Pacific Invasive Species
Battler Series

SUPPRESS FERAL CAT POPULATIONS IN THE PACIFIC

PRISMSS

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere

Department of Conservation
Te Papa Atawhai

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DISCLAIMER

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This is a live document reflecting the latest technical information at the date of publication. It will need to be updated as new information and technology becomes available. Please check the Pacific Regional Invasive Species Management Support Service (PRISMSS) website to ensure you are using the latest version.

Prepared by
Department of Conservation Te Papa Atawhai (DOC)
PO Box 10420
Wellington 6143
New Zealand
www.doc.govt.nz

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Secretariat of the Pacific Regional Environment Programme (SPREP)
PO Box 240
Apia, Samoa
T: +685 21929
E: sprep@sprep.org
W: www.sprep.org

Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures

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About this Guide

Suppress feral cat populations in the Pacific is a joint instructional effort by the National Invasive Species Coordinators and PRISMSS Partners. It provides practical advice on ways to reduce the harmful effects of feral cats in the Pacific islands region. Most of the advice is based on tried-and-true methods for suppressing feral cat populations. Where there is not enough information to form best practice advice, we provide you with practical recommendations based on observation. Emerging technologies are referred to but are not covered in detail here. Whether you are a technical expert or a concerned local community member, we created this guide to help you humanely suppress feral cat populations, safeguarding the values you care about.

This guide is part of a collection of Battler online resources on managing invasive species, which can be found here. Bolded and underlined words are linked to a technical definition in the Key terms. This guide recommends using only tools and methods that are legally permitted in New Zealand. It is overarched by the Invasive Animal Suppression Framework outlined in *Use a framework to plan and implement an invasive animal suppression project*, which covers universal aspects of invasive animal suppression that are not covered in this species-specific guide.

This guide was written by Verity Forbes (DOC). Craig Gillies, Nick Poutu, Souad Boudjelas, Josh Kemp, Vanessa Mander, and Keith Broome, also from DOC, provided peer review.

PRISMSS partners are instrumental in sustained invasive species suppression work in the Pacific. In developing this document, special mention goes to Steve Cranwell (Birdlife International), David Moverley (SPREP), and Tehani Withers (SOP Manu). Thank you also to Tiffany Straza for the editing of this document.

Dear Invasive Species Battler,

We are a diverse bunch of people in the Pacific region, which spans about one third of the Earth's surface and encompasses about half of the global sea surface. We have ~2,000 different languages and ~30,000 islands. The Pacific is so diverse that its **ecosystems** make up one of the world's **biodiversity** hotspots, with many species found only in the Pacific and nowhere else. In fact, there are 2,189 single-country **endemic** species recorded to date. Of these species, 5.8 per cent are already extinct or exist only in captivity. A further 45 per cent are at risk of extinction. We face some of the highest extinction rates in the world.

The largest cause of extinction of these endemic species in the Pacific is the impact of **invasive species**. Invasives also severely impact our economies, ability to trade, sustainable development, health, ecosystem services, and the resilience of our ecosystems to respond to natural disasters.

Fortunately, we can do something about it.

Even in our diverse region, we share many things in common. We are island people, we are self-reliant, and we rely heavily on our environment to support our livelihoods. We also share many common invasive species issues as we are ultimately connected. Sharing what we learn regionally makes us and our families benefit economically, culturally, and in our daily lives.

The Invasive Species Battler series has been developed to share what we have learned about common invasive species issues in the region. They are not intended to cover each issue in depth but to provide information and case-studies that can assist you to decide about what to do next or where to go for further information.

The SPREP Invasive Species Team aims to provide technical, institutional, and financial support to regional invasive species programmes in coordination with other regional bodies. We coordinate the Pacific Regional Invasive Species Management Support Service (PRISMSS), the Pacific Invasive Learning Network (PILN), a network for invasive species practitioners battling invasive species in Pacific countries and territories, and the Pacific Invasives Partnership (PIP), the umbrella regional coordinating body for agencies working on invasive species in more than one Pacific country.

For knowledge resources, please visit the Pacific Battler Resource Base on the SPREP website: https://brb.sprep.org/

Thank you for your efforts,

SPREP Invasive Species Team

Understanding the biology and dynamics of feral cats is important to develop effective suppression strategies. In this introductory segment, we examine these aspects to equip you with information to help safeguard cherished values from the harmful effects of feral cats.

1. What are feral cats?

Cats (*Felis catus*) were first domesticated around 8,000 to 10,000 years ago, probably from the Near Eastern wildcat. The cat can be a well-fed household pet, but some can be completely feral, living in the wild without contact with people (Figure 1). Stray cats are somewhere between pet and feral where they are partially accustomed to people for food opportunities. Both feral and stray cats are considered invasive species because of the impacts they have on native wildlife. Pet cats that not well looked after can become stray or feral, but most feral cats are born in the wild. From 1769, cats were introduced into the Pacific islands by early European explorers to control rodents aboard the vessels during sea voyages. Over time, cats spread across the Pacific region, reaching most islands with people.

FIGURE 1. Feral cat in a leghold trap. Photo: G. Harper, DOC

Feral cats closely resemble typical short-haired domestic cats. There is a general geographic trend for cats to be smaller near the equator and larger at high latitudes. Females average about 70 to 80 per cent of the weight of males.

Cats have sensitive hearing, responding to tones up to 65 kHz (the human upper limit is 20 kHz). This range allows them to hear ultrasonic sounds, including the calls of rodents. Their exceptional night vision enables them to distinguish objects in lighting conditions as low as one-sixth of what the human eye needs.

Habitat

Feral cats are highly adaptable and can thrive in various environments, such as coastal areas, farmland, forests, riverbeds, sub-alpine environments, and on islands. Their habitat includes sand dunes, pasture, tussock, scrub, exotic plantations, and native forest from sea level to 3000 metres. Cats primarily select habitat depending on where their prey is located. Shelter from wet weather also influences habitat selection. For example, given the option, feral cats on Rakiura Stewart island in New Zealand use podocarp-broadleaf forest over subalpine shrubland.

Home range

Feral cats typically live alone and are sparsely distributed. Home range varies widely in size with reports in the Pacific islands from 50 hectares and up to 200 hectares, 500 hectares, and 2,083 hectares in New Zealand. Territories are influenced by the number of cats in an area and the availability of food. When food is scarce, cats will travel farther to find it, which makes their territory bigger. When food is abundant and cat densities are high, cats maintain smaller home ranges. Within the Pacific context, unless the island is very large (300 hectares or more) you should assume that feral cats are traveling over the whole island during the course of a year. They may confine themselves to certain locations for a month or two to take advantage of seasonally available food like nesting seabirds.

Social organisation and behaviour

Female density (number of animals in a given area of space) and distribution (how they are spread across the habitat) are typically determined by the availability of food. Conversely, the range size of males is influenced by the density and distribution of females.

Feral cats tolerate some overlap in their territories but guard a core area. Sometimes, related cats will form groups, especially around places like farms or places where human food is discarded. These groups are usually made up of females, with one male included or a few males loosely connected to the group. Young males that are nearing sexual maturity are usually driven out of the group.

Territorial boundaries are marked using scent glands, clawing specific trees, spraying urine, and depositing waste, called **scat**, in conspicuous places. Interestingly, domestic cats demonstrate the same territorial behaviour, except that they bury scat when close to home.

In tropical island rainforests, feral cat activity was found to peak in the hours before dawn and after dusk.

Food

Cats are versatile hunters and scavengers, eating a wide range of foods and switching from one type of prey to another when the opportunity arises. The diet of feral cats largely depends on what is available in the home range environment and includes mammals, birds, reptiles, amphibians, fish, insects, and carrion. In New Zealand, rabbits and rodents are a major part of the diet, birds compose a smaller component, and reptiles are eaten at low latitudes. Birds compose a much larger part of the diet of feral cats on islands than in mainland populations, with seabirds often staple items for island-dwelling cats. For instance, on Howland and Jarvis Islands, two small uninhabited islands in the central Pacific Ocean, cat stomach contents revealed sooty terns to be the primary prey species, although other seabirds, lizards, insects, and house mice were also found.

Feral cats do not usually need to drink water as they get the fluids they need from prey. Some drinking water may be necessary when food is scarce or when they are nursing kittens.

FIGURE 2. Feral cat with remains of 102 short-tailed bats it killed within seven days, New Zealand. Photo: J. Scrimgeour, DOC

Reproduction, development, and lifespan

Cats typically reach sexual maturity between eight and twelve months of age. The pregnancy period lasts around 65 days, and most kittens are born in the spring and autumn. While domestic cats may have two or three litters per year, feral cats have fewer, comprising up to five kittens. Cats can breed at any time of year, depending on their environment. In New Zealand, pregnant and lactating cats are commonly seen from October to May, though some have also been recorded in winter.

Mothers keep their kittens in the den where they were born until they reach around 500 grams, which takes approximately five weeks. After this, they relocate to temporary dens, staying only a few days at each location. Feral kittens grow at a slower pace than their domestic counterparts.

Feral cats in general have much shorter lives than their domestic counterparts. While domestic cats commonly live for 15 or more years, feral cats live about half that. The oldest known cats in the Orongorongo Valley in New Zealand were two six-year-old females; and on Kerguelen and Marion Islands, nine years.

Population density

Feral cat densities vary greatly worldwide. In New Zealand, for example, the number of feral cats in different environments ranges from 0.17 to 5.6 cats per square kilometre. The places with the most prey tend to have the highest cat numbers.

2. What impacts do feral cats cause?

Feral cats are directly responsible for a large percentage of global species extinctions, including within the Pacific islands. In island environments, the impacts of cats tend to be severe because many **native** animals on these islands lack natural defences against mammalian hunters like cats. Additionally, the availability of year-round food allows feral cat populations to thrive. Feral cats are one of the top predators in New Zealand ecosystems and have a major impact on native birds, bats, lizards, wētā, and other insects (Figures 2 and 3).

There is a common belief that cats are effective at controlling invasive rats and mice. However, these observations usually apply in and around domestic households. In the wild, rodent populations are usually limited by their food supply rather than their predators.

The consistent pattern of cats playing a role in driving species to extinction, or to the brink, has led to their inclusion in the list of the 100 most harmful invasive species worldwide. In the Fijian Islands, cats are responsible for the extinction of the skink species *Emoia* spp. and are likely the main cause behind multiple seabird extinctions on many islands.

Cats can act as carriers for diseases that may be transmitted to other animals, wildlife, and humans. Some of these diseases include toxoplasmosis, salmonella, fungal infections such as ringworm, intestinal parasites such as roundworms, and hookworms. When cats scavenge on carcasses, they can contribute to the transmission of certain diseases to livestock.

Did you know?

There is a Battler guide that explains how to address multiple threats for ecosystem restoration. For information on managing a site holistically, refer to: *Build resilient ecosystems and communities by managing invasive species in high-priority sites*

FIGURE 3. Seven New Zealand native skinks removed from a cat's stomach. Photo: A. Cree, DOC

3. Have feral cats been successfully controlled in the past?

Feral cats have been successfully removed (eradicated) from at least 48 islands around the world. These include 16 islands in Baja California (Mexico), 15 in New Zealand, five in Australia, four in the Pacific Ocean, four in Seychelles, three in the sub-Antarctic, and three in Macaronesia in the North Atlantic (not to be confused with Micronesia). These eradications have led to significant recovery of many island-dwelling mammals, birds, and reptiles.

Reducing and maintaining cat populations to low levels over time is called suppression, which also benefits nature and people. A key component of a successful suppression project is persistence, with frequent follow-ups to remove individual cats over time. Feral cats will rapidly reinvade areas due to their ability to move quickly and cover long distances. If suppression efforts cease, cat numbers return to pre-suppression levels as they move in from neighbouring areas. For instance, a study in a peninsula of the New Caledonia (25.6 square kilometres) found cats returned to pre-suppression levels three months after control.

Did you know?

The Invasive Animal Suppression Framework *Use a framework to plan and implement an invasive animal suppression project* helps you set project goals, assess feasibility, plan the project and define success criteria. This framework covers universal aspects of invasive animal suppression which are not covered in this species-specific Battler guide.

A good planning foundation helps reap the benefits of suppression work in the long-term. Guidance on how to plan a long-term invasive animal suppression project can be found in the Pacific Invasive Animal Suppression Framework, described in *Use a framework to plan and implement an invasive animal suppression project*.

In the Pacific region, efforts to suppress feral cat populations are underway at numerous sites, often as part of a broader effort to control various predators that threaten native species. It is worth noting that the Trap Neuter Release (TNR) method, which allows feral cat colonies to persist, is not addressed in this series because it does not offer adequate benefits to native wildlife.

4. How should feral cats be monitored?

Monitoring plays a pivotal role in determining the need for a suppression programme and evaluating its success.

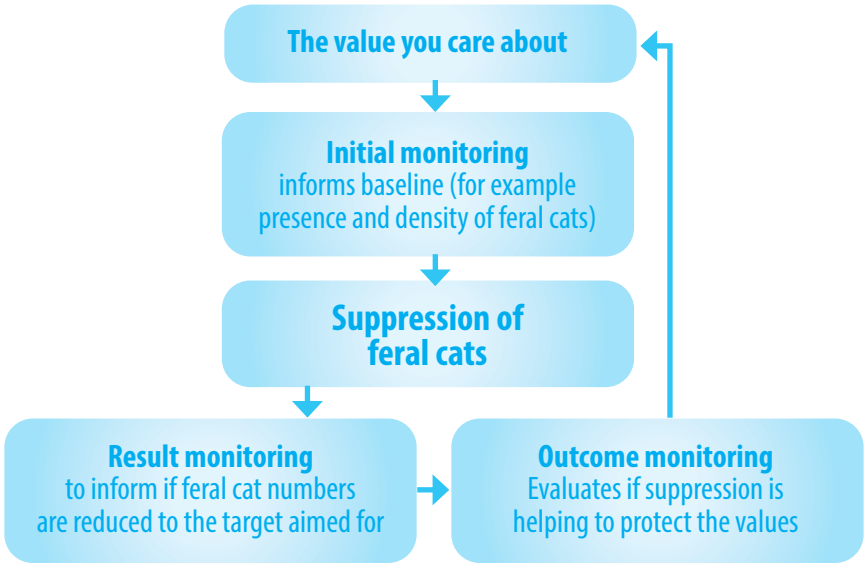


FIGURE 4. Relationship between protecting the value, suppression work, and monitoring

An overview of monitoring is described in the Invasive Animal Suppression Framework, referenced in the section 3 text box. In summary, three main types of monitoring are conducted for invasive animal suppression projects, serving different purposes (Figure 4):

1. **Initial monitoring** provides baseline information on the animals (both valued and invasive) at the site.
2. **Result monitoring** determines if invasive animal numbers are reduced to the desired target level after suppression work.
3. **Outcome monitoring** measures changes in the value being protected, after suppression work.

For instance, monitoring can help identify how many cats are in an area before suppression work (initial monitoring), how many are left after suppression (result monitoring), and whether the native animal numbers recover after cat suppression (outcome monitoring).

Let's talk monitoring!

There are two different approaches to monitoring cat abundance:

a. **Relative abundance** is an approach that looks at the 'smoking gun' evidence, such as cat tracks or scat. It is assumed that more tracks or scat means a higher number of cats. This is a useful approach for feral cats because they are solitary in nature, meaning saturation of the counts is less likely.

b. **Absolute abundance** is an approach that estimates the number of animals present based on direct sightings. It is usually expressed as a density, that is, the number of animals per area. However, this approach is expensive.

Protecting native animals through suppressing feral cat populations is a complex task without a one-size-fits-all solution. The approach depends on factors such as the local environment, cat prevalence, and the potential for reinvasion. Higher cat numbers will require more intense suppression efforts, involving the use of more resources, more frequently, and for longer duration. The risk of invasion varies among locations, influenced by factors like landscape connectivity and social dynamics among cats. For instance, the removal of dominant cats may prompt sub-adults to seek new territories.

Additionally, estimating cat abundance is challenging, emphasising the importance of outcome monitoring to assess the impact of reducing feral cat numbers on the survival and population growth of native species. Given the complexities involved, seeking advice from a PRISMSS expert before initiating a feral cat monitoring programme is recommended.

4.1 Techniques for monitoring feral cat population densities

Using at least two different monitoring techniques to measure cat population densities will increase accuracy, as all techniques have limitations. Techniques include track and scat counts, tracking tunnels, spotlighting, thermal imaging, trail cameras, and DNA analysis. Commonly used techniques are explained below.

4.1.1 Track counting

Track counting involves looking for paw prints in sand or similar material to identify cat presence. Prints can be looked for opportunistically, or deliberate survey plots can be established.

For opportunistic track counting, look for cat prints in sandy locations or where there is soft dust or mud. The beach between tides or along the drift line are good sites. Cats normally avoid wet areas. While searching for sign, also look out for scat, which is often left unburied and in obvious places as a territory marker.

If establishing survey plots, set plot transects along roads or pathways within the treatment area at 100 metre spacing intervals. Smooth the plot surface by raking fine sand or similar material to make tracks visible. Place a meat **lure** in the middle of each plot to attract cats. Mark the GPS coordinates of each plot on a map. Visit each plot for three consecutive mornings to count and record any cat tracks. Smooth the sand after each count. Calculate cat abundance as the number of individuals tracked per square kilometre of area surveyed with the tracking plots.

Table 1 illustrates a New Zealand monitoring example using sand plots to estimate the relative abundance of feral cats following suppression efforts.

TABLE 1: Example of result monitoring using sand plots to estimate residual cat abundance.

Goal (record what is left in area after suppression)	Target	Method and Frequency
Determine location and relative abundance of cats remaining after predator suppression	Either (a) a 90 per cent reduction in the share of sand plots with cat tracks or (b) less than 5 per cent of sand plots have cat tracks	Sand plots placed out for 3 days every 2 months and tracks recorded Sand plot spacing every 1 to 2 kilometres

4.1.2 Tracking tunnels

A tracking tunnel comprises a wooden or solid base, a tray, and a cover. The tray is divided into three compartments: a central compartment that contains an ink pad with paper compartments on either side. A suitable meat lure is placed in the centre of the tray to entice predators into the tunnel. As the animal investigates the lure, it will step onto the central ink tray, leaving footprints on the other end (Figure 5). If you do not have access to ink pads, a sponge soaked in food colouring dye and absorbent paper either side to capture the pawprints works well. Knowing how to recognise animal footprints will make it easier to identify them. Check out this *Short guide for identifying footprints on tracking tunnel papers* (based on invasive mammals in New Zealand) for more information.

FIGURE 5. Kitten prints in a tracking tunnel. Image: DOC

4.1.3 Spotlighting

Spotlighting is the practice of shining a light over terrain to survey for cat eye glow. Cat eyes show up strongly in torch or spotlights and can be seen for hundreds of metres over open terrain. Cat eyes glow a yellow-green colour. Using lower wattage spotlights below 50 W is advisable, as strong spotlights can cause cats to avert their gaze. Spotlighting is effective in open areas but is not suitable for use in dense vegetation.

4.1.4 Thermal imaging

Thermal imaging equipment detects mammals via their body heat. This method is increasingly used for locating cats at night, especially in areas where cats have become adept at evading spotlights.

4.1.5 Trail cameras

Trail cameras are becoming increasingly popular (Figure 6), despite high purchase costs and the analysis of camera footage being labour-intensive. The cameras can operate continuously, are activated by motion, and document the date, time, and coordinates whenever a feral cat is detected. Camera images, once analysed, provide valuable information on feral cat presence or absence in the area, their abundance, where they are located in the landscape, and habitat preferences. Based on these data, suppression methods can subsequently target the areas where feral cats are present. Once suppression is complete, the cameras can be reinstated or reactivated to measure the success of the programme.

FIGURE 6. Field officer checking a trail camera on Fatu hiva. Photo: J. Zito

Camera grids comprise multiple sites, spaced evenly across the landscape with each site consisting of one camera. (Refer to section 6.2.2 for setting up a grid network.) The project goal will influence the optimal number of cameras to use, the timeframe for deployment, and the type of cameras to be used. For example, three recent studies in New Zealand, conducted in the Auckland Islands, Hawke's Bay, and Rakuria Island, used cameras with meat lure to detect feral cats, and inform trap placement. This strategy proved highly effective at targeting and reducing feral cat populations.

You can find straightforward steps for using trail cameras at this link from Predator Free NZ. Additionally, the National Eradication Team at NZ DOC has shared a summary of their experiences in placing trail cameras, in **Appendix 2**.

More detail on monitoring methods, along with the strengths and weaknesses of each, can be found in the online resource *Feral and stray cats monitoring and control, a preliminary guideline towards good practice*.

5. What suppression methods are used? *Trapping, poisoning, shooting*

To suppress feral cat populations, it is usually best to use a combination of methods. Methods include kill-trapping, live-trapping, poisoning, and shooting. Sometimes special predator-proof fences are used around discrete areas to exclude feral cats. A common approach involves setting up a network of traps in and around the treatment area. These traps are regularly checked and serviced. Sometimes a trap network is used in combination with poison **bait** (such as in Figure 7). Depending on whether the suppression efforts continue all year or just during certain seasons, some methods may be used intermittently, while others are used consistently.

5.1 General principles

5.1.1 Whatever tool you use, use it well

For the successful suppression of feral cat populations, tools must be used correctly. Misusing tools will not only fail to safeguard the species for protection but will also waste resources and inflict unnecessary harm to cats. For instance, poorly set traps can make cats cautious of traps, and eating non-lethal doses of poison can make them wary of bait and new foods. Additionally, using bait stations designed for rats will be ineffective, as cats dislike putting their heads into tight spaces. The risk of avoidance is further heightened when the same approach is applied for too long. Use tools according to the proper instructions and change methods from time to time to keep cats susceptible to suppression techniques.

FIGURE 7. Poison in bait stations and cage trapping for feral cat suppression in Rakiura Stewart Island. Photo: K. Carter, DOC

5.1.2 Keep good records and label and number all tools

Make sure to label, number, and record all tools specific to each location, like traps, **bait stations**, or hand-placed poisons. Use a waterproof marker, tagging system, or ideally, GPS, to note the locations during installation. This will make it easier to relocate them and gather data later on.

If you move any of the devices, be sure to re-label and re-number them. Keeping the same number can cause confusion when reviewing information about trapping efforts and locations.

Always keep a diary of what you did each day to help you remember small changes, details of captures, and so on. This can be vital if you find a glitch in the data later.

5.1.3 Keep lure and bait palatable

Most cats are not attracted to old, smelly lure, and poison bait usually has an expiration date. Keep these palatable by replacing as needed. Fresh lure such as meat will deteriorate quickly with hot weather and flies and may need to be replaced daily. In cooler weather, fresh lure may last up to three days. Dispose of old lure in trash bags and remove from the site to make it unavailable to cats. For specifics on cat poison and poison disposal, refer to section 7.

5.1.4 Minimise human scent on the tools, and dispose of carcasses

Before setting up new traps, reduce the scent of humans and protective coatings by rinsing them in fresh water and airing outdoors for at least a week.

For trapped or shot feral cat carcass disposal, either throw the carcasses a few metres away from the device and allow them to naturally decompose, or collect the carcasses in a bag for later burial or incineration. Ensure that carcasses are discarded at a minimum distance of 50 metres from public pathways, areas, or structures. Poisoned carcasses are treated differently, as explained in section 7.4.

5.1.5 Manage non-target risks

Non-target wildlife, domestic animals, or livestock animals can ingest poison bait directly, succumb to **secondary poisoning** if they consume other poisoned animals, or be injured in a trap. Interference by non-target animals can also jeopardise the success of a project (Figure 8). Some non-target species consume excessive bait, reducing resources for the target species. Additionally, certain animals may damage bait stations or trigger traps. In the Pacific islands, land crabs pose a major interference challenge. To manage non-target risks, follow these steps during the feasibility stage:

FIGURE 8. Pig interfering with feral cat trap at Marble Hill, New Zealand. Photo: A. Low, DOC

- identify the non-target species present on the island
- assess the level of risk to the non-target species
- assess whether non-target species' interference with the proposed methods could compromise the project
- implement tailored management plans to deal with each identified risk.

For further information on options to manage non-target interference, refer to the *Resource kit for rodent and cat eradication, guidelines on non-target species*.

6. What trapping tools are recommended? *Kill traps, leghold traps, and cage traps*

Commonly used trapping methods include kill trapping, leghold trapping, and cage trapping.

6.1 General principles for trap use

Trapping feral cats at high densities is labour-intensive and can be expensive to set up. Trappers need to be diligent to make sure traps are set accurately, so cats do not start avoiding them, and to minimise interference by non-target animals. Each trap is important. For this reason, new trappers should receive training from an experienced trapper before heading out into the field. Make sure a trap is unset before handling it.

6.1.1 Animal welfare and trap checking

You must prevent cats or any other animal suffering unnecessary pain. In New Zealand, there are legal standards in place to ensure the humane treatment of animals during trapping and killing operations. These standards impact the design of traps and the frequency of field checks, as well as imposing responsibilities on trappers to inspect live capture traps, such as legholds and cage traps, daily – that is, within 12 hours after sunrise. Any animals caught alive in these traps must be promptly attended to or humanely dispatched. Trap checking obligations do not apply to kill traps, because kill traps are designed to kill the animal, not live capture it. It is important to find out what animal welfare laws apply in your country or territory. If there is no specific information, it is best to follow the standards set in New Zealand.

6.1.2 Remote checking of traps using wireless technology

Wireless technology allows trappers to check their traps remotely (note that remote checking is also known as remote monitoring). When a trap is triggered or reset, sensors (called nodes, Figure 9) automatically send an update to the trapper's mobile phone in real time. This enables trappers to focus only on the triggered traps, rather than physically checking the entire trap network. Projects which are likely to benefit from remote monitoring are those that are large in scale, have limited or costly labour, are able to use long-life bait, have relatively few trap triggers by cats or non-target animals, have people with the skills to set up and operate the remote monitoring system, and have the required infrastructure (such as cell phone service if the system requires it). For more detailed information on remote trap monitoring, you can refer to the post *Remote monitoring of traps* from Predator Free NZ.

FIGURE 9. Node for satellite network of cat traps on Fatu Hiva. Photo: B. Ignace

The use of a remote checking system that is actively maintained, fail-safe, and reliable and that promptly communicates the capture of an animal is a valid method for daily checking of live-capture traps. If a system does not have these elements, it is not suitable for replacing daily physical checks of live traps to attend to or dispatch the animal. For details, refer to these *Guidelines for good practice, remote monitoring of live capture traps for vertebrates*.

6.1.3 Trap maintenance

If you find problems with how a trap is set or maintained, fix it right away to prevent slow triggers or ineffective captures that may result in trap-shy cats. To maintain traps and keep them working well, clean them regularly with a wire brush. Get rid of any mould, fur, or remains. Check and replace any worn-out parts like pivots or weak springs. Every so often, inspect and activate both sprung and un-sprung traps to ensure they are still working. If you are unsure about the performance of a trap, replace it.

6.2 Trap network layout

Laying the trap network should take into account the type of traps being used as well as factors such as the abundance of feral cats, the terrain, environment (such as forests, grasslands, shorelines, wetlands, riverbeds, farmland, or other human-made habitats), the availability of prey, and the size of feral cat home ranges. Use enough traps to be sure a feral cat will come across one. There are three general approaches for laying out traps: the use of animal pathways, the use of grid configurations, and a combination of the two.

6.2.1 Using animal pathways

Some experts argue that where you place the trap and how well you set it up is more important than how many traps you have in a given area. Feral cats prefer to use easily travelled routes, and placing traps along these pathways is considered a highly effective strategy (Figure 10).

Trapping using animal pathways

In this ongoing suppression project, a total of 426 leghold traps and 76 cage traps are strategically placed in five designated block areas in the valley. Traps are opened once per year for ten consecutive nights, before being closed. This is done in April and May when cats are known to be actively dispersing in the area.

The leghold traps are positioned with a spacing of 100 metres, and **hazed**, while the cage traps are set at 500 metre intervals in locations of cat presence. Both types of traps are lured with fresh rabbit or hare meat.

Since all the traps are designed for live capture, they are inspected daily, either on foot or using a vehicle. Any captured cats are humanely dispatched then disposed of off-site. Any sprung traps are reset, and the legholds are re-hazed. Lures are replaced midway through the trapping period, and leftover lures are removed from the valley site.

The data collected from the daily checks of the live capture traps are recorded in field notebooks. At the end of each trapping session, the information is transferred to an Excel spreadsheet at the office and later analysed.

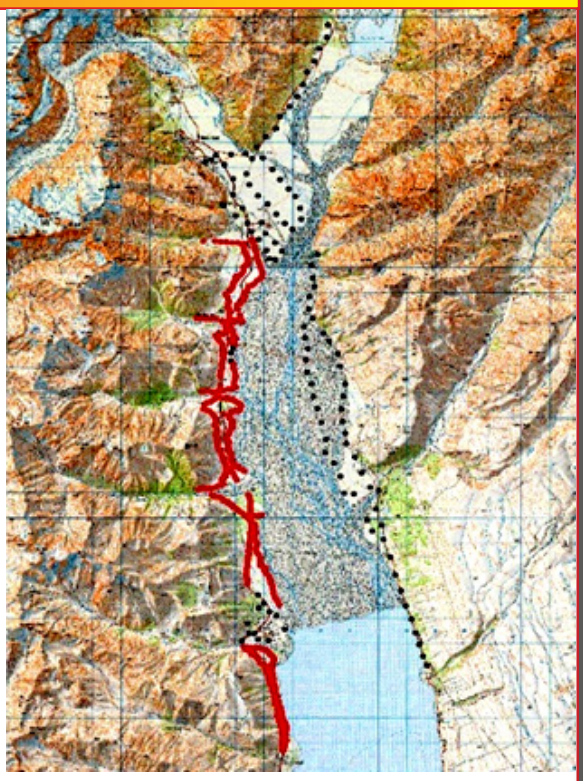


FIGURE 10. Trap network using animal pathways. Cage traps (black) and leghold traps (red) in Tasman Valley, New Zealand. Image: DOC

The spacing between traps can vary in successful operations, ranging from one trap every 50 metres to one every 500 metres along each trapline. An accepted practice for feral cat population suppression is to establish an extensive layout of traps 100 to 200 metres apart along linear pathways used by animals, such roads, tracks, open ridgelines, bush edges, habitat edge areas (such as the edges of forests and grasslands), and the coastline on islands. It is important to avoid wet muddy areas and thick ground vegetation, noting that the edges of such areas may be prime locations for trap placement. Additional trapping around nearby farm buildings, offal pits, and rubbish dumps can also assist in reducing the feral cat population and slowing reinvasion.

6.2.2 Using grid configurations

DOC often uses a grid configuration for trapping projects. While some experts advocate using feral cat routes over a grid system, the systemic nature of grid configurations are valuable in situations where site comparison and robust statistical analysis are important. Although there is no widely accepted practice for optimal spacing between traplines when developing grids, three recent studies in New Zealand, conducted in the Auckland Islands, Hawke's Bay, and Rakuria Island, offer general guidance on establishing device grids. Grid configurations with intervals set at 500 x 500 metres (Figure 11) are usually sufficient to ensure a high probability that every individual feral cat encounters at least one device. In areas with higher densities of feral cats or small home ranges, grid spacing should be reduced to 500 x 240 metres to enhance targeting reliability. All of the studies highlighted the importance of aligning the number of devices with feral cat densities and home range sizes specific to the site.

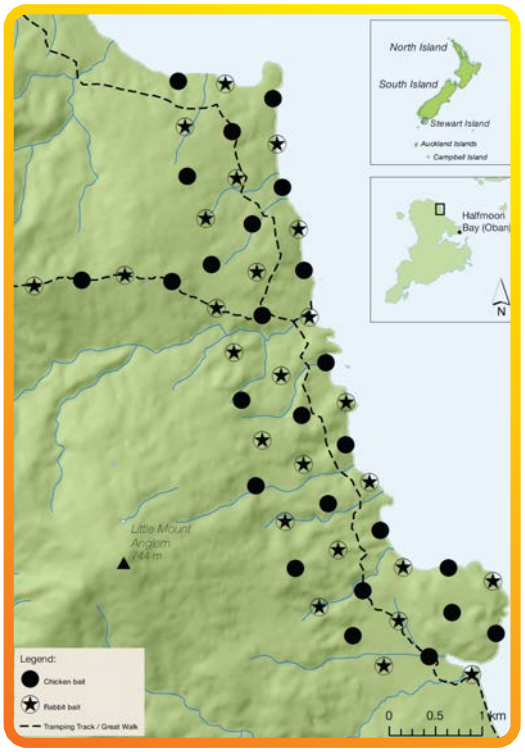


FIGURE 11. A grid formation of camera traps on Rakiura Stewart Island for feral cat bait trials. (Glen et. al. 2022)

6.2.3 Using a combination of animal pathways and grid configurations

A 'soft grid' approach, employed in two of the studies, let field staff choose device locations within a 100 metre radius of the designated grid point. This flexibility allowed for placement of devices along animal pathways, walking tracks, and habitat boundaries, where encountering feral cats is more likely, while retaining the benefits of systemic grid configurations.

6.2.4 Marking the locations of traps

When placing traps in scrub or bush, use flagging tape (Figure 12), plastic triangles, or some other clearly visible marker to indicate their location. Ensure the marker is positioned at a height that makes it easily observable from the road or track. If using tape, replace it periodically because it deteriorates over time.

FIGURE 12. Using flagging tape to mark trap location. Photo: V. Forbes, DOC

6.3 Kill traps

Kill trapping is a method that uses a lure to entice a cat into the trap, which triggers as the cat reaches for the lure. Once triggered, the trap swiftly and humanely kills the cat. A key advantage of kill traps is that they do not require daily checking and so are well-suited for locations where daily trap checks are not feasible.

However, kill traps pose several potential issues. They require regular inspections to replenish lures, their effectiveness in reducing cat populations is not well documented, and there is a risk of unintentionally capturing non-target animals. They should be used only in situations where non-target captures are unlikely or unimportant.

The frequency of trap inspections should be tailored to cat populations, weather conditions, longevity of the lure or bait, and the values you are protecting. In cases of high cat activity or during hot weather, traps should be checked regularly, possibly weekly or even more frequently. In contrast, with lower cat numbers and colder temperatures, monthly inspections may suffice. Daily checks might be necessary, depending on the values you are safeguarding.

The following three kill traps and systems have been designed to kill feral cats while incorporating aspects to help avoid accidental captures of non-target animals present in New Zealand. These systems have been assessed as being acceptable against New Zealand's animal welfare standards. They are all designed to work with solid bait lures, like fresh, frozen or salted meat, fish, or ideally local food sources that cats are familiar with.

6.3.1 SA2 Kat trap raised on ramp

The SA2 Kat trap (Figures 13a–d) works with solid meat, catfood, cat biscuits, or peanut butter. The cat triggers the trap with its head while feeding on the lure that is placed inside the trap-housing on the wooden base. When correctly deployed, this trap is effective at deterring ground birds. Although the SA2 Kat Trap comes with detailed setting instructions, they are summarised with the images below. All SA2 Trap images are sourced from Steve Allan.

FIGURE 13A. To mount the trap, place it on a wooden ramp at approximately 750mm above ground level, on an angle of up to 45 degrees, against a sturdy tree or structure. Screw the trap into position {an 8mm socket on the end of a battery drill works well).

FIGURE 13B. To lure the trap, smear peanut butter, minced meat or canned catfood on the wooden base inside the trap. Additionally, you can place a small piece of meat on the screw at the back of the trap.

FIGURE 13C. To set the trap, stand in front of the secured trap, with the front part of the trigger pointing at you. It is important to use the correct hand orientation to set the trap -a flat palm with fingers pointing to rear of the trap. Pull then push down the handle, using a reasonable amount of force.

FIGURE 13D. While holding down the handle, rotate the front part of the trigger up into the second half of the trigger with the washer. The parts should fit together in the set position. Fingers must not be anywhere near the inside of the trap! The final act of luring the trap is to throw in a handful of cat biscuits. You can place additional lures outside the trap to entice the cat into it.

FIGURE 13A–D. SA2 Kat Trap. Photos: Steve Allan

Always release the trap before luring it, by slowly holding down the handle with the flat of your palm, fingers pointing towards the rear of the trap, and disengaging the trigger arm out of the washer. Keep the tension on the handle until it returns to the upright position.

6.3.2 Timm's trap

The Timm's trap can be used set directly on the ground (Figure 14a) or on a raised platform (Figure 14b). Raising the trap helps to avoid non-target animal captures.

Setting instructions

1. Slide the meat lure onto trap trigger, making sure it goes up to, and beyond, the bent step, as indicated in Figure 14b.
2. Position the lured trap on the ground or, if raised, on the platform, and firmly secure it using the provided screws. Activate the trap.

FIGURE 14A. Timm's trap, ground set. Photo: Connovation.co.nz

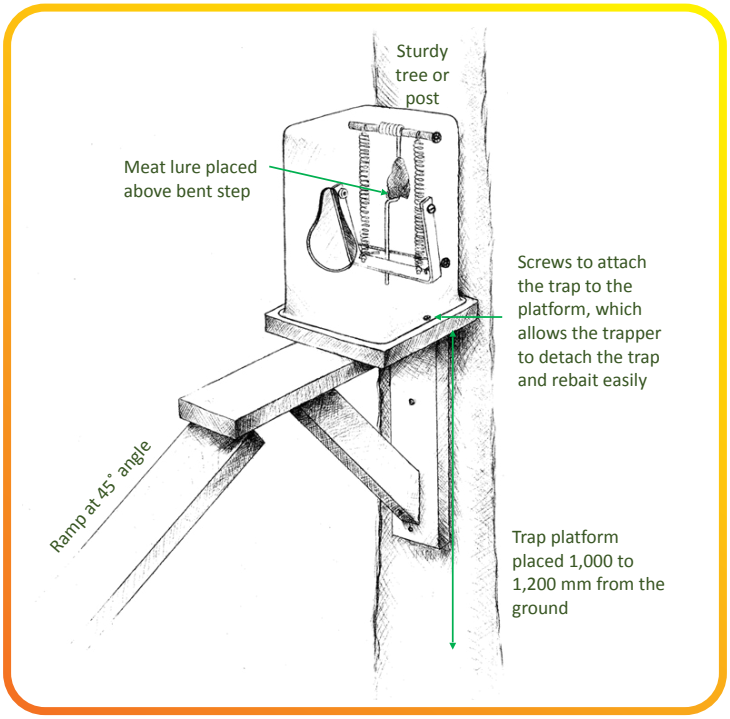


FIGURE 14B. Timm's trap, raised set. Image: P. Waddington

6.3.3 Belisle Super X 220 conibear trap in a 'chimney' cover

The Belisle Super X 220 conibear trap in a 'chimney' cover (Figures 15a,b) can be treated prior to field use by immersing it in melted preserving wax before using in wet conditions to protect it from rusting.

Training is required before setting this trap because it comprises two powerful springs that, if not carefully used, present risk of injury to the trapper. Once the trap is lured and set, it is placed into the box as shown in Figure 15a.

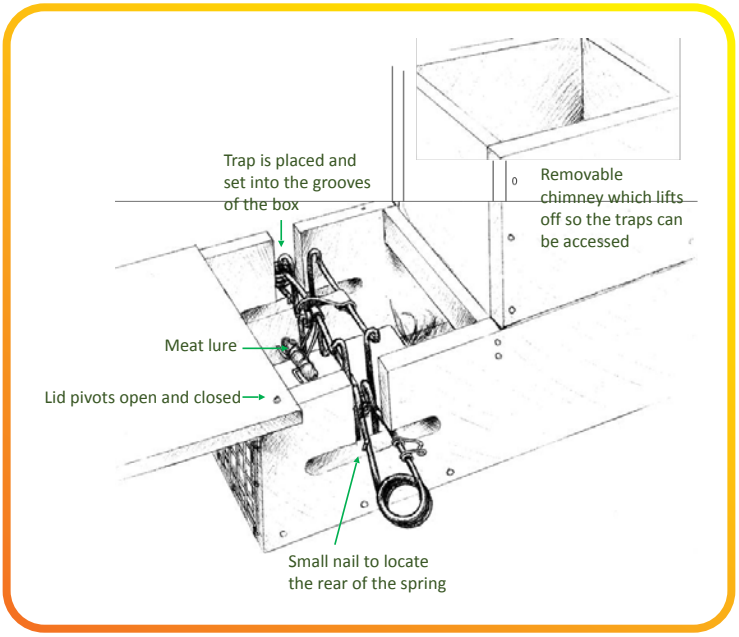


FIGURE 15A. Belisle Super X 220 chimney cover trap. Image: P. Waddington

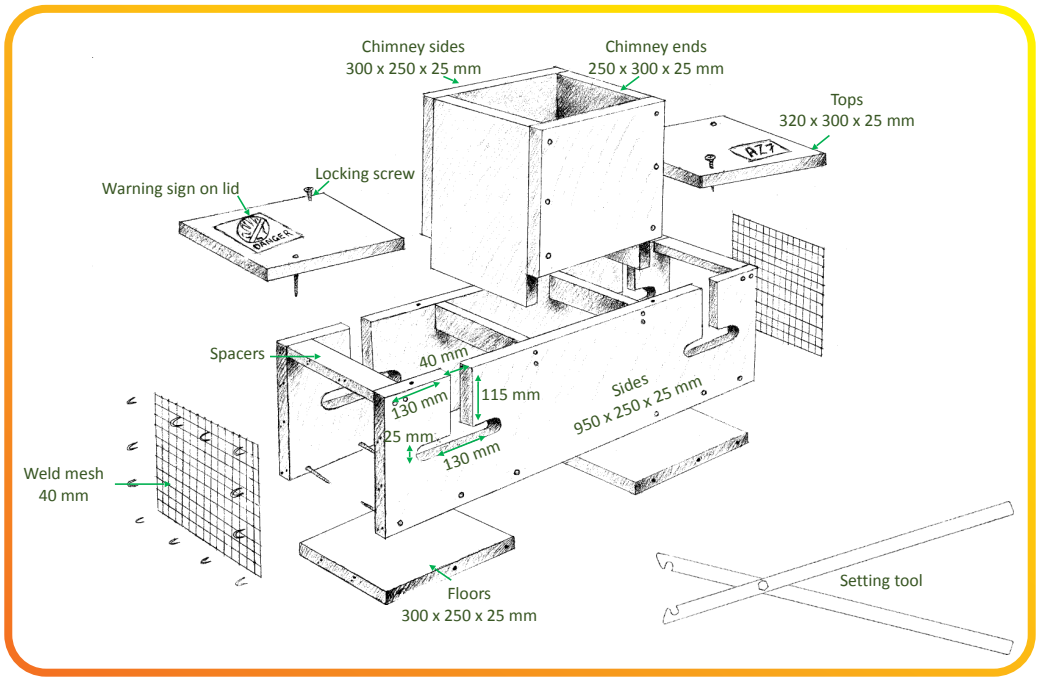


FIGURE 15B. Belisle chimney cover design configuration. Image: P. Waddington

6.4 Leghold traps

Leghold trapping involves capturing a cat by its leg and holding it in place until it is dispatched by the trapper. In New Zealand, it is prohibited to use leghold traps within 150 metres of any residence without the permission of the occupier, or in areas where there is a likely chance of catching a pet cat or dog. Check out laws relating to trapping in your country or territory. Always talk with residents if you are trapping near their property.

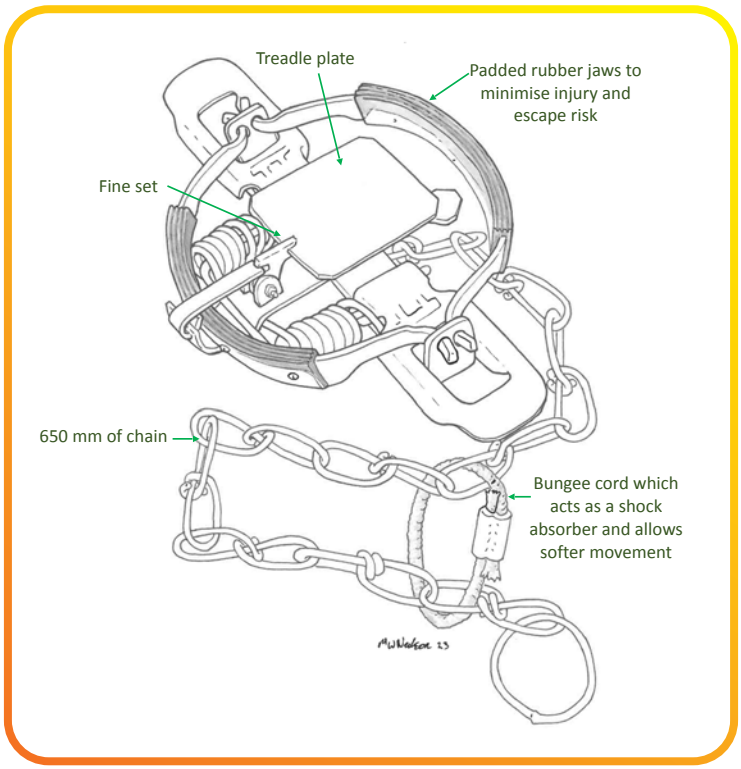


FIGURE 16. Victor 1.5 double coil spring padded jaw leghold trap, with key components. Image: Mark Neilson

This trap can be used with or without a lure. It is activated when the animal places its paw on a treadle plate between two sprung jaws. The Victor No. 1.5 double coil spring padded-jaw leghold trap is recommended as a suitable leghold trap for feral cats because it has been proven to be effective while minimising injury and escape risk. This leghold has a rubber-like padding on each jaw which cushions the impact of the jaw on the cat's limb while preventing the captured leg from sliding along or out of the jaws. All of the trap components shown in Figure 16 are arranged to minimise escape or injury to the animal: the length of chain, the way the chain attaches to the trap, the bungee cord on the chain, and padded jaws in good condition. For humane capture, set traps aiming for the cat's front leg because this reduces the risk of bone fractures compared to capturing the back leg.

6.4.1 Hazing, blind, and walk-through leghold trap arrangements

When installing leghold traps, it is important to 'haze' them properly (Figures 17 and 18). Hazing involves using surrounding plants or rocks to guide the cat's movement towards the trap, encouraging the cat to step onto the treadle plate. The key is to apply these materials subtly, influencing the cat's behaviour rather than trying to force it. Cats can easily become suspicious and may bypass the trap. A common mistake is to use vertical sticks in the ground, creating a kind of picket fence at head height for a cat. Instead, place lightweight sticks at different angles around the trap to discourage access from the sides. Make sure the vegetation is not taller than a cat's head. A natural, open setup is more likely to influence a cat's travel direction than a structured, constricted arrangement.

In areas where ground-dwelling native non-targets are unlikely to be caught, you can use either a technique called the double 'walk-through' set (Figure 17) or a method that creates a dead-end area, known as a 'cubby' or 'blind' arrangement (Figure 18). Both of these approaches can be used with or without bait lures but should be used with hazing.

A 'walk-through' set refers to using two or more traps in an area where cats are known or suspected to travel. These sets, placed near fresh cat sign (such as scat or tracks), are frequently used to catch feral cats. Traps should be positioned about 1 to 1.5 metres apart. Some trappers prefer not to bait a walk-through arrangement, relying on the natural features of the trap site. Cats that are cautious or shy of baited traps are more susceptible to un-baited walk-through sets. Sometimes trail cameras set beforehand can be useful to show exactly how cats pass through your intended trap site and therefore how best to set up the trap.

Setting instructions

1. Clear the area of debris and securely position the trap in the ground for stability.
2. Attach the trap firmly to an anchor point like a tree or stake, using two staples or wire ties. The 'bungee' complements the chain and serves as a backup in case of chain failure. Ensure the swivel rotates freely to prevent the cat from gaining leverage to escape.
3. Orient the trap so that the jaws face parallel to the cat's expected path of movement. This places the trigger on the side.
4. If using a blind technique, position the trap 150 to 250 millimetres from the tree, wall, or other solid object that serves as the back of the trap.
5. Embed the trap in the ground so it sits flush with the surface.
6. If using a meat lure, prepare a spot for the lure hook using a nail or similar object, directly behind the trap. Ensure it is at least a hand-width away from the trap and positioned 250 to 300 millimetres above the trap level. Attach the meat lure to the hook, ensuring the hook remains above ground level.
7. Conceal the trap using grass or very light, fine soil, and use the hazing technique to guide the cat to the entry points and trap plate. Avoid placing larger twigs, tufts of grass, or roots over the trap, and remove any vegetation that might entangle it or prevent the trap jaws closing effectively on the cat's leg.

- *Effective lures* for use with leghold traps include fresh, frozen, or salted meat (like rabbit or hare), fish, or fish-flavoured cat food wrapped in mutton cloth (a lightweight fabric made from cotton, also called cheesecloth). Lured traps may work better than non-lured traps when food is scarce. Changing the lure type can lead to more captures if the catch rate drops off.
- *When considering lure placement,* you may need to place it under cover to reduce the risk of capturing birds who may sight the meat lure from the air.
- *For inspection,* check leghold traps daily within 12 hours after sunrise.
- *When checking the traps,* remove the catch and any old lure for disposal. Make sure the traps have fresh lure. Reset and re-haze the trap.
- *Closing traps*: it is important to close any traps that will not be checked daily. Remove any hazing from the traps before closing them. If you have a lure hook (for example, see Figure 18), hang the trap on the hook above the ground.
- *When native ground birds are present,* use a chimney cover (Figure 19) to exclude ground birds. Alternatively, leghold traps can be set 700 millimetres or more off the ground, ensuring the chain on the trap is long enough for a caught animal to sit on the ground. However, raised legholds are not considered particularly effective for feral cats. Other trap options that may exclude ground birds should also be considered, such as the SA2 Kat Trap (Figure 13), the raised Timms (Figure 14b), or the Belisle Super x 220 (Figure 15).
- *For maintenance*, spring and reset the traps in the field every one to two weeks. Periodic filing and applying graphite (like from a builders pencil) to trigger mechanisms will help maintain quick set-off time.
- *Potential issues:* legholds are not suitable near human settlements due to the risks they pose to pets, farm animals, and people. In such cases, consider using cage traps instead.

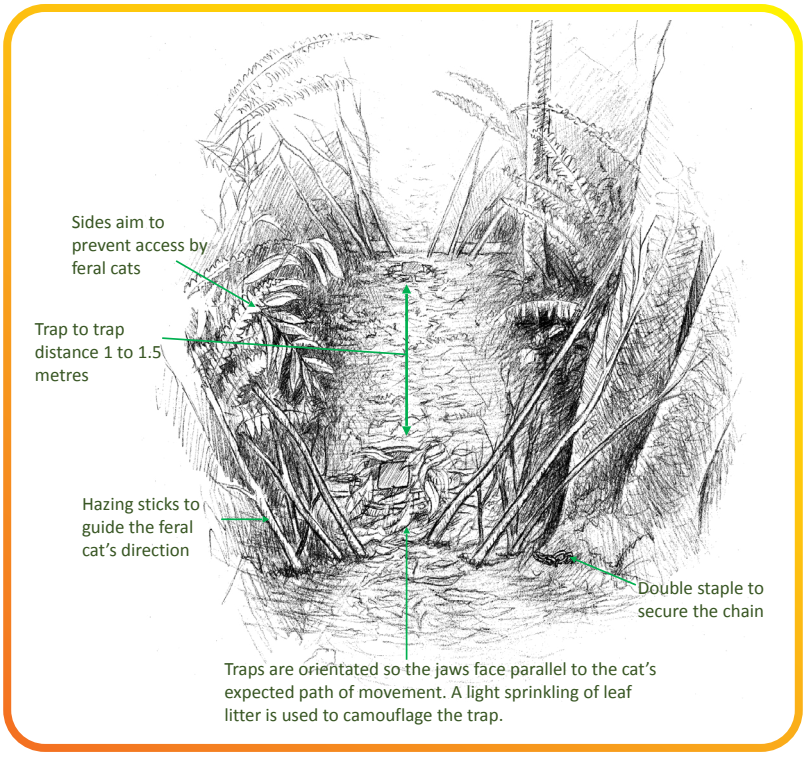


FIGURE 17. The double walk-through technique for setting and hazing leghold traps.

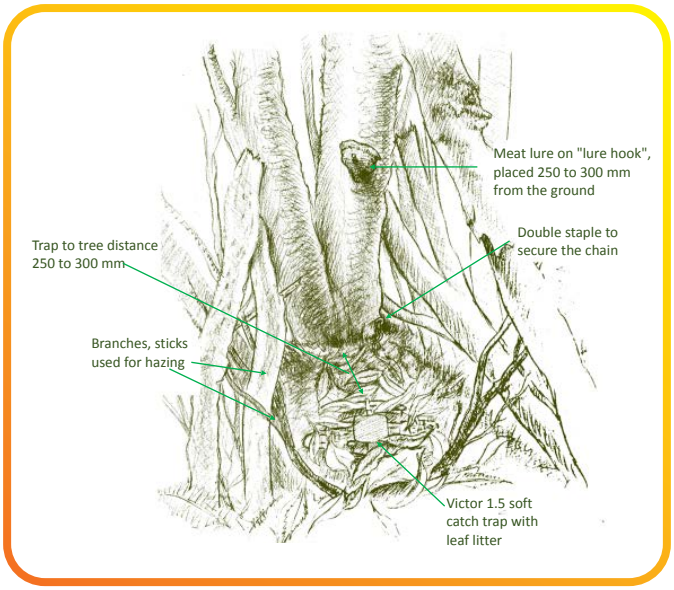


FIGURE 18. The blind technique for setting and hazing a leghold trap. Image: P. Waddington

The Scott Theobald chimney cover trap (Figure 19) is a bulky but good option where there are vulnerable ground-dwelling non-target species. Cats readily gain access through the open 'chimney' top and are caught by one or more of the legholds that are set underneath the cover. Less agile species are not able to enter the chimney.

Setting instructions

1. Clear the area of debris, and securely position the leghold traps flush with the ground for stability.
2. Ensure the jaws of the leghold traps are oriented to be parallel with the sides of the cover.
3. Hammer a large peg into the ground to anchor the trap chains.
4. Lure the device by placing meat lure on the bait hook at the end of the cover set.
5. Place the chimney construct over the line of traps, ensuring the lure and traps remain in place.

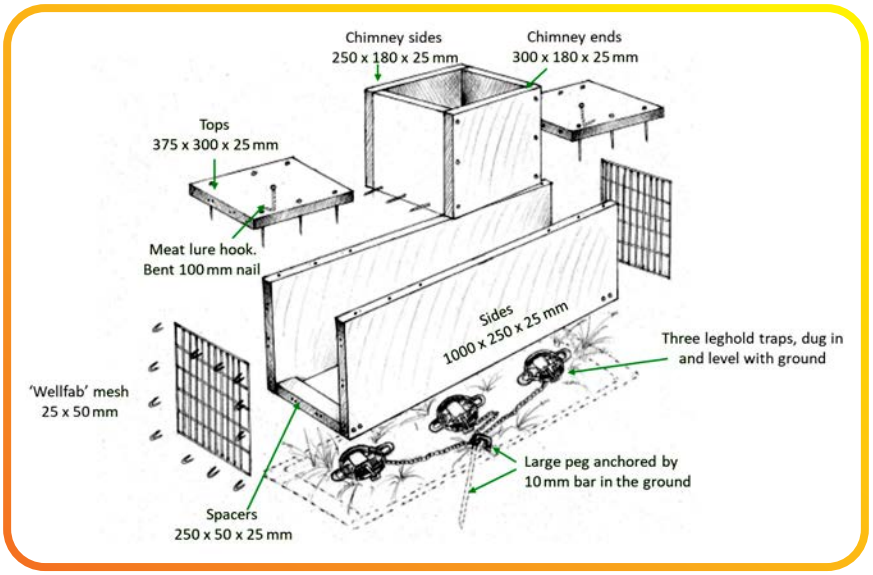


FIGURE 19. Scott Theobold chimney tunnel and configuration, used with leghold traps. Image: P. Waddington

6.5 Cage traps

Cage trapping is a method used to catch a cat in a small cage and, like the kill traps, is designed to work with a meat lure. When the cat enters the cage, it touches the lure or steps on a trigger, causing the door to close behind it.

Cage traps are generally viewed more favourably by the public than other methods. Using cage traps results in fewer injuries to the captured animal than leghold traps. Cages also present less risk to non-target animals. However, they are less effective than leghold traps and are typically used in combination with other techniques (see an example in Figure 10). Their size can make cage traps challenging to transport and use in the field. As with leghold traps, operating cage traps is labour-intensive since they have to be checked every day within 12 hours after sunrise.

Every so often, activate cage traps that have not been triggered to ensure the mechanisms are in good working order. Additionally, make sure the cage door closes swiftly and cleanly. Be mindful that trigger mechanisms can rust. Applying wax to the catch on the mechanism will help prevent rusting and ensure smooth operation. Apart from the trigger, these traps do not require treatment to prevent rust.

6.5.1 Havahart model 1089 (treadle-type) cage trap

The Havahart model 1089 (treadle-type) cage trap (Figure 20) is an example of a treadle-activated cage trap that is a suitable size for feral cats.

Setting instructions

1. Wire the meat lure to the rear of cage.
2. Place the cage on the ground, making it level.
3. Firmly peg the cage to the ground, securing it to prevent wobbling.
4. Set the trap trigger finely.

In populated areas, it is advisable to position the traps where they are less likely to be noticed by passersby because sometimes people release captured cats.

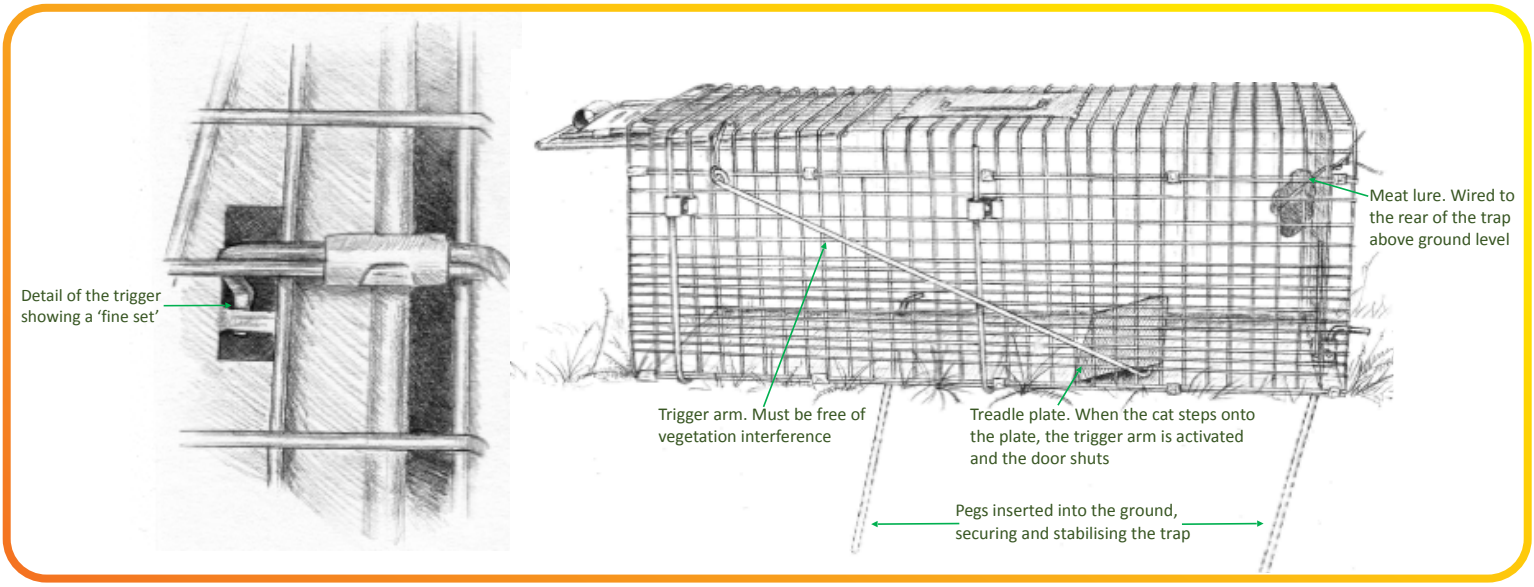
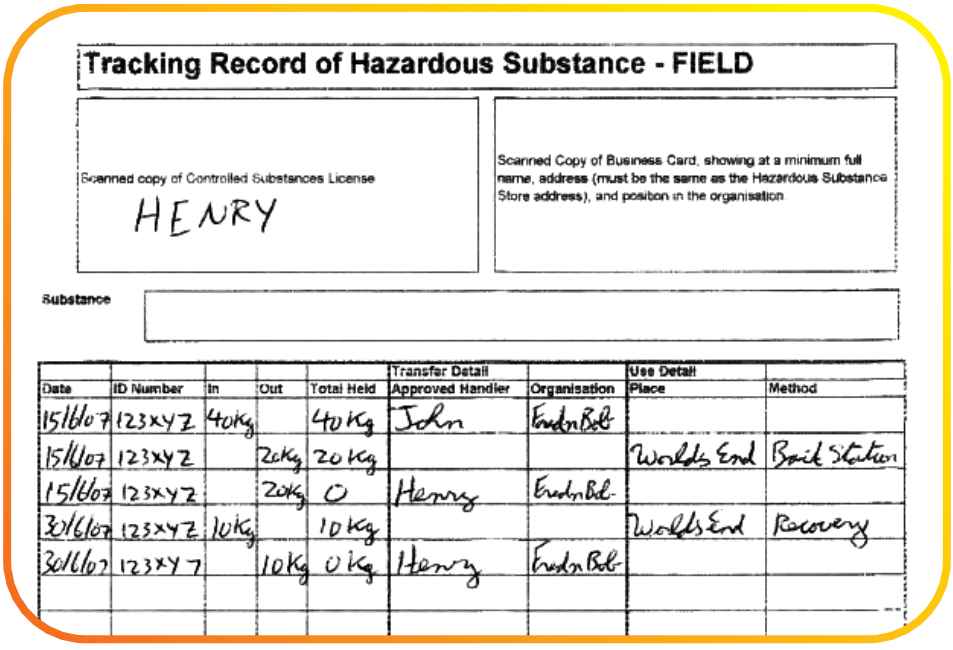


FIGURE 20. Havahart model 1089 cage trap. Image: P. Waddington

7. How is poison used effectively to suppress feral cat populations?

Vertebrate poisons used in feral cat suppression projects present hazards to people that must be managed carefully. Safety should always be your top priority. Before planning on using poison bait to target feral cats, find out what the legal requirements are for toxin use in the country or territory where the project is taking place, and make sure you comply with those requirements. Additionally, all poisons come with a label that describes mandatory instructions for using the poison safely. It is essential to strictly follow these label instructions.

Only two poisons are approved in New Zealand for direct use against cats: 0.10% 1080 Feral cat bait and PredaSTOP™ PAPP bait for feral cats. Cats are also vulnerable to secondary poisoning from other toxins, such as brodifacoum (an anticoagulant poison) used against rodents and, to a lesser extent, pindone or 1080 aimed at rabbits. This means that using brodifacoum to control rodents, or pindone or 1080 for rabbit control, can also help to suppress cat populations. If you decide to use brodifacoum to target rats with the expectation of suppressing cats via secondary poisoning, make sure to follow the safe use guidelines outlined in *Use anticoagulant rodent bait safely*.



Tracking Record of Hazardous Substance - FIELD

Scanned copy of Controlled Substances License: HENRY

Scanned Copy of Business Card, showing at a minimum full name, address (must be the same as the Hazardous Substance Store address), and position in the organisation

Substance

Date	ID Number	In	Out	Total Held	Transfer Detail: Approved Handler	Organisation	Use Detail: Place	Method
15/1/07	123XYZ	40Kg		40 Kg	John	Ends Bob		
15/1/07	123XYZ		20Kg	20 Kg			Worlds End	Bait Station
15/1/07	123XYZ		20Kg	0	Henry	Ends Bob		
30/1/07	123XYZ	10Kg		10 Kg			Worlds End	Recovery
30/1/07	123XYZ		10Kg	0 Kg	Henry	Ends Bob		

FIGURE 21. Example of a form tracking poison use in the field. Image: Bionet.nz

Using poison against **vertebrate** pests is closely monitored and regulated in New Zealand. Depending on the type of poison, there may be legal obligations such as tracking its journey from manufacturing to disposal (for examples of record-keeping, see Figure 21 and the tracking form in **Appendix 1**), storing it securely, obtaining a special licence for its use, following specific transportation rules, and having an emergency plan for potential mishaps. The New Zealand standards for using PredaSTOP™ and 0.10% 1080 Feral cat bait are below.

PredaSTOP™

To use this poison in New Zealand, a person must be an Approved Handler and hold a Controlled Substance Licence. Tracking is not required.

0.10% 1080 Feral cat bait

To use this poison in New Zealand, a person must be a DOC staff member and hold a Controlled Substances Licence. This poison must be tracked using the unique pack identifiers, for its full lifecycle, including date acquired and used, location of its use, and means of disposal.

7.1 Pre-feeding

To help cats become accustomed to the bait, it is strongly recommended to use non-toxic food as a lure before applying poison. This step is commonly known as pre-feeding. It is important to use the same type of food that will be used in the poison bait application phase and to present it in a similar way.

It is recommended to have several pre-feeding sessions spaced out over one to three days until the cats regularly take the lure. Keep a record of how much food they consume and be sure to remove any non-toxic food that remains uneaten before starting the poisoning process.

PredaSTOP™

It is a requirement for pre-feeding to be done before using this poison.

0.10% 1080 Feral cat bait

It is not a requirement to prefeed before using this poison.

7.2 Caution periods and disposing of poison bait and poisoned carcasses

Set up 'caution periods' in and around public areas where poison has been used, indicating the time after applying or removing the poison when the risk of residues to the public is expected to have diminished. For some poisons, you may need to monitor the poison bait or carcasses to ensure they no longer pose a danger to people or non-target animals. Caution periods also play a role in determining when it is safe to consume animals from a treated area and when to remove warning signs. A poison's label will also include instructions for the disposal of poison bait and sometimes carcass disposal. The caution period and disposal information for PredaSTOP™ and 0.10% 1080 Feral cat bait are described below.

PredaSTOP™

Dispose of remaining or spoiled PredaSTOP™ bait by burying.

The caution period for PredaSTOP™ for Cats (toxic loading 410 grams per kilogram and used in bait stations), is one month after bait removal. No carcass monitoring is necessary.

If practicable, remove and take away poisoned carcasses, but if it is not practical, limit access to the treatment area for the caution period during which poisoned animal carcasses will naturally decay and be unlikely to contain residues.

0.10% 1080 Feral cat bait

Any surplus or spoiled 0.10% 1080 Feral Cat Bait poison should be buried with biologically active organic material in a secure area, while avoiding deep disposal or burying where groundwater contamination could occur. Incineration or treating in a sewage or chemical treatment facility is also acceptable. Burn empty bags or bury them at a depth of at least 60 centimetres.

The caution period for 0.10% 1080 Feral Cat Bait is four months after bait removal, and carcasses must be monitored.

Where practicable, animals poisoned by 0.10% 1080 Feral Cat Bait should be burnt or buried at least 600 millimetres below ground. Otherwise, limit access to the treatment area for the caution period during which poisoned animal carcasses will have naturally decayed and are unlikely to be eaten or contain residues.

7.3 PredaSTOP™ (PAPP) description and use

The active ingredient in PredaSTOP™ is the poison called 4-para aminopropiophenone, known as PAPP. PAPP is a green paste that is added to fresh minced meat balls. The baits are prepared by the user, by forming small mince balls composed of 15 grams (3 teaspoons) of mince and inserting a single dose of PredaSTOP™ into each. The whole meat ball has to be eaten in one go for the poison to work effectively. If not enough PAPP is absorbed into the bloodstream at one time, the animal will survive.

The poison must only be used according to the label instructions, which are summarised in this section. However, it is important to read and understand the full label, as well as the bait preparation instructions, linked here: *Best practice guideline*.

Once PAPP is absorbed into the blood stream, it causes a condition which reduces the ability of red blood cells to absorb and transport oxygen. It is considered humane in action and naturally degrades in the environment. Its palatability to feral cats relies in part on the freshness of the meat bait.

PredaSTOP™ label requirements summary

- Warnings, precautions, and symptoms of poisoning are described, as well as instructions for use and bait disposal.
- Wash hands thoroughly after handling. Do not eat, drink, or smoke while using. Prevent access to bait by non-target animals, especially those attracted to mince.
- Only use in bait stations.
- Remove all pre-feed when laying toxic bait.
- Use meat baits within 48 hours of preparation. Ensuring baits remain fresh will help maximise feral cat suppression.

Setting and baiting instructions

- The Chimney bait station is recommended for use with PAPP (Figure 22).
- Place bait stations in an approximate grid pattern at 500 metre intervals. Where possible, they should be located in preferred habitat for feral cats (habitat edges, pathways, fence lines, along riverbanks, and isolated patches of cover).
- Secure the bait stations to the ground or to a post to ensure they cannot be knocked over.
- Introduce a non-toxic meatball lure (pre-feed) initially, for about one week before switching to bait containing PAPP.

FIGURE 22. Chimney bait station with bait placed at either end. Photo: Rod Dickson, Hawke's Bay Regional Council

- Two toxic baits should be placed in the bait station, at either end.
- Record the bait station GPS location to ensure an accurate log of where baits are.
- In cold months, baits should be replaced about every five days, more frequently in warm weather. Ideally, PredaSTOP™ operations should be done during winter months, when limited food and colder conditions make feral cats more likely to consume toxic baits. Colder months will also lengthen the field life of pre-feed and toxic baits.

7.4 0.10% 1080 Feral Cat Bait description and use

This is a fishmeal-based bait which comes in the form of a dry pellet, containing poison called sodium fluoroacetate (known as 1080) at the ratio of 1 gram to 1 kilogram. It degrades naturally through microbial activity and readily dilutes in water. The poison must only be used according to the label and safety data sheet instructions. Although these instructions are summarised in this section, it is important to read and understand the full versions in the links. You can use this bait by either putting it in a bait station (example shown in Figure 23) or by placing it in small piles on the ground.

While this bait is not appealing to all cats, it does remain palatable for at least two weeks, making it suitable to use in areas that cannot be checked frequently.

0.10% 1080 Feral Cat bait label and safety summary

- Warnings, precautions (such as wearing protective clothing, washing hands, and washing equipment), symptoms of poisoning, and first aid are described.
- Storage requirements (the poison must be stored in its original container, locked away, and be under the control of an approved handler), ways to deal with spillage, conditions of sale, disposal, directions for use, tracking requirements, shelf-life expectations, and legal obligations (including signage) are explained.
- Warning signs must be erected at every normal point of entry to the place where the poison is to be applied. The signs must remain in place until baits are retrieved or are no longer toxic (refer to the caution period).
- This product should be used within three months of its date of manufacture. After this time, palatability reduces.

Baiting instructions

- Baits should be laid carefully by hand at regular intervals in small heaps of 40 grams to 200 grams only or used in suitable weatherproof bait stations.
- Do not hand broadcast the bait.
- The distance between bait stations and quantity of bait laid will be dictated by the terrain and cat population density. Replenish the stations regularly to ensure fresh bait.
- Replace any bait which becomes spoiled by weather or mould.
- Orient the station away from the direction of prevailing wind and rain.
- Position bait stations in a way that allows the operator to service them safely.
- Replace any damaged stations.

Note that there are innovative developments related to the delivery of both 1080 and PAPP poisons to suppress feral cats. These developments have not yet been registered for use in New Zealand but are described in the 'Emerging Technology' section 13, below.

FIGURE 23. Stewart Island, New Zealand, bait station for feral cats. Photo: K. Carter, DOC

7.5 Common issues with poisons

- Bait interference may arise if non-target animals eat it.
- Local legal standards may create challenges; check before using poison in different areas, including regulations regarding poison use near water.
- Some communities may not endorse the use of poison.
- Initial setup costs for bait stations can be expensive.

7.6 A practical way to use poisons on islands

Similar to the approach for traps, the optimum spacing intervals between bait stations or hand-laid poison piles should be tailored to the specific goals of your project, taking into account variables such as terrain, environment, feral cat densities, and home ranges. In island environments, placing poisons in preferred habitat for feral cats, such as easily travelled routes, is a preferred strategy.

Specific advice pertaining to the Pacific islands recommends starting by laying non-toxic lures along tracks (spaced 25 metres apart) and beaches (spaced 50 metres apart) for about one week or until a significant portion of the lures are known to be consumed by cats. Following this pre-feeding, lay the toxic bait (in good condition) at the same spacing intervals, for a period of 30 days, replacing it as per the label instructions.

8. How is shooting used to safely suppress feral cat populations?

Firearms present hazards to people and must be managed carefully and safely. Before planning on using firearms for feral cat suppression, find out what the legal requirements are for firearm use in the country or territory where the project is taking place, and make sure you comply. In New Zealand, for example, there are requirements for licensing, storage, and safety considerations for people wishing to possess and use a firearm. For further information, refer to New Zealand's firearms safety e-learning modules.

Shooting feral cats is typically used as a supplementary method alongside trapping. It is useful for dealing with concentrated groups, like those near rubbish dumps, or for cats that are wary of traps. However, relying solely on shooting is generally not very effective due to the challenge of finding and shooting feral cats. The sole use of shooting often leads to a lot of effort for minimal results.

8.1 Shooting cats outside of a trap

Most shooting of feral cats is done at night when feral cats are most active. Shooting is generally done with the aid of a spotlight. Spotlighting helps detect the cats by making their eyes shine brilliant yellow or green. This method relies on the ability of the shooter to approach the animal until it is within shooting range.

Feral cats must never be shot from a moving vehicle. The shooter needs to be in a firm, safe, and stable position before taking a shot. Shooting over the top of hills or ridges also is an unacceptable risk because you cannot see what is on the other side. The spotlight only illuminates a small portion of the danger zone and only a fraction of the bullet's range.

Increasingly, nocturnal shooting programmes are done with the use or assistance of thermal imaging equipment. Feral cats are identified using a thermal camera, then located with a thermal rifle scope. It is also possible to use a handheld thermal scope to initially spot the cat, then switch to spotlight and optical sights for shooting.

Before undertaking shooting, first familiarise yourself with the terrain and note potential hazards and landmarks for navigation. For guidance on shooting a feral cat caught in a live capture trap, please consult section 9.2.

9. What is the best way to address live trapped feral cats?

If using leghold or cage trapping as a suppression method, you will need to plan and prepare in advance how the live trapped cats will be killed. The method must ensure both a quick death and minimal suffering for the cat, as well as be safe and practical for the operator. There are two effective options to choose from in the sections below; select the one that best suits your specific situation.

Handling live feral cats, and even feral kittens, in traps can be difficult and dangerous. Ensure your tetanus immunisation is current because there is a risk of being bitten or scratched. See a doctor if a bite or scratch occurs. Keep in mind that feral cats can carry diseases that can be transmitted to humans, such as ringworm or toxoplasmosis. For this reason, it is important to wash your hands thoroughly after any contact with cats, carcasses, faeces, or related equipment.

When approaching a feral cat, do so confidently and in a calm, quiet manner. If a cat feels threatened, it might try to escape from the trap. To prevent this, set up your equipment out of the cat's line of sight.

9.1 Option 1: Firearm or high-power air rifle

Shooting is the preferred method of cat dispatch because it allows for a safe distance from the cat. Each shot taken needs to be precise and lethal to ensure a humane death (see Figure 24). Use either a .22 calibre (rimfire) firearm or a .22 calibre air rifle that has a minimum specification of 800 feet per second (fps) rating. Use heavy round-nosed or pointed pellets, around 18 grams in weight.

If using an air rifle, take special care to ensure accurate shot placement. The shot should effectively incapacitate the central areas at the back of the brain near the spinal cord. Always administer a follow-up shot immediately after the initial one. Afterward, confirm the cat's death by checking for the absence of a blink reflex and ensuring breathing has permanently ceased. Alternatively, use the concluding methods outlined in option 2.

With a cage trap, wait until the feral cat has stopped moving, and take a head shot from as close as possible, ideally around 3 to 5 centimetres away. With a leghold trap, more distance is required because the cat may become highly agitated if you move close to it, increasing the risk of its escape. Quietly find a rest for the rifle and aim for a head shot from about 10 metres away from the cat. Take your time to minimise disruption to the cat and maximise firing precision.

If lactating females are shot, reasonable efforts should be made to find dependent kittens and to kill them quickly and humanely.

Manage the risk of bullet ricocheting against cages or rocky substrates.

Frontal shot
Aim at the centre of the head slightly below midway between the ears.

Shot from above
Aim between the ears, ensuring the shot passes through the centre of the brain.

Shot from the side
Aim behind the ear so the shot passes through the brain towards the opposite eye.

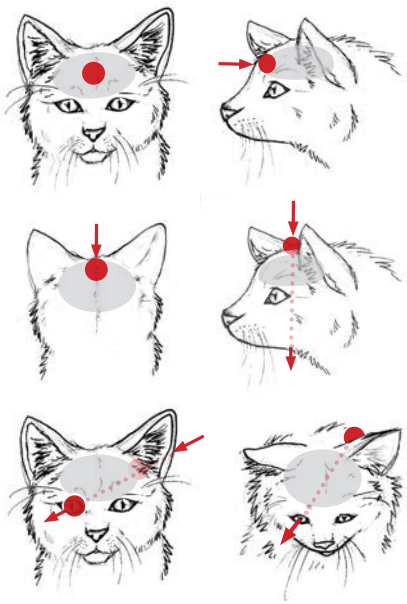


FIGURE 24. Shot placements. Images: J. Aitken

9.2 Option 2: Blunt force applied to the head

If shooting is not an available option, a feral cat can be quickly and humanely dispatched by first rendering it unconscious by striking the top of the head (called the cranium). Using the blunt force method poses higher risks of cat escape and harm to both the cat and the person involved. It is crucial for the trapper to be calm, quiet, and decisive.

There are various views on the best way to use blunt force. Some recommend using a metal rod or a heavy stick about the size and shape of a small baseball bat. Others use a heavy stick modified by drilling a hole in the end and filling it with lead. If you need to use blunt force, sturdy leather boots are recommended to hold the cat down while completing the action.

Once blunt force has been applied, test whether the cat is unconscious by touching the cornea of the eye in an attempt to elicit a blink response. The eyes should be fixed, glazed, and unblinking. To be certain the cat is dead before moving on, place the head over a solid object, such as a tree root or rock, and administer additional blows to the head, ensuring the skull is compressed. Blood will flow freely from the skull or ears when you lift the head. When this happens, death is confirmed. Alternatively, you can choose to cut the throat to sever all major blood vessels, first bending the head back to expose the throat.

The challenging part of using blunt force is accessing the cat. With a leghold trap, assess whether the front or back leg is caught in the trap. If the front leg is caught and the tail is easily reachable, firmly grasp the tail, and stretch it to use the trapped leg as a counterforce to make striking the head easier. However, if the back leg is caught, the cat can turn, increasing the risk of harm to the dispatcher and stress to the cat. A person using the counterforce technique needs to be extremely confident, deliberate, and quick. Do not try the technique if there is any uncertainty about its success.

With a cage trap, accessing the cat for blunt force action will likely be unfeasible for most people. High skill is required to get the cat from the cage into a sack for blunt force dispatch. Some manage to snag the cat with a noose on a stick through a partially open cage door for subsequent dispatch, but this is an extremely high-risk manoeuvre and is not recommended unless the practitioner is very experienced.

10. What should I consider when selecting the suppression method?

When considering which suppression method or combination of methods to use, consider these factors.

10.1 Risk to domestic cats

If the operation is within the vicinity of residential areas, you may need to manage risks to domestic cats. Cage trapping can be used if there is a concern that domestic cats may be present. Residents should also be informed of the operation, and responsible cat ownership behaviour should be advocated – such as confining domestic cats during the operation and clearly identifying them with collars or tags.

Trappers should try to identify a cat as feral before dispatching it. Look for collars, tags, or long hair, as these would indicate the cat belongs to a household. If the cat is obviously calm and untroubled by the presence of humans, it is likely to be a domestic animal. However, for the most part, it is very difficult to tell if you have a caught a feral or owned cat because even domestic cats can act aggressively when confined in a trap.

10.2 Feeding behaviours of local feral cats

You can enhance the success of your suppression efforts by understanding the local feral cat population's feeding behaviour. If they tend to rely on scavenging (like cats near rubbish tips, towns, markets, or near people's homes), using cage traps can be very effective. For cats that live in the wild and actively hunt, or are difficult to catch, leghold traps will be more effective than cage traps.

10.3 Timing, season, and food

Dry weather periods are important when employing methods to suppress feral cat populations. When using traps, wet conditions can lead to lower capture rates. Similarly, if toxic bait is being used, adverse weather can either spoil the bait or render it unappetising to cats.

Food availability also impacts the effectiveness of suppression tools. Baited traps work best when there is not much other food around. Cold seasons are good for poison bait operations because there are fewer active reptiles and invertebrates, fewer rodent numbers, and, on islands, seabirds have not arrived yet. In the Pacific, natural food is generally scarce from winter to early spring, though this timing can vary among islands depending on the prey present. Dry, cold seasons are ideal for cat suppression operations.

10.4 Social and safety considerations

It is important to use traps, poison, and firearms responsibly to protect people and non-target animals. Help ensure safety by educating the community and others about the suppression work as well as what measures to take to prevent harm.

10.5 Terrain, access, and area size considerations

Having a road or track network within the suppression treatment area is important. It will not only enable field workers access to set up traps, bait stations, or apply poison, but it will benefit access by cats which also use paths, boardwalks, and road edges for travel and hunting. Maintain the track network by clearing overgrown vegetation. In densely vegetated regions, such as temperate wet islands, the presence of a well-established track network is especially valuable because cats prefer dry tracks for their travel.

For small sites, the risk of cat re-invasion from neighbouring areas is higher. To address this risk, a more comprehensive trap network is necessary to handle increased catch numbers, requiring more frequent clearing, rebaiting, and setting.

In large sites with low cat densities, cage traps may have limited effectiveness.

The use of tree-mounted traps is contingent on the availability of suitable trees. In cases where there are insufficient options, use supportive apparatus like stakes or posts.

11. What equipment and skills may be required?

The equipment and skills required for a cat suppression operation vary based on the chosen method as well as the specific location and its infrastructure. The examples given below offer an overview but do not cover every scenario.

Equipment	Why
Suppression lures and tools of choice	To entice and dispatch the cats
Straps and cable ties if using cameras	To secure the cameras
Popsicle sticks if using lures or bait	To mark bait
Bush knife/machete, secateurs, grubber, silky saw	Clearing vegetation and making traps flush with the ground and hazing
Cat pole and dispatch stick	Manoeuvring and dispatching the cat
Small knife	Dispatching unconscious cats
Wet weather gear	Keep dry and warm
Sunhat, sunscreen, sunglasses	UV protection
Communication equipment: mobile phones where coverage is good, or radios where coverage is not reliable	Communication and safety
GPS units with trap locations loaded	To find and manage the traps
Site map(s) of the area being protected	Understanding the locality
Pens/pencils/notebooks	Field data collection
Waterproof marker or other tagger	Marking bait stations or other device stations
Flagging tape	Marking station or bait locations
Data record sheets	Field data collection
Fresh lures or bait, replacement hooks, and spare traps	Trapping and dispatching the cat
Transport (such as quad bikes)	To get to the location
Jerry cans and fuel for transport vehicles	Fuel for transport
High-visibility vests, helmets	Visibility and protection
Instructions on most efficient loops/deployment of staff	Staff understanding of roads, tracks, and routes
Storage space for transport bikes and gear	Storage and safety
Any keys that may be required for gates	Reliable access to the site
Personal Protective Equipment (PPE) when using poisons, such as breathing filters, gloves, and disposable overalls	Health and safety
Washing facilities and soap, for clothes, equipment, and people	Health and safety
Suitable antidote when using poison	Health and safety
First aid supplies	Health and safety
Warning signs for traps or poisons	Health and safety of staff and public

Skills	Why
Trapping, bait application, shooting techniques	Dispatching cats
Bush navigation, map reading, compass, and GPS skills	Understand locality, direction, safety
Map reading	As above
Use of compass	As above
Use of GPS	Record and relocate tools and routes
Data collection and input	Record activities and findings to monitor change
Vehicle license	Transportation

11.1 Online tutorials and other useful resources

a. This online tutorial shows how to set the SA2 Kat trap. Although the target animal is possums, not feral cats, it has been included because the visuals are useful: Setting your Steve Allen SA2 Trap | Good Wood Wildlife New Zealand – Good Wood Products

b. To understand the importance of a trap network and to choose the best spots to place traps, see: Predator control tips & tricks: shifting your traps to better spots – YouTube

c. To learn compass skills, see these video instructions: www.youtube.com/user/DOCskillable

d. Check out this short video of a cat suppression project in New Zealand: Lake Rotoiti, New Zealand: trap alert technology protects native species from feral cats – YouTube

Relevant information from these resources has already been incorporated into this document. However, if you wish for further detail, please click on the links below.

a. B2 vertebrate toxic agents: minimum requirements for safe use and handling, best practice guidelines

b. B8 minimum requirements for tracking vertebrate toxic agents

c. A4.2 kill traps: a guideline to trap possums, ferrets, stoats, and feral cats using kill traps

d. A4.1 leghold traps, a guideline for capturing possums, ferrets, and feral cats using leghold traps

e. For guidance on signs, see New Zealand WorkSafe examples: https://worksafe.govt.nz/topic-and-industry/hazardous-substances/managing/hazardous-substances-signs/

f. For examples of sign templates, see New Zealand DOC templates: https://www.doc.govt.nz/about-us/our-policies-and-plans/our-procedures-and-sops/managing-animal-pests/warning-sign-templates/

g. For an example of a project that records national data to understand the suppression levels to protect the values you care about, see an Introduction to Trap.NZ

12. What does data collection look like?

The goals of your project will determine what data to collect and how it will be used. Data collection is the process of gathering and measuring information on variables of interest, in a systematic fashion. An analysis of these data will help to determine the status of something or detect change. The collection of data needs to align to your planned monitoring regime, discussed in section 4.

The type of data you gather depends on what you want to measure and the monitoring methods used (such as sand plots, scat counts, cat captures through trapping, or amount of poison bait taken). Some data-collection methods are straightforward, while others can be more complicated. It is a good idea to talk to a PRISMSS advisor at this point, to ensure high-quality data collection and analysis.

Example of data collection for result-monitoring purposes using trapping methods

Result-monitoring data collection using traps is the simplest type of data to gather. All that is needed is to document the cats that have been caught, along with the trap type and number, location, weather, and any other pertinent details. The data should be collected routinely, compiled electronically, and stored in a systematic and safe way. Once compiled, the data can be used to analyse changes in cat captures over time.

FIGURE 25. Manual data collection using a field notebook. Photo: V. Forbes, DOC

To collect data efficiently, clearly label and number the traps. If possible, note the precise locations of the traps using GPS coordinates. Everyone involved in suppression activities should keep a field notebook, whether in paper or digital form, to document their actions and findings (see Figure 25). This record should include:

- date, time, and the name of the person involved;
- weather conditions during the operation;
- specifics about the type of trap, how it was set, the lure and bait used;
- the unique identification number and location of the trap; and
- observations and findings from each trap.

Certain trap locations lead to a notably higher number of cat captures, which suggests influences beyond chance. Recognising the underlying reasons for these patterns can be challenging, especially in areas with uniform forest. Gathering additional information, such as the direction the trap is facing, the type of habitat, the trap's proximity to edges, and potential feral cat routes, can help identify consistent features of exceptionally successful trap setting and locations.

If you are working to reduce the number of cats to very low levels, recording the captured cat's approximate age can help identify whether breeding is occurring. Taking DNA samples can also help determine how closely related the cats are and whether the population levels are due to breeding or migration.

13. What technologies are emerging?

13.1 Sausage bait using 1080

A recent trial using ready-made sausage bait shows exciting potential for growing the feral cat toolbox. During a 2023 winter study on Rakiura Stewart Island, DOC staff hand-laid 18-gram sausages, comprising rabbit and 0.025% 1080, over a treatment area sized 1,750 hectares (Figure 26). Transect lines were set 500 metres apart, and baits were placed 60 metres apart along the lines. Trail cameras were set up within parts of the operational area to monitor cat density before and after the operation and to record how cats and other animals interacted with the bait. Two rounds of pre-feed were used, ten days apart, then three rounds of toxic baits were used seven days apart. Preliminary results show a high bait take, a high reduction of cat numbers, and no known consumption of baits by non-target animals.

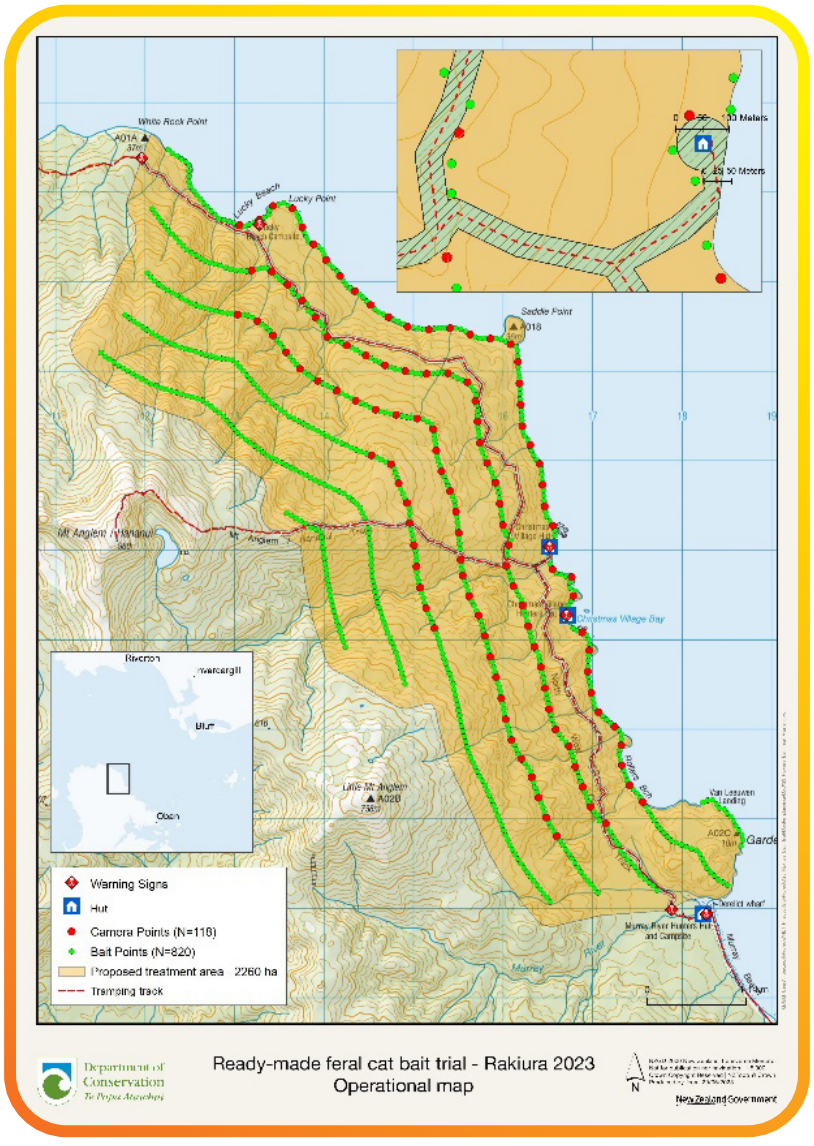


FIGURE 26. Ready-made feral cat bait trial, Rakiura Island 2023. Operational map. Image: DOC

13.2 Curiosity® bait using para-aminopropiophenone (PAPP)

The Australian government has invested in a project to develop a humane, broad-scale poison bait to suppress feral cats, called Curiosity®. The bait comprises a meat-based sausage containing a small hard plastic pellet encapsulating the PAPP poison. The bait is registered for use in Australia but is not yet registered for use within New Zealand. An Australian Standard Operating Procedure is available which explains how to use the bait to suppress feral cats. For more information, see this link.

13.3 New traps

New tools are introduced to the market routinely. For example, the AT220 (Figure 27) is a new kill trap that can set and lure itself for up to six months. It is advertised as a trap for possums and rats but is also anecdotally effective for killing feral cats. Although this trap has not yet been formally evaluated for efficacy or humaneness for feral cat suppression, its practicality is potentially a gamechanger. The trap does pose a risk to vulnerable non-target animals which would need careful management.

The AT220 is currently being trialled in Fiji to assess its effectiveness for suppressing cat populations. The results may help determine its suitability for use in other Pacific islands.

FIGURE 27. AT220 self-resetting, self-luring trap designed by NZ Autotraps. Photo: Predator Free Whangārei

14. What comes next?

Work involving the suppression of feral cat populations is completed in cycles. Projects are iteratively planned, done, reviewed, and adjusted based on lessons learned and changes in the local context.

Suppression of feral cat populations has many benefits, including for local economies, native ecosystems, and priority native species. Suppression is often integrated into efforts aimed at restoring natural areas and building climate resilience. Ideally, the work done in a suppression project informs and is interlinked with this broader national, regional, and even global effort.

Consider sharing project work with the Pacific Invasive Learning Network (PILN), a network for invasive species practitioners battling invasive species in Pacific countries and territories, and the Pacific Invasives Partnership (PIP), the umbrella regional coordinating body for agencies working on invasive species in more than one Pacific country. The PRISMSS team is available to assist with a project and in sharing its results.

Key terms

Bait	Baits and lures are both used in invasive animal suppression (see lure definition below). Although the terms bait and lure are frequently used interchangeably, they serve different purposes. Bait is a substance that is used to attract and eliminate pests, like fishmeal bait laced with 1080 poison.
Bait station	A bait station is a container that holds poison bait while still allowing the target animal to access it. Bait stations are an alternative to placing baits directly on the ground, serving the role of sheltering the bait, with some designs limiting access to vulnerable wildlife, people, domestic animals, and livestock.
Biodiversity	Biological diversity or the variability among living organisms from all sources, including land, marine, and freshwater ecosystems and the ecological complexes of which they are a part; this includes diversity within species (including genetic diversity), between species, and of ecosystems.
Cat (categories)	**Domestic cat.** A pet or house cat living in close connection with a household where its requirements are intentionally fulfilled by humans. **Stray cat.** A stray is a cat that relies only partially on humans for provision of its requirements, such as food and shelter. This includes animals kept on farms for rodent control, dumped animals, and cats living in urban fringe situations, such as rubbish dumps. **Feral cat.** This is a free-living cat that has minimal or no reliance on humans and which survives and reproduces in self-perpetuating populations. Individual cats can potentially move between each category during their lifetimes.
Ecosystem	A community of plants, animals, and microorganisms in a particular place or area interacting with the non-living components of their environment (such as air, water, and mineral soil).
Endemic	A species that is only found in a single defined geographic location and not anywhere else in the world.
Haze	Hazing refers to the practice of using surrounding plants or rocks to guide a cat's movement towards a trap.
Invasive species	A species taken beyond its natural range by people, deliberately or unintentionally, and which becomes destructive to the environment or human livelihoods.
Lure	Lures and baits are both used in invasive animal suppression. Although these terms are frequently used interchangeably, lures and baits serve different purposes. A lure is a substance or device that is designed to attract pests to a specific location, but it may not necessarily lead to their direct elimination. Lures are often used in conjunction with traps or other control methods. For example, a meat lure can be used to attract an animal into a trap.
Native	A species that occurs naturally on an island or in a specified area, having either evolved there or arrived there without human intervention.
Scat	Cat faeces.
Secondary poisoning	Secondary poisoning refers to one animal being poisoned after consuming the flesh of another animal that has ingested the poison directly.
Suppression	Actions taken to reduce population levels, in this case, of feral cats. Also called management or control.
Vertebrates	Vertebrates are animals with backbones, including humans and creatures like cats.

APPENDIX 1. Forms for tracking poison storage, transport, and use

Scanned copy of Controlled Substance Licence	*Business name, approved handler name, address (must be the same as the Controlled Substance Licence Store address), and position in the organisation.*

Storage Form: tracking and recording poison in and out of storage area

Substance					Transfer detail		Disposal detail		
Date	ID Number	In	Out	Total held	Approved handler	Organisation	Approved handler	Place	Method

Field Form: tracking and recording the use of the poison

Substance					Transfer detail		Use detail	
Date	ID N umber	In	Out	Total held	Approved handler	Organisation	Place	Method

APPENDIX 2. Summary of lessons in setting up trail cameras to detect cats

Guide for set-up of trail cameras for small mammals

Summary of lessons by NET, 2022

This document is based on lessons from detection and bait palatability trials undertaken by the National Eradication Team, New Zealand. It is supported by images of important elements of good and poor camera practices.

1. Find a good site

Cameras are best deployed in a 'soft' grid (cameras can be placed a maximum of 100 metres away from a pre-determined point). The chosen site needs to be suitable for detecting a cat: look for a well-used game trail, a habitat edge, localised food sources, a natural bridge across a stream, and so on. See images in section 17.2 for examples of good sites. The site needs to be open enough to allow a distance between the camera and the bait of 2.5 to 3.5 metres.

2. Place the bait

Bait needs to be placed on the ground where it can be clearly seen by the camera (in the centre of the camera's field of view with no obstructions). If your site is a game trail, put the bait on the edge of the trail – if you place it in the middle, there is a reasonable chance that it will be trodden on or kicked. Rake away leaf litter from around the bait to form a small clearing. Insert a small branch or similar directly behind the bait so that the bait can be more easily identified in the images during analysis.

3. Install the camera

Either knock in the stake or select a good sturdy tree for the camera. The camera should be high enough above the ground to enable you to cleanly open and remove the battery and. Have the camera aiming at the bait on a slight downward angle (to reduce triggers from background foliage). A minimum of 20 centimetres from the ground is recommended.

Think about where the camera will be oriented; for example, you do not want the camera to be pointed into the sun or at great swathes of wavy vegetation because these will generate thousands of false triggers and greatly increase the required analysis time. Equally try to point the camera into the prevailing weather if the site is exposed because rain on the lens can make identification of the images problematic. You will need to trim wavy vegetation to the ground or uproot it to clear the field of view of the camera. Remember that vegetation can grow quickly in the spring and may be back up again before the end of the study.

The camera must be securely attached using the strap, and the bracket nut should be tightened up (Browning cameras only). Make sure that the bait is centred in the middle of the camera screen before fully tightening the strap and nut. Adjusting the vertical plane is important; Browning cameras have a pivoting bracket to allow for this adjustment, whereas for other models adjustment can be achieved by using a piece of a branch as a wedge.

Once you have attached the camera, it should not be able to be easily moved, either left and right or up and down. If it is loose, then attach it again. Importantly, tie the loose ends of the strap off so there is no risk that they will flap in front of the camera. Do not tie the strap around the face of the camera.

4. Check that the camera is set up correctly

The cameras will most likely have been set up prior to the deployment, but double-check the settings to be certain (you will have a list of the settings in your task specification). Make sure to check the date because correctly date- and time-stamped images are vital during data analysis.

If you were forced to place the camera pointing towards wavy vegetation and you suspect that false triggers will result, then adjust the sensitivity of the camera from "normal" to "low".

Ensure that the camera is turned to "on", then, after the required time delay, walk in front of the camera a few times then review the footage on the camera to ensure that the camera is functioning and that the field of view is centred on the bait.

5. Flag the camera site

Make sure that you flag the site with one or two pieces of long flagging tape tied at head height. Camouflaged trail cameras can be very hard to spot. Make sure that none of the flagging tape is within the field of view of the camera because the camera would continually trigger.

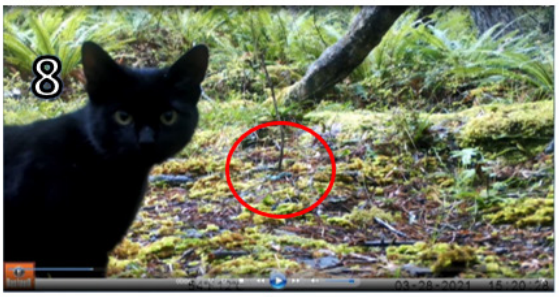
Refer to the examples on next page of poor vs. good camera placement.

Examples of poor camera placement

Examples of poor placement

1. Vegetation in front of camera.
2. A camera that has been knocked off of 'true', with the camera pointing too high.
3. Camera much too close to the bait and knocked off 'true'.
4. Camera too close to bait; image not centred on bait.
5. Bait out of view behind a hummock, with the camera pointing too high.

Examples of good camera placement



Examples of good placement

6. Example of camera set on game trail; note camera on slight downward slope 20 cm from ground, on game trail with bait set off to one side of the track and marked with a stick.
7. Bait centred in frame with stick marking the bait, camera far enough back to capture all interactions.
8. Similar to 7.
9. Inserted a stick behind the camera to ensure the camera is pointing in the correct direction vertically. Camera is tightly strapped on so neither branch nor camera can move.
10. Excellent site on a pig trail through a scrub lane.
11. Excellent site on a log bridge with a strong game trail, Matheson Bay, NZ.

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