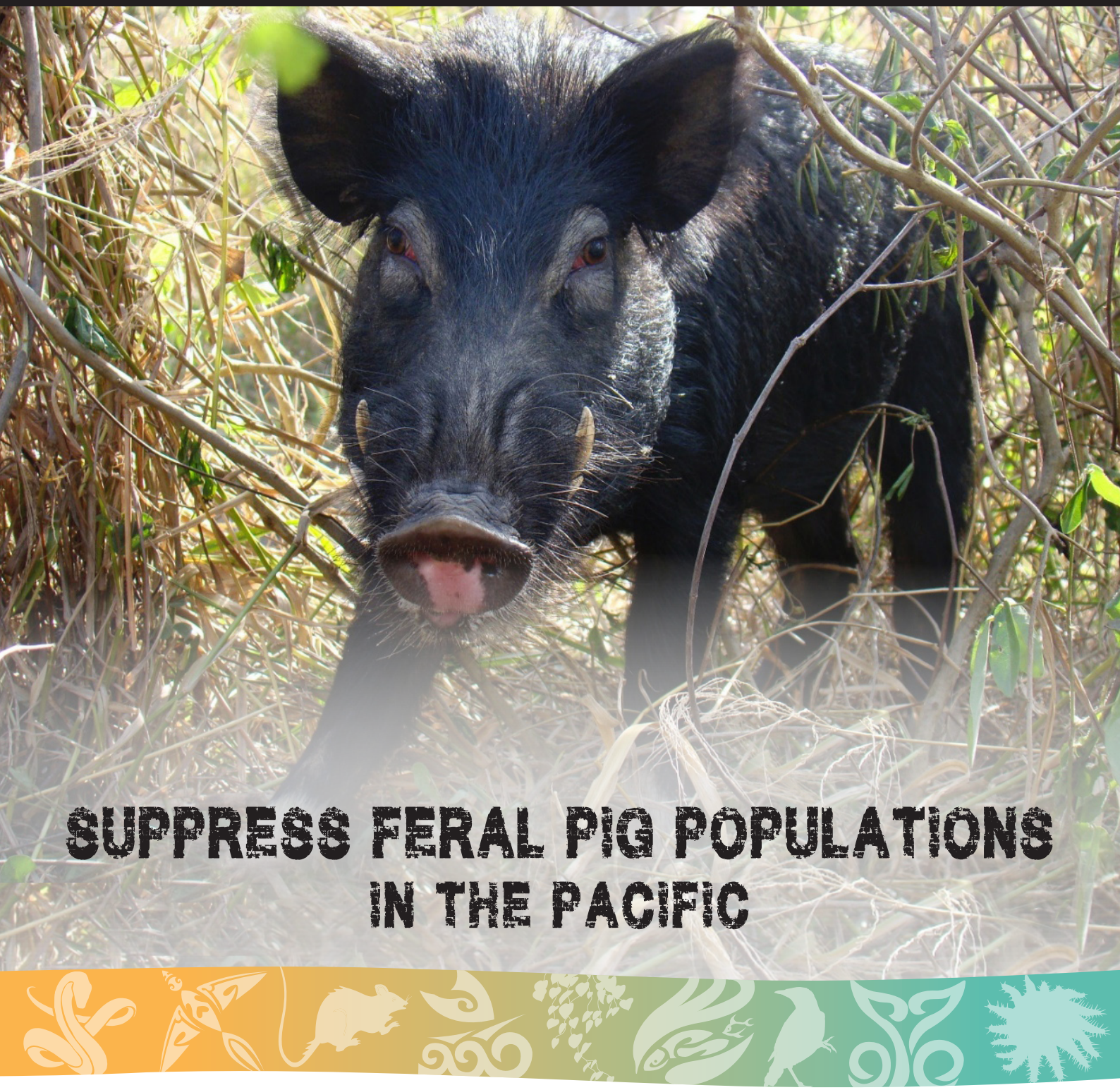
Pacific Invasive Species Battler Series



SUPPRESS FERAL PIG POPULATIONS IN THE PACIFIC

PRISMSS

NEW ZEALAND FOREIGN AFFAIRS & TRADE Manatū Aorere

Department of Conservation *Te Papa Atawhai*

SPREP Secretariat of the Pacific Regional Environment Programme

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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.

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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 pig populations in the Pacific is a joint effort by the National Invasive Species Coordinators and PRISMSS Partners. It provides practical advice on ways to reduce the harmful effects of feral pigs in the Pacific region. Most of the advice is based on tried-and-true methods for suppressing feral pig populations. Where there is not enough information to form best practice advice, we provide practical recommendations based on observation. Whether you are a technical expert or a concerned local community member, we created this guide to help you humanely suppress feral pig 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 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 not covered in this species-specific guide.

This publication was written by Verity Forbes (New Zealand Department of Conservation, DOC). Souad Boudjelas, Kellie Mayo, Finlay Cox, Andrew Glaser, Thomas Emmitt, Damien Bromwich, and Keith Broome (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) and David Moverley (SPREP). 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 pigs 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 pigs.

1. What are feral pigs?

Feral pigs (*Sus scrofa*) are the most abundant large, introduced **vertebrate** animal throughout the Pacific region. Populations stem from diverse lineages, including strains from domestic, Asian, and European pigs. Their presence traces back thousands of years to the Neolithic Lapita people, Polynesian ancestors who navigated the Pacific Ocean and settled on the islands. These original Polynesian settlers mark the beginning of feral pig history in the region, well before the arrival of Europeans. The pigs coexisted, freely roaming the outskirts of settlements, valued for their food, cultural, traditional, and folklore significance.

Adult feral pigs have a sparse, coarse coat, which is typically black, with occasional spotting or white feet. They have straight tails with a bushy tip, acute hearing and sense of smell, but poor eyesight. Male boars use their upward-curved canine teeth, or tusks, for fighting, while their shoulders are protected by shields up to 90 millimetres thick. Feral pigs, although generally smaller than domestic pigs, possess larger snouts, robust shoulders, and smaller hindquarters. Despite these differences, it is generally agreed that both feral and domestic pigs are the same species, which means unrestrained domestic pigs can readily join wild mobs and interbreed with them. In the Pacific island region, feral pigs weigh between 45 and 70 kilograms, but instances of females reaching 90 kilograms and males reaching 250 kilograms have been reported.

1.1 Habitat and home ranges

Feral pigs live in and adapt to diverse climates and habitats, requiring reliable water and shelter to cool down in heat due to the absence of sweat glands. They inhabit almost all Pacific islands except the driest regions. In New Caledonia, rainforest-dwelling pigs favour valleys with dense canopy cover, while in New Zealand, they inhabit forests and scrubland, especially near pastoral farmland, in areas up to 1200 metres above sea level. In the east of the South Island, pigs prefer lower altitudes, and on Auckland Island, coastal areas and grassland tops, avoiding steep slopes over 70°. In Australia, they are most abundant around wetlands and river systems.

Limited information exists on the home range size of feral pigs and the distance juveniles disperse in the Pacific islands, despite the fact that most feral pigs are relatively sedentary. Home range size is primarily influenced by food availability, with boars covering larger areas than sows, although seasonal differences remain unclear. A New Caledonian study (of three feral pigs) indicated home ranges of 0.6 to 1.2 square kilometres in the hot wet season, with adult pigs covering approximately 3 kilometres per day in rainforests. Hawai'ian studies reported ranges of 0.3 to 1.4 square kilometres and, more recently, 0.11 to 0.86 square kilometres. In New Zealand, home ranges vary, ranging from less than 1 square kilometre to about 12 square kilometres. In Australian tropical regions, home ranges reach 3 square kilometres in the wet season, while temperate zones range from 11 to 35 square kilometres.

1.2 Social organisation and behaviour

Feral pigs are active throughout the day and night, exhibiting reduced activity during mid-afternoon with peak activity around dawn and dusk. Their behaviour can adapt to external factors; for instance, in response to hot weather or hunting pressure, they tend to become more active at night.

FIGURE 1A. Pig wallow, Whangamarino wetland, New Zealand. Image: H. Coles, DOC.

FIGURE 1B. Pig wallow, Northland forest, New Zealand. Image: DOC.

Pigs in general are sociable creatures, although adult boars over 18 months old are typically solitary. Sows form groups with other sows and their piglets, referred to as sounders. These stable social units comprise several generations of related females and offspring. Young pigs form groups that include both sexes until they reach one year of age, after which they may form bachelor groups consisting of young males. While sounders may be territorially exclusive, feral pigs do not defend their home ranges from others. Juvenile dispersal ranges remain generally similar to home ranges, indicating they stay within their birth sounders.

Feral pigs are renowned for two primary behaviours: wallowing (Figure 1a, b) and rooting (Figure 2). Wallowing, which involves pigs rolling around in shallow depressions filled with water or mud, helps to keep skin cool, moist, and protected from the sun and insects as well as facilitates social interaction. Rooting is a foraging behaviour, where soil is systematically disturbed. Using strong snouts, shoulder and neck muscles, pits roughly 10 centimetres deep over 200 square metres are generated to access food, even from firm soil and partially decayed logs. Pigs prefer sandy or softer soils for rooting over clay or rock, and they tend to root in places where the soil has been previously disturbed. Grazing also occurs as pigs forage the ground surface , meaning visible disturbance may not be obvious.

FIGURE 2. Pig rooting damage in Pureora Forest, New Zealand. Photo: R. Kirkman, DOC

1.3 Food

Feral pigs have a broad diet that includes both plant and animal matter. Relying on their keen sense of smell, they eat fruits, grasses, and roots of many plant species. In New Zealand, the root and base of bracken fern is a staple, while in coastal areas, seaweed becomes part of their diet. Their consumption of animal matter is indiscriminate and predatory; they forage for invertebrates, prey on ground-nesting bird eggs and chicks, young rabbits, newborn lambs, frogs, lizards, snails, eels, and rodents, and also eat carrion, such as dead livestock.

1.4 Reproduction, development, and lifespan

Under favourable conditions, pigs can multiply quickly, with populations rebounding rapidly post-hunting or suppression efforts. Pacific islands provide ideal conditions for feral pigs due to island productivity, which allow for year-round breeding and two litters annually. Sows typically breed at five to eight months old, with around six piglets per litter. Gestation lasts 112 to 114 days, and successful breeding requires a diet with about 25 per cent protein. Older, heavier sows yield larger litters.

Accounting for farrowing in suppression planning is important because it refers to the period when heavily pregnant sows are about to give birth, and sows move less and are more evasive during this time. In Australia, mating peaks in response to the flush of green vegetation following heavy rain, which sees most births in Southern New South Wales occurring in summer and autumn, while in the Northern Territory there is a peak in the early dry season. Survival rates vary, with up to 90% piglet mortality when conditions are poor. While protein shortage may prompt sows to reabsorb piglet foetuses, most adult sows will continue to breed even during adverse conditions. Piglet weaning typically occurs at two to three months, although they remain near the nest for two to three weeks and stay with the mother until the next litter.

Lifespans of feral pigs fluctuate in response to several factors, including population density, food availability, weather conditions, disease outbreaks, and hunting pressure. For example, pregnant and lactating sows are very susceptible to starvation during droughts or periods of food shortage. In Australia, few pigs live more than five years, while in the USA, the average lifespan in the wild is six to eight years. In captivity, when food and water sources are abundant, boars have lived for up to 20 years.

1.5 Population density

Limited information exists on feral pig ecology in the Pacific islands, stemming from difficulties accessing habitats and estimating abundance. However, population densities are known to fluctuate seasonally and annually, depending on habitat quality and food availability. In optimal conditions, with sufficient food, pigs can reach high densities, increasing rapidly when high-protein food is available. In Australia, feral pigs can almost double their numbers every year even if mortality of pigs is 70 to 80 per cent. This phenomenon explains why pig populations can recover from heavy hunting or suppression so quickly.

2 What impacts do feral pigs cause?

Within their global range, feral pigs adversely impact hundreds of **native** species spanning 54 countries. Their activities have pushed many species to the brink of extinction, directly leading to the extinction of 14 species. Most Pacific islands did not have any ground-dwelling mammals before humans arrived, leaving native species unprepared for the challenges posed by the introduced pig.

Did you know?

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

2.1 Soil disturbance, habitat destruction, and diminished water quality

Rooting and wallowing behaviour causes localised soil disturbance and habitat destruction, which have long-term impacts on ecosystem processes. In the tropical wet forests of the Pacific, a single pig can disturb up to 200 square metres of soil daily. Their trampling and soil compaction destroy habitats of crabs, insects, and spiders as well as the burrows of ground-nesting birds. This soil disturbance also causes erosion and runoff, contributing to downstream sedimentation and diminishing water quality by increasing levels of nitrogen, acidity, and faecal coliform bacteria. These changes, in turn, alter freshwater and marine communities. In Australia, pigs trampling mudflats surrounding marshes destroy turtle habitats. In New Zealand, severe localised impacts are observed, particularly to threatened species with limited range or in vulnerable ecosystems like wetlands.

2.2 Spread of disease

Pigs are very susceptible to catching tuberculosis (Tb) from other infected wildlife, which is a particular problem in the Pacific region, especially affecting cattle farming. In Fiji, Tb management has been a priority for animal health, biosecurity, and human health authorities for over two decades. Feral pigs also contribute to other disease transmission between animals and people, such as leptospirosis. In Hawai'i, standing pools of water created by pig activity have become breeding grounds for mosquitoes carrying avian malaria, which in turn has caused extinction of some endemic forest bird species. Climate change exacerbates the avian malaria threat, expanding mosquito habitats into higher elevations that were once mosquito-free. In New Zealand, feral pig activity contributes to the spread of a disease lethal to kauri forests caused by *Phytophthora* taxon Agathis.

Did you know?

Bovine tuberculosis (Tb) is a bacterial disease which is spread by pigs to cattle and other animals in the Pacific. It can also infect humans, although rarely. In the early stages, clinical signs are not visible in cattle, but in later stages signs may include emaciation, lethargy, weakness, fever, and pneumonia with a chronic cough. It can also express as pus-filled lesions in the lymph nodes of the throat and chest. If not detected early, the animal will die.

Leptospirosis is a serious bacterial disease which commonly infects unvaccinated pigs and can cause major illness in humans and other animals. People working with pigs can catch the disease when splashed with urine or other body fluids (except saliva) from infected animals. Without treatment, leptospirosis can lead to kidney damage, meningitis, liver failure, respiratory distress, and even death.

2.3 Vegetation damage, weed dispersal, and impacts to invertebrates and animals

Pigs consume roots, buds, flowers, fruits, and seeds, with a tendency to target the bases of various plant species. This behaviour can lead to the destruction of whole populations of preferred plant foods within certain areas. In the Pacific, pigs cause extensive damage to native plants, subsistence gardens, and crops like cassava, vanilla, kumara, taro, and coconut seedlings. In the Hawai'ian islands, pig activity is destroying unique native forests, while their rooting behaviour opens up the ground cover, facilitating the establishment of harmful invasive weeds. Feral pigs directly prey upon ground-dwelling animals and invertebrates, including native frog, birds, lizards, crabs, and worms. In Niue, feral pigs obtain protein by consuming the revered uga coconut crab integral to Niuean culture, ground-nesting bird eggs, and scavenging dead animals. In New Zealand, seabird re-colonisation occurred only after the successful eradication of pigs from Aorangi Island in 1938. On D'Urville Island, pig exclusion immediately doubled the *Powelliphanta* native snail population (Figure 3).

FIGURE 3. Pig-crunched snails of *Powelliphanta hochstetteri obscura*, D'Urville Island. Photo: K. Walker, DOC

2.4 Economic impacts

Feral pigs not only cause economic losses through crop damage and the spread of diseases but also negatively impact tourism in the Pacific islands by damaging resort destinations and residential areas. Agriculture is impacted through pasture and crop damage, as is the exotic forestry sector through destruction of new plantings, ring-barking, and rubbing – a behaviour to remove skin parasites (Figure 4). Sheep farming is affected when pigs kill newborn lambs and cast pregnant ewes.

FIGURE 4. Pig rubbing and rooting at base of kauri tree, New Zealand. Photo: D. Lawson, DOC

2.5 Social complexities

Feral pigs present a complex social issue in the Pacific islands, holding cultural, social, and food significance, despite causing harm. Unrestricted roaming of domestic pigs can be an accepted and common occurrence. For example, on Niue Island, difficulties in providing regular food and water to domestic pigs contributes to roaming, which, in turn, contributes to feral herd growth.

Increasingly, collaborative, co-management arrangements between communities and government resource managers have become critical for invasive species management. Before beginning a feral pig suppression project in the Pacific islands, it is important to obtain the community's support . This entails actively engaging with the community to understand their perspectives on feral pigs, identifying conditions that would make suppression activities acceptable, and ensuring collaborative decision-making. Working closely with the local community and organisations significantly enhances a project's likelihood of success. For example, in the Niuean feral pig pilot programme, shot pigs were distributed within the community for food—a popular move which ensured community approval for the programme (see case study in section 6.5).

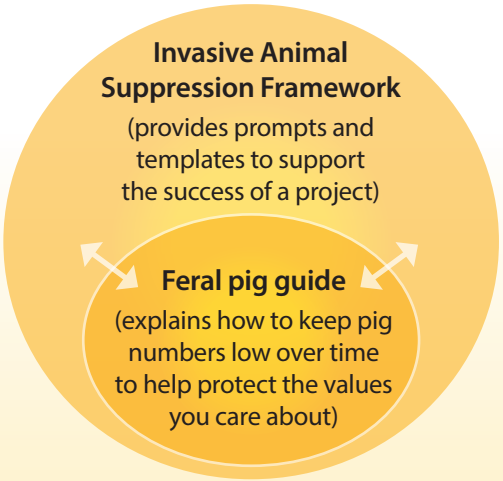
3 Have feral pigs been successfully controlled in the past?

Pigs have been successfully removed from some small Pacific islands and large areas on other islands, leading to considerable ecosystem recovery. Methods for eradication typically involve shooting and poison **control** tools. In other regions, efforts focus on maintaining feral pig populations to low levels. New Caledonia, for instance, implements a permanent suppression programme to safeguard tribal gardens, improve livelihoods, and protect native biodiversity.

After feral pig populations are reduced, the decreased competition for food leads to healthier pigs, larger litters, and earlier breeding. Due to these factors, populations tend to rebound swiftly after knockdown, unless suppression effort is sustained long term. This highlights the importance of planning for long-term success. Guidance on how to plan a long-term invasive animal suppression project can be found in *Use the framework to plan and implement an invasive animal suppression project*.

Did you know?

The Invasive Animal Suppression Framework 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.



4 Why monitor feral pigs?

4.1 What is monitoring?

Monitoring plays a pivotal role in determining the need for a suppression programme and evaluating its success. It is conducted from the beginning, throughout, and at the conclusion of a project. An overview of monitoring is discussed in the Invasive Animal Suppression Framework. In summary, three main types of suppression project monitoring are done, serving different purposes (Figure 5).

Initial monitoring provides baseline information on both valued and invasive animals at the site, helping to identify the problem.

Result monitoring determines if the invasive animals targeted by the suppression project are reduced to the desired levels.

Outcome monitoring measures changes in the value(s) being protected, after suppression work.

Let's talk monitoring!

There are two different approaches to monitoring feral pig abundance:

a. **Relative abundance** is an approach that looks at the 'smoking gun' evidence, such as pig activity. It is assumed that more activity means a higher number of pigs.

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.

For instance, monitoring can help inform managers about the population size of feral pigs in an area *before* suppression work as well as the extent of their impact (initial monitoring), the remaining population *after* suppression (result monitoring), and whether native species (or other values) recover *after* suppression (outcome monitoring). Throughout the project lifespan, monitoring decisions, tools, and resources will determine whether an adaptation of approach is needed to enhance performance. Monitoring methods are discussed in section 5.

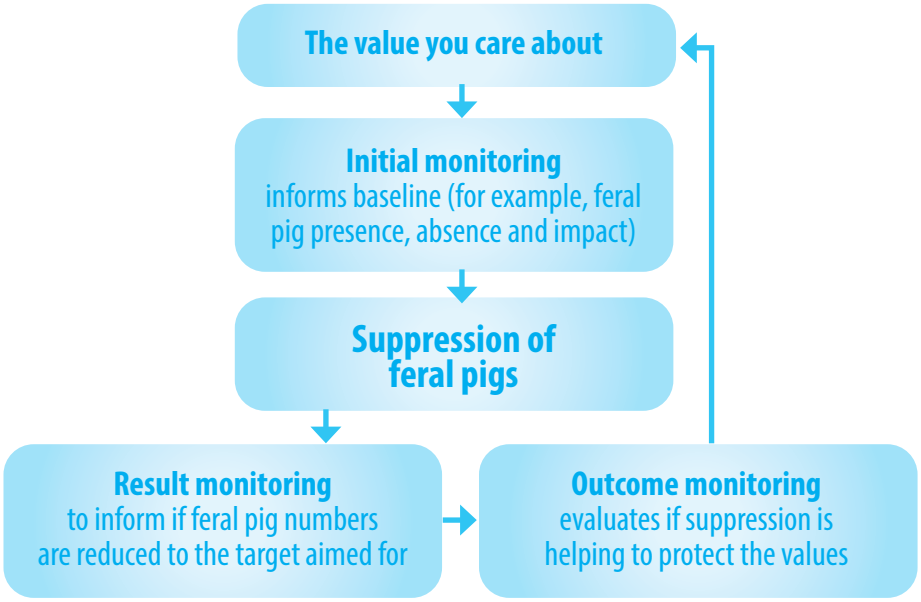


FIGURE 5. Relationship between protecting the value, suppression work, and monitoring

4.2 Why collect monitoring data?

Consistent monitoring data collection is essential for all suppression projects. Observations must be gathered and recorded to enable analysis, provide evidence, reveal insights, address questions, and inform decisions. Data collection methods vary in complexity; some are straightforward, while others are more intricate. Manual recording using a field notebook is basic but valuable; however, electronic recording is more efficient and reliable. GPS, mobile phone apps, or electronic spreadsheets are ideal. Consult a PRISMSS advisor to ensure high-quality data collection and analysis that aligns with project goals and the monitoring regime.

EXAMPLE Data collection for initial and result monitoring

In Niue's feral pig pilot project, initial monitoring data collected via observations of pig rooting, plantation damage, camera surveillance, and hunting records revealed the locations of pig presence and absence. These data were collected routinely, compiled electronically, and stored systematically. It showed the feral pig problem originated from the eastern and north-eastern side of Niue, where the feral pig population was mainly concentrated. This initial data helped identify the location and extent of the problem, enabling planning for resource allocation.

For result monitoring, shot pigs were recorded with their location, coordinates, and estimated age and sex. Analysis revealed high boar numbers, low sow and family group counts, and low recruitment rates. The lack of large sounders suggested a pig issue stemming from illegal domestic pig release, especially boar piglets.

5 What can be used for monitoring and supplementing suppression methods?

Some tools serve multiple purposes, being used both for monitoring and to support suppression methods such as trapping, shooting, and poison baiting (see Table 1). A typical suppression project starts with monitoring to establish baseline data, followed by operational planning. To align with this sequence and avoid repetition as far as practicable, this section focuses on describing these multi-purpose tools. Suppression tools are described subsequently (in section 6).

TABLE 1. Summary of tools used for monitoring and to supplement control tools for suppression methods

Tools	Examples of use in monitoring and suppression
Observing feral pig activity **Passive surveillance reporting**	**Monitoring:** determining pig presence, absence, abundance, and impact. **Supports suppression by:** informing timing and placement of dispatch tools.
Lure using non-toxic feed	**Monitoring:** enticing pigs to an area to determine presence or absence and abundance. **Supports suppression by:** enticing pigs to dispatch tools.
Trail cameras	**Monitoring:** determining pig presence or absence, abundance, assessing pig activity, identifying **non-target** interference of tools, and gathering suppression results. **Supports suppression by:** informing timing and placement of dispatch tools.
Thermal imaging technology	**Monitoring:** determining pig presence or absence and abundance. **Supports suppression by:** locating pig heat signatures for shooting dispatch.
Tracking-collared pigs	**Monitoring:** assessing feral pig seasonal behaviour and habitat use. **Supports suppression by:** determining other pig locations for shooting dispatch.

The following activities are done to monitor feral pig population patterns or inform suppression work. Each method has limitations and varying sensitivity, which is why using a combination of methods is recommended.

5.1 Observing feral pig activity

Feral pig presence is evident through signs, like rooting and wallowing, tracks, pad runs, scats, bedding, and tree rubs. Signs can be looked for deliberately, such as when monitoring transects, or opportunistically during other activities. When planning on-ground surveillance, remember that after rain you might not see fresh sign such as hoof prints because they could be washed away. The following signs are useful for identifying pig activity:

- Rooting and wallowing are conspicuous; look for disrupted soil and vegetation, upturned pastures, and muddy shallow pits (Figures 1 and 2). Rooting activity occurs more frequently during cooler months when soils are soft and grubs are active in the topsoil.
- Hoof tracks have rounded edges toward the tip (Figure 6a, b), distinguishing them from other ungulates like goats, which have a more pointed tip. Dew claws positioned on the ankle at the rear of the hoof may be visible in prints on soft soil. Detecting tracks is easier in damp, cool conditions when prints are more obvious. Placing sand across tracks will also facilitate observation of prints. 'Pad runs' or trails mark animal pathways and are especially noticeable when emerging from dense cover onto pasture. Trails serve as a good starting point for surveillance if feral pigs are suspected in an area.

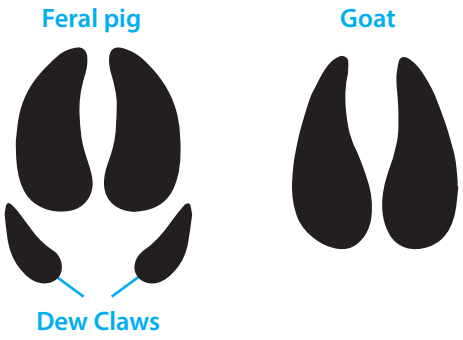


FIGURE 6A. Feral pig hoof prints compared to a goat's. Image: J. Aitken

FIGURE 6B. Feral pig hoof prints in Northland forest, New Zealand. Photo: DOC

- Pig scat, faeces of cylindrical disc-like sections compressed together, vary in size and shape depending on diet. Young piglets may have pellet scat, similar to a rabbit's.
- Pig bedding areas are smooth and flattened and are often found under fallen logs, among organic matter, or within indents in the soil.
- Tree rubs at the base of a tree appear smooth compared to the rest of the bark (Figure 4) and may be covered in dirt or mud.
- Carcasses also signal pig activity, especially lamb skin.

EXAMPLE **Using transects to monitor pig activity and suppression results**

Since 2016, annual monitoring of feral pig ground disturbance in New Zealand's Waipoua forest has been conducted using 24 randomly placed transect lines spaced 100 metres apart in the treatment area. The assessment includes presence, absence, and magnitude of disturbance in each line. Reduced disturbance indicates fewer pigs and signifies successful suppression results.

5.2 Passive surveillance reporting

This technique relies on community awareness, support, and ability to observe, identify, and report signs of feral pig activity. Receiving reports of pigs or sign could be as simple as placing a map in the community centre for people to write their observations on or having a designated phone number, email, or phone app to receive reports. Either way, observations must be reliably documented. The value of community surveillance was illustrated in Niue, where a government phone number facilitated public reporting of feral pig-induced plantation damage. The data collected enabled estimates of pig numbers, informed the source of incursions, and was used to define the timing and location placement of suppression tools.

5.3 Lures

Luring pigs with free-feed is done to entice them to a specific location for monitoring purposes, or to facilitate the use of suppression methods, such as traps or poison bait stations (suppression methods are detailed in section 6). Luring works best when natural food is scarce, typically from winter to early spring in the Pacific, but varying among islands and seasons depending on the prey present. There is no single lure type or quantity that will work in every situation. Food preferences differ among pig populations, and even individuals. Options are presented here that have worked in previous situations, but experimenting with alternatives may be beneficial. Minimise human scent when handling lures and associated equipment, using a consistent handler where practicable, as feral pigs are sensitive to recognisable scents.

Lure type and quantity

Pigs are attracted to strong-smelling lures; vanilla essence, aniseed, and creosote or sump oil can enhance feed attractiveness. Other options like bananas, mangoes, pumpkins, or rockmelons are also effective if available. Coconut flesh and coconut oil have successfully lured pigs in Niue's feral pig suppression programme, with both being easy to use and widely available in the islands. Additional lure choices include various grains, diced onions or apples, red cordial, or molasses. Some lures, such as grain, may attract birds; if this happens, lightly cover the lure with vegetation. In Australia, the use of animal carcasses or pig swill (food scraps that contain meat) as lure is avoided due to the risk of spreading serious diseases like Mad Cow Disease. However, carrion can be a very effective lure for pigs and is suitable for use with clean material where the risk of disease spread is low.

The quantity of lure to use will depend on how long it remains attractive and present. If non-target lure consumption is high (which may be the case on islands with high crab densities), larger quantities may need to be used. As a starting point, use 3 to 10 kg of lure at each selected site. A lure trail is effective for guiding pigs to a specific location or tool.

If using plant lure, choose non-germinating material to avoid contributing to island weed issues.

Lure frequency

Periodically check the site (usually weekly); some pigs may resist new foods and require prolonged luring, while others will interact without hesitation. If no feral pigs are detected after a week or so, relocate to areas with recent activity.

If feral pigs are detected, maintain a regular feeding routine, replenishing the lure every one to two days or as required and around the same time each day. Once pigs consistently visit and their behaviour is recognisable, progress to the suppression phase (suppression methods are detailed in section 6). An Australian project found 10 to 14 days of luring sufficient for developing reliable visiting patterns, though local pig population behaviour may vary.

Lure distributor

Hand distributing lure is simple and helps pigs get used to free feeding. However, it can be challenging for large-scale operations or when the lure is quickly consumed. Using mechanical feeders with a free-flowing lure, like grain, can be much more efficient. These dispense feed automatically, ensuring a constant supply over time. This reduces the effort needed by operators and trains pigs to visit the site, making them easier to target. For example, a study in New Zealand used automatic feeders to attract feral pigs on Auckland island. The feeders dispensed kibbled maize daily for a period of 25 to 37 days, with most visiting pigs returning daily after about 15 days. Feeders installed at sites with fresh pig sign were the most successful. There are a variety of feeder options, from timed electric spinning feeders to simple gravity-feeders, such as an overturned bucket or bag attached to a post (Figure 7a, b).

FIGURE 7A. Barrel tripod electric feeder with spin plate to increase the feed coverage area and digital timer. Photo: Moultrie

FIGURE 7B. Gravity bag feeder. Photo: Moultrie

5.4 Trail cameras

Trail cameras are increasingly popular, despite high purchase costs and labour-intensive field servicing and footage analysis. These cameras are typically used to monitor populations or activity and to help inform where to place suppression tools. The cameras are activated by motion and can operate continuously, documenting date, time, and coordinates upon detecting a feral pig. Analysing camera images provides insights into pig presence, absence (Figure 8), sounder size, location, and habitat preferences. Post-suppression, cameras can be reinstated or reactivated for result monitoring.

The optimal camera number, type, quantity, and deployment varies based on the goals, survey area, and landscape. For instance, if the goal is to determine the presence or absence of pigs in a survey area, camera settings should distinguish between inactive cameras and those that are active but register zero pig counts. This approach ensures accurate recording of pig presence, absence, and monitoring effort. The landscape influences camera placement, particularly in terms of accessibility. For example, areas that are inaccessible are unlikely suitable for camera placement, which can compromise the reliability of data. Consult a PRISMSS advisor for guidance on the type, quantity, and deployment of cameras.

FIGURE 8. Trail camera detecting a feral pig incursion through an exclusion fence, McKenzie Country, New Zealand. Photo: G. Hayes, DOC

Camera spacing and sites

Trail camera grids (Figure 9) involve evenly spaced sites, each with a camera deployed for a set timeframe. Deploying trail cameras spaced 400 to 600 metres apart for at least 30 days effectively detected feral pig presence and absence in an Australian project. Tailoring the grid placement to landscape features and pig activity is crucial. Steep, high-elevation areas where feral pigs usually avoid, should be excluded from the grid.

Luring cameras will increase the likelihood of pig observation. Position the lure in a line parallel to the face of the camera to allow multiple pigs to eat, facilitating easier individual identification.

Setting and installing the cameras

Prepare for camera installation by assigning each device and SD card a unique identifying code, ensuring SD cards are cleared, batteries are fully charged, and the date and time settings are accurate. Customise camera settings based on desired outcomes; for example, to maximise recording of animal movement, use a 5-image rapid-fire sequence with no quiet period.

Mount cameras securely to a non-swaying tree or post, one metre above ground, away from public view and direct sunlight. Position the camera on a 45-degree angle, aiming towards the area of interest, like a feral pig pad-run. Trim any vegetation obstructing the camera line-of-sight to prevent false triggers.

Test and optimise camera positioning by triggering it and reviewing the captured images. Record the GPS locations and relevant site details for each camera. After the predetermined deployment time, collect the cameras.

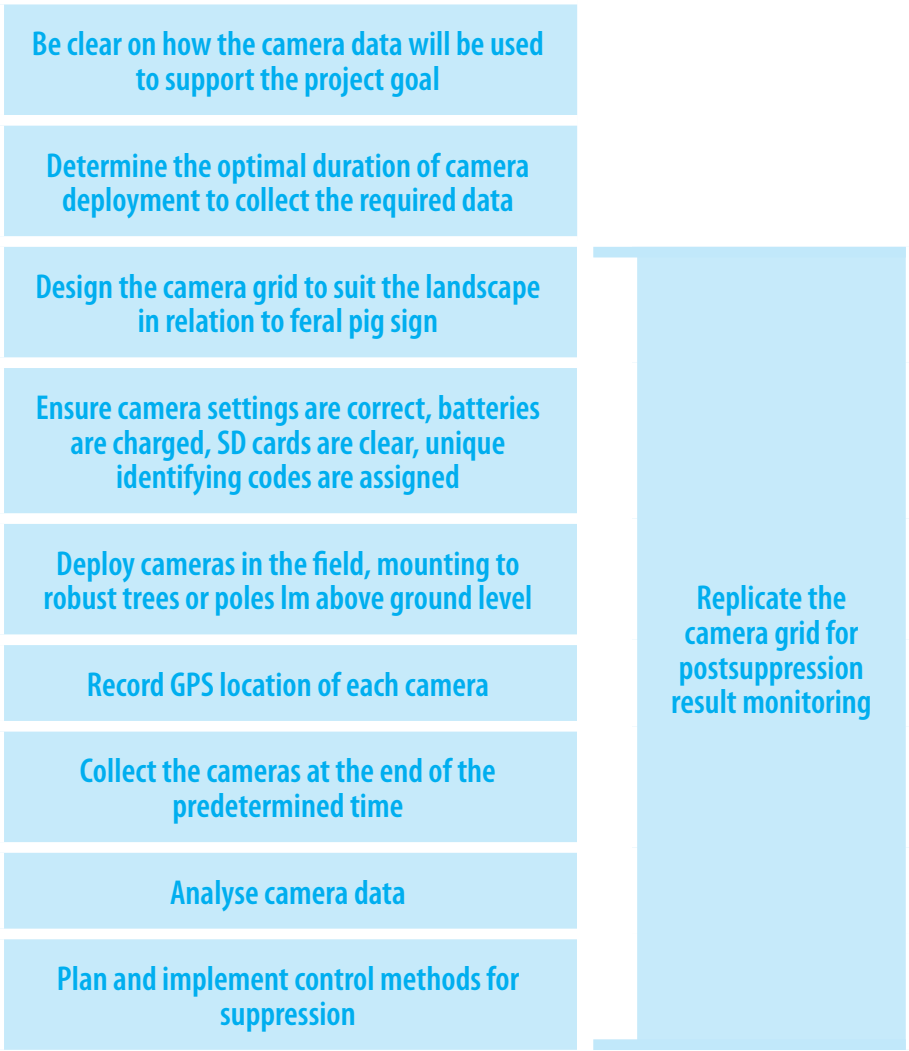


FIGURE 9. Camera grid steps for feral pig suppression

Camera data analysis

The project goals dictate the use of camera data; for instance, the approach used to determine whether feral pigs are present or absent in an area could be as simple as viewing the camera footage and writing observations on a paper map. High-tech data analysis enables greater efficiency, such as GIS software tagging images to a species level. Various software programs manage images, and technology is rapidly evolving. Consult a PRISMSS advisor for quality data collection and analysis guidance.

5.5 Thermal imaging technology

Thermal imaging technology, such as handheld cameras, binoculars, and scopes, detects heat signatures to monitor feral pigs and enhance shooting operations. In cool, low-light conditions, thermal sensors display warm areas with higher contrast because the core temperature of unheated objects is lower than in sunlight. A South Australian study used thermal aerial operations two hours before sunrise and 1.5 hours before sunset or during cool, overcast weather. They found that thermal imaging increased detections and dispatch rates, with zero wounding, compared to visual shoots. Thermal scopes enable night shooting. Some cameras can connect to phones for real-time action. Handheld cameras improve detection of pigs for ground hunting, while those mounted on helicopters, planes, or drones enhance aerial detection and have been successfully used in the Pacific islands. Aerial surveys are costly and require specialised skills, and dense vegetation can limit camera efficacy, leading to missed individuals. Additionally, objects like rocks can retain solar radiation, potentially causing false detection.

5.6 Using pigs with tracking collars

GPS tracking collars can be fitted to live pigs to monitor their movements across landscapes, seasonal behaviour, and habitat preferences as well as to reveal the locations of other pigs through collar data. The collared pig unwittingly leads hunters to other pig locations for dispatch. Allowed to escape, the collared pig seeks out additional groups, perpetuating the cycle.

Although costly due to the need for telemetry gear and skilled operators, this strategy has proven successful in locating feral pigs for Pacific island shooting programmes. Collared pigs can improve efficiency in large-scale suppression projects but are primarily used in eradication programmes to find residual pigs. Once eradication is achieved, the pig is dispatched, and the collar is retrieved.

Some prefer using sows for collared-pig work due to their social connections, but capturing them during farrowing, or when they have dependent young, is discouraged. Others recommend using boars because of their tendency to join multiple sounders during travels.

Different types of radio-transmitting collars, and backpacks with similar functionality, are available. Technology use is limited in dense Pacific tropical rainforests in mountainous areas; however, GPS collars or backpacks with Iridium data transmission can be effective in these conditions. Suppliers can help in selecting the right collar and configuring software settings based on deployment duration, required data, collection methods, collar size, and fitting to feral pig attributes.

Procedure

- Select a suitable pig and use feed lure to entice it into a trap. Allocate enough time for collar deployment because finding and collaring a pig can take up to two months. Ideally, a qualified person would sedate the trapped pig for collar fitting within an hour; otherwise, two individuals are needed for restraint.
- It is important to note the collar battery life. If the battery runs out, relocating the pig and retrieving the collar will be difficult.
- Ensure a snug fit with two fingers space between the neck and the collar for comfort. Fasten the collar at the side, covering any metal parts to avoid skin irritation. Use expandable collars for growing animals. Monitor for signs of discomfort, adjusting as needed.
- Identify the collared pig clearly with paint or ear tags. Remove the magnet or activate the collar if a magnet switch is present and check the transmitter frequency. Adjust GPS timeout for densely vegetated areas or deep gullies, allowing enough time for the satellite signal to be received. Release the collared pig, transporting carefully if needed, protecting it from extreme temperatures.
- Periodically check the collared pig using trail cameras if available. Expect it to join other feral pigs within a week or two. Start radio tracking, and when a group is located, analyse the data then implement the luring and suppression methods. Repeat the process, including re-luring, suppression methods, and recharging the collar battery, until only the collared pig remains. Finally, dispatch the collared pig and retrieve the collar.

Practitioner health and safety considerations when using collars

Transmitters typically use lithium cells, which can react violently and release highly toxic fumes when exposed to air. If a lithium cell is accidentally ruptured, such as by a bullet during pig shooting, it is advisable to avoid the area for a while to allow the dispersal of the toxic fumes.

6 What dispatch methods are used to suppress feral pig populations?

This section outlines dispatch options, including case studies to demonstrate their application. Effective methods include trapping, ground hunting, aerial shooting, poison baiting, and exclusion fencing. Ineffective strategies include luring pigs away from protected areas, using odour-based repellents, electric fencing, and offering bounties.

6.1 What levels do feral pig populations need to be reduced to?

The exact levels needed to reduce feral pig populations for the protection of ecosystem and species are uncertain. Outcome monitoring results will reveal whether the result target and suppression frequency is sufficient to protect the value(s) of interest. While Australian guidance suggests an annual reduction of about 70% is sufficient for environmental protection, this level is likely to be different in the Pacific islands. Result targets depend on the values being protected, their vulnerability to pig impact, and the initial density of feral pigs. Suppression effort needs to be sustained over the long-term, otherwise populations will rebound swiftly after knockdown, especially under suitable conditions.

6.2 Practical tips when using suppression methods

For all methods, minimise human scent, as feral pigs are sensitive to familiar scents and wary of unfamiliar ones. Additionally, manage interference from non-target animals, which can reduce lure or bait for target species and can damage traps. In the Pacific islands region, where land crabs pose a major interference challenge, consider techniques like suspending lure above the ground to prevent crabs from reaching it.

Deciding which method(s) to use is complicated by the variation between feral pig populations but also individual pig behaviour. These complexities mean that no singular method guarantees success in feral pig suppression and relying on one approach is unlikely to have a significant or lasting impact. Pigs are intelligent and can quickly adapt to suppression methods and environmental factors. Combining methods provides optimal results, but be prepared to test a variety to tailor to local feral pig behaviour.

Consider sequencing tools from passive to aggressive. Hunting pigs is aggressive and can be challenging at high densities. Survivors from shooting experiences may learn to be more cautious and wary of future tools. Luring pigs to a site where they are trapped or poisoned is a passive approach that will not undermine future methods. In Banks Peninsula, New Zealand, for example, population reduction that maintained naivety was achieved using these methods in sequence: luring, trapping, aerial shooting, ground-based hunting (using specialised dogs), and thermal night vision equipment.

6.3 Summary of suppression methods

Table 2 summarises effective methods, outlining advantages and disadvantages, and supplementary tools (previously discussed in section 5) that can enhance the effectiveness of a given method. Each is explained in detail subsequently.

TABLE 2. Summary of suppression methods with pros and cons, as well as supplementary tools that enhance effectiveness

Method	When to use	Pros	Cons	Supplementary tools
Trapping	• At all population densities. • When poison baiting is not feasible. • When food is limited and localised.	• Can be made target-specific. • Relatively humane and safe. • Moveable and reusable.	• Labour- and skill-intensive. • May be impractical for large-scale suppression. • Easier with vehicle access. • Some pigs are trap-shy. • Non-target interference with traps may need to be managed if using lure.	Luring, either by hand or using a mechanical feeder. Trail cameras enable users to: • select trap site, inform luring amounts and pig visiting times, • determine the size of the trap needed, • assist trap use, such as confirming all individuals are inside the trap for remotely triggered doors, and • determine post-suppression results.
Snares (traps for individual pigs)	• If legal in the country or territory of the project. • For targeting individual, trap-shy pigs.	• Affordable, transportable. • Easily set up in remote places or rough terrain where traps are impractical or pigs are trap-shy.	• Cruel and inhumane to the pig if the snare is not properly setup and attended. • Ineffective for reducing feral pigs at the population level. • Indiscriminate, posing a high risk of non-target captures. • An operator needs to be highly proficient, attending any caught animal quickly to minimise pain or distress.	Luring. Trail cameras to inform pig capture.

Method	When to use	Pros	Cons	Supplementary tools
Ground hunting	• At moderate to low population densities. • In open terrain. • Early morning or late afternoon when pigs are active. • Spotlighting feeding sites.	• Target-specific.	• Costly for reducing large numbers. • Can be difficult in thick vegetation. • May alter pig activity patterns and disrupt trapping and poison programmes. • Labour- and skill-intensive.	**Luring**, either by hand or using a mechanical feeder. **Dogs** to find, bail, hold, or flush pigs. **Trail cameras** enable users to: • select hunting locations, • inform luring locations and amounts, • inform pig visiting times, and • determine post-suppression results. **Thermal infrared technology**: • Handheld cameras improve detection of pigs. • Scope allows night shooting.
Aerial shooting	• At all population densities. • In open terrain. • In inaccessible or remote areas. • Early morning or late afternoon when pigs are active.	• Target-specific. • Can be cost-effective when pig density is high. • Quick knockdown of pig population.	• Expensive when pig densities are low. • Not suitable for thick vegetation. • May alter pig activity patterns and disrupt trapping and poison programmes. • Requires specialist flying and shooting skills. • Lack of availability of helicopter in some locations.	**Tracking-collared pigs** informs other pig locations for targeted dispatch. **Thermal infrared technology** aids night vision, detection, and shooting.
Poison baiting	• At all population densities. • When there is little other food available.	• Can reduce large numbers of pigs over large areas quickly. • Fast-acting and humane. • No environmental residues when used with bait stations.	• Restrictions on its use. • Can only be used with bait stations (additional costs). • Different poison products have different efficacy.	**Luring**, either by hand or using a mechanical feeder. **Trail cameras** enable users to: • select bait station locations, • inform pig visiting times and estimate bait take, and • determine post-suppression results.
Exclusion fencing	• Construct fences before pigs have moved into an area.	• Low non-target impacts. • Effective for small high-value areas.	• Requires constant maintenance. • Impractical at a large scale. • May impede movement of non-target species. • Excludes but does not reduce feral pig populations.	**Trail cameras** enable users to: • determine pig presence and absence within and around the fenced site to inform suppression actions.

6.4 Trapping

Effective feral pig trapping depends on capturing groups of pigs simultaneously, emphasising the need to lure with free-feed before activating the trap. The process entails selecting a suitable site, erecting the trap, luring with free-feed for several days, setting the trap, and shooting the captured pigs. Community reporting of feral pig activity, along with footage from trail cameras, can help determine trap sites and trap sizes. Various trap types are in use, including nets, panel, silo, box, and brig traps (Table 3).

When choosing a trap, consider the goals and practicality of the trap options. For example, tribal lands in the Pacific islands region are often unfenced, with crop and garden plots typically relocated yearly. This makes permanent traps impractical for plot protection. The Pig Brig® is efficient, effective, and portable, making it an ideal choice for trapping feral pigs in this context.

When constructing traps with steel components, pay special attention to prevent loose wires, sharp edges, or malfunctioning gates to avoid injuries to pigs.

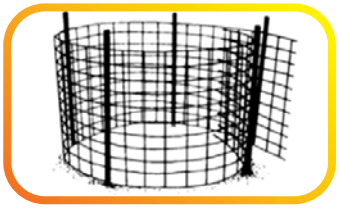
Ensure all traps are placed in areas with vegetation, to provide shade and shelter, given that pigs have poor thermoregulation. Inspect traps daily to prevent dehydration and minimise stress to pigs due to temperature extremes.

In past trapping projects, monitoring results have shown certain sites have higher capture rates than other sites, suggesting non-random influences. Understanding the reasons behind these patterns can be difficult. By collecting data on factors such as habitat type, proximity to pig activity, weather, and season, consistent features of highly successful settings may be identified.

Approach captured animals quietly to reduce panic and the risk of injury, dispatching them quickly and humanely. In cases of lactating sows trapped without their young, make efforts to locate dependent piglets for swift and humane dispatch. Also avoid ground or aerial shooting before or during trapping programmes to prevent dispersing pigs. Killing live trapped feral pigs is addressed in section 6.5.

TABLE 3. Types of feral pig traps with pros and cons

Trap type	Pros	Cons
Pig Brig® trap: double walled, UV-protected strong netting. See case study on p.27).  Sounder caught in a Pig Brig® trap. Photo: D. Lawson, DOC. Videos for setting instructions: • *Part 1. Unboxing your Pig Brig trap system* • *Part 2. What you need in the field* • *Part 3. Site selection and considerations* • *How to close the Pig Brig trap system seam* • *Tree Sets: setup the Pig Brig with trees, not T-Posts* • *Pig Brig trap system forest set-up without T-Posts* • *Proper baiting and conditioning for Pig Brig trap systems* • *Safety tips around a pig-filled Pig Brig*	Lightweight, sturdy, and easily transportable, this system can be set up in areas where steel traps are unfeasible. Can be set up by one person. A continuous trap system which can capture entire sounders. Once the net is lowered to the ground, pigs can root inside but not root back out. Absence of slamming gates or metal walls reduces likelihood of pigs panicking or developing trap shyness. T-posts or trees can provide support for the trap.	High cost of fencing posts in the Pacific. Difficulty driving posts into the ground in Pacific coral islets. Crabs can damage the nets. It is dangerous for hunters to enter the trap with live pigs due to trap design. Using trees as support for the trap can be challenging as it requires arranging the tackle and roping in a specific way. Regular inspection of the net is required to check for and reinforce, any weak points.
Cage trap: basket wire and rebar rods, with a guillotine type door.  Photo: Conservatoire d'espaces Naturels, SPREP See this site for setting instructions: https://brb.sprep.org/sites/default/files/2021-12/pig-cage-trap.pdf	The wire construction is believed to offer a more open and less confining appearance to wild pigs than a wooden trap. Cage traps can usually be set up by one person and are easy to transport.	The catch size per trapping effort is limited to a small number of pigs.

Trap type	Pros	Cons
Panel trap: steel panels are equipped with a spring-loaded, single-catch or multicatch trap door at one end of the cage.  Photo: Australian Trapping systems	The size and shape of the panel trap can be adjusted by removing or adding panels to avoid rocks and stumps. Panel traps are relatively easy to construct, dismantle and transport.	Expensive.
Silo trap: made from weldmesh.  Image: Department of Primary Industries and Regional Development, Government of Western Australia See the 12-minute online tutorial for setting a silo-mesh trap and panel trap here.	Suitable for semi-permanent trap sites. Stronger than the panel trap, it remains flexible enough to prevent pigs from climbing out or breaking the mesh.	More difficult to construct, dismantle, and transport than the other designs because it is made from one or more lengths of weldmesh.
Box trap: structures made of wood fence panel. The most common box trap design is 4 feet (122 centimetres [cm]) wide, 8 feet (244 cm) long, and 5 feet (152 cm) high with no fixed top or bottom.  Photo: Mississippi State University	Box traps are cost-effective alternatives to steel commercial traps, simple to construct, and collapsible for easy relocation. They require less space for transport and storage. The use of steel posts at the corners prevents pigs from lifting the trap.	Catch size per trapping effort is limited to a small number of pigs. The wooden box is more confining than wire panel traps, and they require more long-term maintenance. The side panels are heavy and can be difficult for one person to handle.
Corral trap: constructed using heavy-gauge wire or U-bolts to fasten 16 by 5 foot (488 by 152 cm) welded wire panels to 6½ foot (198 cm) steel T-posts.  Corral trap with a single-catch wooden drop door. Photo: Mississippi State University	Corral traps are effective for capturing large pig groups. The circular shape prevents captured pigs from piling into corners and escaping over the top. Size adjustment is simple by adding or removing panels, enabling enlargement for larger sounders. The open design may seem less threatening to trap-shy pigs.	Requires more setup time than box and cage traps. The panels may need to be cut in half for transport, leading to increased assemblage time and effort. Tree roots can pose challenges for driving and pulling T-posts; therefore a T-post 'puller' is recommended.

Placing traps

Select a site near feral pig activity, with flat terrain and shade to provide pig comfort, ensuring easy accessibility by vehicle for bait and trap transport. The location should be free from biosecurity risks like *Phytophthora cinnamomi*.

Construct the trap, positioning fresh lure inside and outside initially. As pigs grow accustomed to the trap and lure, limit the lure to inside the trap. Continue luring until all pigs in a group consistently enter the trap to feed; this may take up to one to two weeks.

Setting and monitoring traps

Activate the trap each evening, check it the following morning, and dispatch any trapped pigs (see section 6.5 on how to kill trapped feral pigs). Keep setting the trap nightly until no more pigs are caught.

If capturing remaining pigs proves challenging, try using a different lure. Allow one to two nights of free-feeding before re-activating the trap.

Traps may remain at permanent sites ready to be reactivated upon detecting fresh pig activity or relocated to new sites.

Traps can be monitored using remote trail cameras to reduce the need for visiting the site and potentially disturbing un-trapped pigs. NZ guidelines for remote monitoring of live capture traps for vertebrates advise remote systems should:

- be fail-safe to ensure captured animals do not go unnoticed,
- be regularly tested for reliability, and
- be the responsibility of a nominated individual, who undertakes inspections regularly, and have sufficient back-up (that is, have people available to check traps daily, in case of remote system failure)

The Pig Brig® trap

The Pig Brig® trap, used for feral pig suppression in Wallis, a South Pacific atoll, was chosen for its lightweight, easy setup and continuous trapping capability. The process involved:

1. **Setup and conditioning**: the trap was assembled at a known pig activity site, with coconuts placed in the center to lure pigs under the raised net for two to three weeks to acclimate the pigs.
2. **Activation**: the skirt was lowered and anchored inside at various points. Like a fish trap, pigs can push their way into the trap but cannot find a way out.
3. **Monitoring and dispatch**: cameras monitored pig activity to determine trapping readiness, identify trap-shy individuals, and establish visiting patterns. Pigs were dispatched with firearms, with some captured alive. Entering the trap with live pigs was risky due to the trap's design.

The main advantages of the Pig Brig® include its continuous trapping system, ability to capture entire sounders, and portability. Challenges within the Pacific context included the cost of fencing posts, difficulty securing posts in coral islets, and shipping delays. Crab interference also caused holes and damage to the netting.

6.4.1 Snares

Snares are used to trap individual pigs, rather than groups. Snares consist of a loop of galvanized cable that closes easily and is prevented from reopening by a sliding lock device. A heavy swivel on the tie-end of the snare is connected to an anchor to minimise twisting and breakage. The size of the anchor and weight of the cable need to increase with the size of the pigs.

There are several types of snares, including restraining snares, killing snares, foot or neck snares, hand-held or power snares, and others. Effective and humane killing with snares depends on the animal's size, snare type, and the operator's skill. Improper setting or use can cause serious injury to any caught animal.

The use of snares is illegal in many states in America and requires licenses or permits in others due to the risk of non-target captures and cruelty concerns. New Zealand currently lacks specific snare regulations, but this is expected to change due to similar animal welfare concerns.

In the Pacific islands, snares are commonly used, such as in Hawaiian ecological programmes, because they are an economic, transportable option, useful for targeting individual pigs in remote places or rough terrain where traps are impractical or pigs are trap-shy. However, some Pacific operators discourage snare use due to concerns about ineffectiveness in reducing pig populations and about cruelty. As such, snares should only be used with extreme caution, care, skill, and as a last resort. As with other traps, luring can help entice a pig to the snare, and cameras can inform pig capture.

6.5 Ground hunting and aerial shooting

6.5.1 General principles for all operations using firearms

Before planning on using firearms to target feral pigs, find out what the legal requirements are in the country or territory where the project is taking place and make sure you comply with them. If there is no legal guidance, consider whether New Zealand's approach is useful for governing firearm safety for the suppression project. In New Zealand, licensing, storage, and safety considerations apply; refer to New Zealand's firearms safety e-learning modules for details.

Always prioritise safety when using firearms, including public safety. Identify your target, assess range accurately, only load a firearm when ready to fire, and wear a hi-vis vest and adequate hearing protection to prevent irreversible damage from repeated exposure to gunfire. Use of safety glasses is recommended to shield eyes from gases, metal fragments, and other particles. Be cautious of bullet ricochet, especially in areas with rocky substrates.

Keep in mind disturbance from shooting can prompt pigs to relocate.

Procedure

For effective and humane shooting, use skilled shooters, the correct firearm, ammunition, and precise shot placement.

Animals must be clearly visible and within a suitable range. Do not shoot if the animal is obscured or out of range.

Only head (brain) or chest (heart-lung) shots (Figure 10) are acceptable for an instantaneous, humane death. Avoid shooting other body parts to minimize the risk of unnecessary wounding.

Promptly locate and dispatch wounded animals with a second shot, preferably to the head. Leaving wounded animals unattended leads to suffering. Swift action is crucial to prevent unnecessary harm.

Confirm each animal's death before targeting another.

If lactating sows are shot, promptly locate and humanely dispatch dependent piglets. Piglets that escape tend to return to the vicinity within hours.

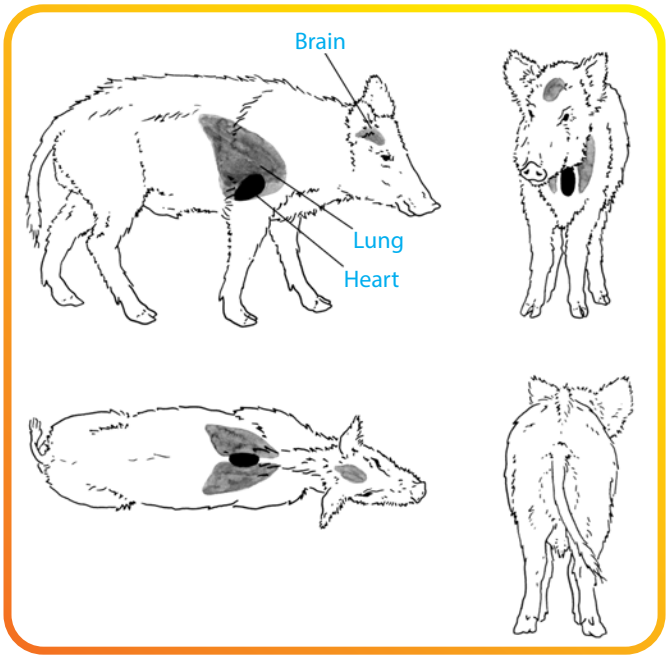


FIGURE 10. Recommended shot placements for feral pigs. Image: M. Neilson, DOC

Confirming the kill

Death is confirmed by observing a limp carcass with relaxed muscles and legs, no head or tail movement, no heartbeat or regular breathing, and no corneal reflex (that is, no blinking when touching the eyeball). Pupils should be dilated and fixed. If there is any doubt, administer another lethal shot.

Firearms and ammunition

With a wide array of firearms and ammunition available, selecting the right tools and accuracy of shot placement are essential for a humane kill. Various factors need to be considered, such as the size of the target pigs and the likely shooting range. Consult a PRISMSS advisor to choose the right firearm and ammunition.

For shooting live pigs in a trap, a rimfire .22 calibre rifle works well for close-range head shots especially if solid (target) ammunition is used. For other ground-hunting situations, a centrefire calibre rifle (such as .223 or .308) is needed. Use ballistic tip, hollow-point, or soft-nosed ammunition with centrefire rifles. These game bullets are designed to mushroom on impact for a higher chance of a quick, humane kill.

Shotguns using buckshot or slugs are also effective for ground hunting. Buckshot (SS or SSG shot) is recommended for moving or smaller targets such as piglets, while slugs offer longer range.

Semi-automatic firearms are recommended for groups of pigs or aerial shooting because they offer a high rate of firing and usually have large magazine capacities.

Consider using suppressors, which reduce noise for safety and minimise disturbance to other pigs. Shortened barrels are helpful in thick vegetation, but they may affect velocity.

Accuracy is crucial, so use sights such as an optical scope (particularly if shooting longer range), precision-test rifles against inanimate targets beforehand, and maintain firearms to ensure function.

6.5.2 Ground hunting using firearms, dogs, and knives

Ground hunting is time-consuming and labour-intensive. When hunting without dogs or lured sites, it can be difficult to achieve feral pig population suppression to the low levels required, when feral populations are at high densities or at large scales. It can also lead to the dispersion of remaining pigs and be impractical where there is a shortage of hunters or challenging terrain. In areas with low pig numbers, considerable effort may yield minimal results, especially when pig density falls below one pig per square kilometre.

Solely relying on recreational hunting to lower pig populations is largely ineffective, as studies show only a 20% annual decrease. However, recreational hunting will likely contribute to suppression when used in conjunction with other techniques. Successful ground hunting programmes in New Caledonia and Niue's pilot programme used trained hunting dogs to locate feral pigs and benefited from strong community support, experienced hunters, and GPS technology.

Using lure sites

Placing lure at specific sites will condition pigs to visit the sites (Figure 11). Hunters can then approach the site stealthily or wait downwind ensuring they are obscured from the pigs' view, intercepting them upon return. Principles to effective luring apply (see section 5.3), and using trail cameras can help interpret pig behaviour, visiting times and approach direction, which can inform when and how to approach sites.

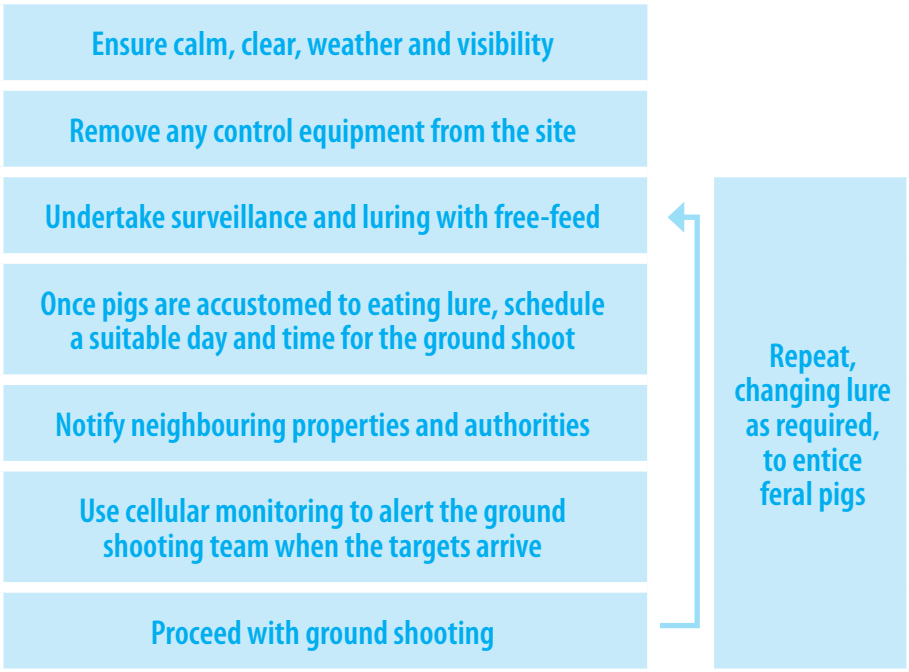


FIGURE 11. Ground hunting procedure using a lure site.

Using dogs

Well-trained dogs are vital for successful ground hunting. Handlers must be skilled, experienced, and effective in communicating with and controlling their dogs.

In pig hunting, dogs serve various roles. They can be finders, bailers, holders, or flushers. Finder dogs track and locate pigs, while bailer dogs use circling and barking to prevent the pig from escaping. Holder dogs physically restrain pigs, while flushing dogs drive pigs out of hiding spots. Some dogs specialise in one skill, while others have multiple. Teams in New Zealand often consist of dogs with different skillsets, such as finders locating the pig while bailers or holders keep it in place until the hunter arrives. While holding is acceptable practice, handlers must prevent their dogs attacking pigs.

Using radio tracking collars (Figure 12) during hunts not only helps a hunter to find dogs quickly but also speeds up locating pigs. It can be difficult to locate a barking dog with a bailed pig, especially on windy days and in rough terrain.

FIGURE 12. Ground shooting in New Zealand using trained hunting dogs with GPS tracking collars. Photo: A. Theobald, DOC.

Ensuring dog welfare is essential:

- Keep dogs hydrated, particularly in tropical climates, to prevent overheating and potential fatalities.
- Little fire ants *(Wasmannia auropunctata)* present in parts of the Pacific, can sting dogs' eyes causing irritation which can cause blindness. If dogs are stung, flush their eyes with clean water.
- Avoid letting dogs become fatigued to reduce the risk of injury.
- Locating dogs reliably (for example, by using a radio tracking collar) helps prevent dehydration, starvation, or exposure if dogs become lost. Lost dogs can also impact livestock and native animals.
- Never shoot at a pig until dogs are safely positioned behind the shooter.
- Consider using a suppressor on the firearm to reduce loud noise that could harm dog hearing.

Use of ground control methods to suppress feral pigs in Niue

A successful feral pig suppression pilot project in Niue involved training locals as professional hunters with greyhound-cattle dog crosses. These dogs, fast and hardworking yet non-confrontational with pigs, were preferred over local Niuean dogs lacking these traits. Bailer dogs were deemed a liability due to the risk of injury from boars.

Result monitoring revealed a 50% reduction in pig numbers within 12 months of initiation of the programme. While ecological and economic outcome data were unavailable, using five trained hunters with dogs and GPS effectively addressed Niue's pig problem.

Hunters Huggard, Dan and Hele with a wild boar, Niue. Photo: SPREP, 2016

Using knives

When the risks of shooting a bailed or wounded pig are high (due to potential harm to dogs or bullet ricochet) it is acceptable to use a knife. A handler should only use a knife when calm, when it is possible to use precise knife positioning, and when in control of the pig. Ensure the knife blade is at least 15.24 centimetres (6 inches) for adequate heart reach.

If a holding dog secures the pig, the handler has two options: either turn the pig over, holding the lower front leg up to restrain the pig, and pierce the *jugular fossa* (the deep hollow just in front of the chest, at the base of the neck) toward the heart; or for larger pigs, hold the animal (using the tail if suitable) and pierce behind the front shoulder. Maintain the hold until the pig dies. Penetrating both these areas guarantees a swift and humane death, as the knife reaches the heart.

6.5.3 Aerial shooting

Aerial shooting is cost-effective with high feral pig densities, becoming more expensive as numbers decrease. The method is valuable in inaccessible areas with sparse vegetation and is humane when using skilled shooters and pilots, proper equipment, and precise shot placement. The use of thermal technology and tracking-collared pigs can enhance shooting success rates. Helicopter shooting requires calm weather with good visibility for safety. It is unsafe in adverse weather such as strong wind, rain, or low cloud.

Feral pig habitat in the Pacific islands is often densely forested, which limits the effectiveness of aerial shooting as pigs can be concealed. Optimal aerial shooting periods are during dry seasons or droughts when pigs are forced to gather in open areas to access water and food.

Due to the challenge of accurately assessing death from a distance, a deliberate 'flyback' or 'overkill' policy must be adopted, involving a minimum of two shots per animal. For this procedure, the helicopter returns to confirm that shot animals are dead before moving forward. The costs of ammunition and additional flying should not deter this approach. Both shooters and pilots collaborate to verify kills, and if conditions allow, the helicopter may land for confirmation.

To avoid leaving dependent piglets to starve, it is preferable not to conduct aerial shooting when sows have recently farrowed.

Procedure

a. Target feral pigs during their peak activity and when they are away from cover, typically in early morning, late afternoon, and evening, especially on cooler, overcast days.

b. Muster pigs away from watercourses and dense vegetation before shooting, to aid in locating wounded animals.

c. Confirm the target before safely positioning the helicopter close for an effective and humane kill.

d. Ensure a stable shooting platform to enhance accuracy, and avoid shooting from a moving helicopter.

e. Only shoot feral pigs within clear visibility, effective firearm range, and with a high probability of a humane kill; refrain from shooting if uncertain.

f. Use a shotgun with OO Buckshot, AAA, or BB shot loads for piglets within 20 to 30 metre range, or consider a self-loading rifle in favourable, calm conditions.

g. Initially, opt for a head shot, which is easier to achieve with a moving animal. However, shooter judgement is paramount, and chest shots may be suitable in certain conditions.

h. Immediately follow the initial shot with a second chest shot to ensure humane dispatch.

i. In a line of running animals, start shooting from the tail end, progressing forward until all are shot.

j. Dispatch wounded animals promptly before addressing the rest of the herd.

6.6 Poison

Ground-based poison baiting can be an effective method for suppressing feral pig populations, particularly in areas where trapping is impractical, or pigs are trap-shy and when accompanied by luring. It can also be more cost-effective than hunting. Trail cameras can help inform where to place bait stations and bait amounts.

6.6.1 Follow the poison label and safety instructions

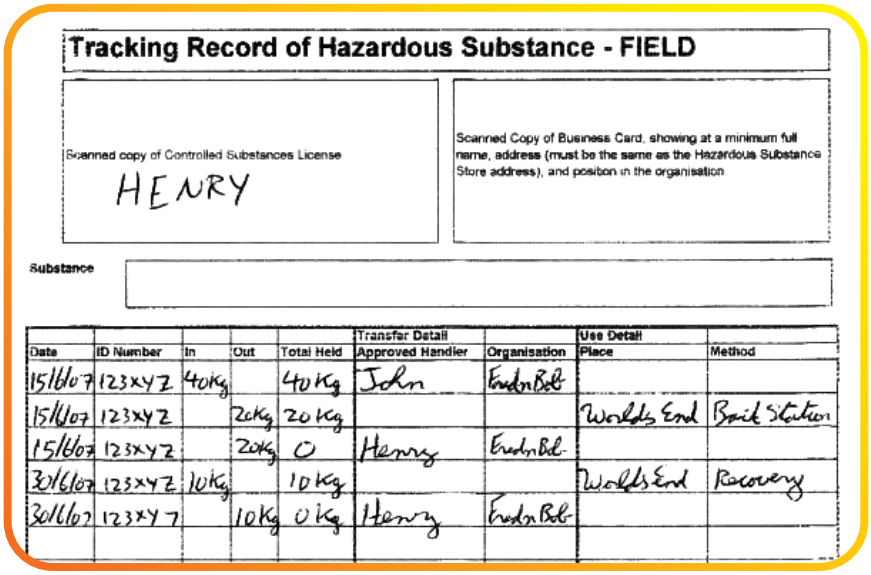
Vertebrate poisons require careful management due to potential hazards to people. Safety should always be your top priority. All poisons come with a label containing mandatory instructions for safe use, including precautions, first aid, symptoms of poisoning, instructions for use, storage, and spill management (for example, see the Bait-Rite® label). It is essential to strictly follow these label instructions.

6.6.2 Check your local laws

When planning on using poison to target feral pigs, 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. If there is no legal guidance, consider whether New Zealand's approach is useful. Vertebrate poisons are strictly monitored and regulated in New Zealand. Depending on the poison type, legal obligations include tracking its journey from manufacturing to disposal (for an example, see Figure 13), secure storage, obtaining a special usage licence, adherence to transportation rules, and the development of an emergency plan for potential mishaps.

Set up 'caution periods'

In areas where poison is used, New Zealand regulators establish 'caution periods' to inform how long it takes for the risk of residues to decrease after applying or removing the poison. Caution periods guide the safe consumption of animals from treated areas and the removal of warning signs (the use of warning signs is addressed in the Invasive Animal Suppression Framework). In the Pacific islands region, imposing a caution period in and around areas treated with poison to prohibit crab harvesting will help keep people safe. The duration of the harvest prohibition can be determined by New Zealand's Caution Period Calculator, which provides caution periods for all vertebrate toxins registered in New Zealand (as included in Table 4).



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		40kg	John	Ends Bob		
15/1/07	123XYZ		20kg	20kg			Worlds End	Bait Station
15/1/07	123XYZ		20kg	0	Henry	Ends Bob		
30/1/07	123XYZ	10kg		10kg			Worlds End	Recovery
30/1/07	123XY7		10kg	0kg	Henry	Ends Bob		

FIGURE 13. Example of a form tracking poison use in the field. Image: Bionet.nz

Practical tips when applying poison

Use poison in locations where it is likely to be encountered during feral pigs' daily activity.

Consider seasonal conditions and alternative food availability. In the Pacific islands, natural food generally reduces in the dry season and in colder months from winter to early spring, with variations among islands depending on the prey present. Cold seasons are optimal for poison use due to reduced reptile and invertebrate activity, lower rodent numbers, and the absence of seabirds on islands yet to arrive for the season.

Administer poison before pig breeding season, as farrowing sows limit their normal home range by up to 94%, reducing their exposure to baits. Always use free-feed lure before using poison baits, allowing sufficient time for feral pigs to become familiar with the lure, bait, and location.

Do not use old poison, avoid mixing non-toxic lure with toxic bait, and always comply with a label instructions.

Avoid shooting activities that will disrupt pig behaviour, preventing them becoming accustomed to a poison site.

Common issues with poisons

- Bait interference may become a problem if non-target animals eat it. In the Pacific islands region, crabs will almost certainly consume bait. Refer to section 6.2 for a suggested way to manage this interference. Using self-closing bait dispensers will help reduce interference.
- Local legal standards may differ between areas, including regulations for using poison near water.
- Some communities may not endorse the use of poison.
- Initial setup costs for **bait stations** can be expensive.

6.6.3 Poison and product options for feral pig suppression

Table 4 summarises the poison and product options for feral pig suppression, along with respective pros and cons. The poison refers to the active ingredient in each product; the products are commercial formulations (such as paste, capsules, or pellets) designed to be palatable to pigs for effective poison delivery.

This table includes two Australian products because registered options in New Zealand are limited. HogGone bait is identified as the most suitable poison product for suppressing feral pigs in the Pacific islands region.

Concept trial using bait stations in Niue

In the Niue Island feral pig suppression pilot project, trail cameras were installed at bait stations and lured with coconut flesh and oil. To habituate pigs to the lure, box lids were initially left open and gradually lowered once the pigs recognised the presence of the lure. Subsequently, the lids were closed. Within a single night, pigs adeptly learned to open the bait station lids to access the lure. While poison was socially unacceptable for use in this project, incorporating encapsulated sodium nitrate within the bait stations after pigs acclimatised to them would offer effective suppression, with closed lids preventing non-target animals from accessing the poison bait.

TABLE 4. Summary table of poisons and products for feral pig suppression with pros and cons

POISON	Pros	Cons	PRODUCT	Pros	Cons
Sodium nitrite A crystalline powder chemical, soluble in water. It is found at low concentrations in most vegetables and is used as a preservative in meats, such as salami. As a food additive, it prevents growth of harmful bacteria.	A humane poison which exploits the unique physiology of feral pigs, inducing swift unconsciousness and leading to death with minimal distress. Biodegradable with no persistent residues. Minimal risk of secondary poisoning. Antidote is available.	In large amounts, it can be toxic to animals, including humans.	**HogGone, Micro-encapsulated sodium nitrite (MESN).** In Australia, the label specifies the bait must be used with a specific bait box called the HogGone Bait Box®. Bait stations must house the bait, self-close after pigs feed, be robust, and be well anchored to withstand multiple pigs feeding. A feral pig baiting video developed by Agriculture Victoria provides useful instruction.	Proven to be effective in the field in Australia and early field trials in NZ also demonstrate good field efficacy. The product is stable and slow to degrade (has a shelf life of about 6 months) Only small amounts (100 to 200 grams) of MESN needs to be eaten to kill even large individual pigs.	Not yet registered for use in NZ, although DOC is working to obtain full approval for use. Must be used with a bait station. Untested in wet tropical environments.
			Bait-Rite® Paste The caution period in NZ is four months. This means four months after removing the bait, warning signs can be taken down and animals from the treated area can be hunted and consumed.	Registered for use in NZ.	There is little information on its field efficacy. In NZ, early field trials have demonstrated poor efficacy and low pig mortality. Degradation and loss of palatability begins from the time of manufacture. Must be used with a bait station.
Sodium mono-fluoroacetate, 1080 An odourless, tasteless white powder that is marked with a dye to identify it as a toxin.	Effective against feral pigs within the Australian context.	Substantial doses are needed to kill feral pigs. Non-target risk is high due to large amounts used. Not registered for use against pigs in NZ. To use humanely and effectively requires special precautions and conditions. For details, see PestSmart feral pig toolkit resource.	Products are not detailed here, as they are considered unsuitable for use for feral pig population suppression within the Pacific context for the reasons outlined in the cons column.		

6.7 Fencing

As a general rule, fencing is not recommended for broad-scale management of feral pigs but is valuable when employed in three specific ways:

a. Preventing or slowing pig movement into new areas. For example, combining fencing with other ground control methods effectively reduced pig numbers to near zero within Hawai'ian management zones. Trail cameras can be used to inform about any fence breach (Figure 8).

b. Partitioning treatment areas enables practitioners to focus on one portion at a time. For instance, successful pig eradication on Santa Cruz island in California was achieved through a multistep process. The team first divided the area into management zones with fences, then employed trapping, ground shooting, and finally aerial shooting using sterile pigs with tracking collars to target remaining individuals.

c. Separating management objectives between lands. For example, exclusion fencing can be used to protect areas after removing feral pigs, which is a strategy employed as part of a programme to protect the unique Archey's Frog species in New Zealand.

FIGURE 14. Addressing escape challenges: small pig breakout captured on trail camera due to wide fence netting, New Zealand. Photo: M. Griffin, DOC.

Despite being a common tool in Pacific island pig management, high initial expenses and ongoing inspection and maintenance requirements are drawbacks to fencing.

Non-electric, woven wire fences are effective at limiting feral pig movement, though their cost can be high. For instance, in 2019, building exclusion fencing for pigs in Hawai'i ranged from NZD 16,800 to 47,600 per kilometre. Recommended designs include 15 × 8 centimetre hinge joint or diamond mesh construction with a mesh size of no more than 15 centimetres (Figure 14 shows escape problems with wide mesh). A minimum height of 1.2 metres is crucial because feral pigs can jump shorter fences. Ideally, the bottom wire should be pulled tightly into dips in the ground, but where this is impractical, barbed wire can be used along the bottom to discourage pigs from pushing underneath. In Hawai'i, iron posts, spaced 2 metres apart, were used to anchor the fence.

Electric fencing can be cheaper but is generally ineffective when used on its own because feral pigs simply push through the electrical shocks.

7 What are the best ways to address safety, animal welfare, and biosecurity?

Safety is priority when working with feral animals. Use traps, poison, and firearms responsibly, following the safety advice outlined in the respective sections above. In this way, you will work to achieve the project goal while safeguarding yourself, others, and non-target animals. Educate the community on suppression safety measures relevant to them.

7.1 Manage your safety

Adult pigs are equipped with sharp teeth and very strong jaws that can cause serious injury. Boars have tusks used for goring, while sows with litters can be aggressive, especially when cornered away from their young. Prepare by developing safety guidelines, an emergency plan, and a checklist of items for potential injuries. When ground hunting, have an escape route, like a climbable tree or high rock. Ensure you have a reliable way to communicate with others, such as cell phones or two-way radios.

Adult feral pigs can weigh over 100 kilograms, requiring careful handling using proper lifting and carrying techniques, such as the piggie-back (Figure 15). They can also be dragged by placing a strop over the upper jaw behind the grinders (Figure 16). Alternatively, employing machinery such as a tractor, winch, or crane to move carcasses significantly reduces manual handling risks. Some land managers may require leaving carcasses on-site to mitigate these risks.

FIGURE 15. Carrying a feral pig using rope to tie hooves in traditional 'piggie-back' method. Photo: A. Newport, DOC

Feral pigs and carcasses can harbour potential diseases and parasites that can affect humans and other animals. Stay away from any animal showing signs of illness to protect yourself from disease risk. To protect your health when handling these animals, routinely wash hands and use protective clothing. Cover any cuts or abrasions and consult your doctor regarding vaccinations against diseases associated with feral pigs.

FIGURE 16. Using a strop to handle a pig. Image: J. Aitken

7.2 Manage safety of other people

If carcasses are not being recovered and distributed to the community for food, proper disposal is recommended to avoid disease spread. Dispose of carcasses by burying them at least 500 millimetres deep at the location of dispatch. Ensure the burial location is away from waterways and groundwater supplies so decaying material does not leach into the groundwater supply. Alternatively, incinerate or transport carcasses to an approved waste disposal facility.

7.3 Manage safety of non-target animals' interference with control tools

Accidental harm to non-target species, such as native wildlife and domestic animals, is a primary concern in suppression projects. This can result from being caught in traps or poisoning, including **secondary poisoning**.

During the feasibility stage of a suppression project, identify and assess the risk of non-target species interference to help tailor management plans.

7.4 Manage feral pig welfare

Check for animal welfare laws in the country or territory where the suppression project is taking place. Even if none exist, ensure humane treatment of feral pigs by swiftly and efficiently dispatching them to prevent unnecessary pain and suffering. In New Zealand, legal standards mandate humane practices, influencing trap design, frequency of live-capture trap inspections (daily, within 12 hours after sunrise), and policy around humane shooting practices.

7.5 Prevent the spread of pests and diseases from one site to another

Moving soil, water, animals, or plants pose biosecurity risks of spreading pests, such as weeds, ants, and diseases. For example, *Phytophthora cinnamomi,* present in Papua New Guinea, can cause death in plants and habitat loss for animals. This serious disease can remain dormant during dry periods, making detection challenging. Activities such as bushwalking and transferring vehicles or equipment between sites can facilitate its spread. To minimise cross-site pest and disease transmission, ensure footwear, tools, vehicles, and equipment are clean upon arrival and departure.

8 What online tutorials and other useful resources are available?

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

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

a. The Australian model code of practice for the humane control of feral pigs: https://pestsmart.org.au/toolkit-resource/code-of-practice-feral-pigs

b. Use of Judas pigs. Standard Operating Procedure. PestSmart website.

c. Trapping of feral pigs. Standard Operating Procedure. PestSmart website, includes an instructional tutorial.

d. Ground shooting of feral pigs. Standard Operating Procedure. PestSmart website.

e. Aerial shooting of feral pigs. Standard Operating Procedure. PestSmart website.

f. Poisoning of feral pigs with sodium nitrite (HogGone). Standard Operating Procedure. PestSmart website.

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

h. B8 minimum requirements for tracking vertebrate toxic agents

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

j. 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/

9 What comes next?

Work involving the suppression of feral pig populations is completed in cycles. Projects are assessed for feasibility, planned, implemented, reviewed, and adjusted based on lessons learned and on changes in the local context.

Suppression of feral pig 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 island 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.

Control — Various meanings within a suppression context:

- A control programme is one that that aims to reduce invasive animal population numbers in a specific area over time, often used when complete eradication is impractical due to difficulty or cost. Control programmes are also known as suppression or management programmes.
- Various control methods are used, such as trapping, ground hunting, aerial shooting, poison bait, and exclusion fencing. There are different types of traps, poisons, firearms, and fences, known as control tools.

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.

Feral pig — Any pig that is living in a wild state and is not being herded or handled as a domestic animal or kept within an effective fence or enclosure for farming purposes.

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.

Non-target — Species such as native wildlife, or domestic animals, that are not the intended focus of suppression measures but could be harmed by the suppression tools directly or harmed indirectly by secondary poisoning.

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 pigs.

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Halo

Tālofa nī

Halo

Tālofa

Halo

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