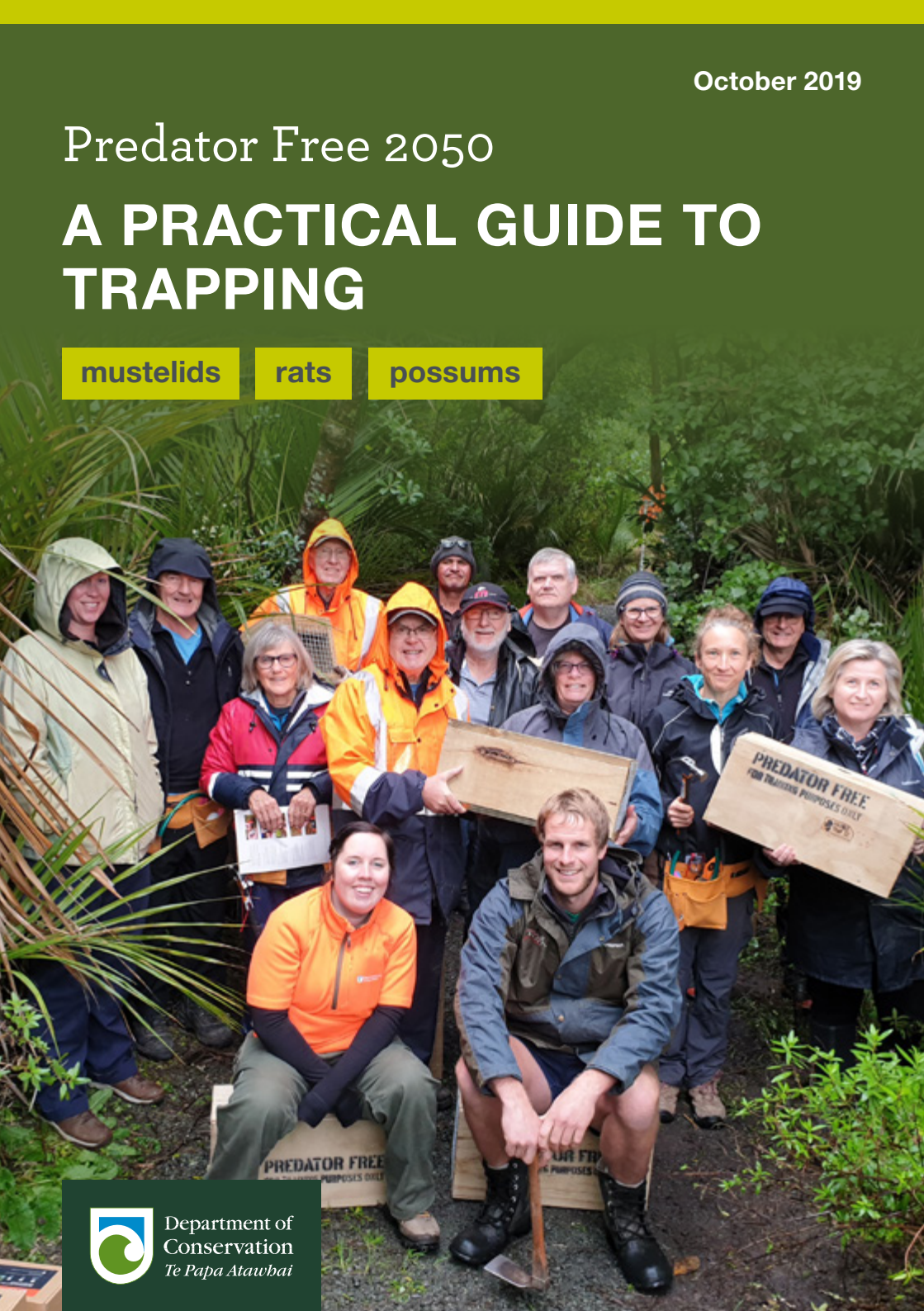
October 2019

Predator Free 2050

# A PRACTICAL GUIDE TO TRAPPING

mustelids | rats | possums




Department of Conservation
*Te Papa Atawhai*

Aotearoa New Zealand's unique and ancient native species of plants and animals will be safe from extinction and flourishing once more, if our lands are predator free.

Predator Free 2050 (PF2050) is a co-ordinated nationwide goal to eradicate mustelids (stoats, ferrets and weasels), rats and possums from mainland New Zealand by 2050.

Predator Free 2050 builds on the achievements of hundreds of scientists, ecologists, iwi and community conservationists and is inspiring thousands more to join the movement. It offers the unifying vision of an endgame, and an action plan to win it. That culture of care and responsibility to nurture the welfare of the land and, by extension the people, is called kaitiakitanga.

Whakahokia mai ngā reo karanga o te ngangara, o te mokomoko, o te pekapeka, o te manu ki te ngāhere, ara ki te wao nui a Tānemāhuta, pamu, me nga tāone.

Return the voices of the insects, reptiles, bats and birds back to the forests, farmland, towns and cities.

Tomtit
*Image: Shellie Evans*

Cover image:
Participants Auckland trapping workshop. *Image: DOC*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# 1. Foreword

'A practical guide to trapping' was developed by the Department of Conservation (DOC) to support your valuable hard work in protecting Aotearoa New Zealand's unique and highly vulnerable native taonga species.

Your predator control work is an extremely important contribution toward the country's vision of a flourishing natural heritage arising from a Predator Free New Zealand – thank you!

This concise guide gives you access to DOC's best practice trapping techniques for mustelids (stoats, ferrets and weasels), rats and possums, including technical advice on a range of trapping subjects, in an easy-to-use booklet.

The guide includes all the information you will need to start your own trapping programme, no matter how big or small. You will learn to identify your target predator, how its natural behaviour is likely to affect your trapping, what traps and bait to use and where and how to place your trap network.

The guide also covers the importance of pre- and post-trapping monitoring – how to monitor your wildlife and vegetation (outcomes) and the number of predators remaining after trapping (results) – and the art of calibrating and maintaining the DOC series traps.

For any further information on trapping or the contents of this guide please contact your local DOC Office or visit the Predator Free 2050 online toolkit www.doc.govt.nz/predator-free-2050

Happy trapping!

From PF2050 Communities Team, Department of Conservation





# 2. Our vulnerable native taonga – wildlife

**Before the arrival of** humans, the only native land mammals in New Zealand were three species of bats; New Zealand was primarily a land of birds, small lizards and invertebrates. Our native species evolved without mammalian predators, making them especially vulnerable when these animals arrived.

Due to our country's unique natural history, our extinction rates are among the highest in the world. This is largely due to the impact of introduced predators, invasive species and loss of habitat.

Our native wildlife need three things – safety from predators, suitable habitat and enough genetic diversity for long-term resilience. Of these, the first – safety from predators – needs addressing most urgently.

These guidelines focus on trapping mustelids (stoats, weasels and ferrets), rats and possums – the most voracious predators of New Zealand's wildlife.

Female kea feeding its chick in Fiordland. *Image: James Reardon* ©

# 3. Staying safe

**If you're a volunteer, you must take reasonable care of your own safety and take care not to do anything which could harm another person – www.worksafe.govt.nz**

Volunteer trappers. *Image: New Plymouth Boys High School*

Most community groups will have a health and safety plan in place. You should be familiar with this plan and refer to it often. A safety talk at the start of volunteer activities will ensure the correct personal protective equipment is being used, identify any new risks on the day and inform any changes that need to be considered to reduce those risks prior to undertaking the work. For example, the risks of disease from handling carcasses and injury from traps are unique to trapping and should be addressed in your health and safety plan.

For further information on your responsibilities as a volunteer, search for 'volunteer' on the WorkSafe New Zealand website www.worksafe.govt.nz

Working in the outdoors, and in different environments, presents a range of hazards and conditions that will require a comprehensive health and safety plan. Changing weather conditions, difficult terrain, working close to coastlines and waterways will present new challenges for many volunteers. Risk assessment and risk management strategies (including training) need to be applied to all potential hazards.

In your role as a volunteer trapper you will be required to recognise these hazards and manage the risks they present.

Safety meeting. *Image: Kaitake Ranges Conservation Trust*





# 4. Know your target predator

## Mustelids – stoat (*Mustela erminea*), ferret (*Mustela furo*) and weasel (*Mustela nivalis*)

Weasel (back), stoat (middle) ferret (front). *Image: Alaine Holdom DOC*

Mustelids (Mustelidae) are a diverse group of small to medium-sized carnivores. In the 1880s three species were introduced into New Zealand to control the burgeoning rabbit population – stoat, ferret and weasel. All have a characteristic long body, short legs and sharp, pointed faces.

All three mustelid species are established in the North and South Islands and stoats have also reached some of the nearer offshore islands unassisted. All three species are absent from Great Barrier Island (Aotea), Stewart Island/Rakiura and the Chatham Islands.

**Table 1. Mustelid fact comparisons[1]**

| | Stoat | Ferret | Weasel |
|---|---|---|---|
| Average male weight | 324 g | 1200 g | 126 g |
| Average female weight | 207 g | 600 g | 57 g |
| Average life span | < 1 year (max 3–8) | < 1 year (max 5–10) | < 1 year (max 2–3) |
| Breeding season | September to November | Usually September to October but can last longer | September to March |
| Usual number of litters per year | 1 | 1 (max 2) | 1–2 (max 3) |
| Usual litter size | 8–10 (max 20) | 4–8 (max 12) | 3–6 (max 11) |
| Juvenile dispersal | Most often December to January but sometimes can start in November | February to March | January to March |
| Known dispersal distances | Up to 65 km | Up to 45 km | None published |
| Average home ranges (min–max) | Males 147 ha (16–313) Females 79 ha (9–127) | Males 200 ha (80–760) Females 122 ha (45–230) | Males 1–192 ha Females < 1–29 ha (Not averages, but min–max from overseas studies) |

[1] Details in this table and elsewhere in this section on mustelids were obtained from 'Pest mustelids: monitoring and control' (National Pest Control Agencies 2018, available from www.bionet.nz/library) and 'The handbook of New Zealand mammals' (King, C.M. (Ed.) 2005, Oxford University Press).





# Stoats (*Mustela erminea*)

Stoat. *Image: Tim Sjoberg (DOC)*

Stoats are ferocious predators and the number one killer of many of New Zealand's endangered native species.

## Identification

- Stoats have long, thin bodies and sleek, pointed heads.
- They are smaller than ferrets. Male stoats grow up to 30 cm long and females up to 25 cm.
- Their ears are short and rounded.
- Their face, upper body and legs are brown while their chin and lower body are creamy-white. Some stoats may be white or pied in winter, particularly at high elevation in the South Island.
- Their tails are relatively long and have bushy, black tips.

## Habitat

- Stoats will live in any habitat where they can find prey. They can be found in rural communities where they will prey on domestic fowl, along coastal areas and beaches, in remote high country and at any altitude up to and beyond the treeline, in any kind of forest.
- Stoats are more common than ferrets and weasels in forest habitats.
- Stoats do not make their own dens but take over those of other animals. Den sites are well hidden and include holes and cavities in tree trunks and amongst roots, rabbit burrows, ditches and piles of logs.
- Stoats can tolerate extremely wet weather (e.g. > 6000 mm rain p.a. in Westland and Fiordland) and moderately dry conditions (e.g. < 500 mm rain p.a. in parts of Otago and Canterbury).

## Behaviour

- Stoats are agile climbers, semi-arboreal (can live in trees) and hunt at any time, day or night.
- Adult stoats live in separate home ranges for most of the year. These often overlap, particularly between sexes. The size, length of tenure and pattern of use of home ranges depend largely on the distribution of prey.

- Female stoats move about less during the breeding season (from September to November) and those with small young are likely to stay close to dens unless moving to new den sites.
- Breeding females and any juvenile females in dens will be impregnated by adult males. Female juveniles are usually pregnant before they become independent. Average annual litter size is 8–10 (max 20).
- Females caught between November and August inclusive are almost always (>99%) in the pre-implantation phase of pregnancy. This means they carry anywhere up to 8–10 fertilised eggs ready for implantation in the uterus.
- Stoats communicate through scent marking, which is thought to convey information on social and reproductive status and, possibly, individual identity, allowing subordinate animals to avoid conflict with larger individuals.
- Stoats are prolific breeders. Young males mature when they are 10 months old. Males search for females actively during the breeding season but do not establish even temporary bonds with them and take no part in rearing the young.
- Stoats can reach islands by swimming across water gaps of up to 1.5 km and possibly further. A stoat may be able to reach land at a greater distance than it can swim by 'rafting' on floating material (such as driftwood logs).

## Threat

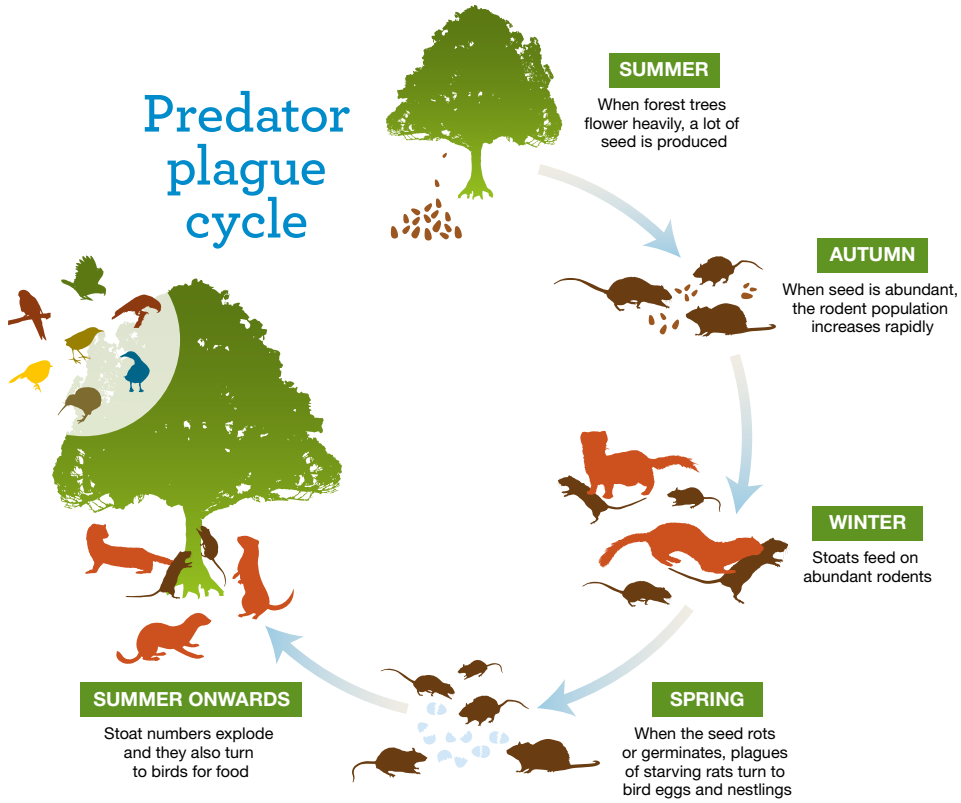
- The serious effect of stoat predation on the survival of many of New Zealand's bird species cannot be overestimated. They are voracious and relentless hunters.
- Stoats are by far the most serious threat to kiwi survival. In areas where they are not controlled, stoats can kill up to 95% of North Island brown kiwi chicks hatched annually before they are able to reach a stoat-proof weight of > 1000 g.
- They have a significant effect on coastal bird species such as wrybills, New Zealand dotterels and black-fronted terns. Forest birds that nest in holes in tree trunks (such as mohua, kākā and kākāriki) are particularly vulnerable to stoats, which can destroy eggs, chicks and incubating adults in one attack.
- Stoats are implicated in the extinction of a South Island subspecies of bush wren, the laughing owl and New Zealand thrush.
- Stoats, rats and mice form a complex predator-prey relationship in association with beech tree seed production. In periodic 'mast events' – when high levels of beech seed are produced – rat numbers explode. As their main prey becomes more abundant, stoat numbers also increase. Later, when the seed supplies run out and rat numbers drop, the hungry stoats turn their attention to birds, insects, bats and landsnails.

Northland brown kiwi. *Image: Tui De Roy / DOC*





## Predator plague cycle




Predator plague cycle diagram: DOC

# Ferrets (*Mustela furo*)

Ferret. *Image: Michelle Bridge (DOC)*

Although rabbits are the main diet of ferrets, this mustelid will attack, kill and eat native species.

## Identification

- Ferrets are the largest of the mustelid species in Aotearoa New Zealand. Male ferrets grow up to 44 cm long and females up to 37 cm.
- Ferrets have creamy-yellow undercoats and longer dark guard hairs which give them an overall dark appearance.
- Legs and tail appear darker than the rest of the body.
- Face is lighter in colour than the body, with a dark mask around the eyes and across the nose.

## Habitat

- Ferrets are not as widespread as stoats.
- It was originally thought that ferrets were limited to open country like pasture, scrubland and coastal areas, and on the fringes of forests; however, recent research has found them within some Northland forests, where their presence would add to the pressure on already threatened kiwi populations.
- Ferrets are generally absent or in low numbers in places where rainfall is high, where there are few rabbits, or deep within forested areas.





- In the 1980s, at least 17 ferret farms were established in Northland. When these closed due to a downturn in the market, many ferrets escaped or were set free, which likely contributed to the northward expansion of ferrets into some of New Zealand's remaining prime kiwi habitat.

## Behaviour

- Ferrets are mainly nocturnal. Unlike stoats and weasels, ferrets are not good climbers.
- Individual ferrets will usually exclude others of the same sex from their central home range. They use their scent glands extensively to leave territorial scent markers.
- Ferrets usually mate in September. The litter, usually of 4–8 (up to 12), is born in October or November, with young becoming independent by late January. Females can have a second litter after this if food is abundant. There is high mortality in the first year, and an average lifespan in the wild may be 4–5 years.
- Ferrets will often revisit the site of a kill.
- The main food of ferrets is rabbits and hares. Densities of ferrets seem to be strongly correlated with density of rabbits. A sudden reduction in rabbit numbers results in hungry ferrets attacking other animals (such as threatened native species).

## Threat

- Ferrets are a significant pest of both conservation and economic importance in New Zealand. They prey on indigenous wildlife and also carry bovine tuberculosis (Tb).
- Kiwi are particularly at risk when ferrets occur in their forest habitat. In some North Island brown kiwi populations ferrets have caused sudden population decline by killing large numbers of the resident adult birds.
- Ferrets are known to prey on royal albatross chicks, yellow-eyed penguins and little blue penguins, weka, North Island brown kiwi and numerous freshwater wetland birds (e.g. ducks).
- They are considered to be one of the major causes of decline of the white-flippered penguin, and along with cats have contributed significantly to a decline in the distribution of grand and Otago skink populations.

# Weasels (*Mustela nivalis*)

Weasel with egg. *Image: DOC*

Weasels are found in low numbers in most habitats in New Zealand. They pose a significant threat to native wildlife.

## Identification

- Weasels are the smallest and least common mustelid in New Zealand. Males grow to about 20 cm long.
- Weasel are brown on their upper bodies and white below, similar to stoats.
- Their tails are short, brown and tapering.
- To identify a weasel from a stoat, a weasel does not have a bushy black tip at the end of the tail and a stoat does.



## Habitat

- Weasels are found in low numbers in most habitat types in the North and South Islands but are not present on Stewart Island or on offshore islands.
- In New Zealand, weasels are less common than stoats and ferrets and may be displaced by stoats.
- Weasels have been observed in forests, tussock grasslands, and farmland. They are more common in rough grassland than stoats, possibly because of the abundance of mice, their preferred prey, in grassland.





## Behaviour

- Weasels can be active during the day and the night.
- Their breeding season is from September through to March and a female can have up to three litters during that time. Litter sizes average 4.5 kits.
- When food is abundant, female weasels can breed in their birth year.
- While mice are their preferred food, weasels are also known to eat birds, mice, geckos, skinks and invertebrates (including wētā).

## Threat

- Weasels, being smaller, less common, more patchily distributed and present at much lower densities than the other mustelids in New Zealand are thought to pose a less significant conservation risk. However, they are known to have adverse impacts on lizard, invertebrate and bird populations.
- In particular, weasels may damage small and localised populations of endangered species such as Whitaker's skink (*Cyclodina whitakeri*). On the mainland, predation pressure and loss of habitat has reduced Whitaker's skink to a single remnant population that remains under constant threat from weasels, rats and mice.
- While weasels are not able to tackle the larger bird species (e.g. adult takahē and kiwi) that are preyed upon by stoats and ferrets, they will tackle prey much larger than themselves, so many nesting birds are easy targets.

Three weasels on the boardwalk at Pauatahunui Inlet, Porirua. *Image: Brent Higham*

# Rats – ship rat (*Rattus rattus*), Norway rat (*Rattus norvegicus*) and kiore (*Rattus exulans*)

Three species of rats have been introduced to New Zealand: ship rat (sometimes referred to as black rat or roof rat), Norway rat (often called brown rat, water rat or sewer rat) and kiore (also referred to as Pacific rat, Māori rat or native rat, even though they are not native to New Zealand). It is thought that kiore arrived with the first Polynesian settlers, about 1250–1300. Ship rats and Norway rats arrived with the first Europeans and spread quickly.

## Home range

- Noway rat: 0.8–21 ha
- Ship rat: 0.3–11.4 ha
- Kiore: Data unknown

## Identification

Comparison of *Rattus*. *Image: C Mahoney*

The three colour morphs of ship rat found in New Zealand. *Image: John Innes, Landcare Research*

Two ship rats preying on a thrush nest. *Image: David Mudge*

**Table 2. Identification of New Zealand rats[1]**

| | Ship rat *Rattus rattus* | Norway rat *Rattus norvegicus* | Kiore *Rattus exulans* |
|---|---|---|---|
| Normal adult weight | Up to 215 g | Up to 450 g | Up to 187 g |
| Max. body length (HBL) | 230 mm | 275 mm | 185 mm[2] |
| Tail length | Much longer than HBL. Uniformly coloured. | Clearly shorter than HBL. Thick with pale underside. | Slightly shorter or longer than HBL. Thin and uniformly dark. |
| Ears | 19.0–26.0 mm, cover eyes when pulled forward. Fine hairs do not extend beyond edge of ear. | 14.0–22.0 mm, do not cover eyes when pulled forward. Obvious hairs extend beyond edge of ear. | 15.5–20.5 mm, cover eyes when pulled forward. Fine hairs do not extend beyond edge of ear. |
| Adult hind foot | 28.0–38.0 mm | 30.0–41.5 mm | 24.5–31.0 mm |
| Colour of upper side of hind foot | Uniform colouring over whole foot, usually dark. | Always completely pale. | Outer edge dark near ankle, rest of foot and toes pale. |
| Fur on back | Brown or black[3] | Brown | Brown |
| Fur on belly | Uniform monotone of grey, white or creamy-white | White-tipped grey giving irregular colour. | White-tipped grey giving irregular colour. |
| Length of droppings | 6.8–13.8 mm | 13.4–19.1 mm | 6.4–9.0 mm |
| Number of nipples | 10–12, usually 10 | 12 | 8 |
| Habits | Very agile and frequent climber; rarely burrows; nests mainly in trees and shrubs; infrequent swimmer. | Burrows extensively; climbs much less frequently than other rats; nests underground; very wary; strong swimmer. | Agile climber; digs small holes; nests on ground; or in trees; feeds on ground and in trees; infrequent swimmer. |

[1] Table is from 'Guide to the identification and collection of New Zealand rodents' www.doc.govt.nz/documents/science-and-technical/rodent-identification.pdf

[2] The normal maximum weight and head-body length are given for each species. However, larger kiore may occasionally be encountered.

[3] There are three colour forms or morphs (not subspecies) of *Rattus rattus*:
(a) 'rattus' – uniformly black back (sometimes has a blueish look); uniformly grey belly.
(b) 'alexandrinus' – brown back with long black guard hairs; uniformly grey belly.
(c) 'frugivorous' – brown back with long black guard hairs; uniformly white or creamy-white belly.

## Habitat

- Ship rats are found in most habitats and are now the most abundant and widespread rats on mainland New Zealand. They are good climbers and are therefore the rats most commonly found in forests.
- Norway rats are more typically associated with human activity and are usually found in urban areas, wet habitats and on some offshore islands.
- Kiore were once found all around New Zealand and on many offshore islands. On the mainland they are confined to parts of Fiordland, Southland, and South Westland. They have some cultural significance because of their association with the migration of Polynesians throughout the Pacific, and their value to Māori.

## Behaviour

- Rats have a built-in defence mechanism which makes them wary of new things in their environment. Therefore, new traps, bait stations or tracking tunnels need to be installed a minimum of 3 weeks before you need to use them.
- Rats have a high rate of population increase. Annually they can have several litters and produce 11–16 pups.
- This means control projects must either control continuously or time their efforts carefully to provide protection to native species at vulnerable times (e.g. for birds during their breeding season).
- Rat food preferences are often passed on socially. This means rats 'teach' others about food sources and this can include their preferences towards poison and baits.

## Threat

- Rats have a major impact in New Zealand because they are omnivores – eating birds, seeds, snails, lizards, fruit, insects, eggs, chicks, larvae and flowers. The varied diet of rats also makes them competitors with native wildlife for food sources.
- Ship rats are widespread in lowland podocarp-broadleaf forests. Because they are good climbers, they can access bird nests high in trees.
- On offshore islands, Norway rats are large enough to kill burrow-nesting adult seabirds and eat their eggs and chicks.

**TOP**
Ship rat eating a land snail.
*Image: Nga Manu Images ©*

**BELOW**
A ship rat attacks a fantail/pīwakawaka at its nest.
*Image: David Mudge, DOC*





# Brushtail possum (*Trichosurus vulpecula*)

The brushtail possum was first introduced to New Zealand from Australia in 1837 to establish a fur trade. This release was unsuccessful and a second release 20 years later at the same Southland location was required before they were able to establish.

Brushtail possum. *Image: Alan Cressler*

## Home range

- **Male** 0.7–3.4 ha
- **Female** 0.6–2.7 ha

## Identification

- Cat-sized marsupials with thick, bushy tails and body fur, pointed snouts, large, fox-like tapering ears and brown eyes.
- Possums in New Zealand have two main colour forms – grey and black, with many variations in appearance.
- Possums have three basic gaits – walking (along horizontal and gently-inclined surfaces), half bounds (jumping from branch to branch or up steeply inclined surfaces or through long grass) and bounds (on vertical surfaces such as tree trunks).
- Their tails are capable of grasping (prehensile) and help maintain grip until all their feet have shifted from one branch to the next.
- The size and weight of possums varies greatly across New Zealand. Adult possums are 65–95 cm long and weigh between 1.4 and 6.4 kg.
- Possums are arboreal (live in trees) and have flexible 'hands' with five independent digits used for clasping branches and holding leaves and other food when eating. Their 'feet' are similar except that the 2nd and 3rd digits are joined for most of their length and the first toe ('thumb') is enlarged and has no claw.

## Habitat

Possums are nocturnal and can live anywhere where there is shelter and a varied food supply. They are now widespread across most of New Zealand. Their preferred habitat is forest, and possum densities can be particularly high in podocarp-broadleaf forests. The margins where forest meets pasture can also support very dense populations.

Possum scavenges an egg at a kererū nest.
*Image: Nga Manu images ©*

## Behaviour

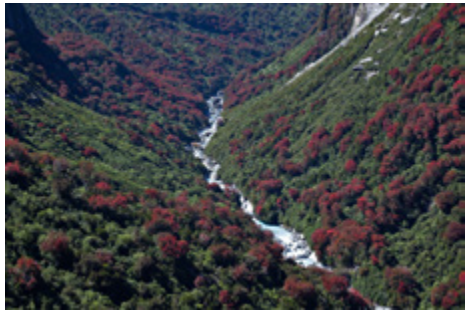
- Possums, while mainly herbivorous (feeding on leaves but also eating buds, flowers, fruit/berries and nectar) are opportunistic omnivores, readily eating most food they come across in their environment, including eggs, chicks and invertebrates.
- They are nocturnal and usually venture out of their dens to feed just after sunset. They spend most of their time in trees and approx. 10–15% of their time on the ground.
- Possums communicate primarily by smell – scent-marking tree trunks with oil from special glands along with urine and droppings. They also make a range of sounds, including screeches, grunts, growls, hisses and chatters.
- They live in dens, preferably in tree branches or trunks, but also in ceiling cavities of buildings. Individual possums may have several dens and change dens several times per night. However, the dens are not exclusive, with more than one possum using them, but generally not at the same time.
- Juvenile females will establish territories close to their mother's, but juvenile males shift further away. Male possums prospecting new territories are often caught in traps.
- Larger, heavier possums are more dominant, and females will dominate similar-sized males
- The main breeding season is autumn but, in some locations, a second breeding season occurs in spring. Usually only one 'joey' is born at a time, though twins do occur occasionally. Young possums become independent at 6–9 months old.





## Threat

- Possums have a significant impact on many of New Zealand's natural ecosystems. They occur in high numbers and their predators, mostly feral cats, do not have much effect on controlling the size of the population.
- While leaves are the main part of their diet, possums will frequently eat other parts of trees or plants (including the buds, shoots, flowers and fruit), which can lead to significant adverse effects on the life cycles of targeted trees and plants. Possums often have 'favourites' (such as mistletoe, rātā, tree fuschia or kāmahi trees), leading to an even greater impact on these species. They also compete with native birds and reptiles for food sources such as nectar.
- In 1993, possums were filmed eating the eggs and chicks of kōkako and this evidence changed many people's views of the threat they posed to wildlife. They eat invertebrates, including wētā, and are significant predators of New Zealand land snails (such as *Powelliphanta* spp.). They often occupy holes in tree trunks for their dens which would otherwise be used by nesting birds such as kākāriki and saddlebacks.
- Dairy and deer farmers have the added worry of possums spreading bovine tuberculosis (Tb). The value of economic losses in primary production associated with damage from and control of possums is in the tens of millions of dollars.



Healthy rātā, Upper Copland. *Image: Andris Apse*

Possum browse on northern rātā and rimu, Castle Rock, Coromandel, March 2000. *Image: DOC*

# 5. Monitoring before trapping

## Monitoring needs will vary depending on your site.

The following section describes DOC Best Practice monitoring techniques that may not be practical for all sites. Monitoring is highly recommended for larger trap networks to inform changes over time and to assist with funding applications. For small sites and backyard trapping monitoring is not essential, but 5-minute bird counts and homemade tracking tunnels/chew cards can be a fun activity for families.

Trapping is not just about how many animals you catch in traps. It is important to understand the outcomes you are trying to achieve before you commence a new trapping programme. This means monitoring what is present before you start as well as what happens after.

### Why monitor?

Monitoring assesses changes over time in ecological aspects of the area you are trapping and is essential for determining how your trapping efforts are contributing to improvements in the area's ecology.

Kererū can be a good indicator species to monitor.
*Image: Shellie Evans ©*

Examples of what should be monitored include numbers of pests, numbers and species of birds present and vegetation growth at your site. Monitoring should be a key component for anyone undertaking trapping as part of an ecological restoration project.

**You need to monitor native species to:**

- Determine what type of traps you will need.
- Identify which native species are present and in what numbers.
- Define and track progress toward the desired outcomes for your project.
- Compare the health of your site with that of others around New Zealand.
- Evaluate success and know when you have reached certain targets.
- Build a sense of achievement.

**You need to monitor mammalian predators to:**

- Determine which predators are present and in what numbers.
- Identify pest invasions.
- Modify how you work (e.g. increasing or decreasing trap numbers and/or checking frequency because your monitoring results are demonstrating certain trends).





## What is the difference between monitoring outcomes and monitoring results?

### Monitoring outcomes

Monitoring the native species you are trying to protect is known as monitoring outcomes. These are the outcomes you hope to achieve by delivering predator control at your site. You will start by monitoring what species you have at your site and measuring the numbers that are present before you start your predator control. This is your baseline measurement that will show if your predator control is working. An increase in native species at your site after predator control can be instrumental in ensuring successful funding applications and for promoting your group.

Now you have finished your initial monitoring and established what wildlife you need to protect at your site you can work on an outcome statement. This will help you decide what predators you need to target to achieve your desired outcomes.

Examples of outcome statements could be:
1. Increased kiwi chick survival rates.
2. Regeneration of the forest canopy.

We know the biggest threat to kiwi chick survival is stoat predation so for outcome statement 1 you will be setting up best practice predator control for stoats.

If our aim in outcome statement 2 is regenerating forest canopy then you would target possums and initiate best practice trapping for possum control.

Indicator species are species that are sensitive to predators or browsing threat and are representative of the other organisms in the ecosystem, easily observable and able to be sampled. They make a great choice for monitoring outcomes because if they are doing well then the less-sensitive species are likely to be improving in numbers as well. Examples of indicator species include kererū, tree wētā, bellbirds and tree fuchsia.

Whatever species you decide to monitor, there will be a monitoring method available. You may need to discuss what you should be monitoring, and how, with an appropriate expert. Five-minute bird counts are a commonly used method for monitoring bird numbers. They are an easy way to find out which native birds are present and to monitor them over time.

Foliar Browse Index can be used to assess the condition of plants. This technique looks at the impacts of possums on forest health, using indicator species, e.g. tree fuchsia. Other methods are available for lizards, invertebrates, bats, etc.

Whatever monitoring technique you select it must be applied consistently so that the data collected is accurate and the studies can be replicated over time. It is advised that you complete training in these monitoring techniques to ensure your results are accurate. For more information on appropriate courses, visit www.doc.govt.nz or www.nmit.ac.nz

## Monitoring results

Monitoring results refers to the monitoring of predator/pest numbers on your site. You will measure the number of predators by monitoring them before you start and on a regular basis once your predator control is underway. This allows you to see if your predator control is working.

The most common methods of monitoring are tracking tunnels for stoats and rats and chew cards or wax tags for possums (and sometimes rats).

If you only want pest/predator data at critical times, you could monitor during bird breeding seasons or before and after control operations.

For ongoing studies, monitor four times per year: February, May, August and November.

For a clearer picture of fluctuations across the year, monitor once per month or every two months.

# How to use tracking tunnels to monitor stoats and rats

## Step 1 – Planning

### Estimate the size of your trapping area

The number of tracking tunnel lines you will need to adequately monitor target animals is dependent on the size of the area being trapped (Table 3).

**Table 3. Suggested number of tracking tunnel lines to use for surveying both mustelids and rodents.**

| Approximate area to be surveyed | ≤300 ha | 300–600 ha | 600–900 ha | 900–1200 ha | 1200–10,000 ha | >10,000 ha |
|---|---|---|---|---|---|---|
| Suggested number of tracking tunnel lines for rodents | 6–8 | 8–10 | 10–12 | 12–15 | 15–20 | 20 (or more if logistically feasible) |
| Suggested number of tracking tunnel lines for mustelids | 4–5 | 6–7 | 7–8 | 9–10 | 10–15 | 15 (or more if logistically feasible) |

* This table is reproduced from 'DOC tracking tunnel guide v2.5.2: using tracking tunnels to monitor rodents and mustelids'. www.doc.govt.nz/Documents/Science-and-technical/inventory-monitoring/im-toolbox-animal-pests-using-tracking-tunnels-to-monitor-rodents-and-mustelids.pdf





### Layout

- For rodents, 10 tunnels per line spaced 50 m apart and at least 200 m between tunnel lines at their closet point.
- For stoats, 5 tunnels per line spaced 100 m apart and at least 1000 m between tunnel lines at their closest point.
- You can use the same installed lines for either rodent or stoat monitoring (if lines are at least 1000 m apart for stoats) by using every 2nd tunnel when monitoring stoats on a 10-tunnel 'rodent' line.
- Don't place lines in a grid but do run each one straight in a single direction.
- Select places to install tracking tunnels that represent the range of ecological types in your trapping area. For example, if 50% of your area is beech forest, put 50% of your monitoring lines in beech forest.

### Exclude bias

When setting out tracking tunnel lines it is very important to ensure that representative environments are sampled within the areas you are interested in (e.g. a rodent control block). The easiest way to do this is to consider the gross environment types that make up your study site or management block and what proportion of that area they make up.

For example, if 50% of your study area is red beech forest, then 50% of your sampling effort should include that environment. The start points for each line should be determined by environment type, access, logistics (all lines need to be serviced on the same day) and the distance away from the next nearest tunnel line.

When determining the direction of tunnel line runs, avoid running lines entirely along geographic features (e.g. roads, ridgelines or streams) or other potential sources of bias (e.g. bait station lines). The best way to avoid any bias is to randomise the direction of your tunnel lines. A simple method for doing this is to roll a six-sided die (dice) and the number rolled determines the compass bearing from the start point along which the line is set out (Table 4). Run the line in the most practicable of the two bearings (either east or west) from the designated start point. If you can't decide which to choose, roll the die again. Pick the westerly bearing if the result is an odd number; pick the easterly if the result is an even number.

**Table 4. Suggested method for determining the direction (compass bearing) of each tracking tunnel line**

| Dice roll | Angle of tunnel line (magnetic) |
|---|---|
| 1 | 285°W–105°E |
| 2 | 315°W–135°E |
| 3 | 345°W–165°E |
| 4 | 15°E–195°W |
| 5 | 45°E–225°W |
| 6 | 75°E–255°W |

### Frequency of running tracking lines

Use your outcome and management objectives to inform monitoring frequency, for example:

- For ongoing studies for rodents, monitor four times per year: February, May, August and November.
- For ongoing studies for stoats, it is recommended as a minimum you should run surveys in November, December, January and February.

## Step 2 – How to make tracking tunnels

Each tracking tunnel consists of a wooden base with a black plastic ‘corflute’ cover. Corflute is the material used for real estate signs; it is cheap, light in weight and reasonably rigid. In most cases these tunnels are quite resistant to interference and damage by other animals. However, if kea, weka or possum interference is so bad that it is compromising the amount of data you are collecting from your surveys, then we suggest you use a sturdier exterior of black polypropylene plastic or timber.

### Tunnel dimensions and materials

- Wooden base: 100 mm (W) × 535 mm (L) plywood or 25 mm thick rough sawn pine (Figs 1 & 2).
- Tunnel cover: black corflute, stapled or nailed to the base, 615 mm (L) allows for 40 mm overhang each end of timber; tunnel internal clearance height should be 100 mm (Figs 1 & 2).
- Polycarbonate trays: 520 mm (L) × 95 mm (W), with each of the three partitions being 173 mm (L) (Fig. 3).
- Papers: each paper should be pre-cut to 173 mm (L) × 95 mm (W) (Fig. 3). We strongly suggest you source this pre-cut from a printer, as hand cutting can be very time consuming. The type of paper may be determined by local availability (and cost), but ensure it is sufficiently absorbent to retain the food colouring animal prints.
- Sponge: 173 mm (L) × 95 mm (W); 3–5 mm thick.
- Tracking media: use liquid red (Amaranth 123) food colouring at approximately 1:3 dilution in water. In extremely dry conditions or where you think freezing is likely to be an issue, mix the food colouring and water solution with polyethylene glycol (approximately 20%).

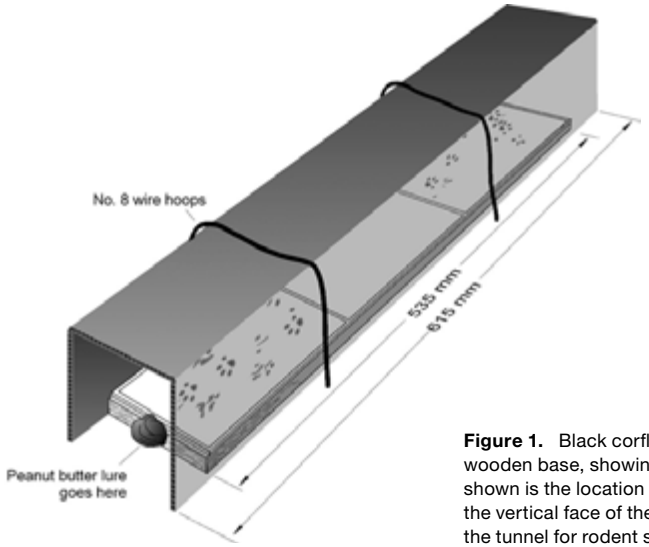



**Figure 1.** Black corflute tracking tunnel cover and wooden base, showing tunnel dimensions. Also shown is the location for smearing peanut butter on the vertical face of the wooden base at each end of the tunnel for rodent surveys.





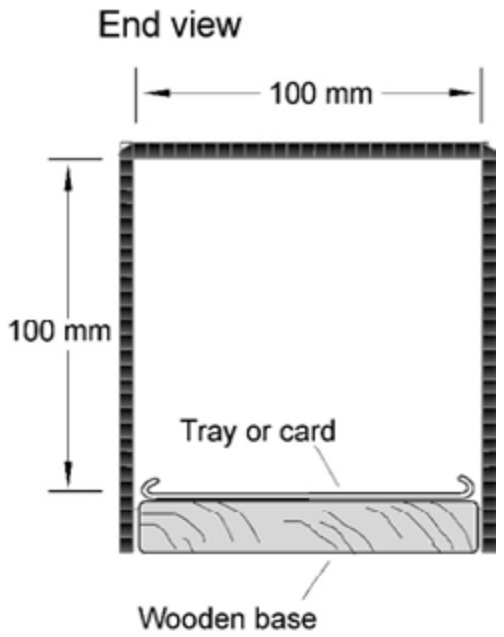



**Figure 2.** Black corflute tracking tunnel cover and wooden base – end view showing tunnel dimensions.

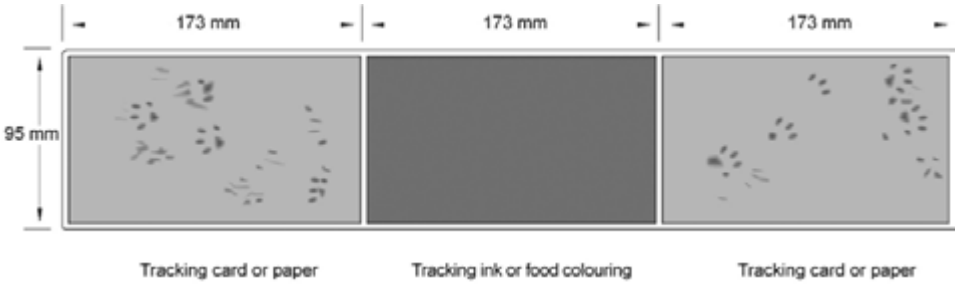



**Figure 3.** Tracking tunnel tray showing paper/card and tracking ink tray.

## Step 3 – Laying the tracking tunnels

Install unset tracking tunnels at least 3 weeks before your first survey. Resident animals should be familiar with them before you start monitoring. Leave the tracking tunnels in place between surveys.

### Equipment

- Tracking tunnels, unassembled and bundled in groups of 10, plus any necessary tools. Make your own tracking tunnels or buy them.
- Tunnel pegs – No. 8 wire loops, two per tunnel.
- Waterproof marker pen.
- Plastic markers and flagging tape, two colours (pink is a popular choice for pest line markers. Don't use orange – it's the colour used on recreational tracks).
- Hammer and nails.
- GPS preloaded with start points, map.
- Compass and distance measuring tool (e.g. hip chain or non-stretch cord).
- Personal gear.

### Mark each line

- Use your GPS device or map to locate the line's start point.
- Follow the randomly-generated compass bearing for the line and measure the distance travelled.
- Place markers and/or flagging tape along the line to make it easy and safe to follow. Label them with the line's identifier.

### Setting out tunnels and lines

1. Set out the tunnels at least 3 weeks (ideally longer if you plan to survey mustelids) prior to the first survey session to ensure any resident animals are conditioned to the presence of the tunnels.
2. Leave the tunnels in place between survey sessions.
3. Mark the tunnel locations with flagging tape (or, if you have the funds, use permanent plastic triangle track markers). Since the tunnels are left in situ between surveys (in some cases for several years), their locations need to be well marked. When using flagging tape to mark tracks it is a good idea to use one colour to mark the track and another to mark the tunnel.
4. Write each tunnel number on the flagging-tape or plastic triangle at the tunnel site with a permanent indelible ink marker pen.
5. Assemble the tunnels as you put them out in the field. It is a lot easier to carry the separate bases, trays and pre-cut unfolded corflute for 10 tunnels than it is to carry 10 fully assembled tunnels.
6. Site each tunnel at the most suitable spot (i.e. a place that look like it would provide a good 'run' for small mammals) within 2 m of the 50-m marker along the survey line.
7. If you have made your own tracking cards, place the tunnel on reasonably level ground, as this will reduce the chances of the food colouring running from the middle sponge tray and flooding the paper on the downhill side.
8. Ensure that the tunnel is held firmly in place by pegging it down with two No. 8 wire hoops. This is particularly important in areas were disturbance by possums is likely to be a problem and especially important if you plan to use the tunnels to monitor mustelids.
9. Check that access to both ends of the tunnel is unobstructed.





## Step 4 – Laying out tracking cards

You will need 2 days of good weather before you lay the tracking cards into tunnels. Weather will play a role in animal activities and may impact your results. Ensure each monitoring survey is conducted over 1 (fine) night.

**Day 1:**

### Equipment list

- Pre-inked or home-made tracking cards.
- Bait: peanut butter for rodents, fresh meat or earyze for mustelids.
- Tools if monitoring any fixed-lid tunnels.
- Personal gear.

### How to set a tracking tunnel

- Remove any scat or detritus from the tunnel.
- Write the number of the tracking tunnel and the date the card is placed in the tunnel on front of card.
- Place the fresh pre-inked tracking card in the tunnel, unfolded.
- In areas where weka are present use pins at either end to fix the paper.
- Place a generous amount of peanut butter on either end of the tracking card.

After one night, collect the cards and process each tunnel.

**Day 2:**

### Equipment list

- Notebook, pencil.
- Optional: smartphone to record results.
- Tools if monitoring any fixed-lid tunnels.
- Personal gear.

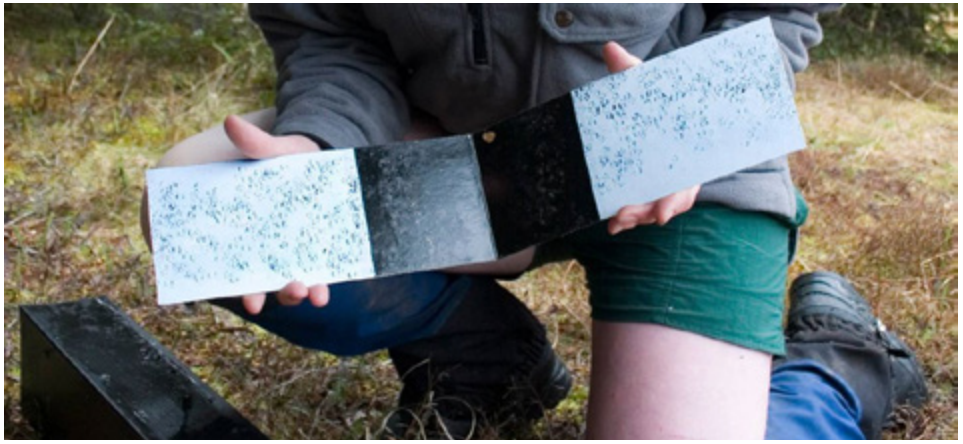
### Process each tunnel in the field

1. Remove the bait.
2. Remove pre-inked tracking card and fold closed.
3. Write the tunnel number and date collected on the card.
4. Keep the cards in order as you collect them.
5. Make notes:
   - If there are no tracks, record whether the bait was taken.
   - If you've mastered footprint identification, you can do that now or back at base.
   - If there's fresh scat in the tunnel, identify it and note the species as present just as if footprints were present. Remove the scat.
   - Note anything else unusual, such as tunnel disturbance.

### Finish processing back at your base

1. Spread any damp papers out to dry.
2. Identify and double check any predator footprints.
3. Update your notes.
4. Bundle the papers, label with the survey area and date, and store for later reference.

A tracking tunnel is baited with peanut butter. *Image: DOC*



Tracking tunnel card showing prints. *Image: DOC*





# How to use chew cards or wax tags to monitor possums

## Step 1 – Planning

### Estimate the size of your trapping area

- The number of chew cards or wax tags you will need to adequately monitor target animals is dependent on the size of the area being trapped. Set up temporary wax tag or chew card lines to monitor possum numbers. Use your results to track progress and make improvements.

Calculate the number of lines required for different trapping area sizes:

- 500 ha: 10 lines
- 500–700 ha: 11 lines
- 700–900 ha: 12 lines
- 900–1100 ha: 13 lines
- 1100–1300 ha: 14 lines
- 1300 ha or more: add 1 line per each additional 200 ha; up to 60 lines.

### Layout

- 10 devices per line.
- Run each line straight in a single direction.
- Keep devices 20 m apart on each line and at least 200 m from the nearest monitoring line at its closest point.

### Exclude bias

- For sampling to be unbiased, all potential possum habitat must have an equal chance of being sampled.
- If the start point for a line (generated by the random selection process; see p. 22) is the same as one used in previous monitoring, it is acceptable to use that start point again provided the prior monitoring was carried out more than 6 months previously.
- Overlay a numbered grid (intervals no greater than 100 m) over the map of the sampling area. Then use random northings and eastings to generate random coordinates. These are the start point locations for the lines. Mark in the lines from the random start points at zero degrees magnetic. Discard any line that falls either wholly or partly outside the sampling area, or within 200 m of any previously selected line.
- Alternatively, a GIS can be used to select random co-ordinates in a given area.

### Frequency of laying out chew cards or wax tags

Use your goal and management objectives to inform monitoring frequency, for example:

- Before and after possum control in order to determine how effective control has been and if it has achieved a target result.
- Annually to see if possum abundance is below a level required to protect valued or indicator species.

## Step 2 – Laying out chew cards or wax tag

Both chew cards and wax tags rely on bite mark identification for successful monitoring of animals. You'll need seven consecutive nights of reasonable weather, with no heavy or prolonged rain. Pre-labelling the chew cards or wax tags with both the line and device number can be easier than doing it in the field.

### Equipment

- Chew cards or wax tags grouped in bundles of 10.
- If using wax tags: luminescent strips plus lure (1 part icing sugar to 5 parts flour).
- You can make your own chew cards from 3 mm white corflute.
  - Cut corflute into 9 x 18 cm pieces so that the flutes are 9 cm long.
  - Bait with smooth peanut butter:
  - Bundle 20 chew cards together to form a temporary block.
  - Stand the block of cards so that the many flute openings along the long edge are facing up.
  - Working from one end to about 5 cm in, use a paint scraper to push a tablespoon of peanut butter about 2 cm into the flutes. Make sure to get an even spread.
  - Flip the block over and do the same at the diagonally opposite corner.
  - If your area has a high density of rats, only apply the peanut butter to one side of the card.
- Waterproof marker pen.
- Flagging tape (pink is a popular choice for pest lines. Don't use orange – it's the colour used on recreational tracks).
- Hammer and 50-mm flathead nails.
- Wooden posts if monitoring in open country.
- Compass and distance measuring tool (e.g. hip chain or non-stretch cord).
- Personal gear.

Wax tag with lure smear. *Image: Possumz* ©

### Mark each line

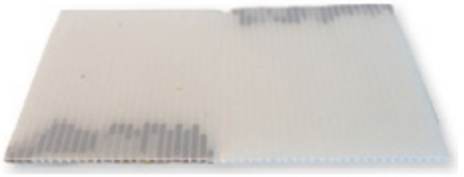
- List of start points (compass bearing is predetermined and the same for each line, use zero degrees magnetic as a default).
- Follow the pre-determined compass bearing for the line and measure the distance travelled.
- Place flagging tape along the line to make it easy and safe to follow. Label the tape with the line's identifier.





### Place and mark each chew card or wax tag

- Every 20 m, place a device and collect your measuring line.
- To place a wax tag:
  - Mount wax tag and luminescent strip on the same nail 30 cm above the ground with the wax block facing the ground. If there are no trees, use a post.
  - Take a handful of lure and smear it up the trunk of the tree to make a 10-cm-wide blaze that finishes behind the tag.
- To place a chew card:
  - Fold a card in half.
  - Push a nail through the top layer 10 mm from the fold and through the bottom layer 5 mm from the fold. This will keep the card open at 90°.
  - Hold the card in place on a tree, 30 cm above the ground with the fold at the top. If there are no trees, use a post.
  - Hammer the nail down into the tree at 30°.
- Label the device clearly with the line and location identifiers.
- Mark the location on your GPS device.
- Continue until you've installed 10 devices.



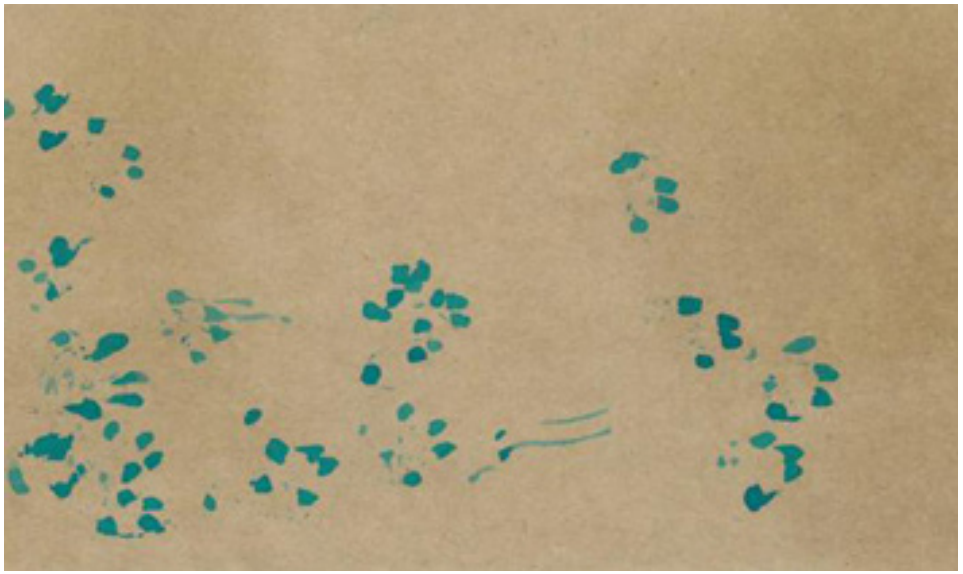
Chew card with bait applied. *Image: Traps.co.nz* ©

## Step 3 – Collecting chew cards or wax tags

- After seven nights, collect the devices and process them.
- Collect the flagging tape – you will set different lines next time.
- Collect the devices, making sure they're labelled correctly.
- Process and record the results:
  - (P) Definite possum bite marks.
  - (NT) Non-target but identifiable bite marks. Record the species too.
  - (U) Unknown bite marks.
  - Leave the record blank if there are no bite marks.
  - (L) Lost or destroyed device.
- Store the devices for at least 2 years.
- For further information on planning and conducting possum population monitoring refer to 'Possum population monitoring using the trap catch, waxtag and chew card methods', available at www.bionet.nz/library/npca-publications/

A nibbled chew card. *Image: Kiwi Coast Project* ©

## Interpret the data for tracking tunnels, chew cards and wax tags



Stoat footprints on a tracking card. *Image: DOC*

To calculate and monitor the abundance of pests over time, you can:

- Use apps or online data management agencies to generate indices, maps and summary tables to export and share. You can also use these apps in the field.
- Use scientific formulae to generate indices yourself: www.bionet.nz.
- Interpret footprint tracking tunnels:
- Guide to reading footprint tracking tunnels: www.landcareresearch.co.nz
  - DOC tracking tunnel guide.
- Interpret bite marks:
  - For wax tags: www.traps.co.nz.
  - For chew cards: www.landcareresearch.co.nz.
- Write a data report to share. Include the following information:
  - Name and location of trapping area.
  - Size of the trapping site.
  - Control methods and start and finish dates.
  - Device type.
  - Number of lines.
  - Number of nights devices were deployed.
  - Weather information.
  - Names of participants (optional – get permission).
  - Maps with data overlays (optional).





# 6. Select the right trap

Trapping at North Head, Auckland. *Image: DOC*

## NAWAC (National Animal Welfare Advisory Committee)

The following information relates to the welfare performance of traps used in New Zealand for capturing and/or killing small to medium-sized mammals. The tests relate to the welfare performance of the traps, NOT to their capture efficiency, safety, costs, or target specificity.

In New Zealand, trap use is regulated by the Animal Welfare Act 1999. This Act permits any trap to be used for trapping any species, but it also enables the Minister of Agriculture to recommend to the Governor General traps that should be prohibited because they cause unacceptable pain and suffering. To enable the welfare performance of traps to be assessed in a standardised way, the National Animal Welfare Advisory Committee (NAWAC) has developed a trap-testing guideline. The NAWAC kill trap test requires 10/10 test animals are to be rendered irreversibly unconscious within 3 minutes to meet the guideline for acceptable performance (Table 5).

**Table 5. List of NAWAC-approved traps.**

| TRAP | Possum | Ship rat | Norway rat | Stoat | Ferret | Weasel | Hedgehog | Feral cat |
|---|---|---|---|---|---|---|---|---|
| DOC 150 | | | ■ | ■ | | | ■ | |
| DOC 200 | | ■ | ■ | ■ | | | ■ | |
| DOC 250 | | ■ | ■ | ■ | ■ | | ■ | |
| BT 200 | | | | ■ | | | | |
| Goodnature A24 | | ■ | | ■ | | | | |
| Victor snapback (PCR mod) | | ■ | ■ | ■ | | | | |
| Victor Professional | | ■ | | | | | | |
| Nooski | | | ■ | | | | | |
| T Rex/Tomcat | | ■ | | | | | | |
| Timms | | | | | | | | ■ |
| Sentinel | ■ | | | | | | | |
| Warrior | ■ | | | | | | | |
| Trapinator | ■ | | | | | | | |
| Goodnature A12 | ■ | | | | | | | |
| PodiTRAP | | | | | ■ | | | |
| SA Coni | | | | | | | | ■ |
| Twizel kill trap | | | | | | | | ■ |
| Belisle Super X 220 | | | | | | | | ■ |
| SA2 Kat trap | ■ | | | | | | | ■ |
| AT220 | ■ | ■ | | | | | | |
| Victor No.1 double coil spring unpadded | ■ | | | | | | | |

**KEY**

■ Passed NAWAC testing guidelines

For further information on NAWAC testing, visit www.landcareresearch.co.nz
Last updated 24 May 2019





# Stoat and rat traps

DOC 200 double-set trap.
*Image: Erana Stevens-Tulip, DOC*

DOC 200 kea and weka-proof trap. *Image: DOC*

## DOC Series – 150, 200, 250 traps

Durable, long service life, proven effectiveness. Must be used inside a covered tunnel box. If targeting stoats, DOC double set traps have been shown in comparison field trials to have considerably higher catch rates than single sets. If you have inquisitive non-target species (such as weka or kea) present, ensure your tunnel is built to non-target species DOC best practice design. For DOC series trap tunnel designs and dimensions for non-target species contact Haines Pallets, manufacturers of DOC-designed wooden tunnels: www.hainespallets.co.nz.

It is recommended that the extended design DOC 200 kea and weka-proof trap is used in areas where domestic cats are present.

To build your own DOC series tunnel contact your local DOC Office for a copy of the DOC best practice tunnel design.

BT200 trap. *Image: DOC*

## BT 200 trap

National Springs BT 200 predator traps have passed NAWAC testing for stoats and are a comparable alternative to the DOC 200 trap provided you are only trapping for stoats. They come in both zinc plated and full stainless options with good solid weld points. The full stainless option will better resist corrosion and would be advisable in coastal areas. It is recommended that the extended DOC-200 tunnel design is used in areas where domestic cats are present.

**Note**: To adhere to NAWAC testing guidelines the trap must be installed within a covered tunnel. The BT 200 is 2 mm larger than the DOC 200 version so take extra care of distance between trap and tunnel walls when installing into a DOC series wooden tunnel design.

Goodnature A24 trap.
*Image: Goodnature*

## Goodnature A24 trap

An automatic resetting trap that triggers 24 times before the gas canister (which powers the trap) needs to be changed, providing constant control with reduced maintenance. Comes with long-life, non-toxic lure and is easy to use. For areas where kea are present, a Goodnature Blocker attachment is recommended. Where weka are present, install the A24 at 1.2 m above the ground.

The Chirp model communicates trap data via Bluetooth to the Chirp App, providing information about your trapping efforts. Chirp is available as a simple retrofit to existing A24s. For large trapping projects the Chirp Dashboard provides a project-wide view.

Chirp App.
*Image: Goodnature*

# Rat traps

Modified Victor trap with tunnel.
*Image: Pest Control Research ©*

## Victor snapback (PCR mod)

Ideal trap for low-density rat populations over small areas. Cost effective, small and light. To meet with NAWAC testing guidelines, the Modified Victor must be used inside a wooden, corflute or plastic pipe tunnel system. The tunnel guides the animal to ensure humane killing and shelters the trap, limiting the risk of by-kill and interaction from non-target species.

Victor Professional trap in tunnel.
*Image: DOC*

## Victor Professional

The Victor Professional is a cost-effective trap. It has passed NAWAC testing for ship rats and is suitable for trapping in native forest where ship rats are most prevalent. To meet with NAWAC testing guidelines the Victor professional must be used inside a wooden, corflute or plastic pipe tunnel system.

Victor Professional trap.
*Image: traps.co.nz*

The tunnel guides the animal to ensure humane killing and shelters the trap limiting the risk of by-kill and interaction from non-target species. The Victor Professional may not be consistently effective for the larger Norway rat. DOC series traps are recommended where Norway rats are present.

Nooski Trap system. *Image: nooski.com*

## Nooski

The Nooski is for use around the home or backyard but is not recommended for large-scale trap networks. A springless rat trap built from ABS plastic. The safety tunnel is a dual-purpose design, acting asthe bait holder as well as safety tunnel.

Light weight, affordable, easy to use.
The tunnel guides the animal to ensure humane killing and shelters the trap, limiting the risk of by-kill and interaction from non-target species.

T Rex. *Image: Key Industries*

T Rex wooden tunnel design. *Image: DOC*

## T-Rex

A cost-effective, reusable rat snap trap that effectively incorporates a combination of trap velocity and trigger sensitivity. Safe and convenient, it can easily be set by hand or foot. The removable bait cup allows the trap to be fully serviced without being set. To meet NAWAC testing guidelines the T-Rex must be placed inside a wooden box, corflute or plastic pipe tunnel system. The tunnel guides the animal to ensure humane killing and shelters the trap, limiting the risk of by-kill and interaction from non target species. The T-Rex is an effective trap in areas where ship rats are present, but may not be consistently effective for the larger Norway rat. DOC series traps are recommended where Norway rats are present.

# Possum traps

**Possum traps in this section are not recommended in areas where domestic cats are present and must be raised above the reach of kiwi and/or weka if either of these species is present.**

Sentinel. *Image: landcareresearch.co.nz*

## Sentinel

The sentinel is a lightweight possum trap set suitable for use in remote areas of native forest where the portable design allows more traps to be packed in. Has a white corflute cover for visibility and to orientate the possum to the trap. Each set includes trap, tree attachment, bait clip and corflute cover.

Warrior set on tree. *Image: landcareresearch.co.nz*

Warrior unset. *Image: National Springs and Wire Products NZ Ltd*

## Warrior

The warrior is lightweight (850 g) easy-to-carry possum trap. It has a 1.6-mm-thick annealed spring steel body. With a strong, rigid structure, it is designed to be fixed to a tree with screws, 1 m above the ground.

Trapinator. *Image: CMI Springs Ltd*

## Trapinator

For low-density possum control. All-in-one spring-set mechanism in a plastic box. It is screwed onto trees or posts, 1 m above the ground. Relatively easy and safe to use compared with other possum traps.

Goodnature A12. *Image: Goodnature*

## Goodnature A12

An automatic resetting possum trap that triggers 12 times before the gas canister, which powers the trap, needs to be changed, providing constant control with reduced maintenance. Comes with long-life, non-toxic lure and is easy to use. The trap needs to be checked monthly to refresh the lure. The trap is set 1 m above the ground.

SA2 Kat trap. *Image: Steve Allan*

## SA2 kat trap

Durable and robust, the SA2 Kat trap is an effective single kill possum trap. The trap has passed NAWAC testing as a raised trap only.

In areas where non-target species are present, it is recommended the trap is placed 750 mm above the ground on an angle (up to 45 degrees).

AT220. *Image: NZ AutoTraps Ltd*

## AT220

A possum spring trap which, once triggered, is reset automatically by a gear drive reset mechanism using a small electric motor. The motor is powered by a rechargeable battery pack. Auto rebaits after each kill and each evening – this ensures bait is always fresh and the trap baited.

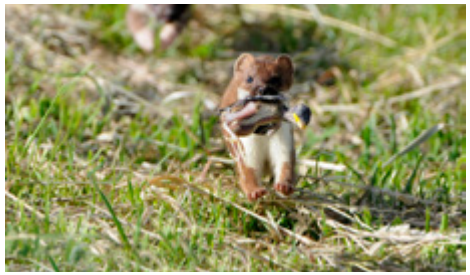
The AT220 has recently passed NAWAC testing for ship rat. This is the only trap that has passed for both possum and ship rats.

The AT220 trap is new to the market, with only limited data presently available on how the traps perform in the field.

# 7. Select the right bait or lure

## Stoats

- Erayz
- salted rabbit
- fresh rabbit meat and eggs
- Goodnature stoat lure
- 'Mustelid & Cat & Rat Lure' by traps.co.nz



Stoat with chick. *Image: David Hallett*

## Rats

- Peanut butter
- Connovation Ferafeed peanut butter mixed with rolled oats
- Goodnature rat lure
- 'Mustelid & Cat & Rat Lure' or 'Rat & Possum Lure' by Traps.co.nz;
- chocolate

Ship rat eating snail. *Image: Nga Manu Images ©*

## Possums

- Icing sugar, flour and cinnamon
- Peanut butter
- Connovation 'Smooth in a Tube'
- 'Possum Dough' by Traps.co.nz
- Goodnature possum lure

Possum scavenges at abandoned wood pigeon nest. *Image: Nga Manu Images ©*





# 8. DOC best practice trapping

## Examples of site-specific factors

Before laying your trap network it is important to consider site-specific factors.

### Risks to non-target species (native and domestic)

It is important to consider non-target species at your site. To reduce the likelihood of trapping valued non target species refer to Section 6 of this guide.

For further information on non-target species at your site, consult with your local DOC office.

### Time of year

- Is there an abundance of naturally occurring feed? Consider the effect on bait uptake or reschedule your operation.
- Does your target pest species behave differently with the seasons? Consider operating when they're easiest to target.

### Density of target pests

- Are rat densities high? Consider self resetting traps or consider whether toxins may be a more successful option to explore.

### Public accessibility of the site

- Does your plan pose a risk to the public's health and safety? Plan to limit any risks.
- Is there a risk of people interfering with installed traps?

### Skill level of the people involved

- Ensure volunteers receive the appropriate training to deliver effective, humane and safe trapping in line with best practice.

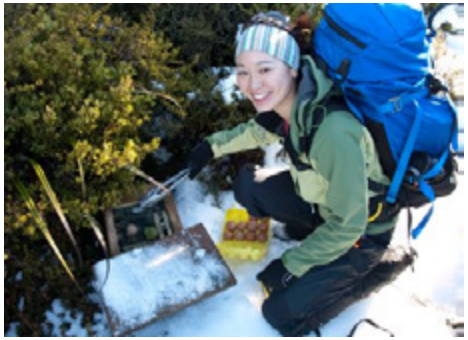
### Potential for re-invasion from the surrounding area

- Is your site small or skinny, or surrounded by pest-dense areas? Take steps to protect borders.

### Kauri Dieback

DOC is responsible for protecting kauri on public conservation land and other land it manages, including many of New Zealand's most significant kauri forests.

For trapping in areas where kauri dieback is present consult with your local DOC office. For more information on Kauri Dieback: www.doc.govt.nz/nature/pests-and-threats/diseases/kauri-dieback/



A volunteer replaces the lure in a DOC 200 trap. *Image: Lauren Schaer ©*

## Rat trap networks

Plan to set your rat traps in a grid pattern using the following spacings.

Spacing between lines: No greater than 100 m.

Spacing between traps on each line: 50 m (25 m along perimeter lines). In high-density rat areas the internal spacing of traps should be 25 m apart.

Grids: laid out on grids by compass bearing or, in rough terrain, placed on ridges and spurs. Spacing should be established as precisely as possible using compass and hip chain. Record all trap station locations on a GPS.

## Stoat trap networks

Plan to set your stoat traps along the natural lie of the land, such as habitat perimeters, ridges, altitude contours, waterways (both sides if larger than a stream) and track and road edges.

Spacing between lines: For broad-scale control, no further than 800 m – 1 km apart.

Spacing between traps on each line: For broad-scale control, traps are placed up to 200 m apart. For intensive trapping operations, traps are spaced 100 m apart. Trap spacing should be established as precisely as possible using compass and hip chain.

## Possum trap networks

Plan to set your possum traps where you see obvious possum sign at the base of trees and posts, and on pad runs (tracks made by possums).

Spacing between lines: 100 m or less.

Spacing between traps on each line: 20–40 m initially, or up to 100 m at low possum densities or if using self-resetting traps.

In difficult terrain: set lines down ridges and spurs, and along contours to achieve the necessary spacing.

Volunteer trapper.
*Image: New Plymouth Boys High School*





## How to combine trap lines

You can combine trap lines for the different predators present at your site and this will mean you can make efficient use of your track infrastructure and servicing time in the field.

Lay rat trap networks first at the recommended distance apart (100 m or less between lines and 50 m / 25 m between traps). Then lay stoat traps on the rat lines that most closely coincide with the recommended distance for stoat traps (no further than 800 m apart), at the recommended spacings (100–200 m). This could result in stoat traps along every eighth rat line. If possum are present lay possum traps on each 100 m spaced trap line. Lay possum traps on each line: 20–40 m apartinitially, or up to 100 m at low possum densities or if using self-resetting traps.

## Marking trap locations

Plot trap locations on a map or with software. Plot your line locations before you head out and consider practicality of access when picking a line's starting point. Mark your locations on a paper map or in a portable GPS device, if possible.

### Mark each line

1. Use your GPS device or map to locate each trapping line's start point.
2. Follow the compass bearing for the line and measure the distance travelled.
3. Place markers and/or flagging tape along each line to make it easy and safe to follow. Label them with the line's identifier.
4. At the relevant distance, place a device and collect your measuring line.

Volunteer trappers. *Image: Kaitake Ranges Conservation Trust*

## Place and mark each device

1. Follow the set-up instructions for your chosen trap.
2. Label the device clearly using a durable blue plastic triangle or Allflex tag attached to the trap lid of a wooden or corflute tunnel design. If using a tree-mounted trap, nail tag to the tree on which the trap is placed. Clearly write the name of the trap line and the trap number e.g. Line A trap 6 = A6.
3. Never use an orange marker to identify a trap line as this colour is used to identify DOC walking tracks. Best practice is to use a Fluro pink plastic triangle to identify a trap line and a blue plastic triangle to identify the location of each trap on the line.
4. Mark the location of the trapping device on your paper map or GPS device.
5. Continue until you've installed the relevant number of devices. Refer to over page.

Volunteer trapper. *Image: DOC*





# How to establish a trap line

### Step 1

- ☐ Trap line marked with pink markers attached at eye level and marked with trap line reference.
- ☐ Double pink markers at start and finish of trap line.
- ☐ All markers as close as practical to trap line.
- ☐ All trap line markers kept vertical unless trap line deviates around a major obstacle.
- ☐ 2 x 75 mm flathead nails with 25 mm driven into the tree and at least 25 mm protuding.
- ☐ All markers pulled out to be flush with the nail heads (this reduces risk of eye injury).
- ☐ At any point along the trap line at least one marker must be visible in either direction.

### Step 2

- ☐ When clearing trap line, do not cut vegetation of stem diameter at ground level >30 mm.

### Step 3

- ☐ Place trap no more than 1 m from the trap line, or as close as possible.

### Step 4

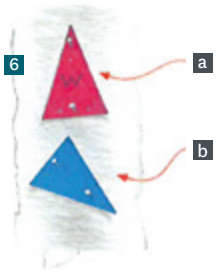
- ☐ Trap boxes must be securely bedded (flat and stable) so that no movement is detected when tested with a 2 kg weight placed on either end.
- ☐ Lid screwed shut.
- ☐ Each end of tunnel should be clear for at least 400 mm.

### Step 5

- ☐ To identify trap, write number with permanent marker on a blue tag and attach by staple to lid of trap.

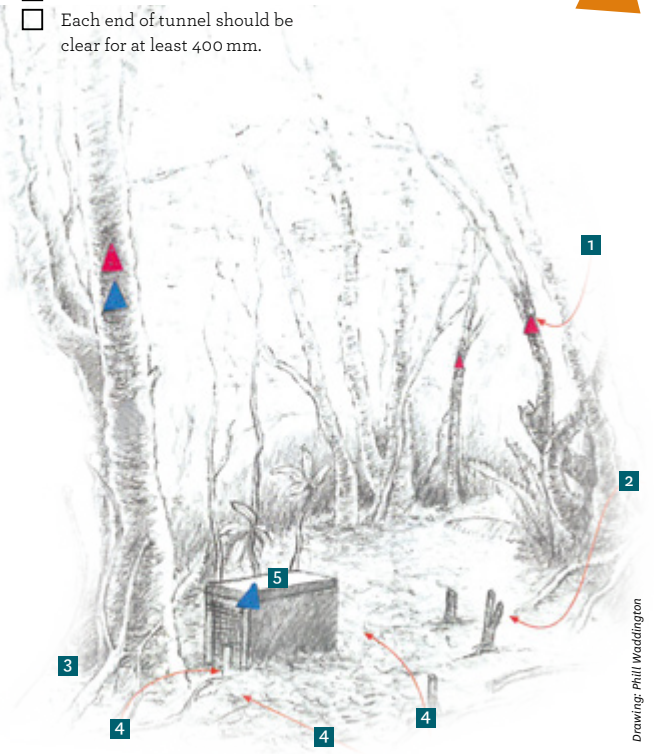
### Step 6

- ☐ Trap locations identified by a double marker. One marker of a different colour.
- ☐ Trap markers must be seen from either direction.
- ☐ **Important: do not use orange markers for trap lines as they are used by DOC to mark walking tracks.**




**a Trap marker**
Marked with trap line reference.

**b Trap marker**
Angled if trap not clearly visible from trap line, otherwise kept vertical.

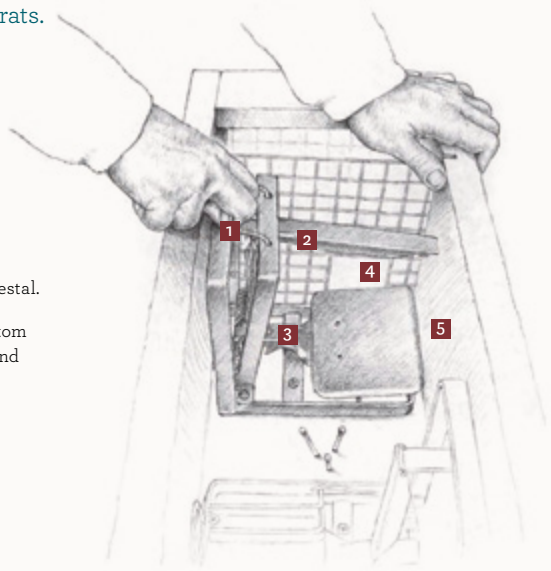


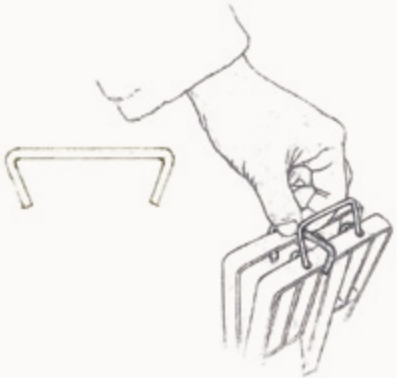

*Drawing: Phill Waddington*

# How to set DOC200 traps

The DOC200 has passed NAWAC (National Animal Welfare Advisory Committee) guidelines as a humane kill trap for stoats, ship and Norway rats.

- ☐ Traps should be fixed with 6 x 25 mm rust proof screws, with the treadle 5 mm (approximate) from the side of the box and the baffle.
- ☐ Place bait (egg or meat) on wood or nail pedestal.
- ☐ SLOWLY release pressure, allowing the bottom of the trigger arm to gently ride up treadle and catch on the sear.
- ☐ Apply safety clip when testing and cleaning the trap. Don't forget to remove!
- ☐ Lid screwed shut.



Key

1. Setting loop
2. Trigger arm
3. Sear
4. Treadle and hole in baffle must be aligned
5. 5 mm gap

# 9. Every trap counts

In the previous section of the guide we described best practice trap networks, based on 30 years of experience in the deployment of landscape scale-trapping across the complex and varied terrain of public conservation land. Often these recommended best practice trap networks are not appropriate to be deployed in a residential backyard or small block of land. This section will help you plan the layout of traps on less-complex sites.

## Planning small-scale trap networks and placement of backyard traps

- There are some factors that are relevant to all trap networks regardless of size or complexity of the site:
  - Target predator behaviour, home range and habitat as described in the section 'Know your target predator'(pages 4–18).
  - Difficult terrain may be a factor that will influence the location of your traps. For example, best practice trap networks (page 41) describes the layout of stoat traps along the natural lie of the land such as habitat perimeters, ridges, altitude contours, waterways, and track and road edges.
- While difficult terrain is less likely to be a problem for most small sites, there are other limitations you will need to consider when placing your traps:
  - Trap proximity to dwellings and property boundaries.
  - Placing your trap where you can see rodent tracks or run lines; fence lines are a great place for a single trap on a small site.
  - If your trap is a tree mounted, its placement will be restricted to the location of suitable trees.
  - Compost is an easy source of food for rodents, so we recommend you remove the temptation. Use a rodent-proof compost bin so rodents are more likely to be attracted to your bait.
  - If there is a risk that the trap may be stolen or interfered with, it is best not to place it close to the street.
- The smaller your site the higher the reinvasion rates, therefore your trap network will need to be more intensive than described in best practice. If you have the funding and time to clear traps, then place them as close as 10 m apart on boundaries.
- If you are surrounded by vacant land, paddocks, bush or residential sections that are not trapped then your catch rate may initially be higher; take this into account when using single kill traps, as they will require more frequent clearing, rebaiting and setting.

- Rodents are the most common predators in residential backyards. Multi-kill automated traps are a great choice for sites with high reinvasion rates; they are less labour intensive and will keep on working without you having to regularly clear or reset them.
- If your traps are near your dwelling and easily accessible, then trap checking won't take as much time, so check them as often as you like, weekly or even daily.
- With a small number of traps, it is important they remain set to trap your target predator. The fewer traps you have, the less likely your target predator will be to encounter a trap. Therefore, increase the frequency of checking and rebaiting your traps.
- In urban settings, consider the risk that traps could present to domestic animals and children. This may require placing traps in less-accessible locations and/or using tunnels that prevent access to the trap. Some rat trap models have only limited injury potential, so may be a safer choice for trapping in residential areas.
- Encourage your neighbours. If every backyard has a predator trap, control is more effective and working together will reduce reinvasion rates and the number of predators in your neighbourhood.
- Don't underestimate the impact that a single trap or small-scale trap network can have on predator control. One household trap can lead to a street of traps, then a neighbourhood of traps which may one day become a city of traps. It may all start with you. Remember, every trap counts.

For further advice on small-scale networks or backyard trapping, contact your local council: www.localcouncils.govt.nz or Predator Free NZ Trust: www.predatorfreenz.org/







# 10. Recording trap catch

Accurate recording is critical. Here are some simple rules for data collection:

1. Record accurate information at each trap. Your data may be used over and over by many people to improve the way we do things, so making accurate records is very important.
2. Record written data clearly.
3. Check all your data a second time before you leave the field. It is easier to check missed data in the field than at home.
4. Look after the data, make back-up copies as soon as practicable and take care to store originals where they cannot be lost or damaged.

Volunteer trappers. *Image: Francis Douglas Memorial College*

There are numerous providers who have developed online data capture tools in New Zealand for managing and analysing your trap data, including interactive maps and graphs.

To compare the features of the various options for online data collection refer to 'Community toolkit' at Predator Free NZ Trust website: www.predatorfreenz.org/toolkits/

- **Walk the Line** – developed by DOC in conjunction with partners at Genesis Energy / Whio Forever and Project Janszoon. Talk to your local DOC office about access to 'Walk The Line' apps.
- **Trap.NZ** – developed with the support of WWF and Groundtruth Limited: www.trap.nz
- **CatchIT** – developed by Auckland University: www.stat.auckland.ac.nz/~fewster/CatchIT/
- **Pest Mapper** – developed by MAIN Trust NZ: www.main.net.nz
- **Ecotrack software** – co-developed by Agile Cloud and Pest Free Kaipatiki: www.ecotrack.nz
- **Urban Rat Project** – developed by Michael Fielding: www.ratproject.org

# 11. Instructions for DOC Series trap maintenance

DOC ranger checking trap. *Image: DOC*

## DOC series trap design

The DOC Series of traps are ergonomically designed for ease of usability. They are highly effective single kill predator traps, NAWAC tested to humanely kill target predators (refer to NAWAC table page 33).

DOC traps require regular maintenance to ensure continued efficacy and humane predator control over long periods of use in the field.

It is recommended that trigger weight testing and calibration of DOC series traps be completed annually. Visual inspections should be completed during every trap check, during which all carcass remains, leaf litter and debris should be removed. Keeping the trap mechanism clean will ensure continued effective performance. Deterioration or any other issues that may prevent the trap from working correctly should be noted and traps replaced as required.





If a trap continually has no catches, then there may well be an issue with its trigger weight, trap mechanism or location. Check the trap's calibration using weight testing and/or move the trap to a new location.

Testing the trigger weight as described on pages 53–57 requires two small weights, one 50 mg the other 100 g. When testing the trap with the weights the trap should not be set off by the 50 g weight. When tested using the 100 g weight, the trap should be set off. This means the trigger mechanism is calibrated correctly to the minimum weight of the target predator.

In double-set trap designs with two traps side-by-side in one wooden tunnel, when one catches a predator it may set the other one off. This is known as sympathetic set off. The first trap is triggered by a catch and the other is found set off and empty. This can indicate that one or both traps require weight testing and calibration or that the trap is not level or the ground too soft.

To prevent continued sympathetic set off, it is recommended that double set traps are securely fixed to the ground. This will require short rods of rebar (reinforcing steel; about 50 cm) be hammered into the ground and nailed to either side of the outside of the wooden tunnel to keep it steady.

## How to clean, weight test and calibrate a DOC Series trap

**WARNING: Always use a safety clip when carrying out trap maintenance**

Video instructions on trap maintenance can be found in DOC Skillables www.youtube.com/user/DOCskillable.

Before calibrating a trap for the first time we recommend you familiarise yourself with a well-calibrated DOC series trap. Review the components and working mechanisms, focus on how the treadle plate and trigger arm interact, move and function when set and unset. Note the height of the sear, and how the trigger sits against it when set.

Adjusting the traps to the right weight takes practice and a trial and error approach. Ensuring traps are not too sensitive is especially important for double set tunnel designs. The force of one trap activating can trigger the other if poorly adjusted.

## Equipment

Before you head into the field check that you have all the equipment needed to complete your trap maintenance. The following list of equipment is recommended for weight testing, calibration and general trap maintenance. It's a good idea to mark your equipment with Fluro flagging tape so you don't lose it in the field.

1. Notebook
2. Permanent marker
3. Safety clip
4. Safety clip for no clearance between wall
5. Gloves
6. 50 g and 100 g weight
7. File
8. Square head driver as tapping tool
9. Pincer
10. 8 mm socket driver
11. Scraper
12. Pruning saw
13. Hammer

## Cleaning

Before weight testing, complete a visual inspection of trap and tunnel. It is important to clean the trap of all carcass remains, bait, soil and leaf litter before you begin weight testing. Figure 4 shows a trap with fur accumulated on the sear. This may prevent the trap from activating when tested at the correct trigger weight.

Focus on the working areas of the trap mechanism where debris can collect and interfere with the correct function of the trap. Using a small wire brush, clean the trap mechanism as follows:

**Step 1**
Put the safety clip on.

**Step 2**
Clean the tip of the trigger arm and the small sear (Fig. 5). The tiny sear is the small protruding metal nub that the trigger tip catches against when the trap is set. It is located on the arm of the trap treadle (plate).

**Step 3**
Clean the hinge at the top of the trigger arm, it should swing smoothly and freely when the trap is not set. (Fig. 6).

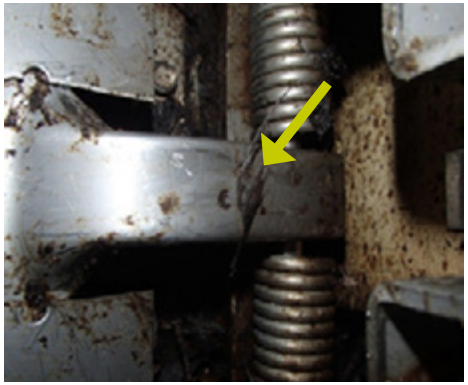


**Figure 4.** Fur accumulation.

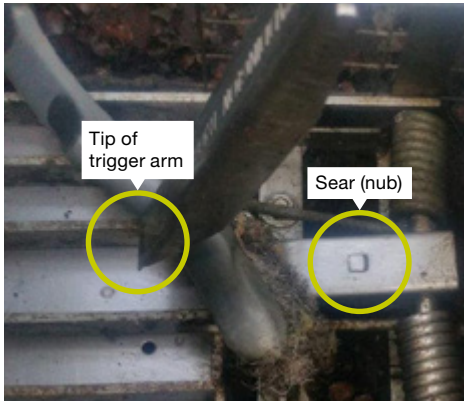



**Figure 5.** Tip of trigger and sear.

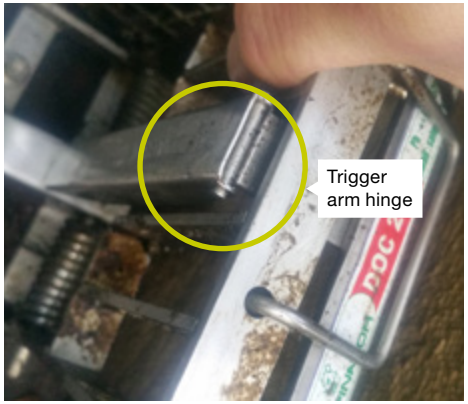



**Figure 6.** Aerial view of hinge connecting trigger arm to trigger hanger.

## Weight testing

The reason for weight testing is to ensure that set traps trigger correctly at 100 g. This weight prevents smaller non-target species, particularly mice, from setting off the trap. This ensures traps remain set and ready to catch their target species.

1. Before weight testing, ensure trap is set correctly and the safety clip is on.
2. **You want the trap to hold at 50 g**. For the first weight test use the 50 g weight. Place it gently and slowly on the location shown on the treadle plates in Fig. 7. The trap should not be triggered by the 50 g weight. If the trap does trigger, it will require calibration.
3. **You want the trap to trigger at 100 g**. For the second test use the 100 g weight. Placing it gently and slowly in the same location as described above. The trap should trigger. If it does not trigger, it will require calibration.

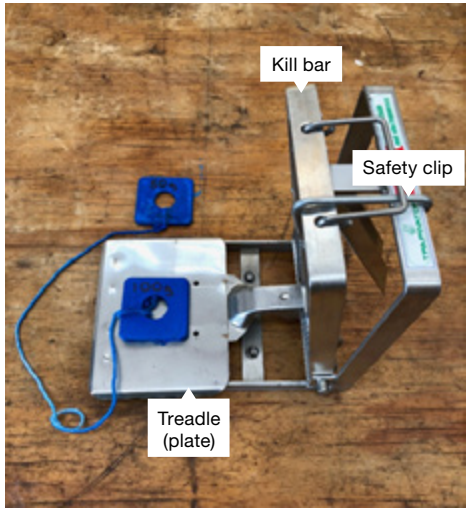



**Figure 7.**

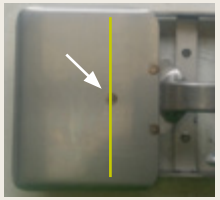
4. Accurate placement of the test weight on the treadle (plate) varies between DOC series models. For correct position of weight refer to Figure 8 for testing DOC 150 traps and Figure 9 for testing DOC 200 traps.

### For DOC150

Align washer with flat plate

**Figure 8.**

### For DOC200



Old model

Current model

Align washer with welding marker

**Figure 9.**



If your trap fails to pass the weight test and before you consider calibrating, take a second look at how clean your trap is. Calibrating can take a lot of time and often a good clean is enough to ensure the trap weight tests correctly; check to see if you have missed anything in your first round of cleaning and try weight testing again. You may not need to adjust any of the trap mechanisms.

## Calibration techniques

### Step 1 – Visually inspect relevant parts of the trap mechanism

There are two parts of the trap mechanism that can be adjusted for correct weight calibration (Fig. 10):

1. The sear (nub)
2. The trigger hanger

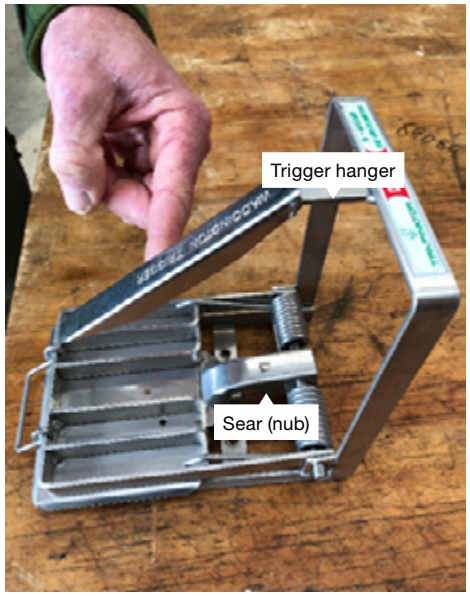



**Figure 10.**

Calibration may require the adjustment of one or both parts of the trap mechanism. Visually inspecting both parts first will help you to determine which part or parts need to be adjusted.

### Step 2 – Check the trap and tunnel

Begin by checking all trap parts are in good order (no rust or debris present, for example) and that the trigger arm and hinge are moving freely (Fig. 10). Check the spring function of the trap treadle (the base plate which the predator steps onto). It should lift and move freely. If it does not, then clean it. If it still fails to move freely then a full trap replacement may be needed.

## Step 3 – Adjusting the sear (nub)

- The sear should be 1 mm high so that the tip of the trigger catches against it when the trap is set (Fig. 11). With constant use, the sear can wear and become too low to catch the tip of the trigger. The trigger then swings back behind the kill bar.
- Your trap sear is not sensitive enough if it won't allow the trap to be triggered when tested with a 100 g weight. To correct this, the sear needs to be lowered.
- You do not need to remove the trap from the tunnel to lower the sear. With the trap unset, use the tip of a square head screwdriver and a hammer to gently tap the sear down slightly (see Figs 12 & 13).
- Lowering the sear by 0.5 mm increases sensitivity by approximately 20 g. Be careful! If you hit the sear too strongly you will lower it too much and you will then have to remove the trap completely, turn it upside down and tap it on its underside to raise it again.
- Your trap sear is too sensitive if the trap sets off when tested with a 50 g weight. You will need to adjust the sear higher to reduce trap sensitivity. To do this you will need to remove the trap from the wooden tunnel, turn it upside down (so you have access to the base of the sear under the trap) and, using the tip of your screwdriver, give the sear a very gentle tap to raise it slightly. It does not take much force to raise or lower the sear.

**Figure 11.**

**Figure 12.**





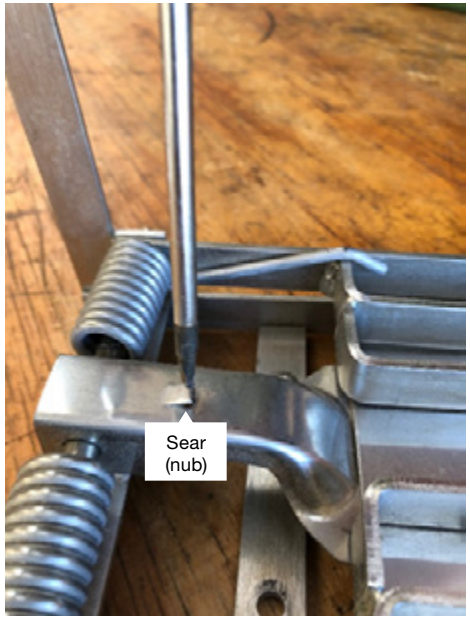



**Figure 13.**

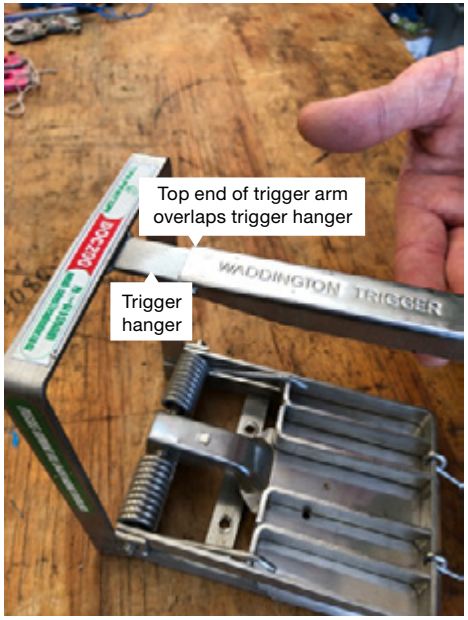



**Figure 14.**

## Step 4 – Adjusting the trigger hanger

The kill bar should fit snugly against the top end of the trigger arm when set. First check that the kill trigger moves freely. In the parallel position, the top end of the trigger arm overlaps the trigger hanger without catching (Fig. 14). The kill bar should pull smoothly up over the top of trigger hanger and rest against the top of trigger arm when set. If the kill bar is dragging or won't go over the top of trigger arm when setting, then use the hammer claw to gently bend the trigger hanger down (Fig. 15). If the kill bar is too loose and keeps slipping forward because it doesn't fit against the trigger hinge to set, then the trigger hanger will need to be bent up slightly.

**Figure 15.**

## Step 6 – Concluding trap maintenance

1. Perform steps 2–5 weight testing between steps until you reach the correct range of trigger weight (the trap should hold at 50 g and trigger at 100 g).
2. Set your trap and don't forget to retrieve the safety clip.
3. It is important to make notes describing the work completed on each trap. Keep a logbook of the dates the trap was tested, how and why the trap failed weight testing and what parts of the trap were adjusted. Record whether the trap passed or failed weight testing so that it can be replaced if required.
4. Check the area around the tunnel ends to make sure they are clear of grass, vegetation and leaf litter, creating a clear run to the trap entrance way (Figs 16 & 17).
5. Finally, check to make sure you don't leave equipment behind!

For further information on DOC Series trap maintenance we recommend you watch the DOC skillable series of videos available on www.youtube.com/user/DOCskillable

For full instructions on testing all other traps, visit the suppliers' websites.

**Figure 16.**

**Figure 17.**



# 12. Suppliers of traps, baits, lures and monitoring equipment

| | |
|---|---|
| **Predator Free New Zealand Trust** | https://shop.predatorfreenz.org/ |
| **Goodnature Traps** | www.goodnature.co.nz |
| **Haines Pallets** | www.hainespallets.co.nz/predator-traps |
| **CMI Limited** | www.cmisprings.com |
| **National Springs and Wire Products NZ Ltd.** | www.natspring.co.nz/predator-traps/ |
| **Pest Control Solutions** | www.pestcontrolsolutions.co.nz |
| **Connovation** | www.connovation.co.nz |
| **Pest Control Research** | www.traps.co.nz |
| **NZ Auto Traps** | www.nzautotraps.com |
| **Key Industries** | www.keyindustries.co.nz |
| **Farmlands** | www.farmlands.co.nz |
| **Hunting and Fishing New Zealand** | www.huntingandfishing.co.nz |
| **Mitre 10** | www.mitre10.co.nz |
| **PGG Wrightson** | www.pggwrightson.co.nz |

# 12. Online resources

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|---|---|
| **Department of Conservation** | www.doc.govt.nz/predator-free-2050 |
| **Predator Free NZ Trust** | www.predatorfreenz.org/ |
| **Predator Free 2050 Ltd** | www.pf2050.co.nz |
| **Forest and Bird** | www.forestandbird.org.nz |
| **NZ Local Government** | www.lgnz.co.nz |
| **Ministry of Primary Industries (MPI)** | www.mpi.govt.nz |
| **Ministry for the Environment (MfE)** | www.mfe.govt.nz |
| **Landcare Research** | www.landcareresearch.co.nz |
| **NAWAC ( National Animal Welfare Advisory Committee)** | www.mpi.govt.nz |
| **Bionet NZ** | www.bionet.nz |
| **QEII National Trust** | qeiinationaltrust.org.nz |
| **NEXT Foundation** | www.nextfoundation.org.nz |
| **New Zealand's Biological Heritage – National Science Challenge** | www.biologicalheritage.nz/ |
| **ZIP (Zero Invasive Predators)** | www.zip.org.nz/ |
| **Pest Detective** | www.pestdetective.org.nz |



# Kōkiri whakamua i te Whakakore Konihi i Aotearoa

# Towards a Predator Free New Zealand

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**Disclaimer**

This guide reflects agreed best practice and latest technical information at the date of publication. As it will need to be updated regularly, please check the DOC website to ensure you are using the latest version.

**The Department of Conservation would like to thank you for your contribution toward a Predator Free New Zealand.**

If you would like further information about the content in this booklet please contact your local DOC office or Regional Predator Free Ranger www.doc.govt.nz

Volunteer trappers. *Image: Whenua Iti Outdoors*

New Zealand Government