start the trapping programme; otherwise you may be wasting resources trapping an already dead possum.

When one technique stops working it is worth changing to something new. Cycling between different toxins in different years, using a range of traps and baits, and adding in an occasional night shoot (on private property) will increase your success. This will also help to remove the cunning or shy animals (usually the older breeders) that have learnt to avoid a certain trap, lure or toxin. For such possums, leaving traps out for a longer period of time will be required.



Monitoring – what are the target levels for possums?

For wax tag or leg hold monitoring, ideally this should be done by a person holding monitoring certification. If people do not have this, at a minimum they should follow the guidelines set out in the National Pest Control Agencies (NPCA) guidance for possum monitoring

(http://www.npca.org.nz/images/stories/NPCA/PDF/a1_possum%20monitoring_2015-nov_lr.pdf)

Generally, aim for achieving possum control to below 5% relative abundance with 10% as a threshold for initiating another knock-down.

Relative abundance is a measure obtained by monitoring possum numbers in an area. Relative abundance measures can only be obtained from areas of 100 hectares or over. There is not enough room to place enough monitoring tools in smaller areas. There are three tools used to determine relative abundance in possums. The one we recommend is the use of plain wax tags placed in lines of 10, with each tag being 20 metres apart. No line should be within 200 metres of each other, or 100 metres from the edge of your control area. Lines must be straight and measured with a hip chain and not with a GPS unit.

For smaller areas, monitoring tools can only show presence/absence, and an accurate measure cannot be determined. Trend changes over time such as trap catch, possum browse, tracks and scat (poo) can be a good indicator that you are heading in the right direction. Keep records of the pest animals that you have trapped or shot as they are good indicators of your progress over time.

Annual observations of possum browse, or photo points of trees favoured by possums, such as kohekohe, māhoe, pūriri, rātā, pōhutukawa and tree fuchsia, will help to determine if your native forest is recovering. Regular bird counts can help to monitor bird populations over time. Other indicators are bite mark indices (BMI), trap catch, trails, poo and browsing. See www.formak.co.nz for more information on monitoring methods.

Monitoring the bait take (in the absence of rodents) and trap catches can also be another indicator effectiveness of your project, but these don't provide the full picture and should not replace monitoring using other tools, as other pests (e.g. rodents), can also be taking the bait. Doing so is less labour intensive because it is just recording what you are doing anyway.

Templates for this can be found in the appendix. In doing so it shows the fluctuations in toxin use or trap catch so you can plan for the following year.



Mustelids

Why are they a threat to native wildlife?

Mustelids include weasels, stoats and ferrets. Telling these three species apart can be difficult. Ferrets are large mustelids (up to 2 kg), usually with a dark facial mask and creamy coloured body with dark guard hairs giving an overall darker appearance from a distance. Stoats and weasels are cinnamon coloured with a white underbelly, with stoats being larger and with a black tipped tail. The line between the brown and white on stoats is straight, but on weasels is wavy and not even. Young stoats can look a lot like weasels. Stoats and weasels are good swimmers and can prey on animals up to 3 times their own body weight. Mustelids can breed rapidly in response to the availability of food – rats, rabbits and mice are staples, but they also eat birds, bird eggs, lizards and invertebrates.



Mustelids, from left to right - weasel, stoat, ferret. Source: [Southland Regional Council www.es.govt.nz](http://www.es.govt.nz)

Mustelids are some of the top predators in New Zealand ecosystems. They are flexible and opportunistic in their diet. A change in the abundance in their normal prey can cause a rapid shift to alternative food sources. This prey switching had implications on pest control operations, in that removing a key food such as rats or rabbits, may cause mustelids to prey more greatly on native birds for example.

Mustelids have fast metabolisms and need to eat 1/3 of their body weight every day. They cannot store fat in their bodies.

In general mustelids are difficult to trap, and only trapping to a high standard will bring about increased survival rates of birds. Keep a watchful eye out for them and their tracks and droppings. Input from an experienced mustelid trapper can be very helpful when setting up your programme.

*Image opposite - Weasel with a gecko in its mouth. Source: **Ngā Manu Nature Images***



Stoat facts:

- Stoats kill 95% of kiwi chicks.
- Stoats have a home range of up to 200 hectares (1.4 kilometres).
- Stoats are active night and day, killing several times a day.
- In colder climates where they originate, they stash their prey in the snow and come back for it later. This does not work the warmer climates of northern New Zealand, so they just continue killing.
- The calling card of a stoat is a bite to the back of the neck.
- Stoats are good climbers and swimmers.
- When food is abundant stoats produce eight to nine young, September – October, with male stoats impregnating all juvenile females before they leave the den.
- Once impregnated, they can hold off the onset of pregnancy for up to one year until conditions are right (plentiful food for example).
- They are more abundant in the summer months as young stoats disperse many kilometres from their birth site, beginning in early summer.
- Average life span is 1 year in the wild.
- Can carry and spread bovine tuberculosis.

Ferret facts:

- Are more common in open country.
- Great variety in coat colours.
- Smaller litter than stoats but may live longer.
- Largest mustelid in New Zealand.
- Can carry and spread bovine tuberculosis.

Weasel facts:

- Smallest mustelids.
- Seem to be the rarest, therefore, seldom a threat to significant wildlife. Once ferrets and stoats come under control, weasels become more prevalent as they are out-competed by the former.
- Can carry and spread bovine tuberculosis.



A stoat, with its distinctive black tipped tail. Source: Ngā Manu Nature Images

Toxins

Parks and Reserves: No, **Private Property:** Varies

The poison registered for stoats is called PAPP (Para-aminopropiophenone). A CSL is required to use this toxin. The toxin is prepared in a paste and recommended to use in the balls of fresh rabbit mince placed in tunnels. Currently in order to use this toxin, it is a legal requirement that all landowners within 3km of bait stations must be notified.

Traps

Parks and Reserves: Yes **Private Property:** Yes

Trapping for mustelids on Auckland Council parks and reserves is the preferred method as no toxins are available for mustelid control in small urban public spaces. To find out more contact your Park Ranger. Traps for catching mustelids include the DOC 200, DOC 250 and Goodnature A24. However, DOC 200s are designed specifically to catch weasels and stoats. A DOC 250 is needed to trap a ferret.

A trap is only useful if it is well serviced. Traps need to be regularly tested to ensure that they will be set off at a weight of a mustelid. Pathways for mustelids need to be kept open, e.g. in pastoral landscape, to ensure the trap-site is found. Good oils to use are Innox or other natural oils. Avoid petroleum-based oils due to smell that may deter animals from going near the trap.

What trap should I use?

DOC 200 trap in a wooden tunnel:

Parks and Reserves: Yes **Private Property:** Yes

- The entrance hole should be no larger than 60mm otherwise ferrets can enter the tunnel and pull out of the trap using their large facial muscles.
- Tilt your tunnel so that salty liquid from the bait runs out of the tunnel and not around the trap in order to avoid corrosion.
- Check DOC 200s are working with a bundle of rags/old socks. Using a soft bundle, rather than setting empty traps off prolongs their life.
- DOC 200s should be triggered at 80g. Check this by weighing your soft bundle of rags/old socks for test fires. For advice on how to calibrate a trap weight, contact a pest Council or DOC pest animal advisor, or other experienced pest control operator.

DOC 150:

Parks and Reserves: Yes **Private Property:** Yes

- Weasels are very light and may not trigger a DOC 200 trap. A DOC 150 is better to target weasels with. Trigger weights may need to be adjusted to catch these. For advice on how to calibrate a trap weight, contact a pest Council or DOC pest animal advisor, or other experienced pest control operator.

DOC 250 trap in a wooden tunnel:

Parks and Reserves: Yes, **Private Property:** Yes

The DOC 250 trap is a third bigger than a DOC 200. It is specifically designed kill trap for ferrets. Ferrets have large facial muscles and are able to pull themselves out of a DOC 200, so DOC 250 should be used where these may be present. These traps can be hard to set so it is recommended that groups receive training on how to do this before using these traps. Ferrets kill adult kiwi and can quickly eradicate a local population.

Trap site selection

Select sites where predators are likely to hunt:

- Stream edges. For rivers have a trap line each side of it.
- Bushland edge.
- Ridges.
- Valley Floors.
- Fence lines.
- Animal runs.
- Crossings over water courses/causeways.
- Fallen trees.
- Track/road edges even in open pasture.

The best sites are where there are converging features like a stream crossing a track at the edge of bush. A change in features is also a good site such as pasture and bush interface. Select sites that are beneath a tree canopy cover where possible.

Mustelids are likely to be less concerned about overhead predators under trees and therefore more likely to enter a trap. At the trap site, dig the ground over and keep the access open by providing a run, e.g. log over grass to trap site, or manually remove grass around the site. It may take a few months to catch a mustelid. Don't be disillusioned by this, and ensure your traps are always primed to catch. If a trap is in a good place (as per details above) – only consider moving it if it hasn't caught for 2 years! If a trap catches regularly, consider adding another trap nearby.



Stoat in a DOC 200. Source: <http://wellington.govt.nz/your-council/news/2015/04/native-birds-at-risk-from-ongoing-vandalism>

How many traps do I need?

For control of stoats, one trap per 20 hectares is recommended.

For the eradication of stoats, one trap per 6 hectares is required.

Trap setting

Mustelid traps are best used in single or double sets in a tunnel-like cover or box. The cover has three functions:

1. To orientate the animal so that it enters the trap correctly
2. To disguise and protect the trap
3. To keep out non-target animals

Special tips for using mustelid traps:

- Wear gloves when handling trapped animals (many target species carry leptospirosis and other diseases).
- Ensure trap box is bedded into ground and made level.
- Take every trap check seriously.
- Keep to a strict routine of what is done to minimise mistakes like leaving safety catches on or obstructions to traps closing.
- Clean out tunnels – keep free of cobwebs/ obstructions etc – make it look like the tunnel is being used by animals.
- Use your boot to clear a path from the tunnel entrance back about half a metre – to look like an animal track.
- Free and oil the treadle.
- Don't put bait under plate.
- Single sets - keep fine setting and place bait not too close to blocked-off end with mesh.
- Double set trap boxes can be effective if there are high rat numbers in the area. Ensuring no trap box movement (well bedded) so that when one trap goes off, it will prevent the second trap being set off.
- Record captures and bait etc.
- If you catch a mustelid in good condition, rub it all over the trap box. This will increase the efficacy of your trap in the future.
- Spray the trap box after each visit with an aerosol spray – salmon spray works wonders at disguising human smell - highly recommend it – plus it is a great lure.

What bait should I use in the traps?

Useful baits include fresh rabbit, salted rabbit, freeze-dried rabbit, freeze-dried rat, pilchards and eggs.

Stoat bait trials have been carried out by the Department of Conservation in Northland. These trials compared salted rabbit, fresh rabbit and eggs. The rabbit baits captured the most stoats over the egg baits. More recently, ferret urine has been shown to be four times more effective than fresh rabbit meat. For the full report see www.doc.govt.nz/upload/documents/scienceand-technical/drds262.pdf.

A useful strategy is to pulse with fresh baits and change bait types, particularly if it is suspected that there are trap-wise or bait-shy animals present. Some pest control operations use fresh or salted rabbit over summer, and eggs over winter.

The frequency of trap checking varies both seasonally and depending upon which native wildlife is being targeted for protection. Many Landcare groups check mustelid traps and replace baits fortnightly in summer and monthly in winter.

Always use gloves when handling meat lures such as rabbits. All mammals (including stoats) can carry the disease leptospirosis in their urine.

Frequency of trap checking

Varies seasonally, and depending on what you are trying to protect

- Fortnightly trap checks from October to April, and monthly checks from May – September will deliver protection for all bird species.
- Where trapping to protect pāteke, more frequent trap checks may be necessary.
- Beware of autumn stoats which will be strong and intelligent and account for a lot of birds at this time of year, especially pāteke and late kiwi chicks.
- If there are high capture rates of rats, consideration could be given to more frequent checks primarily to remove rats from traps, especially in single-set regimes.
- Changing the entry of your DOC 200 from front entry to side entry will decrease rat catch by 50% and not affect stoat catch, leaving traps more available for stoats.

Maintenance and Preparation of Newly Purchased Traps

- Each trap should be dipped in Innox oil solution to prolonging the life of traps (available from boating or fishing shops) before being set in the field.
- At each check the trap should be checked to ensure the treadle plate drops freely. Apply a few drops of cooking oil around the dog hinge, and/or tweak the treadle from side to side to free it.
- If practical bring traps in every 1-2 years and clean, otherwise undertake maintenance in the field. Water blast then use a wire brush to remove any scale rust. Once dry, dip them into natural oil.

Monitoring/Recording Data

Monitoring for mustelids can be difficult due to large home ranges but can be done through:

- Placement of trail cameras in likely stoat areas or where stoats are seen to gauge stoat visit frequency.
- Tracking tunnels baited with Erayz Rabbit Paste (refer to Monitoring Matrix in Appendices).

After successfully trapping a stoat, measure and record its length from snout to vent (nose to bum).

- Feel for a crest on top of its head – an older animal will have developed a bony crest.
- Both the above records will help you determine the age dynamics of your stoat population. Changes in this over time will give some idea of the success of your trapping programme.

Taking part in the annual Kiwi Call Count Survey or doing regular bird counts will also help to determine if bird populations are recovering (See www.formak.co.nz or more information on monitoring methods).

Image opposite - ferret eating a rabbit. Source: Roy Munn Nature Images





Rats

Rat Species

There are two main species of rat on the New Zealand mainland - the ship rat or black rat, which is more able to climb trees; and the Norway rat, usually found near water. Ship rats are usually the most common rat species in Auckland forests. Both species are rapid breeders.

The ship or black rat comes in several colours and is a poor swimmer in comparison to the Norway rat, but more agile and a better climber. It is usually black to light brown in colour with a lighter underside. A typical rat will be 15 to 20 cm long with a further 20 cm of tail. Ships rats tend to be more nocturnal and Norway rats more diurnal.



Ship rat approaching a fantail nest. Source: Ngā Manu Nature Images

Both species are omnivorous, with a preference for grains. In a suitable environment rats will breed throughout the year, with a female producing three to six litters of up to ten young. Ship rats live for about 2-3 years. Social groups of up to sixty can be formed. In New Zealand, ship rats have an unusual distribution and importance, in that they are utterly pervasive through native forests, scrub, and urban parklands. Ship rats are the most frequent predator of small forest birds, seeds, invertebrates, and lizards in New Zealand forests, and are key ecosystem changers.

Image opposite – Norway rat with a dead blackbird. Source: Ngā Manu Nature Images



Ship rat (see appendices)

1. Very long tail - in adult this is longer than the head and body length combined.
2. Very long thin ears - when you pull the ears forward, they will generally cover the eyes of the rat.
3. Smaller of the two rats, weighing around 150 grams.

Norway rat (see appendices)

1. Thick tail usually shorter than head and body length.
2. Small ears that can't be pulled forward over the eyes.
3. Large, robust rat, weighing up to 500 grams.

Why is the species of rat important?

The type of rat present has implications for pest control projects. For example, having more ship rats around has implications for most tree-nesting birds including kererū and small birds. This is because they are more agile and better climbers. Norway rats on the other hand are large and ground dwelling, with potential impacts on ground nesting species. They also prefer wetland and other water habitats (sometimes called Water Rat).

Norway rats have larger home ranges than Ship rats (500m vs 150m average), which will dictate your layout of control tools if just targeting one species in your project area. In addition to their impacts on birds, rats also have impacts on invertebrates and lizards and can also limit seedling germination, by eating fruit, seeds and young plants. Rats have a relatively small home range (about 1 ha for ship rats), and this combined with their rapid breeding means that reinvasion of rats in a controlled area is generally very rapid.

All rats eat a wide range of foods, are quick to find bait stations and communicate their location to other rats. They can detect some poisons, especially cyanide and cholecalciferol if not used appropriately. A dominant rat will protect a large food supply such as a station of baits, and if baits are not fixed in stations, rats may stockpile the baits in or on the ground, which means only a few rats will be taking most of your bait.

Toxins

Which toxin is best for your programme?

Toxins are an effective way to knock down and control rat populations. There are two main toxin types covered in this guide: first-generation multi-feed and second-generation single feed. Deciding which toxin to use is determined by site characteristics and risk to non-target species. These two toxins are anticoagulants and work by stopping the blood from clotting, leading to haemorrhage. Both have antidotes, which not all other toxins have.

Other toxins work in different ways. Cholecalciferol works by calcifying the blood and reducing the animal's ability to filter it, leading to cardiac arrest. 1080 works by preventing cells from producing energy, resulting in either cardiac arrest, or respiratory failure.

Toxins come in both bait block and pellet forms. The bait form you use will determine which bait stations should be used (more on bait stations below).

Bromadiolone and Diphacinone are the only toxins recommended for community group use on smaller Auckland Council Parks and Reserves. Community groups considering using bait should get in contact with their local Park Ranger.

Table 4: Bromadiolone baiting programme for rats

Month	August				September				October				November				December				January				February				March				April			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Fill bait on day 1 and 5	■												■											■								■				
Refill bait on day 14			■											■											■								■			
Remove bait on day 30				■											■											■								■		

Rodent single feed toxin example: Bromadilone

Parks and Reserves: Yes, **Private Property:** Yes

- For second generation toxin Bromadilone, which is a single feed anti-coagulant, toxin only needs to be pulsed 4 times a year (August, November, January and April).
- In this pulse you fill the bait station; Day 1, refill Day 5, and Day 14. Remove bait end of week 4 (as above in table)
- When ending the pulse make sure you remove all bait in stations and dispose of it correctly, degraded bait can make animals bait shy as it is not as attractive.
- As it is a single feed toxin, a lethal dose will be consumed during a single feed event. The antidote is vitamin K1.
- While it is an effective toxin and is less labour intensive, there are higher risks (than Diphacinone) for accumulation of the toxin in the environment, and possible secondary poisoning, but less risk than Brodifacoum.

When should you use the toxin?

For the maximum benefit to birdlife, rat control is best concentrated just before and during the bird breeding season. For most species, this runs from August to about January. Rats are attracted to a range of food sources and will eat almost anything but have the ability to become bait shy from a sub lethal dose, degraded poison or continual baiting year-round by not pulsing.

Table 5: Diphacinone baiting programme for rats

Month	August				September				October				November				December				January				February				March				April			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Fill bait on day 1 and 5	■												■												■											
Refill bait on day 14			■											■												■										
Remove bait on day 30				■											■												■									

Rodent multi- feed toxin example: **Diphacinone**

Parks and Reserves: Yes, Private Property: Yes

- For the use of first-generation bait Diphacinone (which is a multi-feed anti-coagulant toxin), needs to be pulsed four times a year (August, November, January and April).
- In this pulse you fill the bait station on day one, day three and day five. Then refill day 14. If less than half the bait from the previous fill is present on the day 14 fill, consider filling again on day 17. Remove bait at the end of week four (as per the below table).
- When ending the pulse make sure you remove all bait in stations and dispose of it correctly. Degraded bait can make animals bait shy as it is not as attractive.
- As it is a multi-feed toxin it is very important that it is available for 5 consecutive nights, for the rat to be able to consume a lethal dose. This toxin is really only suitable to maintain low rat populations following a knockdown, and while it is more labour intensive, it has lower risks for accumulation in the soil and secondary poisoning than Brodifacoum and Bromadiolone. The antidote is vitamin K1.

Further Toxin Considerations:

- There is a legal requirement that bait is distributed in bait stations and not spread on the ground, which requires a Controlled Substances Licence, and approval from the local Medical Officer of Health.
- Ensure appropriate signage is displayed at every normal entry point for the required period, and information correct (for Parks and Reserves contact your Park Ranger).
- Always read the toxin's label and Safety Data Sheet (SDS) before distributing
- Ensure stock (withholding for slaughter) and domestic animal precautions are followed. Grazing stock should not have access to bait.
- Ensure you know the antidote and if you suspect poisoning in non-target animals or yourself. Contact your vet or doctor immediately.

For further toxins available see the toxin matrix in the appendices.



Bait Stations

Parks and Reserves: **Varies** (by contractor only in some parks, stations must be lockable)

Private Property: **Yes**

Bait stations provide protection to bait from rain and moisture, protect non-target species from accessing the bait and present the bait in a way that is attractive and effective for the target animal.

Bait stations recommendations are determined by site, risk to non-target species and whether they are on private or public property.

Public parks and reserves

- Lockable bait stations (as below) are the only stations permitted to ensure risks are managed to non-target species such as park users.
- Access is only with a key and they are tamper-resistant to protect children and dogs.
- The bait is in block form, which is secured in the station via pins. This ensures the bait can only be consumed in the station and not removed and stored.
- Bait in the form of Contrac (Bromadilone) and Ditrac (Diphacinone) are recommended for use in these stations.

Private property

- Depending on risks with non-target species both lockable and open-faced bait stations (as shown below) are recommended.
- Bait in open faced stations is usually in pellet form, with the option in some stations for a pin fixture (Philproof Stations). Bait fixed on pins means that the animal needs to eat the bait to remove it ensuring control. Non-fixed baits may be stored instead of eaten by rats.



Lockable bait stations. Source: www.belllabs.com/bell-labs/product/us/pest-control/protecta-evo-ambush

How many bait stations do I need?

You should aim to have two bait stations per hectare to achieve effective control of rats. For example, 20 hectares x 2 station per hectare = 40 bait stations. See the guide to laying out bait stations below.

Timing of rat control operations

Timing of rat control is dependent on when the species being protected is most vulnerable. For example, to protect native birds such as Kereru or tomtits during the breeding season, rat numbers must be low while the birds are on the nest until the chicks fledge. This is usually from early spring to late summer. The timing will differ between different species and different localities. To protect invertebrates and lizards, rats should be controlled year-round. Control should be in a pulse.

Bait station and trap layout

Ideally, 'trap lines' should about be 100m apart and perimeter traps and bait stations should be 25m apart. Along trap lines, traps or bait stations should be 50m apart where habitat allows (see examples below). This will create a network of traps or bait stations. It is important to consider the ease of checking and maintaining the equipment; use existing tracks where possible.

When setting up bait stations or traps, look for evidence of rats being present such as fresh droppings, rub marks, gnawing, or feeding activity. Pick trap sites that are naturally attractive, such as near good food sources. Rats often nibble on seeds and fruits of native trees including nīkau, karaka, taraire and kohekohe. Look out for fallen berries with the outer layer chewed away on the forest floor. Rats prefer areas with water and good food sources. Auckland forests with the large number of different types of fruiting native trees and numerous stream systems are ideal for rats!

Setting up bait stations will vary. Depending on the project goals, time and resources a grid may not be an option. Using existing tracks in an area as a guide especially in parks and reserves.



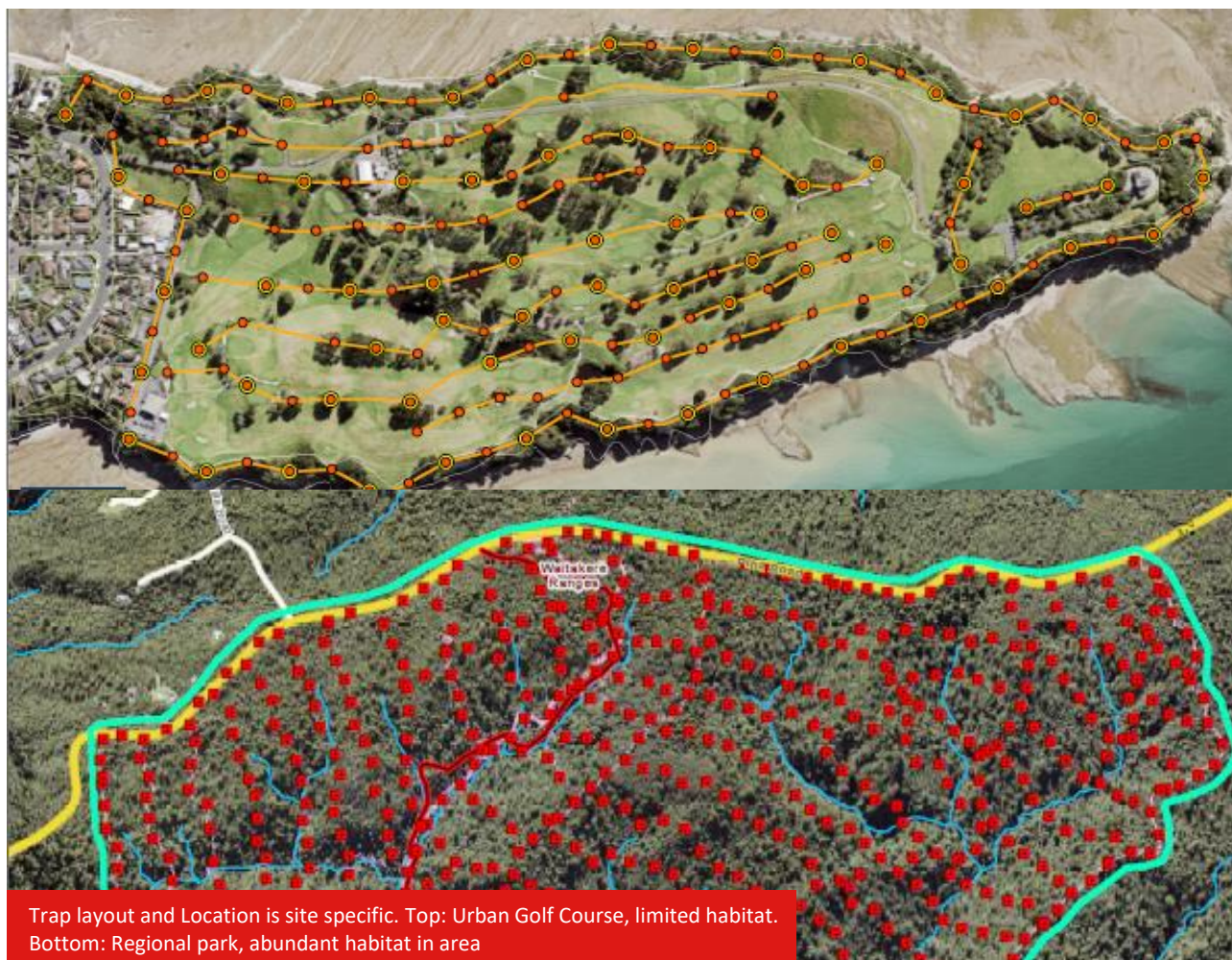
Open faced bait stations. Source: www.connovation.co.nz/philproof-bait-station-mini/c/60Images

Consider placing extra rat traps or bait stations where:

- There is a particularly heavily fruiting tree that attracts rats.
- You have observed nesting or breeding behaviour in a species you are trying to protect.
- There is a tree favoured by native birds such as taraire tree in which you often see kererū.
- At a confluence where two streams intersect. Be sure to position traps and bait stations so that they are not easily accessible by children or stock and that they are above high flood water marks. Bait stations and traps should not be placed in water.

There should be at least one trap or bait station within each rat's home range. Home ranges are generally reported by length. Ship rats have an average range length of 100-200m during the breeding season. Non-breeding ship rats have larger home ranges. Norway rat home ranges are between 218-916m in length. At high rat densities, trap or bait station spacing may have to be reduced further to maximise control.

If you have a large quantity of traps or bait stations, it can help to number each one. This can help to reduce the risk of missing one during checking and allows capture data to be related to each site.



Trapping

In areas with high rat numbers trapping may be time consuming, expensive and ineffective in reducing the rat population despite plenty of rats being caught in traps. A toxin may have to be used first to reduce rat numbers. Trapping can then be used to keep rat numbers low. Commonly used rat traps include the Snap-E and Victor snapback. Kill traps must be set in a tunnel or under a cover.

Trapping should also be pulsed to target control prior and over the bird breeding season.

Pulsing with traps

Parks and Reserves: **Varies** (Bait boxes must be lockable)

Private Property: **Yes**

Trapping is through snap traps (T-Rex or similar) in lockable bait boxes on parks and reserves preferably that allow for a front entry to the trap.

- Trapping will be pulsed 4 x per year, with each pulse being 6 weeks long.
- Traps should be checked 1-3 days.

Rat trapping tips:

- Traps need to be cleared regularly – a trap with a dead rat in it is not available to catch others.
- Regular maintenance of traps is essential, including checking for worn pivots, weakened springs and broken trigger mechanisms.
- Victor snapback traps require periodic retreating with preserving agent.
- When checking Victor snapback traps the trapper should carry spare traps, treadles and pegs. Treadles may be lost when the traps are sprung.
- Traps should be cleaned regularly with a wire brush – remove fur and remains of dead animals.
- Rats are nervous creatures. Ensure rat tunnels good clearance above the trap
- There should be a 200mm gap between the end of the rat tunnel and the trap treadle to avoid catching kiwi. The tunnel will orientate the animal relative to the trap, disguise the trap and keep out non-target species.
- Ensure traps are stable and do not rock around as this will deter rats.

Tunnels or covers should:

- Be at least 500mm long if open at both ends, to prevent non-target animals accessing the trap.
- Have an entry hole of no more than 45mm x 45mm to exclude non-target animals
- Allow easy access for checking traps.
- Be able to be secured to the ground with wire to prevent traps being disturbed and removed by pigs or possums.
- Fully enclose the trap and make sure it is secure, so the trap cannot be dragged out of the cover.
- Keep the traps off the surface of the ground to keep the trap dryer and extend the life of the trap.
- Initially, traps should be checked every 1-2 days. Once catch rate drops (after about 5-10 checks), traps only need to be checked once every 2-3 weeks. When rat numbers increase, the frequency at which traps are checked will also need to increase.

Table 6: Trapping programme for rats

Month	August				September				October				November				December				January				February				March				April				May			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Fill bait on day 1 and 5																																								

Goodnature A24self-resetting rat trap

Parks and Reserves: Yes, Private Property: Yes

The Goodnature A24 rat (and stoat) trap is powered by a CO₂ gas canister and can reset itself up to 24 times. Long life lures have been developed to accompany the trap and ensure rats remain attracted to the trap. Place the lure in the trap as well as under the trap.

These traps may be a good option in rural areas or where toxin is not an option, or where there is sensitive vegetation that may be damaged by multiple foot traffic. No messy handling of caught animals is required.

For more information visit: <http://www.goodnature.co.nz/products/rat-stoat>

Baits and Lures

To attract rats into your traps, use highly palatable lures such as chunky peanut butter, peanut butter mixed with rolled oats and white chocolate. These lures have been proven to be very attractive to rats, as well, are easy to use and cheap. Baits or lures may need to be altered over the duration of control programme in order to attract rats with different preferences!

Limitations

- Constant re-invasion and rapid breeding means effective long-term control must be ongoing. Rat numbers are likely to return to pre-control densities within months after control stops.
- Pig and possum interference with covers can be a problem.
- Mouse numbers may increase after rat control.

Monitoring

To gauge the success of your rat control, use 'tracking tunnels' before and after the control program. Record the number trapped or the amount of bait taken. Observations of rat browse on native fruits such as kohekohe, karaka, taraire and tawa will help to determine if your native forest is recovering. Regular bird counts can help to monitor bird populations over time. See www.formak.co.nz or more information on monitoring methods.

Always wear gloves when handling rats and rat traps as their urine carries the disease leptospirosis.



Mice

Why are they a threat to native wildlife?

The impacts of mice on native plants and animals are not fully understood. They appear to have serious impacts on small invertebrates, some lizards and plant germination rates. Mice can increase in numbers when there is extensive rat control. Current control methods for mice are yet to be refined. Any attempts to control mice should be carefully designed and monitored.

Control Methods

- Anticoagulant poisoning (diphacinone is recommended) on grids of 25 x 25m.
- Trapping using covered mouse traps baited with e.g. peanut butter on grids of 25 m x 25m. This may need to be supplemented with poisoning when mice numbers build up in late summer-autumn. Trapping can be used as a monitoring tool but if it is also the main control method an alternative trap line should be used to monitor mice.
- Mouse control can be very labour intensive. Consider only undertaking this type of control in small targeted parts of a project area to protect specific native species (lizards, threatened plants).
- For specific pulse timing in relation to the species you're protecting, contact Auckland Council's Natural Environment team on 09 301 0101 or pestfree@aucklandcouncil.govt.nz.



Mouse on a bird's nest in a māhoe tree. Source: Ngā Manu Nature Images



Cats

Why are they a threat to native wildlife?

For many New Zealanders, cats are a treasured companion animal, but cats can also have significant impacts on our native wildlife.

All cats, whether feral, stray or domestic, are active hunters during the day and night. They can kill a wide range of native wildlife, including insects, eels, kōura (native crayfish), fish, lizards, frogs, birds (including kiwi and NZ dotterel chicks) as well as rabbits and rodents. They can also carry toxoplasmosis and other diseases and parasites harmful to humans, livestock and native wildlife.

Cats are widespread throughout all landscapes in the Auckland region, especially coastal and lake margins. Cats are often present in far greater numbers than is obvious as they are extremely alert and are quick to hide. Home range on mainland New Zealand is around 200 hectares, depending on the density of cats and prey availability.



A feral cat with typical tabby markings

Are all cats the same?

No. Cats are commonly classified into companion (pet or domestic) cats, and two classes of unowned cats - stray and feral. These classes of cats are further described below.

Companion (pet, domestic) cat:

A common domestic cat (including a kitten unless otherwise stated) that lives with humans as a companion and is dependent on humans for its welfare. Cats are New Zealand's most popular companion animal and can be a much-loved member of the family. Companion cats are not pests and it is not acceptable to intentionally kill companion cats in community conservation projects.

However, even companion cats can be prolific hunters. If you own a cat, make sure it's desexed and microchipped (or easily identifiable in some other way e.g. with a named, addressed collar, so it can be safely returned to you if caught in a live capture trap), and consider making it an indoor cat – it keeps your cat safe and our native wildlife too!

Unowned cats:

Unowned cats are often classed as either stray or feral, depending on the extent of their contact with humans. These two classes of unowned cat are described further here:

Stray Cat:

A companion cat which is lost or abandoned and which is living as an individual or in a group (colony). Stray cats have many of their needs indirectly supplied by humans, and live around centres of human habitation. Stray cats are likely to interbreed with the unneutered companion cat population.

Feral Cat:

A cat which is not a stray cat, and which has none of its needs provided by humans. Feral cats generally do not live around centres of human habitation. Feral cat population size fluctuates largely independently of humans, is self-sustaining, and is not dependant on input from the companion cat population.

Control Methods

Step one – avoid harm to companion cats

Community groups need to be aware that it is important to take all reasonable steps to avoid killing anyone's pet cat. If you are undertaking cat control for your property, we suggest using live capture traps if it is possible that you might catch a companion cat. Any other forms of cat control must not be used in urban areas.

First, you should notify neighbours you are undertaking cat control on your property³. Ask your neighbours whether they have pet cats and, if so, how they can be identified, to help you return them safely if caught.

As above, in the majority of situations the most appropriate method will be live capture trapping to avoid accidentally killing companion cats.

³ Note that express permission from the Ministry for Primary Industries is legally required before leghold traps may be used. These are not a recommended type of trap for community use.

Occasionally, in remote rural areas where you can be confident that companion cats are not at risk, kill traps or shooting may be an option.

Only two toxins are registered for the control of cats in New Zealand. Both require Medical Officer of Health approval, must be administered by a Controlled Substance License holder, and neighbour notifications are a legal requirement. For these reasons, cat control using toxins should be restricted to large scale projects of high biodiversity value, and in rural or remote areas. Toxins are usually not an appropriate method for community groups to use for cat control. If you require more information, please contact Auckland Council Conservation Advisors.

Auckland Council (and/or its contractors) will undertake cat control in accordance with the Regional Pest Management Plan on public land (or private land with consent of the private land occupier) at defined remote rural sites that contain a resident or breeding or roosting population of any regionally or nationally threatened bird, reptile or amphibian.

As it is not appropriate for community groups to undertake this control, the remainder of the advice in this section of the Pest Animal Guide relates to control on private land.

Live capture cage traps

Treadle activated live capture traps are the best option for ensuring that owned cats can be identified and safely returned to their owners.

Cage traps must be checked and cleared within 12 hours of sunrise each day, as this is an important legal requirement to manage the welfare of cats while they are in the cage. Alternatively, remote sensing networks can be used to remotely check traps. The type of remote sensing tool that is applicable will depend on access to cell phone or satellite coverage. It is imperative that there is confidence that the remote sensor is accurate. If there is any doubt about the effectiveness of the remote sensor, then manual inspections of the trap will be required to satisfy Animal Welfare Act requirements.

If a cat is caught, check to see whether it is owned – check for the presence of a collar, or a microchip (your local vet will be able to help if you don't have a microchip scanner). Whether the cat appears to be socialised or not will also be a relevant indicator of whether it is owned.

If an owner can be located, return the cat to its owner as soon as possible.

If the cat appears unowned (no microchip or other form of identification and not socialised) but may not be feral (i.e., it appears stray), contact a local cat rescue group or the SPCA.

If the cat caught is feral and needs to be killed, this must be done in a humane way in which the cat is rendered insensible, and that death immediately follows.

Catching feral cats

Feral cats are easiest to catch in mid-winter when food sources are low. Traps should be at densities of about 1 trap to 150ha. For sites under 150ha, more than one trap may be required – seek advice from a conservation advisor about what is suitable for the habitat the traps are in and the values you're trying to protect. When setting the cage trap attach it to the ground or tree.

Feral cats can be difficult to trap as they are naturally cautious, and any previous bad experience will make a cat become trap shy. To reduce this risk, wire the door of the baited trap open for 5 nights to give the cat time to become familiar with the trap before setting it. After this, run the trap set for a minimum of 10 consecutive nights. Fresh bait is essential as it is easy to create trap-wise cats if unpalatable bait is tasted and then the cat escapes. Cat biscuits in peanut butter are commonly used, or fresh meat (fish or rabbit). Traps should be rebaited fortnightly at a minimum. In warmer months it may be necessary to rebait traps more often.

There is the potential risk of attracting non-target animals, including birds. To reduce this risk, cover the trap top to prevent birds seeing the bait from above. This cover will also protect any trapped animal from sun and rain.

Kill Traps

Kill traps should not be used if it is possible that companion cats could be killed, therefore they should not be used in urban areas. Kill traps can be a useful tool on private property in remote areas when the landowner knows any cats are likely to be feral and the trap cannot be checked every day.

The Timms trap is recommended as a humane kill trap for feral cat control, along with the Steve Allen Mk2 (SA2) Kat trap. Care must be taken to ensure non-target animals are not caught. As above, kill traps are not appropriate in urban areas where there is a risk of catching companion cats. The numbers of kill traps required for any given area, trap position and baiting of kill traps will be as described above for live capture trapping.

Shooting

Shooting for cat control should only be undertaken on private property in remote areas where you are confident that companion cats are not present, as shooting does not allow for cats to be checked for the presence of microchip or other signs of ownership. Also note that it is only lawful to shoot feral cats on private property where it does not amount to wilful or reckless ill-treatment of the animal, and does not endanger any property, or endanger, annoy or frighten any person.

Night shooting with spotlights can sometimes be effective in more open terrain, around the margins of small forest blocks and in isolated trees. When using firearms, all users must have a firearms licence. The seven rules of firearm use must be observed at all times. These rules can be viewed at:

<https://www.police.govt.nz/advice-services/firearms-safety/safety/seven-firearms-safety-rules>



Hedgehogs

Why are they a threat to native wildlife?

Although often not a first species that comes to mind when we think of pest animals, hedgehogs eat large numbers of invertebrates from many habitats, including forest remnants, and they prey on the eggs of dotterels and other ground-nesting birds, and eat native lizards.

How do I know if Hedgehogs are present?

Hedgehogs have a home range of 1.4 square kms and prefer dry hillsides, sandy soils, coastal areas, under wood piles. Presence can be confirmed through sightings, especially at night with a spotlight/torch, scat, and monitoring with tracking tunnels.

Control Methods

There is no specific control method for hedgehogs, but they can be targeted in DOC 200/250 and cage traps that have been baited for cats, ferrets and possums.

Wear gloves to avoid leptospirosis and other diseases. Effective control of hedgehogs requires high density trapping, such as traps at 25m spacing.



Hedgehog and moth. Source: Ngā Manu Nature Images



Rabbits and hares

Why are they a pest?

Rabbits and hares can have a significant impact on sensitive plants such as orchids and dune plants. Rabbits also cause major damage to plantings, amenity area damage from digging and can have severe economic effects on farming in rural areas. Their presence can also help drive the presence of other pest animal abundance (mustelids and unowned cats). They can increase during dry seasons, particularly if mammalian predators are being controlled.

Control methods include:

- Poisoning rabbits with pindone placed in bait stations or furrows (pindone pellets are less effective for hares, but liquid pindone is effective).
- For large operations 1080 applied to cut carrots is an effective option. A controlled substance licence and approval from the Environmental Protection Authority is required.
- Shooting, particularly spotlight or thermal image shooting. This needs to be sustained and is better for lower density populations.
- Carefully planned release of the calicivirus, which may provide temporary benefit. The best time to release the virus is autumn. Council coordinates such releases at a regional scale.
- Fumigation of burrows with Magtoxin.



Adult rabbit. Source: Christchurch City Council

Control needs to be sustained and monitored and there may be a need to provide complementary control methods. Monitoring can include transect counts (replicated), scoring rabbit sign (extent and density of droppings and dung heaps – Modified McLean scale)) and measuring levels of fresh browse on sensitive plant and night spotlight counts.

Control Methods

With rabbits there are six main forms of control, some better suited to being carried out by a professional pest control contractor, and some that could be undertaken by a land owner. Rabbits are rarely controlled with only one of these control methods, and several are usually required to be implemented for success to be achieved. Listed below is information on each control method, timings and material and contractor suppliers that may be able to help.

Pindone pellets

Parks and Reserves: Yes (by contractor), **Private Property:** Yes

Pindone pellets are an anti-coagulant cereal bait that needs to be housed in a bait station. Bait stations should be spaced at about 150 metre intervals in good habitat areas. Two key factors greatly help with success on this control method. Firstly, the bait must be available for five consecutive nights. If it is less than this, effective control will not occur. Secondly these pellets must be more attractive to rabbits than mown or grazed pasture (or other naturally occurring food). For this reason, these pellets are best used in winter when less natural food is available, making them more attractive for rabbits. You do not have to bait all year around with these pindone pellets.

Pulsing is the most effective way for using toxin in rabbit control. This means filling of these bait stations for about 10 days at a time (remembering to keep some bait in there for at least 5 consecutive nights). Rabbits take up to two weeks to show signs of control when using pindone. Don't implement other control until after two weeks or you may be spending time and money controlling rabbits that are effectively dead. This work can be carried out by a land owner. A good place to buy both the bait and the bait stations is Philproof: <https://www.philproof.co.nz/> or Key Industries: <http://keyindustries.co.nz/Pest-Control>

Liquid Pindone:

Parks and Reserves: Varies (by contractor only in some parks),
Private Property: Yes (landowner needs a CSL)

This product can only be used by a person who has a CSL (Controlled Substance License). Stock need to be excluded from where this product is used. Any remaining bait should be picked up and disposed of before stock are allowed back in paddocks. There is risk in urban areas especially where children may have access to areas it is placed; liquid pindone is sweet to taste.

The advantage of liquid is that it can be applied to more palatable and attractive rabbit food such as cut carrots. It also allows the rabbit to feed in a much more natural manner (they do not like to have their vision blocked when feeding which can occur with a bait station). As a result of these two factors, liquid pindone is much more effective than pindone pellets. Again, winter is a better time to use this method due to lower food supply.

Night shooting

Parks and Reserves: **Varies** (by contractor only in some parks)

Private Property: **Yes** (Need to have a firearms license)

Usually best carried out by a professional pest control contractor. A silenced, low calibre, fire arm (such as a .22 rifle, or air gun) with a spotlight attached or using a thermal imaging camera is a good hunting method. This can be carried out at any time of the year. At least 70% of the land area must be hunted for it to be effective.

The firearms safety rules need to be adhered to at all times with this method

<https://www.police.govt.nz/advice-services/firearms-safety/safety/seven-firearms-safety-rules>

Burrow fumigation

Parks and Reserves: **Varies** (by contractor only in some parks)

Private Property: **Yes** (needs to have CSL but is recommended to use a contractor)

Usually best carried out by a professional pest control contractor. This is below ground method that complements the above ground methods of baiting and shooting. Before any fumigation begins, it is recommended that dogs are used to drive underground as many rabbits as possible before systematically fumigating the area.

The product for fumigation is Magtox. It is in the form of a small pill that when placed in the burrow reacts with soil moisture and releases a poisonous gas. In very dry areas placing Magtox pills on a damp piece of paper will help this gas release.

Dust from pellets should not be used during fumigation as this can lead to an explosive reaction.

The entrance to the burrow needs to be blocked to prevent the gas escaping. Often female rabbits will be nursing young in burrows, which will not be exposed to baiting or shooting. Young rabbits will emerge from the burrow about 28 days after birth, so the use of this method is best done within 28 days of a night shoot. Rabbits breed for most of the year, but between June and August breeding slows down significantly. As a result, fumigation is less effective during these colder months.

Depending on the amount of this product used as the site, a certification such as an Approved Handler test certificate or Controlled Substance Licence (CSL) may be needed, as well as notifying local fire station of its use. It is best to use a pest control contractor for this work.

Exclusion

Parks and Reserves: **Yes**, **Private Property:** **Yes**

You may be able to fence off some areas to prevent rabbits getting into it. This is a non-lethal method that can be effective if some parts of the property are very sensitive to rabbit browse. Fences should be mesh, be at least 700mm high, and should ideally have a "skirt" that is buried below the surface on the outside of the fence, extending out about 300-400mm to prevent the rabbits digging down under it.

Habitat modification

Parks and Reserves: **Varies**, **Private Property:** **Yes**

Rabbits love nothing more than mown or grazed grass as this is a source of fresh growth grass and an open area where predators can be seen coming from a distance enabling an effective escape. If grass can be kept longer, rabbits do not like this, and will move out of the area. This technique can be used to concentrate rabbits in one area to make them more prone to control such as baiting or shooting.

A very good document on rabbit control is produced by the National Pest Control Agencies and outlines these methods in much more detail.

<https://www.bionet.nz/assets/Uploads/Publications/A5-201211-Rabbitguide-print.pdf>

What if my area I want to control is too large or small?

It is important to remember that rabbits have a home range of about 10 hectares. This is about 300 metres from one side of their home range to the other. Depending on how big your property is, control may need to be undertaken on neighbouring land that has suitable rabbit habitat for control to be effective on your land. If you have a small area (<10ha), talk to your neighbour and see if they want to join in. This will result in more sustainable rabbit control in the long term.



An adult hare. Source: Northland Regional Council

Why are they a threat to native wildlife?

Feral deer heavily threaten our forests ability to regenerate. Deer browse on seedlings which changes the composition of the forest through reduction of biodiversity, and destabilisation of soils. Feral deer have home ranges between 8km (Fallow) and 15 km (Red). The larger the control area for deer, the better.

Control Methods

Control methods vary depending on the size of the project area, the density of deer and resources available. The main method of control is shooting. This is best undertaken in the early evening when deer are more active. A large calibre firearm is essential to obtain a humane kill. Tools such as infrared night scopes and specifically trained indicating dogs can increase the effectiveness of hunting.

Live capture traps may be an option for smaller properties. These must be checked daily when set.

In public reserves and parks and smaller private properties, any deer control should be carried out by a professional contractor. On larger remote private land, control may be carried out by private land owners.

The use of thermal scopes can improve hunting. Exclusion (fencing) may also be viable option if areas to protect are small and spraying deer repellent on plantings can help deter plant damage.

The firearms safety rules need to be adhered to at all times with deer shooting.

<https://www.police.govt.nz/advice-services/firearms-safety/safety/seven-firearms-safety-rules>

Parks and Reserves: **Varies** (by contractor only in some parks)

Private Property: **Yes** (Need to have a firearms license)



Fallow deer buck. Source: G Hoskins



Goats

Why are they a threat to native wildlife?

Feral goats can have devastating impacts on local biota, particularly regenerating forest understorey. Over time they can change the composition of native forests by their selective browsing of preferred plants. For example, larger leafed Coprosma are a favourite food of goats, and are rarely found in forest patches regularly browsed by goats. Monitoring should include browse on palatable plants such as Coprosma.

Control Methods

- Sustained shooting, particularly if it can be coordinated amongst local landowners can be very effective in eradicating small herds
- Rounding up herds by using farm dogs and sending to freezing works (the ultimate in cost-recovery)
- If employing professional hunters, the use of indicator and/or bailing dogs is the preferred method for control efficacy.

Control of goats on parkland and small blocks of private land should be undertaken by professional contractors. On large blocks of private land, goat control can be carried out by private individuals.

The firearms safety rules need to be adhered to at all times with this method

<https://www.police.govt.nz/advice-services/firearms-safety/safety/seven-firearms-safety-rules>





Feral Pigs

Why are they a threat to native wildlife?

Pigs have a serious impact on forest understorey and threatened species. Kauri snails are particularly sought after by pigs, and kiwi have been recorded as prey.

Control Methods

- Hunting using trained bailing dogs that are regularly exposed to kiwi aversion training if relevant to the area
- Shooting, where pigs can be predictably found coming in to access food sources, e.g. an orchard. When using firearms, all users must have a firearms licence. The 7 rules of firearm use must be observed at all times. These rules can be viewed at: <https://www.police.govt.nz/advice-services/firearms-safety/safety/seven-firearms-safety-rules>
- Pre-baiting pigs into an area in which they can subsequently be shot or poisoned. However, pigs are very taste-sensitive and control advice should be sought from Council and DOC
- Pre-baiting koru-shaped steel-netting traps. Monitoring should include determining extent of recent characteristic grubbing. These need to be checked daily when set.

Parks and Reserves: **Varies** (on some parks only by contractors with a permit)

Private Property: **Yes** (needs to have CSL but is recommended to use a contractor)



Feral pig. Source: Northland Regional Council

Why are they a threat to native wildlife?

Dogs are mentioned in this guide not as pests, but as a recommendation on how to manage your pet.

They can be very dangerous for wild kiwi and other birds; every dog has the potential to cause harm to local wildlife, whether through direct contact or through chasing / running through a roosting or nesting area, causing fright and the risk of nest abandonment (during breeding season).

Some of the wildlife currently at risk of being killed or having nests disturbed by dogs are:

- Kiwi, and other ground dwelling birds.
- Shorebirds, such as NZ dotterel, nesting or feeding on beaches or dune areas
- Seabirds, especially little penguins, nesting along the Northland coast
- Wetland birds, like the Australasian bittern, nesting or living in swamps and long vegetation

The best way to manage your dog is to keep away from areas where these birds live, respecting the on-leash only rules that may be in place, and following the directions of any signage you encounter if out exercising your pet.

You may be able to install signage for your project; enquire with your local conservation advisor or Park Ranger about the options available.

New Zealand Dog Control legislation covers the need for people to control their dogs, so they do not attack or harm threatened wildlife. If you find someone else's dog on your property, and you cannot contact the owner to retrieve it, call Animal Control.

For information on Dogs in Parks and Reserve check out the Auckland Council website

<http://www.aucklandcouncil.govt.nz>



DOC Kiwi Zone sign. Source: Mikis van Geffen



Pest Birds: Magpies and Mynas

Why are they a threat to native wildlife?

Indian mynas and Australian magpies are both aggressive birds known to raid the nests of native birds, destroy eggs and tip out fledglings. This is a result of competition for territory and food. Mynas also predate on native skinks, geckos and insects such as wētā. Australian magpies and Indian mynas are highly intelligent birds. Shooting is not a long-term effective method as the birds quickly become 'gun shy'.

Control Methods

Toxins

Alpha-chloralose is a humane poison that produces a hypnotic effect by interfering with the bird's body temperature control mechanism. It can only work in regions that get frosts. Alpha-chloralose does not discriminate and nontarget birds may take the bait and die as well. **This method should only be carried out by an experienced contractor.**

Larsen Magpie Trap

'Larsen' single-capture, split-perch trap: The trap consists of two compartments, one holding the 'decoy' bird, one armed with a sprung-loaded mesh panel held open by two pieces of dowelling. When a bird drops into the trap to land on the perch, the dowelling gives way and the trap door springs closed. After catching the bird, it must be removed and disposed of humanely.

Pee Gee Myna Trap

The 'Pee Gee' trap consists of a 'trapping' compartment and a 'holding' compartment. A minimum of two 'decoy' Mynas are kept in the holding compartment to call in further birds. There are two 'tunnel' entrances into the 'trapping' compartment and one 'chute' entrance from the 'trapping' compartment into the 'holding' compartment. Attracted by the food in the trap, the bird enters the 'trapping' compartment through one of the one-way 'tunnels', feeds for a while and then looks for a way to escape. The only exit from the 'trapping' compartment is up the 'chute' into the 'holding' compartment which can hold at least ten mynas.

An advantage of the 'Pee Gee' trap is that it can trap multiple birds. Traps are usually supplied with a myna to put in the 'holding' compartment to get you started.

Larsen and Pee Gee traps are available from Adrian Gilbert (adriangilbert@xtra.co.nz), with all profits going to conservation charities.



Why are they a threat to native wildlife?

There are two main types of introduced wasps: paper wasps (narrow bodied) and the plumper Common and German wasps. They have the ability to survive in large populations as they have no natural predators, New Zealand winters are mild and there is plenty of food available. They are large eaters of honeydew, which is an important food for native birds, bats, insects and lizards.

Wasps also prey on insects and have been observed killing newly hatched birds. Wasps will strongly defend their nests if humans or animals get too close.

Paper wasps build umbrella-shaped nests which hang by a single stalk from the branches of trees or eaves of houses. German and common wasps often live in underground nests with one or more entrance holes.



Left - Common wasp (*Vespula vulgaris*) with a black mark behind the eye.

Source: Landcare Research © [CC-BY 4.0](#) licence

Right - (*Vespula germanica*) German wasp with a complete yellow band behind the eye.

Successfully controlling wasps over large areas can be achieved with the toxin Fipronil. It is often retailed as Vespex. Vespex is designed to target both the common wasp and German wasp, but not the paper wasp. Specific rules regulate the use of this control method. For more information on using Vespex, please visit <https://www.merchento.com/vespex.html>



Euthanising live pest animals

Why would we need to euthanise a live animal?

If a control tool fails and the animal is caught but not dead, then that animal needs to be euthanised humanely.

If using live capture traps these need to be checked 12 hours after sunrise and any animals that have been caught must be dealt with. If you are not confident in euthanising live animals humanely then we recommend you either do not use these as a control tools, arrange for the animal to be euthanised by your local vet, or get a contractor to do the control for you.

The standard that must be met:

Euthanising animals must always be done humanely.

The standard that must be met is that any animal must be killed in a way that the animal is:

- a) Rendered insensible (this in effect means it must be unconscious) usually through stunning and
- b) Death immediately follows (heart and brain function being the usual tests)

Remember, all animals are sentient beings, and must always be handled with care and respect , even if being managed as a pest. Best practice pest control aims to minimise the suffering experienced by an animal before death.

Monitoring

Monitoring your target pest animals over time will help you understand if you are making the difference you intend to and can help guide your control work.

Auckland Council has created a detailed community monitoring guide to help you design this aspect of your project. You can find it at <https://knowledgeauckland.org.nz/publications/auckland-community-ecological-monitoring-guide-a-framework-for-selecting-monitoring-methods/>

There are several apps we recommend that you can input your data into – Trap.nz (<https://trap.nz/>) or CatchIT (<https://www.stat.auckland.ac.nz/~fewster/CatchIT/>) being the main two.

Some fundamentals of monitoring are:

- Try and use the same method of monitoring each monitoring round, ideally in the same locations. This will allow you to compare monitoring results over time.
Many things need to be kept constant between monitoring rounds as possible (method, location, time of year, number of nights monitored) so that the main variable is the pest animal numbers.
- Ensure that you monitor a representative proportion of your control area. For example, if your control area is 1/3 wetland, 1/3 bush and 1/3 pasture, place 1/3 of your monitoring tools in each habitat.
- With most monitoring you are measuring relative abundance. This is not all the pests in your control area, but a representative sample
- Try and avoid biases in the placement of your monitoring tools. Do not locate them right next to trap or bait lines, or only along one form of landscape feature.
- The spacing of monitoring tools and lines is important. This is to ensure the tools are placed within the target animals home range, and that lines do not double count animals. Placing of monitoring lines too close to your project edge will not reflect the work inside your project area.
- For possums and rats, areas under 100 hectares are difficult to monitor with accuracy. This is because it is difficult to fit enough monitoring lines in to gain an accurate overall site average relative abundance. For such sites, presence/absence monitors compared over time are best, with less emphasis on fluctuations.
 - Specialist possum monitoring should only be done by a licensed contractor.

Monitoring tools

Rats

Tracking tunnels with inked tracking cards placed in them, left out for three fine nights. Each tracking tunnel line is 450 metres long, with 10 tunnels located every 50 metres along the line. Each line must be a minimum of 200 metres apart. Chew cards can also be used at the same spacing.

Stoats

Tracking tunnels with inked tracking cards placed in them, left out for 3 fine nights. Each tracking tunnel line is 400 metres long, with 5 tunnels located every 100 metres along the line. Each line must be a minimum of 1000 metres apart. For further information on rats and stoat monitoring see <http://www.doc.govt.nz/Documents/science-and-technical/inventory-monitoring/im-toolbox-animal-pests-using-tracking-tunnels-to-monitor-rodents-and-mustelids.pdf>

Possums

Plain wax tags, left out for 3 fine nights. Each monitoring line is 180 metres long, with 10 wax tags placed every 20 metres along the line. For further information on possum monitoring see http://www.npca.org.nz/images/stories/NPCA/PDF/a1_possum%20monitoring_2015-nov_lr.pdf

Rabbits

Night spotlight counts, or systematic survey of sign using the Modified McLean Scale. For further information on rabbit monitoring see <http://www.npca.org.nz/images/stories/NPCA/PDF/a5%20rabbits%202012-11.pdf>

Goats and Deer and Pigs

Use of trail cameras. Survey of sign (droppings, browse, trails, rubbings on trees) at designated monitoring locations. For further information on feral pig monitoring see http://www.npca.org.nz/images/stories/NPCA/PDF/a10_feral%20pigs_2015-nov_lr.pdf

The below are some suggestions of the basic info you should record each time a trap and / or station is checked.

Make sure the data you are recording is appropriate for the system you then put your results into i.e. . Trap.nz, CatchIT or another system.

For relative abundance monitoring, all habitat types need to be covered

Monitoring Matrix – Guide for community groups

Target Pest Species	Monitoring Tool	Lines minimum distances apart	Monitoring device distance along line	x Devices	Duration	Frequency YR
Possum	Plain Wax Monitoring Tags	200m	20m	x 10 wax tags (200m long)	3 fine nights (or 7 if this is practical) <i>*stick to the same nights chosen every time.</i>	2
Rat	Tracking Tunnel with 4-6 cm of peanut butter for the lure.	200m	50m	x 10 tracking tunnels (500 m long)	3 fine nights	4
Stoat	Tracking Tunnel with Eraze Rabbit Paste	1000m	100m	x 5 tracking tunnels (500m long)	3 fine nights	4
Notes:	* trap catch is an acceptable monitoring tool; groups can decide between using trap catch or monitoring tools depending on capacity.					

Bait Take Record

Location				
Person				
Date		Time		
Bait Name				
Safety Issues Identified				

Line	Station ID	Estimate how much bait is still in station? (Blocks)	How much bait did you remove? (Blocks)	How much bait did you put back in? (Whole Blocks)	Other comments e.g. Birds seen/heard, lizards seen, slug/snail damage, bait station condition

Trap Catch Record

Location				
Person				
Date		Time		
Safety Issues Identified				

Line	Trap ID	Has the trap caught anything? (Y/N)	Species caught?	What bait/lure did you use?	Other comments e.g. Nothing caught but lure gone, trap/bait station condition

Community pest control pathway

10 steps to community pest control success

1) Getting Started

Well done! Getting started can be the hardest part of a pest control project. Understanding the steps needed along the way is key to keeping the project on track and make it easier to determine what needs to be done.

2) Background Information

When getting started with any pest animal control project there are a range of considerations to take into account which will shape your pest control project.

- Is there an active volunteer group?
- Is the site on public or private land?
- Identify boundaries and consult neighbours and/or Auckland Council
- Geographical challenges of the site (access, terrain)
- Volunteer labour force available
- What is the main issue?

3) Defining your scope and vision

- What are you trying to protect? (habitat and key species)
- Scope of project and area size
- Pest animal target species

4) Decide on methodology being used (as per above guidelines)

- Are you going to use traps or toxins as your main control tool?
- Target pest animals will determine tools needed and spacing

5) Write your pest control plan (AC template available)

- Identify scope of area
- Target species and home ranges
- Describe methodology being used
- Pest control hardware layout and map
- Hardware needed for set up
- Monitoring methodology and plan

6) How are you going to measure success?

The success (or otherwise) of a project is mainly measured through regular monitoring against the original baseline information

- Go to 'Monitoring' (pg67) for more detail

7) Where to go for assistance?

- Advice (private landowners, Auckland Council's Natural Environment team) or for parks an Auckland Council Park Ranger)
- Funding – Auckland Council has grants and funds that can help support your pest control project
- Further training and upskilling
- Joining a wider volunteer restoration network group

8) Where to get supplies

- Pest control companies
- Auckland Council for parks and reserves

9) Getting set up on the ground

- Identify scope of area
- Target species and home ranges
- Describe methodology being used
- Pest control hardware layout and map
- Hardware needed for set up
- Monitoring methodology and plan

10) Pest control program is live!

- Do you need to recruit more volunteers?
- Is there further training needed?
- Follow the pest control plan to keep the project as effective as possible
- Unsure of actual effectiveness ask for further advice
- Review the programme after the first season

Appendices

Appendix 1: Glossary

Glossary

Word	Meaning
First Generation toxin	One of the first group of vertebrate toxins developed – multiple feeds required over several consecutive nights to be effective
Second Generation toxin	One of the second group of toxins developed, and generally of higher toxicity – only one feed is required by the target animal to be effective
Browsing	Grazing by pest herbivores e.g. goats or deer

Appendix 2: Wasp Identification

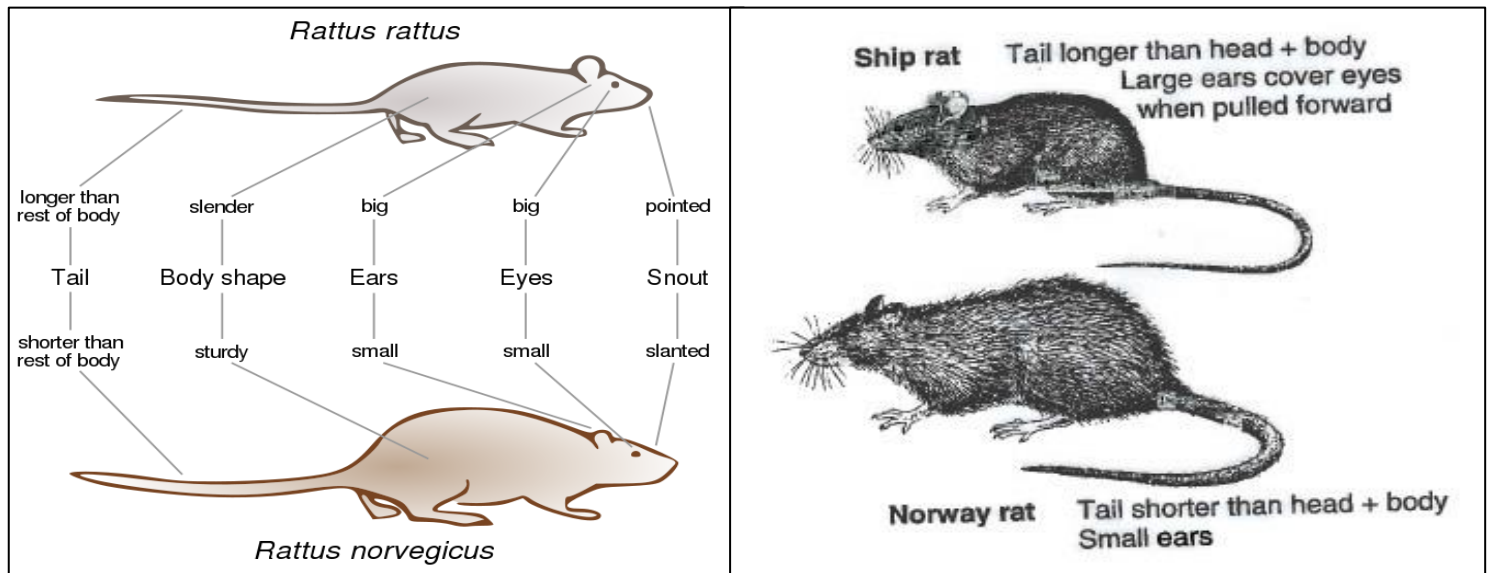


Left - Common wasp (*Vespula vulgaris*) with a black mark behind the eye.

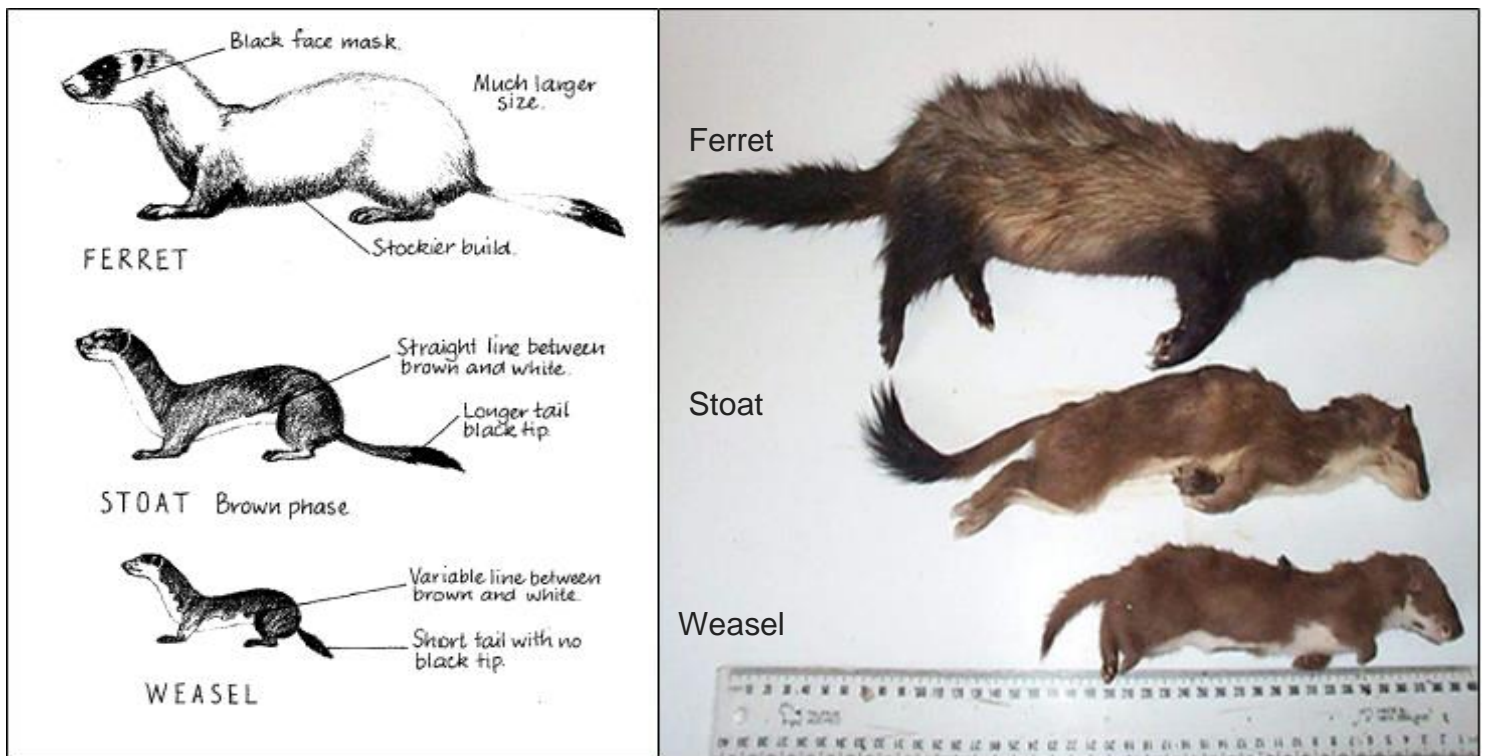
Source: Landcare Research © [CC-BY 4.0](#) licence

Right - (*Vespula germanica*) German wasp with a complete yellow band behind the eye.

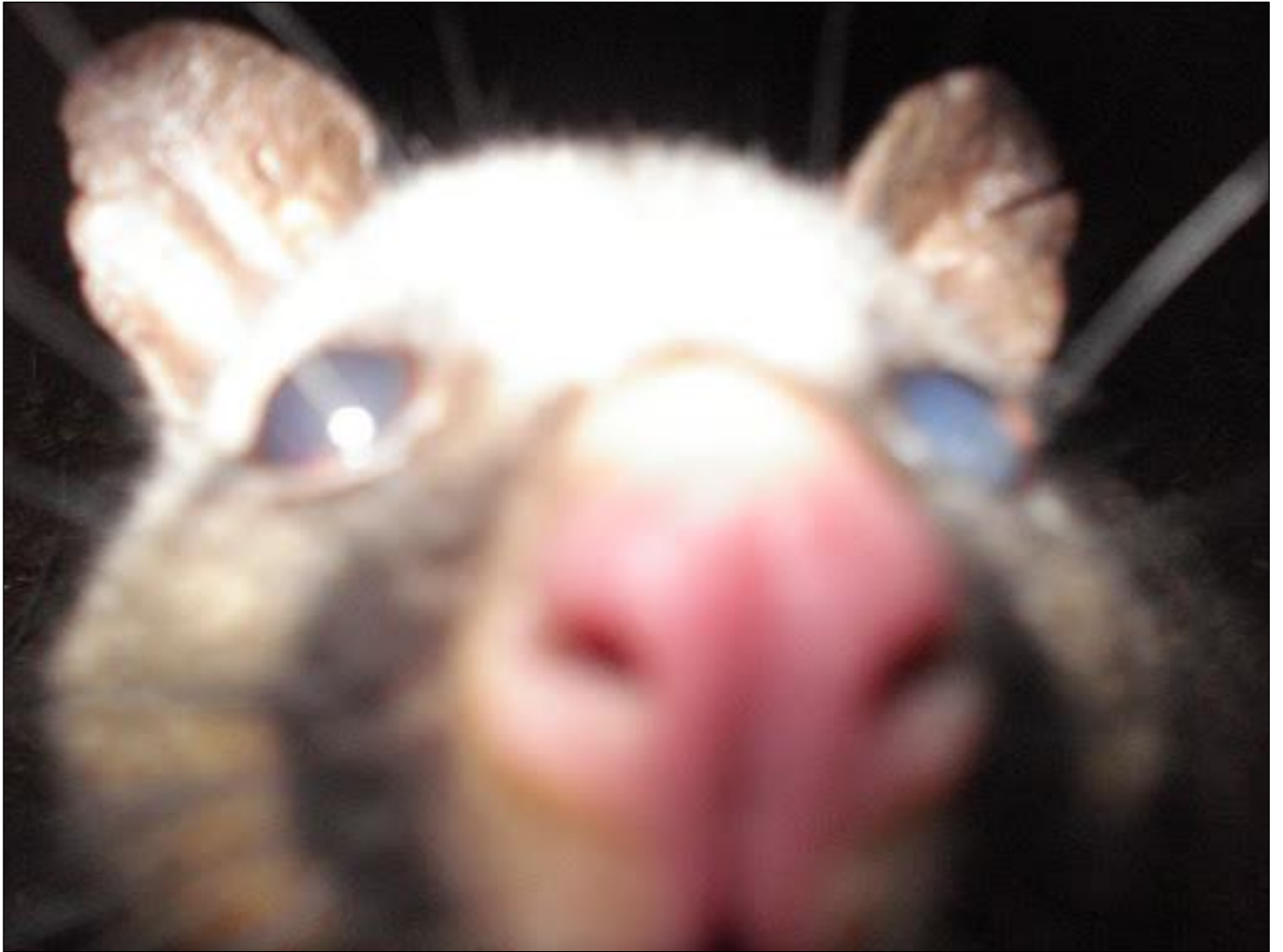
Appendix 3: Rat Identification



Appendix 4: Mustelid Identification



Toxin recommendations for community pest control										
Toxin	Target Animal	Advantages	Disadvantages	Local Parks & Reserves Community Groups	Private Property	Pulsing	Secondary poisoning	Recommended Bait Form	Methods approved without CSL	Antidote
Diphacinone	Rat	Generally effective at controlling rats to keep numbers low. Option for urban environments where residues or non-target effects may be a factor when using higher potency second generation anti-coagulants.	Multifeed. Cannot effectively deal with sudden population surges. Not a knockdown tool. Overtime needs to be rotated with other toxins to avoid populations becoming bait shy or building up resistance. Larger amounts of toxin need to be consumed to obtain a lethal dose. May not be suitable for mice due to low toxicity	Rats: Suitable for parks and reserves. Use in bait block form (DITRAC) lockable bait boxes. Pulse.	Rodents: Private property can use in pellet form in bait stations. Pulse.	Pulsed 4 times a year (August, November, January and April). In this pulse you fill the bait station on; day 1, day 3 & day 5. Then refill day 14. If less than half the bait from the previous fill is present on the day 14 fill, consider filling again on day 17. Remove bait end of week 4 and dispose of it correctly, degraded bait can make animals bait shy as it is not as effective. The reason for the topping up is as multi feed poison it is very important that it is supplied for 5 nights for the rat to be able to consume a lethal dose.	Low Risk	Block, Cereal Pellet, striker	Bait Stations	Vitamin K1
Pindone	Rabbits, Rats, Possums	Generally effective at controlling rats to keep numbers low. Option for urban environments where residues or non-target effects may be a factor when using higher potency second generation anti-coagulants.	Multifeed. Cannot effectively deal with sudden population surges. Not a knockdown tool. Overtime needs to be rotated with other toxins to avoid populations becoming bait shy or resistant. Larger amounts of toxin need to be consumed to obtain a lethal dose. May not be suitable for mice due to low toxicity. Possums need 1-2kg and it can take up to 2-3 weeks to achieve control, so needs to be pulsed to ensure toxin is not being eaten by effectively dead possums.	Rats: suitable for parks and reserves. Use in bait block form lockable bait boxes. Pulse. Rabbits: Can be used in pellet form for rabbit control by contractor. Possums: In bait stations, pulse.	Possums: suitable for private property, can use in pellet form in bait stations. Needs to be pulsed. Rabbits: Needs to be in bait stations (turf spits require Controlled Substance Licence).	Rats: Pulsed 4 times a year (August, November, January and April). In this pulse you fill the bait station on; day 1, day 3 & day 5. Then refill day 14. If less than half the bait from the previous fill is present on the day 14 fill, consider filling again on day 17. Remove bait end of week 4 and dispose of it correctly, degraded bait can make animals bait shy as it is not as effective. The reason for the topping up is as multi feed poison it is very important that it is supplied for 5 nights for the rat to be able to consume a lethal dose. Possums: used in baiting regime with first pulse being brodifacoum & remaining 3 pindone.	Low Risk	Cereal Pellet	Bait Stations,	Vitamin K2
Bromadilone	Mouse, Rats	Single feed. Very effective for knockdowns, has a higher chance of a lethal dose being consumed in one feeding. Effective in controlling rats to low numbers.	Bioaccumulates in the tissues of poisoned animals and slowly breaks down in soil.	Rats/ Mice: suitable for parks and reserves, use in bait bock form (Contrac) inside lockable bait boxes. Pulse	suitable, needs to be pulsed.	Pulsed 4 times a year (August, November, January and April). In this pulse you fill the bait station; Day 1, refill Day 5, & Day 14. Remove bait end of week 4. When ending the pulse make sure you remove all bait in stations and dispose of it correctly, degraded bait can make animals bait shy as it is not as effective.	Medium - High risk	Block	Bait Stations	Vitamin K3
Brodifacoum	Possums, Rats, Mice	Effective as a knockdown tool.	It is slow to break down in the environment and it bioaccumulates in tissues for prolonged periods in living animals. Risk of secondary poisoning is high.	Rats/mice: Only as a knockdown tool during high numbers as first pulse. Move to another toxin (Pindone/ Diphacinone) for next 3 pulses so environmental persistence is minimised. Caution in urban area. Possums: Cannot be used stations are not lockable.	Possums: suitable for private property, can use in pellet form in bait stations. Needs to be pulsed. Keep stations elevated if risk to pets/ children. Livestock need to be excluded from area. Minimum height of bait stations 300mm off ground, or 1.8m off ground to minimise effect on non - target animals.	Pulsed 4 times a year (August, November, January and April). In this pulse you fill the bait station; Day 1, refill Day 5, & Day 14. Remove bait end of week 4. When ending the pulse make sure you remove all bait in stations and dispose of it correctly, degraded bait can make animals bait shy as it is not as effective	High Risk	Block, Cereal bait	Bait Stations	Vitamin K1
Cholecalciferol	Possums, Rats (not stoats)	Will reduce populations of possums and rats but not stoats as it does not bioaccumulate in animals. It breaks down readily in the environment, the risk of secondary poisoning is considered to be low. Lower toxicity to birds than mammals reduces primary poisoning risks to birds.	No Antidote. Less effective than other toxins.	not for use	Yes	Ask Biosecurity for more information	Low Risk/ but risk to dogs	Cereal pellet & striker	Bait Stations, Bait Bags	no
Sodium Nitrate	Pig	It does not leave residues in the environment. Minimal secondary poisoning risk.	CSL required, pre-feeding required, specifically designed bait stations.	Not for use	Yes, large properties	Ask Biosecurity for more information	Low Risk	Liquid, in bait balls		Supplemented oxygen and methylene blue
Cyanide	Possum, Wallaby	Kills quickly & humanely. Cyanide breaks down quickly and does not leave residues in the environment.	Effectiveness varies due to bait shyness. Requires CSL and approval from local medical officer of health (MOH)	Not for use	Controlled Substance Licence required & MOH approval	Ask Biosecurity for more information	Low Risk	Encapsulated pellet,		Amyl nitrite capsules. Hydroxocobalamin and kelocyanor





Find out more: **phone 09 301 0101**
or visit **aucklandcouncil.govt.nz**