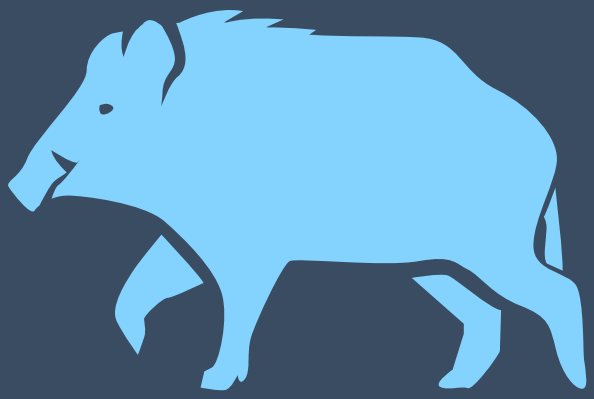
NSW GOVERNMENT | Department of Primary Industries

NSW Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Pigs



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Preface

This document (Code of Practice (COP) and relevant Standard Operating Procedures (SOPs)) provides current information and guidance to government agencies, land managers and pest animal controllers involved in the control of feral pigs in NSW. The aim is for control programs to be conducted in a way that reduces the negative impacts of feral pigs using the most humane, target-specific, economic and effective techniques available.

Previously published and endorsed COPs and SOPs[1] available via the PestSmart website (https://www.pestsmart.org.au/) can provide general guidance for national use, but some of the content may now be out-of-date. This revision of NSW-specific COPs and SOPs [2] has been developed to provide the most relevant and up-to-date information to support best practice pest animal management in NSW. Outdated information has been removed, while new information has been added to reflect the advancements and changes specific to feral pig management within NSW. For ease of use, the COP and SOPs for each species have been consolidated into one document; however, links are provided to allow printing of individual SOPs as required.

Contents

Introduction

All pest animal management must aim to minimise individual animal suffering while at the same time optimising the population impact of a control program. This requires use of the most humane methods that will achieve the control program's aims. Consideration of animal suffering should occur regardless of the status given to a particular pest species or the extent of the damage or impact they create. While the ecological and economic rationales for the control of pests such as the feral pig are frequently documented, of equal importance is an ethical framework under which these pests are controlled.

A **Code of Practice** (COP) provides overarching context and brings together the SOP procedures in context, and now in one document that specifies humane control options and their implementation. In this way, COPs encompass all aspects of controlling a pest animal species as determined by best practice principles, relevant biological information, guidance on choosing the most humane and appropriate control technique and how to most effectively implement management programs.

This COP provides state-wide guidance and is based on current knowledge and experience in the area of feral pig control. It will be revised as required to take into account advances in knowledge and development of new control techniques and strategies.

Standard Operating Procedures (SOPs) ensure that an ethical approach (including the recognition of and attention to the welfare of all animals directly or indirectly affected by control programs) is uniformly applied to each pest animal control option. The SOPs are written in a way that describes the procedures involved and animal welfare issues applicable for each control technique, thus acting as a detailed guide to support best practice control programs.

Definitions and terms

Best practice management – a structured, consistent and adaptive approach to the humane management of pest animals aimed at achieving enduring and cost-effective outcomes. 'Best practice' is defined as the agreed principles and specific techniques at a particular time following consideration of scientific information and accumulated experience [3].

Euthanasia – literally means a 'good death' and usually implies the ending of suffering for an individual; however, when used in regard to animals it usually refers to the means by which an animal is killed rather than the reason for killing it [4, 5].

Humane – refers to an absence of (or minimal) pain, suffering and distress (e.g., a relatively more humane euthanasia method will cause less pain, suffering and distress than a relatively less humane euthanasia method).

Humaneness – level of welfare impact or welfare cost (e.g., assessing level of humaneness is equivalent to assessing welfare impact or cost).

Humane killing – the killing of animals using relatively humane methods in certain situations (e.g., animals used in research or pest management) for reasons other than to reduce their suffering.

Humane vertebrate pest control – the development and selection of feasible control programs and techniques that avoid or minimise pain, suffering and distress to target and non-target animals [6].

Pest animal – (also referred to as vertebrate pest) native or introduced, wild or feral, non-human species of animal that is currently troublesome locally, or over a wide area, to one or more persons, either by being a health hazard, a general nuisance, or by destroying food, fibre, or natural resources [7]. Refer to Vertebrate Pesticide Manual [8] for relevant governance and legislation information as applied to the control of vertebrate pests.

Welfare – an animals' state as regards its attempts to cope with its environment [9]. Welfare includes the extent of any difficulty in coping or any failure to cope; it is a characteristic of an individual at a particular time and can range from very good to very poor. Pain and suffering are important aspects of poor welfare, whereas good welfare is present when the nutritional, environmental, health, behavioural and mental needs of animals are met. When welfare is good, suffering is absent [10].

Best practice in pest animal management

From an animal welfare perspective, it is highly desirable that pest animal control programs are efficient, effective and sustained so that pest populations are reduced to low levels and not allowed to recover, thereby avoiding the need for repeated large-scale killing. Over the last decade, the approach to managing pest animals has changed [3]. Rather than focussing on inputs, it is now realised that like most other aspects of agriculture or nature conservation, pest management needs to be carefully planned and coordinated with the aim of reducing to an acceptable level the damage due to pest animals i.e., the focus is on measurable economic and environmental outcomes. Pest animal control is just one aspect of an integrated approach to the management of production and natural resource systems and management of other factors may also be required to achieve the desired result. For example, for a lamb producer with limited resources, other factors influencing lamb production may include weed control, cover for lambs, ewe nutrition or rams that give a higher twinning rate. Unless pest animal control actions are well planned, collaborative and coordinated at the right temporal and spatial scales, individual control programs are unlikely to have long term benefits. When planning pest animal management, there are some important steps that should be considered (Braysher and Saunders, 2015 [11]):

1. Identify the trigger to undertake pest animal management. Is there a community or political pressure for action on pests and an expectation that pest animals should be controlled? Pest control is unlikely to be effective unless there is strong local or political will to take action and commit the necessary resources.
2. Identify the key group to take responsibility for bringing together those individuals and groups that have a key interest in dealing with the pest issue.
3. Identify the problem. In the past the pest was usually seen as the only problem. We now know that the situation is more complex. First, determine what the problem is. For example, it may be effects on native fauna, reduced levels of agricultural production, and complaints from neighbours or emotional stress from worrying about pest impacts. Several factors impact on each of these problems and control of pests are often only part of the solution.

4. Identify and describe the area of concern. Sometimes it helps to remove agency and property boundaries (nil tenure) so that the problem can be viewed without the tendency to point blame at individuals, groups or agencies. Property and agency boundaries can be added later once agreement is reached on the best approach.
5. Try to break the area into smaller management units for planning. These smaller units may be determined by water bodies, mountain ranges, fences, vegetation that is unsuitable for a particular pest or other suitable boundaries that managers can work to. While it is best to work to boundaries that restrict the movement of pests, this may not be practicable and jurisdictional boundaries, for example, the border of a Landcare group, may have to be used in combination with physical boundaries. Once the management units are identified:
    a. Identify as best you can, the pest animal distribution and abundance in each management unit.
    b. Estimate as far as is practicable, the damage caused by the pest or pests to production and to conservation.
    c. Gather and assess other relevant planning documents such as recovery plans for threatened species and property management plans. Identify any key constraints that may prevent the plan being put into operation and identify all the key stakeholders.
    d. Develop the most appropriate pest management plans for each of the management units.

Implementing effective and humane pest animal control programs requires a basic understanding of the ecology and biology of the targeted pest, other species that may be affected directly (non-targets) or indirectly (e.g., prey species) by a control program. Managers should take the time to make themselves aware of such information by reading the recommended texts included in this document.

The NSW *Biosecurity Act 2015* and pest animal management

From 1 July 2018, the management of pest animals in NSW needs to account for the requirements and obligations under the NSW *Biosecurity Act 2015*. Everyone in NSW who deals with pest animals, including land managers (public and private), recreational land users, other community members and even visitors to the state must manage those pest animals where they present a risk to biosecurity in NSW.

There are some specific requirements relating to some pest species outlined under the Biosecurity Regulation 2017. For example, under the Biosecurity Regulation, it is illegal for a person to keep, move or release a feral pig, wild rabbit, feral deer or European red fox.

A number of documents are available to help land managers and other community members to understand which pest animals they must manage and how they can be managed. Central to these are the Regional Strategic Pest Animal Management Plans that set out the requirements for managing the impacts of pest animals.

Specific members of the Local Land Services' team can investigate if they suspect a person or organisation is not managing pests properly and are able to provide educational material outlining the biosecurity risks presented by the pest animals, and management actions that must be taken to manage the risk posed. If appropriate management action is not taken to

manage the pest animals, trained and authorised staff from Local Land Services can undertake enforcement action.

Animal welfare and humaneness

Pest animals continue to cause significant damage and risks to the environment, agricultural production and to public health. Each year hundreds of thousands of pest animals are trapped, poisoned, shot or otherwise destroyed because of the harm they cause [12]. For most people in today's society the management of pest animals is considered acceptable provided that such management is *humane* and *justified* [13]. However, some deficiencies need to be addressed, inhumane techniques replaced and new, more humane, alternatives developed. For further detail refer to RSPCA Policy E02 *Management of wild animals*.

The humaneness of an individual pest control technique is highly dependent on the way the technique is applied and on the skill of the operator involved. Attention to details such as timing and coordination of control, bait delivery, lethal dose rates, type or calibre of firearm and ammunition have significant effects on animal welfare and target outcomes of control programs. By standardising the way control methods are applied, many of the negative welfare impacts can be reduced or even prevented. This document (COP and SOPs) has been specifically developed to address this issue.

It also contains a summary of the results of humaneness assessments for all individual techniques included as SOPs. The full assessments can be found on the PestSmart website (https://www.pestsmart.org.au/). These assessments were carried out using a model developed by Sharp and Saunders (2008, 2011)[14,15]. The model provides a practical, general means of assessment that can be applied to any control technique. The goal of humaneness assessment is to evaluate the impact of a control technique on individual animals and to use this assessment to determine which methods are more or less humane compared to others.

Assessment of humaneness using the Sharp and Saunders model is based on the five domain approach to welfare assessment as developed by Mellor and Reid (1994)[16]. According to this approach, potential or actual welfare compromise is identified in four physical or functional domains and one mental domain:

1: Nutrition – water or food deprivation, malnutrition.

2: Environmental – exposure to excessive heat or cold.

3: Health – disease or physical injury.

4: Behaviour – spatial or interactive restriction.

5: Mental or Affective State – includes impacts from the first four domains (e.g., thirst hunger, anxiety, fear, nausea, pain, boredom, depression, frustration, loneliness, distress) and any other cognitive awareness of external challenges leading to negative affective states.

When considering the humaneness or welfare impact of a control method, impacts are assessed in relation to nutrition, the animal's environment, its health or functional status, its behavioural needs and its overall mental status. As described by Sharp and Saunders (2008, 2011)[14, 15] and Beausoleil and Mellor (2015)[17] when data is available, actual impacts in each of the four domains are evaluated using a range of quantitatively assessed changes in behaviour and physiology along with pathophysiological indicators of functional disruption.

Compromise in one or all of the physical domains is then used to infer potential negative affective impacts in the fifth domain. As welfare is generally considered to be a state within an animal that most directly relates to what the animal experiences, the overall impact of a control method on the animal's welfare generally reflects impacts in Domain 5. When the model is applied to a range of different methods, these can be compared, thus allowing an informed decision on control method choice based on relative humaneness.

Humaneness assessment using the Sharp and Saunders model follows a two-part process: Part A examines the impact of a control method on overall welfare and the duration of this impact; and Part B examines the effects of the killing method on welfare (so is only applied to lethal methods). For example, with live trapping followed by shooting, both Part A and Part B are applied, but with fertility control only Part A is applied.

In Part A, overall welfare impact is assessed by looking at the impacts in each of the five domains as described above. In Part B, the killing method is assessed by examining the level of suffering and the duration of suffering based on the time to insensibility based on the criteria described by Broom (1999)[9]. Matrices are then used to determine the score for each part and then the two scores are combined to obtain the overall humaneness score.

Feral pig management

Background

Feral pigs (*Sus scrofa*) are estimated to inhabit 45% of Australia (as at 2008), occurring in all states and territories, but most abundantly in New South Wales and Queensland. Population size estimates vary between 3.0 million and 4.4 million, but their distribution and abundance can vary markedly from year to year according to environmental conditions [18]. They can increase their population size at a rate of 86% per year in good seasons but can also reduce by 50% in periods of drought. Feral pigs are habitat generalists, their prime requirements being an adequate supply of water, food and cover. The reproductive potential of feral pigs is more similar to that of rabbits than to that of other large mammals in Australia. Fecundity increases with age and body weight but can be strongly affected by seasonal conditions. Under favourable conditions, breeding can occur throughout the year and sows can produce two weaned litters every twelve to fifteen months, with an average of six piglets per litter. This gives feral pigs the capacity to recover quickly from the effects of management programs or other setbacks such as droughts.

Feral pigs are responsible for several types of agricultural damage. They prey on newborn lambs, eat and destroy grain crops, damage fences and water sources, reduce yields of sugarcane and some tropical fruit crops, and compete with stock for feed by eating or damaging pasture. There are no reliable estimates of the cost of feral pig damage to agricultural production, although it is likely significant but highly variable dependent on seasonal conditions. The most important environmental impacts are likely to be habitat modification through selective feeding, trampling damage and rooting for underground parts of plants and invertebrates, as well as predation on, competition with, or disturbance of, a range of native animals. They also spread weeds and can act as hosts or vectors of several endemic and exotic diseases and parasites that can affect other animals, including domestic livestock and humans. Their preference for wetlands and riparian ecosystems also leads to decreased water quality.

For further information please see:

- Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs: http://www.environment.gov.au/biodiversity/threatened/threat-abatement-plans/approved
- PestSmart: https://pestsmart.org.au/toolkits/feral-pigs/

Primary and supplementary control techniques

Pest control programs must be cost-effective. The techniques used within a control program need to be complimentary to each other and lead to a maximum impact reduction, which often requires reducing pest animal densities to low levels over a large scale and maintaining this level of population suppression indefinitely. This leads to a situation where the need for ongoing control is minimised and rates of re-invasion reduced. Follow-up control programs, where the initial reduction is maximised, are also much cheaper to implement as the target population is relatively small. Control techniques can be seen as primary or supplementary based on the following general principles.

Primary techniques are those that can achieve rapid pest population knockdown over large areas in a cost-effective way. Supplementary techniques are generally only effective in helping to maintain pest population suppression once densities have already been reduced to low levels. For example, in the management of feral pigs, ground baiting is a primary method of control and supplementary techniques are used as a follow-up, e.g., ground shooting. Regional variations can also occur within species. For example, aerial shooting of feral pigs would be considered a primary technique in the western division where visibility is good whereas in the more timbered east, primary control would consist of baiting and trapping. For effective control, regionally appropriate selection of at least one primary control technique and one supplementary control technique should be utilised to help satisfy general biosecurity duty requirements.

Spatial scale is also important. To achieve cost efficiencies and depending on the movement behaviour of the target pest, the area under control may need to be a collaboration of many adjoining land managers. This is particularly the case for highly mobile pest animals such as feral pigs.

Poorly executed control programs can simply become sustained culling operations that do little to achieve long-term successful outcomes. This in turn can lead to sporadic implementation of crisis management programs where pest numbers have become unacceptable, but the outcome usually becomes sub-optimal. A rotation of primary and supplementary techniques can also be important. Pest animals can become familiar to a particular technique (e.g., bait aversion) that may require switching to another lethal method (e.g., aerial shooting). Another factor to consider is timing of control operations. Time of the year can mean targeting a biological weakness in the pest animal (e.g., a period of food and water stress) when bait uptake might be maximised. Alternatively, application of control can align with the need for the commodity to be protected when it is most vulnerable e.g., when lambs are being born.

Feral pig management methods

Integrated management using a range of control techniques produces the best results, but a lack of reliable information on 'on-farm' control costs is seen as a barrier to adoption of some techniques. In the case of feral pigs there is also the complication that they can be viewed by some as a major pest of the environment and agriculture, and by others as a resource and source of income. Control strategies need to address both these viewpoints. The most commonly used feral pig control techniques are lethal baiting, shooting, trapping and exclusion fencing. There are currently no biological or fertility control agents available for use against feral pigs. Cost-effectiveness, humaneness and efficacy for each control technique need to be evaluated in every program. A brief evaluation of the humaneness of control techniques follows:

Humaneness of control techniques

Lethal baiting

Lethal baiting is considered to be a cost-effective method of feral pig control in extensive rangeland areas; however not all poisons are equally humane. Depending on the poison used, target animals can experience pain and suffering, sometimes for an extended period, before death. Baiting should be avoided during the farrowing period where possible. Non-target animals including native species, such as quolls, working dogs and livestock can also be exposed to poisons either directly by eating baits intended for pest animals (primary poisoning) or through the scavenging of tissues from a poisoned animal (secondary poisoning). Sodium monofluoroacetate (1080) is currently used for feral pig control in Australia. Yellow phosphorus (CSSP) and warfarin have previously been used but are considered to be inhumane and are no longer registered for use in NSW. Sodium nitrite has recently been evaluated and is now registered as HOGGONE bait for feral pig control.

1080

In feral pigs, initial signs of poisoning from 1080 will appear after a latent period of around 1 to 2 hours, and is typified by salivation, jaw chomping, vomiting, increased lethargy, and laboured respiration often with white froth around the mouth and nostrils. Some pigs exhibit signs of central nervous system disturbance including hyperexcitability, squealing, manic running, paralysis or convulsions, followed by coma and then death. Other animals may lie quietly, breathing slowly and laboriously until death. Time to death is variable depending upon the amount of 1080 absorbed but is usually around 4 to 6 hours after ingestion under field conditions.

There is presumed to be minimal pain or distress during the latent period; however, nausea and discomfort are likely before and during vomiting and retching. In the later stages, when severe CNS dysfunction has developed, it is unknown if animals are perceiving pain. If animals are conscious during the convulsive episodes or if they become conscious afterwards it is possible that they may experience pain and anxiety. There is also potential for injuries to occur after the appearance of clinical signs.

Relatively large amounts of 1080 must be used in baits to kill feral pigs, creating a potentially serious risk of primary poisoning in non-target species. Individual baits are of considerable concern as they contain a high concentration of 1080 (72 mg per bait), which is more than 10

times the concentration used for wild dog baits (6mg). There is also potential for greater variability in the dose received when 1080 is delivered in grain or pellets, as opposed to the larger PIGOUT bait which contains a waxed pellet of 1080 to deliver a specific dose.

Sodium nitrite (HOGGONE)

Sodium nitrite, a common human food preservative, is fast-acting, highly toxic to pigs, and is far more humane than existing baiting systems [19, 20]. The mode of action is similar to carbon monoxide poisoning, with sodium nitrite intoxication leading to a state of unconsciousness before death. HOGGONE baits containing sodium nitrite are less hazardous for operators, do not cause secondary poisoning through muscle tissue, and livestock and native species are not usually attracted to HOGGONE baits.

Sodium nitrite works very quickly in the pig, resulting in unconsciousness and death within about two hours. This is a much shorter timeframe than other toxins currently or previously used for feral pig control in Australia such as warfarin (1–2 weeks), phosphorus (yellow phosphorus or CSSP; 2–4 days) and sodium monofluoroacetate (1080; 4-6 hours). Sodium nitrite does not cause severe clinical symptoms, and animals appear to show signs of distress for only a short period (5 to 10 minutes) prior to reduced consciousness. Signs of sodium nitrite poisoning progress rapidly in pigs and are limited to progressive lethargy, in-coordination, limited vomiting in some animals, increased respiratory rate, severe dyspnoea when close to death, limited terminal seizure events, and coma.

Shooting

Ground shooting

Shooting can be a humane control method when: it is carried out by competent, accurate and responsible shooters; the correct combination of firearm and ammunition and optimum shot placement are used; the target animal can be clearly seen and is within range; and all wounded animals are promptly located and euthanased humanely. Head shots are the preferred shot placement when prevailing conditions are appropriate, e.g., stillness of target.

Dependent young will experience significant negative welfare impacts if they are not euthanased humanely after their mother is shot. Shooting can also have negative effects on surviving animals in social groups.

Trained dogs are sometimes used to detect or flush out pigs prior to shooting. When undertaking pest control using ground shooting it is unacceptable to set a dog onto a feral pig with the intention of bringing down, holding or attacking.

Aerial shooting

All aerial shooting programs in NSW managed by Government agencies must adhere to the instructions and requirements of the NSW Feral Animal Aerial Shooting Team (FAAST) Manual [21]. Private or commercial operators in NSW that are not conducting shooting as part of a FAAST program must still adhere to all relevant regulatory and legislative requirements.

Aerial shooting of feral pigs from a helicopter can be a humane control method when: it is carried out by highly skilled and experienced shooters and pilots; the correct firearm, ammunition and shot placement is used; and wounded animals are promptly located and euthanased.

With shooting, initial shots to the chest do not render the animal instantaneously insensible and time to death is slower whereas a well-placed initial shot to the head to destroy the brain will result in instantaneous insensibility and a quicker death. However, with aerial shooting, chest shots are generally preferred for smaller species since the heart and lungs are the largest vital area and accurate shots to the head to destroy the brain can be difficult to achieve. This is particularly the case for species that move quickly and erratically. Head shots should only be attempted when conditions are ideal to avoid wounding. Shooting at other parts of the body (outside of head (brain) and chest (heart-lung) target zones) is unacceptable.

Compared with ground shooting, aerial shooting allows the delivery of multiple shots in quick succession to ensure a rapid death. There is also much better opportunity for rapid follow-up shots for any injured animals. There must be a minimum of two shots per animal – one of which must be a chest shot.

Use of Judas pigs

A captured 'Judas' pig is fitted with a tracking collar and released so that it can locate and join feral pig groups. This method is useful to find difficult to locate groups, animals in low-density populations, or survivors of other control methods that have become wary. Capture, handling and restraint of pigs for use as Judas animals can cause anxiety and sometimes pain or injury if they struggle to escape. Repeatedly being isolated and having to find other pigs may cause fear and anxiety. Tracking and the nearby shooting of cohorts may also be a source of distress.

The lightest collar/transmitter available should always be used (<5% of the body weight of the animal). The collar must be properly fitted for the comfort and safety of the animal. It should fit snugly enough to prevent it from coming off or chafing the neck, but it must also be sufficiently loose as to be comfortable and not interfere with swallowing or panting. The fitting of a collar to a feral pig is not recommended without the use of sedatives. This makes the technique generally unsuitable for routine management and it is best restricted to use as a research technique. A SOP for this technique is therefore not included in this document.

Trapping

Fixed panel or mesh traps must be inspected at least once daily and should be set up to provide shade and shelter. Pigs have poor thermoregulation and can suffer greatly when exposed to extremes of heat and cold. In hotter areas, setting the trap in the evening and checking early in the morning will prevent some of the suffering associated with thirst and heat-stress. Duration in the trap should usually be less than 12 hours and maximum time held is 24 hours. The trap should be constructed in a way so as not to cause injury from loose wire, sharp edges or malfunctioning gates. Also, a smaller mesh size should be used to prevent injuries to the pigs' snouts if they charge at the trap when attempting to escape.

Remotely activated 'drop-down' traps, where the entire trap is dropped over pigs after they have been detected by cameras and motion detectors, must not be used as they can crush or strike pigs causing serious injuries. Pigs injured by 'drop-down' traps will experience considerable suffering as they can't be quickly and humanely euthanased since they will be some distance away from the remote operator.

Pigs trapped in fixed panel or mesh traps must be destroyed by shooting as quickly and humanely as possible. Never shoot pigs from a distance through the trap panels. Always shoot pigs either over the top of the trap or with the muzzle of the rifle through the mesh of the trap panel. Keep the trap environment as calm as possible by parking vehicles away from the site and with voices low.

Young piglets could get trampled underfoot especially when the adult animals are stressed (e.g., in the presence of humans). Very small piglets (<5kg) can be shot or alternatively caught by hand and humanely killed with a concussive blow to the head after the larger pigs have been shot. If lactating sows are caught in a trap without their young, efforts should be made to find dependent piglets and kill them quickly and humanely.

Although pig traps are designed for the capture of feral pigs, there is still a risk of capturing other species. Use of a pig-specific gate trip mechanism minimises the risk of catching some species e.g., wallabies, whilst the placement of a steel post across a funnel trap entrance at a height of 1 metre above the ground will prevent cattle from entering.

Non-target animals that are caught but not injured should be released at the trap site. If they are injured, but may respond to veterinary treatment, such treatment should be sought. Severely injured non-target animals must be euthanased quickly and humanely using and appropriate method (see *GEN001 Methods of Euthanasia*).

Exclusion fencing

Despite being expensive to establish, pig-proof exclosures can provide long term environmental and production benefits to properties e.g., protecting lambing paddocks or threatened ecosystems.

Exclusion fencing over large areas is an option for landholders to reduce and share fencing costs by enclosing an entire group of neighbouring properties within the one perimeter fence. However, fences need to be designed appropriately for the animals that are being excluded, as well as those being enclosed, to maximise efficacy and reduce animal welfare impacts. There is also the caveat that exclusion fencing is only effective where the fencing itself is regularly inspected and repaired where required. Otherwise, they will be breached.

Although fencing can act as a barrier to pigs it can also have negative effects on non-target species (such as kangaroos and emus) that are excluded from or contained within a fenced area. Fences will prevent access to familiar sources of food, water and shelter and potentially disrupt social groups and alter natural dispersion. Entanglement in fences can also cause significant injuries and death (or electrocution with electric fences) and they can prevent the movement of animals to safer areas during bushfires or flooding.

A number of actions can be taken to prevent the impacts of fencing on non-target animals. Fences can be designed to allow movement of some species by incorporating species-specific access points (e.g., wombat gates) or to minimise entanglement (e.g., by using highly visible top wires). Fences should also be checked frequently, especially in the immediate period after construction, to allow prompt removal or euthanasia of entangled animals. If non-target animals are enclosed and their abundance needs to be reduced, they must be culled using an acceptable and humane technique (i.e., shooting). In addition, if animals congregate around a new fence and are exhibiting signs of distress (e.g., pacing, not eating or drinking) it may be necessary to euthanase them using a humane method.

Refer to the following RSPCA website for further perspectives on the humaneness of exclusion fencing:

https://kb.rspca.org.au/knowledge-base/what-are-the-risks-to-wildlife-associated-with-barrier-and-cluster-fencing/

For further information on pest exclusion fence design, please refer to sites such as:

https://www.wool.com/globalassets/wool/sheep/pest-animals/wild-dog-exclusion-fencing--australian-wool-innovation/kondinin-group-research-report---exclusion-fencing.pdf

Similar pest fence designs are also available from the websites of commercial fencing manufacturers.

Risk assessment – bait application

An authorised control officer (ACO) must conduct a risk assessment to determine if it is appropriate to *supply* certain toxic baits (i.e., 1080 baits) to any person. When issuing other vertebrate pesticides as baits, ACOs must consider if a risk assessment is relevant or required e.g., where there is zero risk which requires no further controls.

Refer to the relevant Pesticide Control Order (PCO) https://www.epa.nsw.gov.au/your-environment/pesticides/pesticides-nsw-overview/pesticide-control-orders and the NSW DPI Vertebrate Pesticide Manual https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/publications/nsw-vertebrate-pesticide-manual for further details on performing risk assessments.

Users of baits must always refer to any risk assessment and to a specific permit, approved label and Pesticide Control Order (PCO) for up-to-date information on conditions of use including distance restrictions, public notification and bait preparation, distribution, storage, transportation and disposal.

Table 1: Humaneness, Efficacy, Cost-effectiveness and Target Specificity of Feral Pig Control Methods

Control technique	Acceptability regarding humaneness* and Relative humaneness score (Part A [1-8], Part B [A-H]**)	Efficacy regarding population reduction	Cost-effectiveness	Target Specificity	Comments
Ground baiting with 1080 *Primary*	Acceptable Score: 1E-1F	Effective	Cost-effective	Relatively large amounts of 1080 are required to kill pigs; therefore there is a significant potential risk of poisoning non-target animals. Strategic ground baiting uses fewer baits than aerial baiting programs. Uneaten baits can be collected and destroyed.	Currently the most cost-effective technique available. 1080 ingestion can also kill non-target animals including native species, cats, dogs and livestock. 1080 is toxic to humans; operators need to take precautions to safeguard against exposure.
Aerial baiting with 1080 *Primary*	Acceptable Score: 1E-1F	Effective	Cost-effective	Relatively large amounts of 1080 are required to kill pigs; therefore there is a significant potential risk of poisoning non-target animals. Uneaten baits cannot be collected.	Effective for broad scale control in remote areas. 1080 ingestion can also kill non-target animals including native species, cats, dogs and livestock. 1080 is toxic to humans; operators need to take precautions to safeguard against exposure.
Sodium nitrite baiting *Primary*	Acceptable Score: N/A	Effective	Cost-effective	Low risk of primary poisoning in non-target animals as other species are less sensitive to sodium nitrite poisoning.	Feral pigs are particularly susceptible to sodium nitrite. It is more effective than 1080, is fast-acting and there are less restrictions on its use.
Aerial Shooting *Open country: Primary* *Closed country: Supplementary*	Acceptable Score: 4B (chest)	Effective	Relatively expensive. More cost-effective when pig density is high	Target specific	Provides high level medium- to long-term control of feral pig populations.

Control technique	Acceptability regarding humaneness* and Relative humaneness score (Part A [1-8], Part B [A-H]**)	Efficacy regarding population reduction	Cost-effectiveness	Target Specificity	Comments
Ground shooting *Supplementary*	Acceptable Score: 2A (head), 2D (chest)	Not effective	Not cost-effective	Target specific	Labour intensive, only suitable for smaller scale operations.
Trapping with fixed mesh/panel traps *Supplementary*	Acceptable Score: 4A	Can be in certain situations	Can be in certain situations	May catch non-target animals	Important control technique in areas where baiting or aerial shooting is not possible. Not practical for large scale control.
Trapping with drop-down traps	Not acceptable	Unknown	Expensive	May catch non-target animals if not seen before activating trap remotely	Other trap designs are available that are more humane, effective, simple to use and much cheaper
Use of Judas pigs *Supplementary*	Acceptable Score: N/A	Effective	Relatively cost-effective compared with searching for pigs from helicopters or on foot	Target specific	Can be a useful adjunct to other control methods. Effective if local eradication is the aim. Requires expensive equipment and skilled operators
Exclusion fencing *Supplementary*	Acceptable Score: N/A	Limited	Expensive	Can be in certain situations	Fencing can be effective for small, critical (economically or environmentally) areas, though the maintenance costs are high.

Footnotes Table 1

* Acceptable methods are those that are relatively humane when used correctly in accordance with the applicable Standard Operating Procedure. Conditionally acceptable methods are those that, by the nature of the technique, may not be consistently humane. There may be a period of poor welfare before death.

Methods that are not acceptable are considered to be inhumane – the welfare of the animal is very poor before death, often for a prolonged period.

** From assessments conducted using a model to assess the relative humaneness of pest animal control methods (Sharp and Saunders 2011)[15]. Humaneness score (AB) consists of Part A - welfare impact prior to death, scale of 1 – 8, less suffering to more suffering and Part B - mode of death, scale of A – H, less suffering to more suffering. For assessment worksheets and matrix of relative humaneness scores see: https://pestsmart.org.au/toolkit-resource/feral-pig-control-methods-humaneness-matrix/.

N/A = Humaneness score not available.

Control techniques are classified as primary (maximum effect), supplementary (follow-up) or 'not available'. In some situations, techniques can alternate between primary and supplementary.

Relevant legislation

All those involved in pest animal control should familiarise themselves with relevant aspects of the appropriate federal and state legislation. The table below lists relevant legislation. This list is by no means exhaustive and was current at the time of writing.

Commonwealth	*Agricultural and Veterinary Chemicals Code Act 1994* *Environment Protection and Biodiversity Conservation Act 1999*
New South Wales	*Biodiversity Conservation Act 2016* *Biosecurity Act 2015* *Game and Feral Animal Control Act 2002* *Local Government Act 1993* *Local Land Services Act 2013* *National Parks and Wildlife Act 1974* *Pesticides Act 1999* *Prevention of Cruelty to Animals Act 1979*
Other relevant legislation	*Civil Aviation Act 1988* *Civil Aviation (Carriers' Liability) Act 1967* *Dangerous Goods (Road and Rail Transport) Act 2008* *Firearms Act 1996* *Work Health and Safety Act 2011*

Note: copies of the above legislation and relevant regulations may be obtained from federal and state publishing services.

Further information

Local Land Services	https://www.lls.nsw.gov.au/biosecurity/pestplan
NSW National Parks and Wildlife Service	https://www.environment.nsw.gov.au/topics/animals-and-plants/pest-animals-and-weeds/pest-animals
NSW Department of Primary Industries	https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests
NSW Environment Protection Authority	https://www.epa.nsw.gov.au/your-environment/pesticides/pesticides-nsw-overview/pesticide-control-orders
PestSmart Connect	https://www.pestsmart.org.au/

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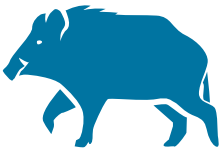
Standard Operating Procedures

- Trapping of feral pigs (NSWPIG SOP1)
- Aerial shooting of feral pigs (NSWPIG SOP2)
- Ground shooting of feral pigs (NSWPIG SOP3)
- Poisoning of feral pigs with sodium monofluoroacetate (1080) (NSWPIG SOP4)
- Poisoning of feral pigs using PIGOUT 1080 baits (NSWPIG SOP5)
- Poisoning of feral pigs with HOGGONE® sodium nitrite baits (NSWPIG SOP6)



NSWPIG SOP1
Trapping of feral pigs

Background

The use of fixed large panel or mesh traps for the live capture and destruction of feral pigs (*Sus scrofa*) is common throughout NSW.

Prior to trapping, free feeding of bait is offered at sites where pigs are active. After selecting a suitable site, a trap is then erected and free feeding is continued for a number of days before the trap is set. After pigs have been caught they are shot whilst still inside the trap. Good trapping techniques may enable whole groups of pigs to be caught at one time with minimal impact on non-target animals.

This standard operating procedure (SOP) is a guide only; it does not replace or override the relevant legislation that applies in NSW. The SOP should only be used subject to the applicable legal requirements (including WHS) operating in the relevant jurisdiction.

Individual SOPs should be read in conjunction with the overarching Code of Practice for that species to help ensure that the most appropriate control techniques are selected and that they are deployed in a strategic way, usually in combination with other control techniques, to achieve rapid and sustained reduction of pest animal populations and impacts.

Application

- Trapping should only be used in a strategic manner as part of a co-ordinated program designed to achieve sustained effective control.
- Trapping is effective for reducing numbers of feral pigs in areas where 1080 poisoning cannot safely be used or when pig populations are relatively low. It is often used as a follow-up control method after initial reduction of high density pig populations.
- It is successful as a control technique when food resources are limited.
- Maintenance of traps is time consuming. Therefore, it is only suitable to use traps in situations where the operator has time to check them on a daily basis.
- Shooting of pigs should only be performed by skilled operators who have the necessary experience with firearms and who hold the appropriate licences and accreditation. Storage and transportation of firearms and ammunition must comply with relevant legislation requirements.

Animal welfare implications

Target animals

- Traps should be set up at sites where vegetation can provide shade and shelter. Pigs have poor thermoregulation and can suffer greatly when exposed to extremes of heat and cold.
- Free feeding is essential for effective trapping as it increases the proportion of feral pigs in the area encountering and learning to enter the trap. Free feeding also trains additional pigs to enter the trap after the first few pigs have been caught and the trap door is activated.
- Free feeding also helps identify suitable trap sites and allows early identification of non-target interference.
- To minimise the possibility of dehydration and heat or cold stress, all traps must be inspected daily.
- Trapping must not be conducted during extremes of weather; however, shade cloth or hessian can be used to provide some protection if the weather changes unexpectedly.
- The trap should be constructed in a way so as not to cause injury from loose wire, sharp edges or malfunctioning gates.
- Captured animals must be approached carefully and quietly to reduce panic, further stress and risk of injury.
- Trapped pigs must be destroyed by shooting as quickly and humanely as possible.
- If lactating sows are caught in a trap without their young, efforts should be made to find dependent piglets and kill them quickly and humanely.

Non-target animals

- Traps are designed for the capture of feral pigs and so pose only a small risk of capturing other species. Use of a pig-specific gate trip mechanism minimises the risk of catching some species e.g., wallabies. Placement of a steel post across a funnel trap entrance at a height of 1 metre above the ground will prevent cattle from entering.
- Live non-target animals caught in traps must be examined for injuries and signs of illness or distress and dealt with as follows:
    - Animals which are unharmed or have only received minimal injuries such as minor cuts or abrasions should be immediately released at the site of capture.
    - Animals which have more severe injuries or which are suffering from thermal stress should receive appropriate attention. An animal suffering from thermal stress can initially be placed in a suitable quiet holding area which provides warmth or shade to allow recovery before release. Animals with treatable injuries that cannot be immediately released or those failing to recover from thermal stress should be presented to a veterinarian or a registered wildlife carer for treatment.
    - Animals that have injuries which are untreatable or which would compromise their survival in the wild should be euthanased using a technique that is suitable for the

species. For more information on euthanasia techniques refer to *GEN001 Methods of Euthanasia*.

- If a trap continually catches non-target animals, an alternative bait attractant could be considered or the trap could be moved to another site where it will have minimal effect on other species.

Workplace health and safety considerations

- During construction of traps, operators should be wary of the risks of injury from lifting heavy items. Leather gloves and eye protection will help prevent injuries from wire, steel panels and hammers.
- Firearms are potentially hazardous. Everyone should stand well behind the shooter when pigs are being shot. The line of fire must be chosen to prevent accidents or injury from stray bullets or ricochets.
- Care must be taken when handling pig carcasses as they may carry diseases such as leptospirosis, Q fever, brucellosis, sparganosis, melioidosis and tuberculosis that can affect humans and other animals. Routinely wash hands after handling all carcasses. Carcasses can be heavy (>100kg), so care must be taken when lifting/dragging.
- Never enter a trap with a live captured adult pig. Feral pigs can be aggressive and will attack, especially in situations when they, or their dependent piglets, are distressed or threatened.

Equipment required

Traps

- Several trap designs exist, differing mainly in their gate construction. These include the silo trap, the drop-gate trap, the panel trap and the box trap. All are basically an enclosed area with a one-way gate.
- It is best to use steel mesh with a small grid size e.g., 50mm x 75mm or 50mm x 100mm. A grid larger than this will damage the pigs' snouts if they charge the mesh.
- The minimum height needs to be 1.5 metres.
- Entrance to the trap can be a funnel entrance, a tripped gate or a pig specific trigger.
- Choice of trap design will depend upon habitat, material available and accessibility to site.
- Details of trap specifications and construction can be obtained from relevant pest control manuals and guidelines, for example:
  - PestSmart: https://pestsmart.org.au/resources/

Bait

- Bait preferences can vary from area to area. Current diet will sometimes determine how readily the pigs will accept an alternative food.

- Pigs will be more attracted to bait with a strong odour.
- Bait can include grain (e.g., wheat, oats, barley or sorghum) or commercial pellets. Grain can be soaked in water (fermented) with molasses added as an attractant). Vegetables and fruit can also be used.
- It is illegal in NSW to use mammal product e.g., meat portions or carcases, as free feed or as bait in traps due to the risk of transmitting disease. However, a permit can be obtained from the NSW Chief Veterinary Officer (CVO) for the purposes of baiting. Under these circumstances the CVO would need to be satisfied that the mammal product being used does not constitute a disease risk. Please refer to the Biosecurity Regulation 2017 under the NSW *Biosecurity Act 2015*.
- Large amounts of bait will be required; around 10-20 kg each time the trap is set.

Firearms and ammunition

- Smaller calibre rifles such as .22 magnum rimfire with hollow/soft point ammunition are adequate for euthanasia of pigs at short range (within 5 metres).
- 12 gauge shotguns may also be used with shot sizes of SG or SSG for large pigs over 40kg, and BB or AAA cartridges for small pigs less than 40 kg.

Procedures

Selection of trap sites

- Free feeding should be undertaken at sites where pigs are active, for example, near watering points, holes in fences, wallow areas or sites of recent damage to crops. This helps to retain pigs in the area and will give an indication of the most suitable trap site. Leave 5 to 10 kgs of grain or pellets at each selected site. If necessary a short (5-10m) trail of bait can be used to lure pigs to a chosen trap site.
- Cease any activity in the area that will disturb normal feeding behaviour e.g., shooting or use of dogs.
- If possible, choose a site that is in a shady area with as much natural vegetation as possible.

Placing the trap

- Build the trap at a site where bait is being regularly taken.
- Place fresh bait both inside and outside the trap to keep pigs feeding for 1 to 2 days.
- Once the pigs have become accustomed to the trap and are still regularly feeding, only place bait inside the trap. Keep feeding until all pigs within a group are going into the trap to feed before it is actually set. This may take 1 to 2 weeks.

Setting the trap

- Once bait is being taken inside the trap, set each evening and check the following day, preferably in the morning.

- Continue to set the trap each evening until no more pigs are caught. A change of bait may be tried to entice more pigs, with free-feeding again for 1 to 2 nights before activating the trap.
- Traps can be left at permanent sites and reactivated when fresh pig activity is detected or they can be moved to new sites depending on requirements.
- Some baits, e.g., grain, may attract birds. Where this happens, lightly cover the bait with vegetation. Night baiting may also reduce bird take. Additionally, grain that has been dyed green may help to deter consumption by birds.

Shooting of pigs

- Caught pigs should be destroyed by shooting inside the trap.
- Shooting must be conducted to cause sudden and painless death with minimum distress to the animal. Only head shots are acceptable.
- The shooter should approach the animals in a calm and quiet manner. To prevent unnecessary agitation of the trapped pigs, other people should keep away from the area until shooting is completed. Park vehicles away from the trap site and keep voices low.
- Direct shot through open top of the trap or with the muzzle of the rifle through the mesh of the trap panel. Do not shoot pigs at a distance through the trap panel. To maximise the impact of the shot and to minimise the risk of misdirection the range should be as short as possible.
- Accuracy is important to achieve a humane death. Shots are more likely to be accurate when the animal is not moving and is looking at the shooter.
- A single, accurate shot to the head should ensure instantaneous loss of consciousness and rapid death without resumption of consciousness. However, if an animal does not appear to be killed by the initial shot, then a further shot (or shots) must be taken to ensure death before targeting further animals.
- Shots must be aimed to destroy the major centres at the back of the brain near the spinal cord. This can be achieved by one of the following methods (see also Figure 1).

Frontal position

- This is the ideal site for shooting pigs. The firearm should be aimed at a point midway across the forehead and about 2cm above the level of the eyes. The bullet should be directed in the direction of the tail.

Temporal position

- This shot is useful for older pigs and large boars that can have foreheads consisting of thick bones and a ridge that runs down the centre. The firearm is aimed from the side of the head so that the bullet enters the skull at a point midway between the eye and the base of the ear on the same side of the head. The bullet should be directed horizontally into the skull.

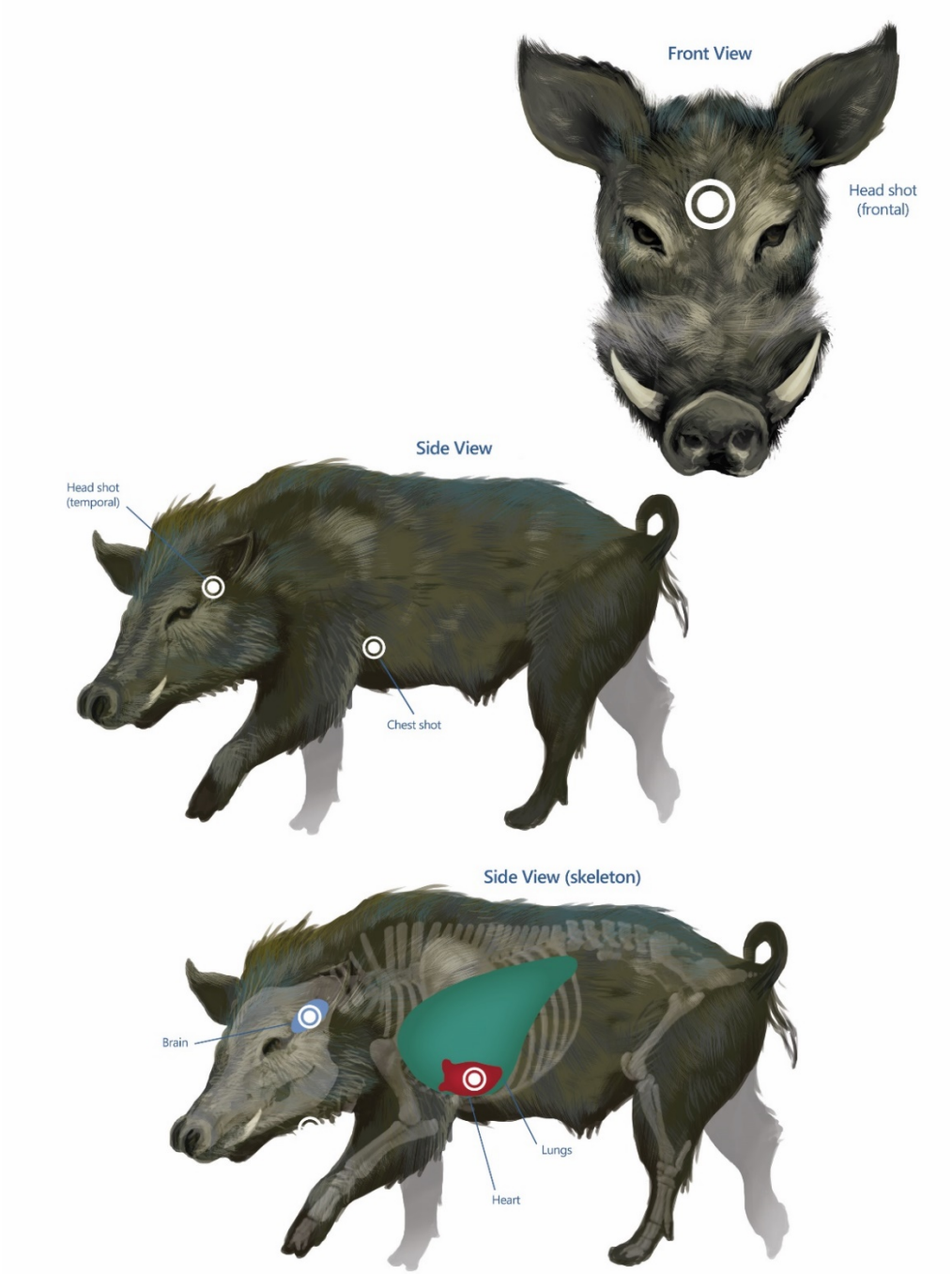
Behind the ear

- This shot is also used for older pigs and large boars that can have foreheads consisting of thick bones and a ridge that runs down the centre. The firearm is aimed at a point behind the ear directed towards the opposite eye.
- Once all animals in the trap have been shot, death should be confirmed in each animal by observing a combination of the following:
  - no heartbeat
  - no breathing
  - no corneal reflex (no blinking when the eyeball is touched)
  - no response to a painful stimulus e.g., a pinch of the ear tip.
- If death cannot be verified, a second shot to the head should be taken immediately.
- If small piglets (<5kg) are caught in the trap, it is preferable to shoot the adult pigs first to avoid the piglets being trampled However, ideally, shooters should shoot those animals that are calm and present themselves for an accurate shot first, regardless of size or age. Very small piglets (<5kg) can also be captured by hand and euthanased with a concussive blow to the head once the larger pigs have been shot.

Disposal of carcasses

Carcasses should be removed from the trap to minimise disease risks associated with using meat to attract other pigs as discussed above. Carcases should be buried some distance away from the trap. For further information about disposal of carcases refer to https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/1299603/animal-carcass-disposal.pdf

Figure 1: shot placement for trapped feral pigs



Head shots (temporal or frontal - as above, or behind the ear -not shown) should be used for shooting feral pigs caught in traps. See text for details.

Note that shooting an animal from above or below the horizontal level as depicted here will influence the direction of the bullet through the body. Adjustment to the point of aim on the external surface of the body may need to be made to ensure that the angled bullet path causes extensive (and therefore fatal) damage to the main organs in the target areas.

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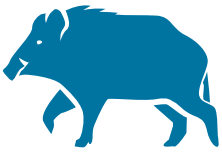


NSWPIG SOP2
Aerial shooting of feral pigs

Background

Aerial shooting of feral pigs from a helicopter is used in extensive or otherwise inaccessible areas. It is an effective and relatively cost-effective method of quickly reducing feral pig populations. Teams involved in shooting from a helicopter require (at minimum) a shooter (seated immediately behind the pilot), an observer/navigator and the pilot. The observer or navigator primarily looks for and reports hazards plus keeps the helicopter within the approved shooting area, identifies target animals for the pilot, and records locations, species and animals killed. The pilot aligns the helicopter for the optimum shot, advises the shooter when to shoot and can also confirm kills and advise on requirements of additional shots for humaneness purposes.

Aerial shooting is a humane method of killing feral pigs when it is carried out by experienced and skilled shooters and pilots; the animal can be clearly seen and is within range; the correct firearm, ammunition and shot placement is used; and wounded animals are promptly located and killed.

This standard operating procedure (SOP) is a guide only; it does not replace or override the relevant NSW or federal legislation. The SOP should only be used subject to the applicable legal requirements (including WHS) operating in the relevant jurisdiction.

Individual SOPs should be read in conjunction with the overarching Code of Practice for that species to help ensure that the most appropriate control techniques are selected and that they are deployed in a strategic way, usually in combination with other control techniques, to achieve rapid and sustained reduction of pest animal populations and impacts.

Application

- All aerial shooting programs conducted by Government Agencies - National Parks and Wildlife Service (NPWS) or Local Lands Services (LLS) - in NSW must be planned and implemented under the NSW Feral Animal Aerial Shooting Team (FAAST) framework and in accordance with the procedures of the NSW FAAST Manual.
- Private or commercial operators in NSW that are not conducting shooting as part of a FAAST program must still adhere to all relevant regulatory and legislative requirements.
- Shooting of feral pigs should only be performed by competent, trained personnel who have been tested and accredited for suitability to the task and marksmanship and who hold the appropriate licences and accreditation (e.g., accredited through the NSW Feral Animal Aerial Shooting Team [FAAST] training course or other approved competency,

e.g., AHCPMG311 – Use firearms for pest control activities from aircraft, AHCPMG304 – Use firearms to humanely destroy animals).

- Aerial shooting should only be used in a strategic manner as part of a coordinated program designed to achieve sustained and effective control. A shooting operations plan must be prepared and approved by the relevant agency for each FAAST aerial shooting program.
- Aerial shooting is a cost-effective method where pig density is high or the area is inaccessible. Costs per pig increases as pig density decreases. Also, pigs learn to avoid helicopters, so successive shoots can become less effective.
- Aerial shooting is best suited to areas where pigs are living and feeding in extensive or inaccessible areas (e.g., swamps, marshes and rough terrain or broadacre crops) where vehicle access is impossible or impractical and/or pre-feeding will not successfully attract enough pigs for trapping or baiting.
- There are two scenarios in which aerial shooting can be used. The first in areas of closed vegetation (e.g., heavily vegetated creek lines, woodlands and dense forest), effectiveness is limited since pigs may be concealed and difficult to locate from the air. In this scenario aerial shooting would be a secondary method. The second scenario is in relatively open country where pigs are highly visible and readily shot. Aerial shooting here would be a primary method of control.
- The optimal period for aerial shooting is when pigs are away from cover e.g., during dry seasons or droughts when pigs are forced to congregate in areas with limited access to water and feed.
- For safety reasons, shooting from a helicopter cannot be undertaken in adverse weather conditions (e.g., strong wind, rain, low cloud, hot days that cause unpredictable thermals).
- Operators (including helicopters, pilots, shooters and navigators/observers) must hold the appropriate licences and permits and be skilled and experienced in aerial shooting operations. Where managed by Government Agencies they must also be approved by FAAST.
- Helicopter operators must have approval from the Civil Aviation Safety Authority to undertake aerial shooting operations.
- Aerial shooting should comply with all relevant federal and state legislation, policy and guidelines.
- Storage use and transportation of firearms and ammunition must comply with relevant legislative requirements.

Animal welfare implications

Target animals

- The humaneness of aerial shooting as a control technique depends on the skill and judgement of both the shooter and the pilot. If properly done, it can be a humane method of killing feral pigs.
- Only chest (heart-lung) or head (brain) shots must be used. Although well-placed head shots result in instant insensibility, a more realistic target point for aerial shooting of feral

pigs is the larger heart-lung zone. The initial shot must be followed up with a further accurate heart-lung shot once the animal has collapsed. This deliberate 'overkill' policy is aimed at ensuring a quick death given the difficulty in confirming death from the air.

- Death from a shot to the chest is due to massive tissue damage and haemorrhage from major blood vessels. Insensibility will occur sometime after the shot, ranging from a few seconds to a minute or more. If a shot stops the heart functioning, the animal will lose consciousness very rapidly. Correctly placed head shots cause brain function to cease, and insensibility will be immediate.
- Shooting must be conducted in a manner that maximises its effect thus causing rapid death. This requires the use of appropriate firearms and ammunition.
- A target animal can only be shot when:
  - it is clearly visible and recognised
  - it is within effective range of shooter and the firearm and ammunition being used
  - a humane kill is probable.
  - if in doubt do NOT shoot.
- The pilot must offer the shooter the best opportunities for a humane kill. This includes maintaining a stable shooting platform and to ensure that the helicopter is always aligned so that the shooter can maintain accuracy and to avoid shots to unacceptable parts of the body e.g., spine or neck shots. Aerial shooting should not be carried out if the nature of the terrain reduces accuracy resulting in too many wounding shots and prevents the humane and prompt despatch of wounded animals.
- If lactating sows are shot, reasonable efforts should be made to find dependent piglets and kill them quickly and humanely. Piglets older than 5 weeks of age will tend to fall in to line behind the sow. Any piglets that escape after a sow has been shot will usually return to the area over the following few hours.
- Aerial shooting programs by their nature must be highly accountable. Apart from maintaining absolute animal welfare standards, records should be kept of number and location of animals killed, hours flown, ammunition used and fly-back procedures.

Non-target animals

- Shooting is relatively target specific and does not usually impact on other species. However, there is always a risk of injuring or killing non-target animals, including livestock, if shots are taken before an animal has been positively identified.
- Sensitive livestock such as horses, farmed deer and free range poultry are easily frightened by gunshots, helicopter rotor noise, wind etc. and may injure themselves by running into fences and other obstacles. Avoid shooting in areas where these livestock occur or organise the removal of them from the area prior to the shooting program.

Workplace health and safety considerations

- The potentially hazardous nature of aerial shooting requires that safety protocols be strictly followed. Each team member must be aware of and trained in all aspects of helicopter and firearm safety.

- The helicopter pilot must perform a thorough pre-flight briefing with all personnel to establish communication protocols between the shooter and the pilot including pre-shot manoeuvre, commands for firing and emergency procedures.
- Shooting from a helicopter can be hazardous, particularly in areas of rugged topography. The combination of low-level flight, close proximity to obstacles (trees, rocks, and wires) and the use of firearms makes this task extremely hazardous.
- It is essential that ejected ammunition cases do not interfere with the safe operations of the helicopter. It might be necessary to fit a deflector plate (mandatory for FAAST operations) to the firearm to ensure shells are ejected safely.
- Firearm users must strictly observe all relevant safety guidelines relating to firearm ownership, possession and use.
- When not in use, firearms must be securely stored in a compartment that meets state legal requirements. Ammunition must be stored in a locked container separate from firearms.
- Adequate hearing protection should be worn by the shooter and others in the immediate vicinity of the shooter. Repeated exposure to firearm noise can cause irreversible hearing damage.
- Safety glasses are recommended to protect the eyes from gases, metal fragments and other particles.
- Refer to the current version of the FAAST Management and Training System for further details on workplace health and safety requirements.

Equipment required

Firearms and ammunition

- Firearms should be:
  - Reliable, well maintained and capable of good accuracy
  - Fitted with a red dot scope with zero magnification
  - Rifles should be semi-automatic .308 calibre.
  - Shotguns should be 12-gauge and either pump action or semi- automatic – for small to medium sized pigs only.
- To provide a backup in case of firearm/ammunition malfunction, at least two functioning firearms must be carried by shooters at all times.
- The accuracy and precision of firearms should be tested against inanimate targets before any shooting operation.

- Ammunition
  - Hollow point, 130gn -135gn; protected point 130gn or SG, SSG (larger pigs) and AAA, BB (small pigs or piglets)
  - Firearm and ammunition combinations for rifles with maximum shooting distances are included in the table below:

Cartridge	Bullet weight (gr)	Muzzle velocity (ft/sec)	Muzzle energy (ft-lbs)	Maximum distance (metres)*
.308 Winchester	130	3050	2685	70
.308 Winchester	135	3000	2699	70

Source:

https://www.federalpremium.com/rifle/american-eagle/american-eagle-varmint-and-predator/11-AE308130VP.html

https://www.osaaustralia.com.au/products/ammunition/centrefire-rifle/308-win/osa-ammo-308win-135gr-sierra-20-pack/

*With aerial shooting, most shots are taken at 20 to 50 metres and the maximum range would be about 70 metres

- Specifying ammunition based on species alone rather than individual body mass is problematic. Shooters should select ammunition (from those specified) that best suits their situation, and which is justifiable on animal welfare grounds. This may particularly apply to situations where multiple species are being controlled in the one operation.
- The accuracy and precision of firearms should be tested against inanimate targets before any shooting operation.

Aircraft

- Aircraft used for aerial shooting should be manoeuvrable, fast and responsive to allow quick follow-up of any wounded animals.
- The FAAST governance structure has compiled a list of helicopter operators, aircraft and pilots who are approved for FAAST operations. Only helicopter operators and aircraft deemed appropriate to the particular task will be selected for FAAST operations. Approved operators can be sourced through the State Air Desk (LLS) or the through the Flight Operations Unit (NPWS).
- GPS (global positioning systems) and computer mapping equipment with appropriate software must be used to assist in the accurate recording of information (e.g., where animals are shot) and to eliminate the risk of shooting in off-target areas.

Other equipment

- Flight helmet (with intercom).
- Fire-resistant flight suit.
- Safety harness.
- Other personal protective equipment including lace-up boots, gloves and appropriate eye and hearing protection.
- Survival kit (including a first aid kit.)

- Emergency locating beacon.
- Lockable firearm box.
- Lockable ammunition box.
- Refer to the current FAAST Manual for further information.

Procedures

- Shooters must not shoot at an animal unless they are confident of cleanly killing it without unnecessary pain, distress or suffering. Only chest (heart-lung) or head/brain shots must be used. Shooting at other parts of the body is unacceptable.
- Wounded animals can suffer from pain and the disabling effects of the injury (including sickness due to infection). The cost of ammunition and extra flying time must not deter operators from applying fly-back procedures.
- Where target animals are encountered in a group they should typically be shot from the back of the group first (the last one shot is furthest away from the helicopter). This may not always be possible e.g., when an animal breaks away from a group. In this case the shooter and pilot need to communicate so they focus on the same animal.
- Each animal must be shot *at least* twice with at least one bullet placed in the heart/lung and before shooting further animals. The only exemption to two shots is when the heart/lung is completely destroyed after the first shot as may be the case with smaller animals.
- The shooter must shoot an animal *more than twice* in the following circumstances:
  - where directed by the pilot or if the shooter considers it necessary
  - until a bullet is placed in the heart/lung of the animal
  - if the animal doesn't appear dead (signs of life could include attempting to lift its head, any coordinated body movement, eye blinking or breathing).
- Each animal shot must be considered dead by the shooter and pilot, and verbally announced as a 'kill' by the pilot before shooting further animals. This procedure allows for both the shooter and pilot to make a judgement of each animal shot being dead, by the animal exhibiting no sign of life and/or by observing the placement of a bullet into the heart/lung.
- A flyback procedure is required after shooting a group of animals and must be applied at all times. The procedure is as follows:
  - fly back over each animal of the group shot
  - hover over each animal long enough to assess that the animal doesn't exhibit any sign of life
  - where there is any doubt by the shooter or pilot that the animal is dead or that there is a bullet in the heart/lung, the shooter is to shoot further bullet/s into the heart/lung of the animal.

- When large groups of animals are encountered or when groups are encountered in heavy vegetation, the shooter and pilot must consider the ability to conduct an effective flyback procedure. If an effective flyback is likely to be hampered by continuing to shoot further animals in a group or when animals already shot are unlikely to be found, shooting should temporarily cease, and a flyback conducted over animals already shot.
- The best time to shoot feral pigs is when they are most active and away from cover; that is, in the early morning, late afternoon and evening. During winter months and on cooler, overcast days pigs will be more active during daylight hours.
- Target pigs should be mustered away from watercourses and areas of dense vegetation before being shot, as wounded animals will be difficult to locate if they go down in these locations.
- Once a target is sighted and has been positively identified, the pilot should position the helicopter as close as is safe to the target animal to permit the shooter the best opportunity for a humane kill.
- The pilot should aim to provide a shooting platform that is as stable as possible.

Target and shot placement

Aiming points for head and chest shots are as follows (see also Figure 2).

Chest Shot

Side view

- The firearm is aimed at the centre of a line encircling the minimum girth of the animal's chest, immediately behind the forelegs. The shot should be taken slightly to the rear of the shoulder blade (scapula). This angle is taken because the scapula and humerus provide partial protection of the heart from a direct side-on shot.

Head Shots

Poll position (rear view)

- When aerial shooting, most head shots will be taken at this position as animals are running away from the helicopter. The firearm should be aimed at the back of the head at a point between the base of the ears and directed towards the mouth.

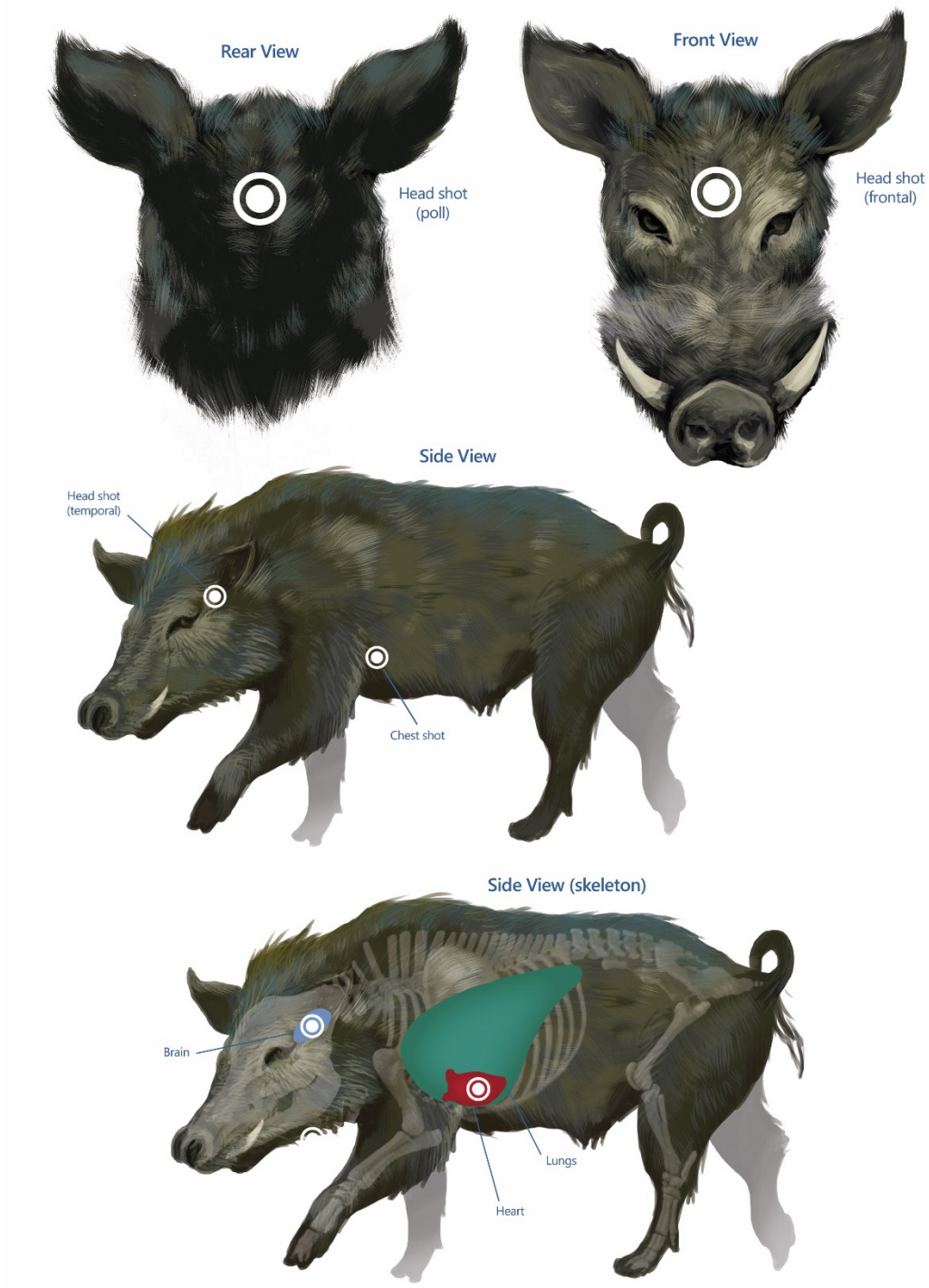
Temporal position (side view)

- This shot is occasionally used where a second shot needs to be delivered to an injured animal that is lying on its side. The pig is shot from the side so that the bullet enters the skull at a point midway between the eye and the base of the ear.

Frontal position (front view)

- This position is occasionally used when an animal faces the shooter. The firearm is aimed at a point in the middle of the forehead slightly above a line drawn between the eyes.

Figure 2: shot placement for aerial shooting of feral pigs



Note that shooting an animal from above or below the horizontal level as depicted here will influence the direction of the bullet through the body. Adjustment to the point of aim on the external surface of the body may need to be made to ensure that the angled bullet path causes extensive (and therefore fatal) damage to the main organs in the target areas.

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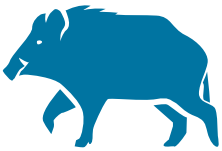


NSWPIG SOP3
Ground shooting of feral pigs

Background

Ground shooting of feral pigs is undertaken by government vertebrate pest control officers, landholders and professional shooters. Although intensive ground shooting operations may reduce the local populations of feral pigs, it is rarely effective for damage control and is not suitable as a long-term control method. Shooting from a helicopter is considered a more humane control method, as mobile wounded animals can be promptly re-located and killed. It is also a more effective method of quickly reducing feral pig populations. Refer to *NSWPIG SOP2 Aerial shooting of feral pigs*.

Shooting can be a humane method of killing feral pigs when it is carried out by experienced, skilled shooters, the animal can be clearly seen and is within range, the correct firearm, ammunition and shot placement is used, and wounded animals are promptly located and killed.

This standard operating procedure (SOP) is a guide only; it does not replace or override the relevant legislation that applies in NSW. The SOP should only be used subject to the applicable legal requirements (including WHS) operating in the relevant jurisdiction.

Individual SOPs should be read in conjunction with the overarching Code of Practice for that species to help ensure that the most appropriate control techniques are selected and that they are deployed in a strategic way, usually in combination with other control techniques, to achieve rapid and sustained reduction of pest animal populations and impacts.

Application

- Shooting should only be used in a strategic manner as part of a coordinated program designed to achieve sustained effective control.
- Ground shooting is often used as a secondary control method after initial reduction of high density pig populations by aerial shooting and/or poisoning. It is time-consuming and labour intensive and therefore an inefficient method for large-scale feral pig control.
- Ground shooting should not be conducted prior to, or during any other control program e.g., trapping or poisoning, as it can disrupt normal feral pig activity and may cause temporary dispersal of pigs to other areas.
- Ground shooting is not suitable in inaccessible or rough terrain where sighting of target animals and accurate shooting is difficult or when wounded animals cannot easily be followed up and killed.

- Trained dogs are sometimes used to detect or flush out pigs prior to shooting. It is unacceptable to set a dog onto a feral pig with the intention of bringing it down, holding or attacking it.
- Shooting of feral pigs should only be performed by skilled operators who have the necessary experience with firearms and who hold the appropriate licences and accreditation.
- Storage and transportation of firearms and ammunition must comply with relevant legislative requirements (*See Firearms Act 1996*, Firearms Regulation 2017).

Animal welfare implications

Target animals

- The humaneness of shooting as a control technique depends almost entirely on the skill and judgement of the shooter. If properly carried out, it is one of the most humane methods of killing feral pigs.
- Shooting must be conducted in a manner which aims to cause immediate insensibility and painless death. The appropriate firearms and ammunition must always be used. Shooters should not shoot at an animal unless it is clearly visible, and they are confident of killing it with a single shot.
- When shooting an animal, it must be clearly visible and able to be killed with a single shot due to the difficulty of follow-up shots from the ground, particularly in difficult terrain. A solid rest or support should be utilised to ensure accurate shot placement.
- Only head (brain) or chest (heart-lung) shots must be used. A well-placed shot to the head to destroy the brain will result in instantaneous insensibility and a quicker death compared to a well-placed shot to the chest. Chest shots to destroy the heart can present challenges for accurate placement and may not always result in rapid death. For this reason, under ideal conditions, head shots are preferred over chest shots, however in some situations (e.g., where close approach is not possible; the head is obstructed or cannot be targeted; the animal is already wounded; or a second 'follow-up' shot can be quickly taken), because the chest is a larger target, a chest shot may be the most suitable option. Shooting at other parts of the body is unacceptable.
- Correctly placed head shots cause brain function to cease, and insensibility will be immediate. Death from a shot to the chest is due to massive tissue damage and haemorrhage from major blood vessels. Insensibility will occur sometime after, from a few seconds to a minute or more. If a shot stops the heart functioning, the animal will lose consciousness very rapidly.
- The shooter must be certain that each animal or defined group of animals is dead by physical inspection before another is targeted.
- Wounded pigs must be located and dispatched as quickly and humanely as possible with a second shot preferably directed to the head. If left, wounded animals can suffer from the disabling effects of the injury, from sickness due to infection of the wound, and from pain created by the wound.

- If lactating sows are shot, reasonable efforts should be made to find dependent piglets and kill them quickly and humanely. Piglets that escape after a sow has been shot will usually return to the area within the next few hours.
- If dogs are used to flush feral pigs out from vegetation, they must be adequately controlled to prevent them from attacking pigs. In the event that a dog latches onto a pig, the dog must be called off and be made to stay behind the shooter until the pig has been shot.

Non-target animals

- Shooting is relatively target specific and does not usually impact on other species. However, there is always a risk of injuring or killing non-target animals, including livestock, if shots are taken at movement, colour, shape or sound. Only shoot at the target animal once it has been positively identified and never shoot over the top of hills or ridges.
- Shooting should be used with caution around lambing paddocks as it may disturb the lambing flock and cause mismothering. Also avoid paddocks containing sensitive livestock e.g., horses and farmed deer. They are easily frightened by spotlights and gunshots and may injure themselves by running into fences and other obstacles.
- If using dogs to locate and flush feral pigs out from vegetation, the following should be observed:
    - Dog handlers must be experienced, and the dogs well trained i.e., they must be easily controlled by a whistle or call, obey the handlers' commands and will not chase or attack non-target animals including livestock. Dogs that are deliberately bred or trained to attack without provocation must not be used.
    - Handlers must not encourage dogs to bring down or attack feral pigs. They should only be used to locate pigs, NOT to capture and hold them.
    - Chest, neck and body plates should be used on working dogs to prevent serious injuries which can be inflicted by feral pigs. If a dog is injured it must receive veterinary attention as soon as possible.
    - Never shoot at a pig until the dog is out of the line of fire.
    - Do not let the dog become fatigued as it is more likely to sustain injury.
    - Where affordable, it is recommended that dogs wear a working radio collar so that they can be located quickly if lost. Lost dogs can suffer from dehydration, starvation and exposure and can have a negative impact on livestock and native fauna if they are left to run wild.
    - For more details refer to *GEN002 The care and management of dogs used for pest animal control.*

Workplace health and safety considerations

- Firearms are hazardous. All participants in the culling program should stand well behind the shooter when an animal is being shot. The line of fire must be chosen to prevent accidents or injury from stray bullets or ricochets.

- Shooting from a vehicle is potentially dangerous. An agreed safety procedure between the shooter and others in the vehicle must be in place to ensure that people do not enter the field of fire or disturb the taking of a shot.
- Firearm users must strictly observe all relevant safety guidelines relating to firearm ownership, possession and use.
- Firearms must be securely stored in a compartment that meets state legal requirements. Ammunition must be stored in a locked container separate from firearms.
- The shooter and others in the immediate vicinity should wear adequate hearing protection to prevent irreversible hearing damage, and safety glasses to protect eyes from gases, metal fragments and other particles.
- Care must be taken when handling pig carcasses as they may carry diseases such as leptospirosis, Q fever, brucellosis, sparganosis, melioidosis and tuberculosis that can affect humans and other animals. Routinely wash hands after handling all carcasses. Carcasses can be heavy (>100kg), so care must be taken when lifting/dragging.

Equipment required

Firearms and ammunition

- Large calibre, high velocity centre-fire rifles fitted with a telescopic sight must be used. The minimum firearm and ammunition requirements for the ground shooting of feral pigs are:
  - calibre: .243 inches
  - bullet weight: 80 grain
  - muzzle energy: 1819 (ft-lbs).
- Examples of acceptable firearm and ammunition combinations with maximum shooting distances are included in the table below:

Cartridge	Bullet weight (gr)	Muzzle velocity (ft/sec)	Muzzle energy (ft-lbs)	Maximum distance (metres)
.243	80	3200	1819	200
25-06 Rem	90	3350	2243	200
.308 Win	150	2820	2649	200

Source: https://press.hornady.com/assets/pcthumbs/tmp/1410995911-2019-Standard-Ballistics-Chart.pdf

- Rifle bullets must be of an expanding type designed to deform in a predictable manner e.g., hollow point, soft-point, polymer tip.
- 12-gauge shotguns with heavy shot sizes of SG or SSG, may be effective, but only up to a distance of 20 metres from the target animal.
- The accuracy and precision of rifles should be tested against inanimate targets prior to the commencement of any shooting operation.

Other equipment

- If shooting at night, a handheld spotlight, or a helmet or headband mounted spotlight
- Thermal/night vision monocular and scopes
- First aid kit
- Lockable firearm box
- Lockable ammunition box
- Personal protective equipment (hearing and eye protection)
- Communication devices (e.g., 2-way radios / mobile or satellite phones) are recommended for safety reasons.

Procedures

- Feral pigs must NOT be shot from a moving vehicle as this can significantly detract from the shooters' accuracy.
- It is recommended that during daylight hours shooters familiarise themselves with the shooting zone and the terrain they are to cover at night. Take note of potential hazards or risks and also any landmarks that may help with navigation.
- Be aware that the spotlight only illuminates a small portion of the danger zone and only a fraction of the projectile's range. If possible, a thermal device should always be used to assess any potential risks before a shot is fired.
- Ensure you are in a firm, safe and stable position before taking a shot.
- The best time to ground shoot feral pigs is when they are most active i.e., in the early morning, late evening and throughout the night if spotlights or thermal image devices are used.

Target and shot placement

- The objective is to fire at the closest range practicable in order to reduce the risk of non-lethal wounding. Accuracy with a single shot is important to achieve an immediate and, therefore, humane death.
- A feral pig should only be shot at when:
  - it can be clearly seen and recognised
  - it is within the effective range of the firearm and ammunition being used
  - a humane kill is highly probable
  - If in doubt, do NOT shoot.
- Although pigs are comparatively large animals, the vital areas targeted for clean killing are small. Shooters should be highly skilled and experienced at shooting and be able to accurately judge distance, wind direction and speed and have a thorough knowledge of the firearm and ammunition being used.

- The shooter must aim either at the head, to destroy the major centres at the back of the brain near the spinal cord or, at the chest, to destroy the heart, lungs and great blood vessels. This can be achieved by one of the following methods (see also Figure 3).

Head Shots

Frontal position

- This is the ideal site for shooting pigs. The firearm should be aimed at a point midway across the forehead and about 2cm above the level of the eyes. The bullet should be directed in the direction of the tail.

Temporal position

- This shot is useful for older pigs and large boars that can have foreheads consisting of thick bones and a ridge that runs down the centre. The firearm is aimed from the side of the head so that the bullet enters the skull at a point midway between the eye and the base of the ear on the same side of the head. The bullet should be directed horizontally into the skull.

Behind the ear

- This shot is also used for older pigs and large boars that can have foreheads consisting of thick bones and a ridge that runs down the centre. The firearm is aimed at a point behind the ear directed towards the opposite eye.

Chest Shots

Side view

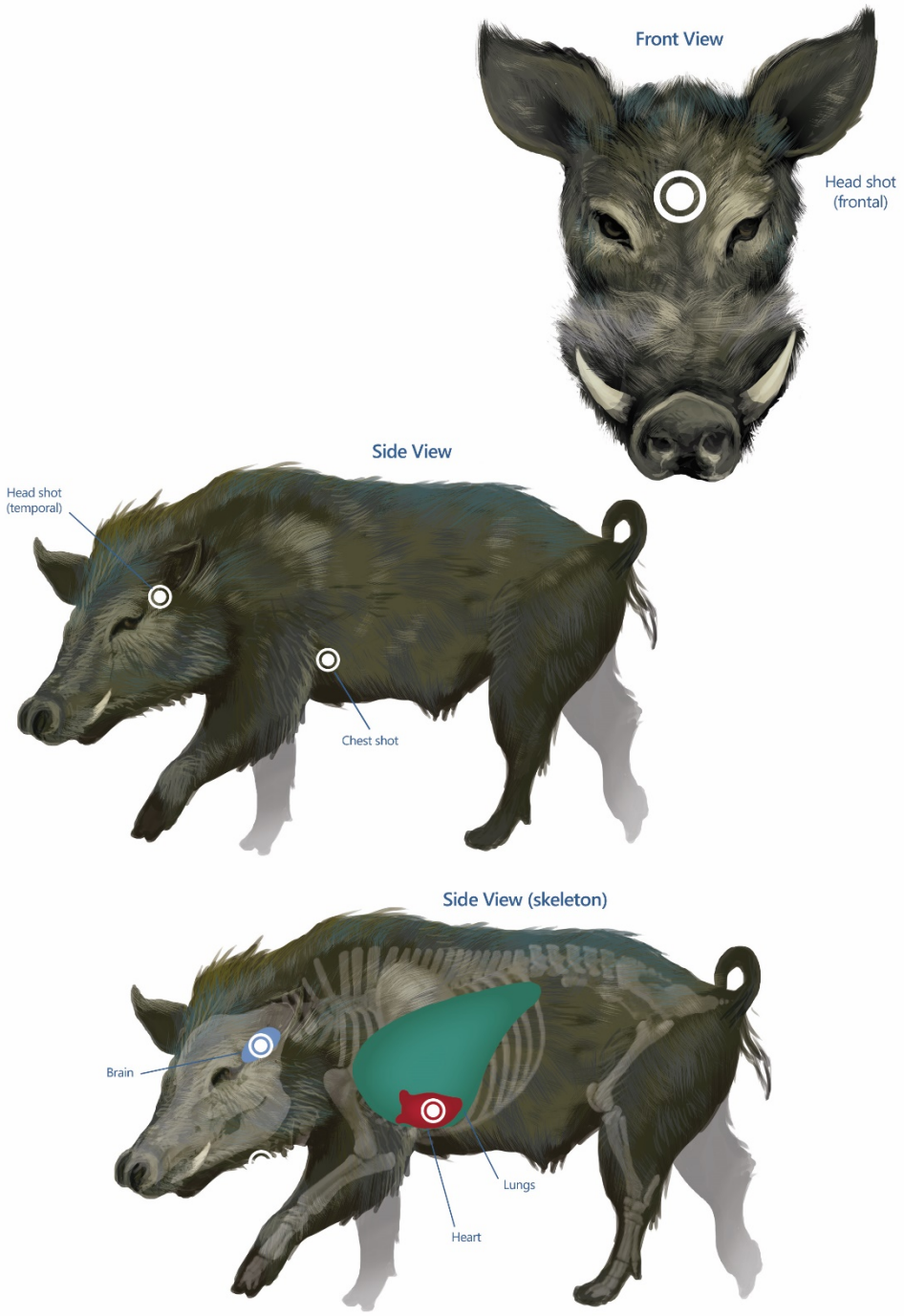
- The firearm is aimed at the centre of a line encircling the minimum girth of the animal's chest, immediately behind the forelegs. The shot should be taken slightly to the rear of the shoulder blade (scapula). This angle is taken because the scapula and humerus provide partial protection of the heart from a direct side-on shot.

Front view

- The firearm is aimed horizontally at the point midway between the forelegs and immediately below the base of the throat. Frontal shots should only be used for animals in the 'head high' position. Adult males have a thickened cartilaginous shield under the skin which protects the shoulders and ribs during fighting. This shield may interfere with frontal chest shots; therefore, side chest shots are preferred.
- When using a rifle, the target animal must be stationary and within a range that permits accurate placement of the shot. Shots to the head are preferred over chest shots.
- When using a shotgun, the target animal may be stationary or mobile, but must be no more than 20 metres from the shooter. The pattern of shot should be centred on the head or chest. It is essential that the distance to the target animal is accurately judged. To achieve adequate penetration of shot, the animal must be in range. It is recommended that shooters practice estimating distances before a shooting operation.

- The target animal should be checked to ensure it is dead before moving on to the next animal. Death of shot animals can be confirmed by observing a combination of the following:
  - no heartbeat
  - no breathing
  - no corneal reflex (no blinking when the eyeball is touched)
  - no response to a painful stimulus e.g., a pinch of the ear tip.
- If death cannot be verified, a second shot to the head should be taken immediately.

Figure 3: Shot placement for feral pigs



Note that shooting an animal from above or below the horizontal level as depicted here will influence the direction of the bullet through the body. Adjustment to the point of aim on the external surface of the body may need to be made to ensure that the angled bullet path causes extensive (and therefore fatal) damage to the main organs in the target areas.

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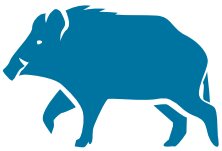

NSWPIG SOP4 Poisoning of feral pigs with sodium monofluoroacetate (1080)

Background

Lethal baiting with sodium monofluoroacetate (1080) is considered to be one of the most effective methods of quickly reducing feral pig numbers. 1080 is an odourless, tasteless, concentrated solution that has a coloured dye added for identification of the toxin. It is incorporated into a suitable bait material and offered along a trail or in a bait station. Free-feeding with unpoisoned bait is performed for a number of days prior to laying poisoned baits and is an essential step in a baiting program. Aerial application of bait may be an effective means for dealing with specific feral pig problems although a number of restrictions apply. A disadvantage of using 1080 is that it carries a high risk of non-target poisoning due to the larger doses required to kill feral pigs.

This standard operating procedure (SOP) is a guide only; it does not replace or override the relevant legislation that applies in NSW. The SOP should only be used subject to the applicable legal requirements (including WHS) operating in the relevant jurisdiction.

Individual SOPs should be read in conjunction with the overarching Code of Practice for that species to help ensure that the most appropriate control techniques are selected and that they are deployed in a strategic way, usually in combination with other control techniques, to achieve rapid and sustained reduction of pest animal populations and impacts.

Application

- 1080 baiting is subject to an authorised control officer (ACO) risk assessment.
- Baiting with 1080 should only be used in a strategic manner as part of a co-ordinated program designed to achieve sustained effective control.
- 1080 baiting of feral pigs is considered a relatively inexpensive and effective method of reducing medium-high density pig populations.
- Poisoning is primarily used as an initial control method whilst other methods such as trapping, ground shooting and exclusion are used as follow-up techniques to keep pig numbers at a low level.
- Baiting with 1080 should not be used in areas where there is an unacceptably high risk to humans and companion animals, such as urban/residential environments.
- 1080 use is restricted in areas where there is a high risk of poisoning domestic stock and wildlife.
- The best time to conduct a poisoning program is when surface water is scarce, and pastures have dried off. At this time pigs will be concentrated near permanent water

points and are more likely to eat bait due to hunger. It can be difficult to get feral pigs to take or find bait when there is abundant green feed. To achieve maximum population reductions, it is also recommended that broad scale control programs be conducted prior to breeding, which usually peaks between May and October. In south-eastern Australia, late autumn is usually the most effective period for baiting pigs.

- Baiting of feral pigs with 1080 can only be carried out under conditions set down in a specific permit issued by the Australian Pesticides & Veterinary Medicines Authority (APVMA) under Commonwealth legislation (*Agricultural and Veterinary Chemicals Code Act* 1994).
- In NSW, 1080 must also be used in accordance with the *Pesticides Act 1999* and the relevant Pesticide Control Orders (which include distance restrictions, signage and notification requirements).
- 1080 is a restricted chemical product (under Regulation 45 of the Agricultural and Veterinary Chemicals Code Regulations 1995) and is listed as a Schedule 7 – Dangerous Poison under the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP). These listings require special precautions in the manufacture, handling, storage and use of 1080, along with specific regulations regarding labelling or availability.
- Handling of 1080 concentrated solution and preparation of baits must only be performed by an authorised person (ACO) who has the appropriate training.
- Prepared and manufactured 1080 baits can only be obtained through an authorised control officer employed by Local Land Services, National Parks and Wildlife Service, Border Fence Maintenance Board of NSW and other NSW public authorities.
- The 1080 user should refer to the NSW Vertebrate Pesticide Manual (VPM) for all relevant legislation and its application.

Aerial baiting

Only 1080 Feral Pig Baits that are specified in the VPM and approved for aerial baiting can be used and it can only be applied by helicopter. At this stage only PIGOUT is approved (See NSWPIG SOP5 Poisoning of feral pigs using PIGOUT 1080 baits) for procedures.

Animal welfare implications

Target animals

- The toxicity of 1080 is due to the conversion of fluoroacetate to fluorocitrate, which inhibits the tricarboxylic acid cycle – a mechanism necessary for cellular energy production. In general, herbivores experience cardiac failure, whereas carnivores experience central nervous system (CNS) disturbances and convulsions and then die of respiratory failure. Some species, usually omnivores such as pigs, can be equally affected by both CNS and cardiac signs.
- After a pig has ingested 1080 there is a latent period, usually around an hour, before signs such as salivation, jaw chomping, vomiting, increased lethargy, and laboured respiration are observed. Although the precise nature and extent of suffering after ingestion of 1080 is unknown, it is likely that the animal will experience discomfort prior

to and during vomiting. Some pigs exhibit signs of CNS disturbance including hyperexcitability, squealing, manic running, paralysis or convulsions, followed by coma and then death. Other animals may lie quietly, breathing slowly and laboriously until death. Time to death is variable depending upon amount 1080 absorbed but is usually around 4 hours after ingestion. With low doses, pigs can take a number of days to die.

- Vomiting is a prominent early sign of 1080 poisoning in feral pigs, occurring approximately 1 to 5 hours after ingestion. Most pigs vomit frequently over a number of hours. This high incidence of vomiting has the following implications:
  - Vomitus containing 1080 may cause secondary poisoning of non-target species.
  - Vomiting can result in sub-lethal dosing of target animals, potentially decreasing the overall effectiveness of the poisoning program.
  - Animals surviving a sub-lethal dose may develop an aversion to 1080, decreasing their susceptibility to subsequent poisoning programs.
- To minimise the animal welfare implications of leaving dependent piglets to die a slow death from starvation it is preferable not to undertake 1080 baiting programs when sows have recently farrowed. This can vary with season and area.

Non-target animals

- 1080 is toxic to a wide range of species including birds, mammals and reptiles; however, there are marked differences in sensitivity. Dogs are extremely sensitive, and most other mammalian carnivores are highly sensitive to 1080 poisoning. Herbivores are less sensitive, and birds and reptiles increasingly more tolerant.
- Poisoning of non-target species can occur either directly by eating baits intended for feral pigs (primary poisoning) or through the scavenging of tissues or vomitus from a poisoned animal (secondary poisoning).
- The susceptibility of non-target species to 1080 poisoning is determined by many factors including sensitivity to the poison, body weight, concentration of 1080 in the bait, bait placement, bait type and palatability, timing of baiting and level of exposure to toxic baits.
- Vomitus containing 1080 has the potential to kill a number of non-target animals. Pigs may vomit repeatedly for a number of hours after 1080 ingestion so it is likely that vomitus would be distributed over a wide area creating a potential hazard for non-target animals.
- Relatively large amounts of 1080 must be distributed in baits to kill feral pigs, creating a serious risk of primary poisoning in non-target species. Meat baits are of considerable concern as they need to contain a high concentration of 1080 (72 mg per bait), which is more than 10 times the concentration used for wild dog baits.
- Herbivorous and granivorous birds and mammals have a high risk of poisoning if they eat the grain, pellets or fruit/vegetable baits. Macropods and wombats appear to be the most at risk. Cats, dogs, native carnivorous mammals, birds and some rodents are potentially at risk when meat baits are used.
- To minimise the potential for toxic baits to be lethal to non-target animals, the following baiting strategies are used:

- *Pre-feeding with non-poisoned bait* – allows an assessment of what animals are eating the bait.
- *Camera traps* – devices that detect heat-in-motion – can be used to assess visitation. The camera is triggered to take photos as the subject moves within the detection zone i.e., vicinity of bait station.
- *Bait type* – use of bait that is locally attractive to pigs e.g., fermented grains, and less attractive to non-targets.
- *Colouring of baits* –bait material is dyed a green or blue colour to reduce attractiveness to non-target fauna, especially birds.
- *Use of bait stations* – bait can be placed in a fenced area which excludes livestock and other non-target animals but allows pigs to push through to access the bait.
- *Placement of baits* – the bait should always be placed in the prime feeding areas of feral pigs.
- *Timing of baiting* – baits are best laid in the evening as feral pigs are mostly active between dusk and dawn. Baits thus laid will be mostly consumed overnight before non-target animals have access.
- *Collection of uneaten bait and feral pig carcases* – any uneaten bait and poisoned pig carcases are collected and destroyed or buried with a minimum of 500 mm of soil.

First aid for dogs

- Care must be taken to ensure that working dogs and pets do not come into contact with 1080. Dogs may eat meat baits, pelleted bait, vomitus from a poisoned pig or poisoned pig carcasses. The prognosis for poisoned dogs is extremely poor unless vomiting can be induced shortly after ingestion of the bait and before clinical signs are evident.
- If a working dog or pet is known to have eaten material containing 1080 but is NOT yet showing signs of poisoning, induce vomiting by giving one of the following emetics by mouth:
  - washing soda crystals (sodium carbonate) – 3 to 5 crystals orally, DO NOT use laundry detergents or powders.
  - table salt – 2 teaspoons of salt in 1 cup of water; more or less depending on the size of the dog.
  - dilute hydrogen peroxide (3% solution) – 3 to 5ml.
  - If the dog has vomited, clean it up immediately as the vomit is toxic.
  - THEN SEEK VETERINARY ATTENTION IMMEDIATELY. The sooner action is taken following poisoning the better the prognosis.
  - If these emetics are not immediately to hand or you are not having success in making the dog vomit it is better to seek veterinary attention immediately rather than waste time.
- If the dog has already begun to show signs of toxicosis (retching and vomiting, frenzied behaviour such as running and howling, convulsions, difficulty breathing etc.), DO NOT induce vomiting, but seek veterinary attention without delay.

- Veterinary intervention aims to decrease 1080 absorption and facilitate excretion; control seizures; and support respiration and cardiac function.
- See *First Aid – 1080 and your dog* for more information: https://pestsmart.org.au/resources/

Workplace health and safety considerations

- If human poisoning occurs, contact a doctor or the Poisons Information Centre (Ph 13 11 26) IMMEDIATELY. Urgent hospital treatment is likely to be needed. There is no effective antidote to 1080.
- For further information refer to the Material Safety Data Sheet (MSDS), available from the supplier, the Pesticide Control (1080 Bait Products) Order, and the NSW DPI Vertebrate Pesticide Manual.

Procedures

- An ACO must conduct a risk assessment to determine if it is appropriate to supply 1080 baits to any person. Risk assessments should consider threats to non-target species particularly domestic dogs, human health and the environment.
- ACOs must conduct a risk assessment of planned group baiting programs where baiting occurs less than the prescribed minimum distances provided in the current Pesticide Control (1080 Bait Products) Order (PCO).
- Users of 1080 must always refer to any risk assessment, specific permit, approved label and PCO for up-to-date information on conditions of use including distance restrictions, public notification and bait preparation, distribution, storage, transportation and disposal.
    - Pesticide Control (1080 Bait Products) Order
    - NSW DPI Vertebrate Pesticide Manual

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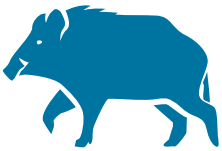

NSWPIG SOP5 Poisoning of feral pigs using PIGOUT 1080 baits

Background

Poisoning with sodium monofluoroacetate (1080) is considered to be one of the most effective methods of quickly reducing feral pig numbers. 1080 is an odourless, tasteless concentrated solution that is incorporated into bait material and offered either in bait stations, where many baits are laid in one area, or by cluster style aerial baiting (a number of restrictions apply). PIGOUT® baits contain a core of 1080 powder surrounded by a matrix of fish-flavoured cereal that has been dyed green to minimise uptake by non-target species. They are also coated with a biodegradable cellulose skin to further minimise non-target uptake, prevent drying out and increase resilience when deployed from the air.

Free-feeding with unpoisoned grain bait or PIGOUT® free-feeds is performed for a number of days prior to laying poisoned baits and is an important step in most baiting programs.

Although PIGOUT® baits are more target specific than freshly prepared baits, because of the large doses of 1080 required to kill pigs, baiting should be undertaken with caution. Good baiting technique helps to minimise the risk to non-target species and maximise the effect on targeted feral pig populations.

This standard operating procedure (SOP) is a guide only; it does not replace or override the relevant legislation that applies in NSW. The SOP should only be used subject to the applicable legal requirements (including WHS) operating in the relevant jurisdiction.

Individual SOPs should be read in conjunction with the overarching Code of Practice for that species to help ensure that the most appropriate control techniques are selected and that they are deployed in a strategic way, usually in combination with other control techniques, to achieve rapid and sustained reduction of pest animal populations and impacts.

Application

- Subject to an authorised control officer (ACO) risk assessment
- Poisoning with 1080 should only be used in a strategic manner as part of a co-ordinated program designed to achieve sustained effective control.
- 1080 baiting of feral pigs is considered a relatively inexpensive and effective method of reducing high pig populations. PIGOUT® baits have also been used in South Australia, Northern Territory and the Australian Capital Territory.
- Poisoning is primarily used as an initial control method whilst other methods such as trapping, ground shooting and exclusion are used as follow-up techniques to keep pig numbers at a low level.

- Baiting with PIGOUT® should not be used in areas where there is an unacceptably high risk to humans and companion animals, such as urban/residential environments.
- Use of PIGOUT® is restricted in areas where there is a high risk of poisoning domestic stock and wildlife.
- The best time to conduct a poisoning program is when surface water is scarce, and pastures have dried off. At this time pigs will be concentrated near permanent water points and are more likely to eat bait due to hunger. It can be difficult to get feral pigs to take or find bait when there is abundant green feed. To achieve maximum population reductions, it is also recommended that broad scale control programs be conducted prior to breeding, which usually peaks between May and October. In south-eastern Australia, summer or autumn is usually the most effective period for baiting pigs.
- Baiting of feral pigs with PIGOUT® can only be carried out under conditions set down in a specific permit issued by the Australian Pesticides & Veterinary Medicines Authority (APVMA) under Commonwealth legislation (*Agricultural and Veterinary Chemicals Code Act* 1994).
- PIGOUT® must also be used in accordance with the *Pesticides Act 1999* and the relevant Pesticide Control Orders (which include distance restrictions, signage and notification requirements).
- 1080 is a restricted chemical product (under Regulation 45 of the Agricultural and Veterinary Chemicals Code Regulations 1995) and is listed as a Schedule 7 – Dangerous Poison under the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP). These listings require special precautions in the manufacture, handling, storage and use of 1080, along with specific regulations regarding labelling or availability.
- PIGOUT® baits can only be obtained through an authorised control officer employed by Local Land Services, National Parks and Wildlife Service and other NSW public authorities.
- The 1080 user should refer to the NSW Vertebrate Pesticide Manual for all relevant legislation and its application.

Aerial baiting

- Although not specifically covered in this SOP, aerial baiting of feral pigs using PIGOUT® may be applicable in inaccessible and remote areas. Aerial baiting of feral pigs is not generally used in NSW and should only be considered when:
  - difficult access makes ground baiting impractical
  - it is the most cost-effective means of control
  - it will form an integral part of a properly planned and executed control program
  - the risk to non-target species has been assessed and all steps will be taken to minimise this impact.
- There are a number of restrictions and legal requirements associated with aerial baiting programs. The intended program should be discussed with the Local Land Service (LLS) ACO several months in advance. Only 1080 Feral Pig Baits that are specified in the VPM and approved for aerial baiting can be used and it can only be applied by helicopter. At this stage only PIGOUT® Feral Pig Bait is approved.

- Aerial baiting must be organised through either LLS or NPWS or another NSW public authority that the EPA has given approval to undertake such an activity.
- Approval for aerial baiting on land reserved under Part 4 of the *National Parks and Wildlife Act 1974* must be obtained from the relevant NPWS Branch Director.
- For all other land, approval for aerial baiting must be obtained from the LLS Chief Executive or their delegate.
- All programs involving aerial application of 1080 feral pig baits must follow the guidelines contained in the NSW Vertebrate Pesticide Manual. Your local LLS has full details.

Animal welfare implications

Target animals

- The toxicity of 1080 is due to the conversion of fluoroacetate to fluorocitrate, which inhibits the tricarboxylic acid cycle – a mechanism necessary for cellular energy production. In general, herbivores experience cardiac failure, whereas carnivores experience central nervous system (CNS) disturbances and convulsions and then die of respiratory failure. Some species, usually omnivores such as pigs, can be equally affected by both CNS and cardiac signs.
- After a pig has ingested PIGOUT® baits there is a latent period, usually between one and several hours, before signs such as salivation, jaw chomping, vomiting, increased lethargy, and laboured respiration are observed. The delayed onset of symptoms associated with PIGOUT® baits, compared to feral pigs poisoned with unbound 1080, is due to the hydrophobic core not completely breaking down until it reaches the duodenum of the animal. Although the precise nature and extent of suffering after ingestion of 1080 is unknown, it is likely that the animal will experience discomfort prior to and during vomiting. Some pigs exhibit signs of central nervous system disturbance including hyperexcitability, squealing, manic running, paralysis or convulsions, followed by coma and then death. Other animals may lie quietly, breathing slowly and laboriously until death. Time to death is variable depending upon amount 1080 absorbed but is usually around 4 to 6 hours after ingestion under field conditions. With low doses, pigs can take a number of days to die, but may not show symptoms for much of this time.
- Vomiting is a prominent early sign of 1080 poisoning in feral pigs, occurring approximately 1 to 5 hours after ingestion. Some pigs vomit frequently over a number of hours. This high incidence of vomiting has the following implications:
  - Vomitus containing 1080 may cause secondary poisoning of non-target species if they consume the vomit
  - Vomiting may result in sub-lethal dosing of target animals decreasing the effectiveness of the poisoning program
  - Animals surviving a sub-lethal dose may develop an aversion to PIGOUT®, decreasing their susceptibility to subsequent poisoning programs.
- To minimise the animal welfare implications of leaving dependent piglets to die a slow death from starvation it is preferable not to undertake PIGOUT® baiting programs when

sows have recently farrowed. This will vary with season and area. Peaks in mating often occur in response to the flush of green vegetation that follows heavy rain or flooding, with farrowing occurring 112-114 days later. For example, in southern NSW, most births occur in summer and autumn. Weaning age of piglets varies from 2 to 3 months. At times of farrowing, sows tend to move over less distances and are usually more cryptic which may reduce the effectiveness of any pig control conducted at this time.

Non-target animals

- 1080 is toxic to a wide range of species including birds, mammals and reptiles; however, there are marked differences in sensitivity. Dogs are extremely sensitive, and most other mammalian carnivores are highly sensitive to 1080 poisoning. Herbivores are less sensitive, and birds and reptiles increasingly more tolerant.
- Relatively large amounts of 1080 must be distributed in baits to kill feral pigs, creating a serious risk of primary poisoning in non-target species. PIGOUT® baits contain a high volume of 1080 (72 mg per bait), which, for example, is 24 times the concentration used for standard fox baits.
- The overall susceptibility of non-target species to 1080 poisoning is determined by many factors including sensitivity to the poison, body weight, concentration of 1080 in the bait, bait placement, bait type and palatability, timing of baiting and level of exposure to toxic baits.
- Poisoning of non-target species can occur either directly by eating baits intended for feral pigs (primary poisoning) or through the scavenging of tissues or vomitus from a poisoned animal (secondary poisoning).
- PIGOUT® baits are targeted for omnivorous feral pigs, therefore other omnivores, such as brush-tailed possums, foxes and some birds can also be attracted to the bait. Remaining baits should be retrieved when evidence of possum (bait skin hollowed out) or bird (pecking of baits) take is evident.
- Although domestic stock has previously shown little interest in PIGOUT®, bait take by cattle (*Bos indicus)* has occurred. Non-toxic test baits should first be trialled with cattle in situations where destocking is not possible.
- Vomitus containing 1080 has the potential to kill a number of non-target animals. Pigs may vomit repeatedly for a number of hours after 1080 ingestion so it is likely that vomitus could be distributed over a wide area creating a potential hazard for non-target animals that consume vomit. Vomit consumption by non-target wildlife did not occur during PIGOUT® trials; however, the occurrence cannot be ruled out completely.
- To minimise the potential for toxic baits to be lethal to non-target animals, the following baiting strategies are used:
    - *Pre-feeding with non-poisoned bait* – allows an assessment of what animals are eating the baits.
    - *Camera traps* – devices that detect heat-in-motion – can be used to assess visitation. The camera is triggered to take photos as the subject moves within the detection zone i.e., vicinity of bait station.
    - *Bait type* – use of PIGOUT® baits, as they are attractive to pigs (under most conditions), and generally unappealing to non-targets.

- *Colouring of baits* – PIGOUT® baits are dyed green to reduce attractiveness to non-target fauna, especially birds.
- *Use of bait stations* – PIGOUT® baits can be placed in a fenced area which excludes livestock and other non-target animals but allows pigs to push through to access the bait. Field trials have shown that this is generally unnecessary, as few non-target species consume baits.
- *Placement of baits* – PIGOUT® baits should always be placed in the prime feeding areas of feral pigs. Limiting the number of cluster bait stations further limits non-target fauna exposure, particularly species with small home ranges.
- *Timing of baiting* – PIGOUT® baits are best laid in the evening as feral pigs are mostly active between dusk and dawn. Baits thus laid will be mostly consumed overnight before non-target animals have access.
- *Collection of uneaten bait and feral pig carcases* – any uneaten PIGOUT® baits and poisoned pig carcases are collected and destroyed or buried with a minimum of 500 mm of soil.

First aid for dogs

- Care must be taken to ensure that working dogs and pets do not come into contact with 1080. Dogs may eat meat baits, pelleted bait, vomitus from a poisoned pig or poisoned pig carcasses. The prognosis for poisoned dogs is extremely poor unless vomiting can be induced shortly after ingestion of the bait and before clinical signs are evident.
- If a working dog or pet is known to have eaten material containing 1080 but is NOT yet showing signs of poisoning, induce vomiting by giving one of the following emetics by mouth:
  - washing soda crystals (sodium carbonate) – 3 to 5 crystals orally, DO NOT use laundry detergents or powders.
  - table salt – 2 teaspoons of salt in 1 cup of water; more or less depending on the size of the dog.
  - dilute hydrogen peroxide (3% solution) – 3 to 5ml.
  - If the dog has vomited, clean it up immediately as the vomit is toxic.
  - THEN SEEK VETERINARY ATTENTION IMMEDIATELY. The sooner action is taken following poisoning the better the prognosis.
  - If these emetics are not immediately to hand or you are not having success in making the dog vomit it is better to seek veterinary attention immediately rather than waste time.
- If the dog has already begun to show signs of toxicosis (retching and vomiting, frenzied behaviour such as running and howling, convulsions, difficulty breathing etc.), DO NOT induce vomiting, but seek veterinary attention without delay.
- Veterinary intervention aims to decrease 1080 absorption and facilitate excretion; control seizures; and support respiration and cardiac function.
- See *First Aid – 1080 and your dog* for more information: https://pestsmart.org.au/resources/

Workplace health and safety considerations

- If poisoning occurs, contact a doctor or the Poisons Information Centre (Ph 13 11 26) IMMEDIATELY. Urgent hospital treatment is likely to be needed. There is no effective antidote to 1080.
- For further information refer to the Material Safety Data Sheet (MSDS), available from the supplier, the Pesticide Control (1080 Bait Products) Order, and the NSW DPI Vertebrate Pesticide Manual.

Equipment required

PIGOUT® baits

- PIGOUT® baits have been developed to provide a highly-targeted and ready-to-use tool for the management of feral pigs. Each manufactured bait contains 72 mg of 1080 bound in a centralised core. The 1080 has been centralised to prevent toxin intake through minor bait nibbling by possums/rodents or pecking by birds. At least 2cm of bait matrix must be consumed from any one direction before the toxin is reached.
- The effect of 1080 on feral pigs, and in turn individual susceptibility to PIGOUT® baits, varies greatly depending on animal size, health, physical stress and environmental conditions. It is impossible for any one individual bait to reliably kill every feral pig, whose weight may range from 5kg to over 200kg. Furthermore, feral pigs are gregarious, and often feed within a mob. Baiting strategies that take into account such variables must be employed.
- Each PIGOUT® bait contains enough 1080 to kill a feral pig around 20 - 30kg under field conditions. Larger animals require two or more baits, and consequently cluster baiting at bait stations is required for the effective control of feral pigs. It is known that feral pigs will self-regulate bait intake based on body size, as long as sufficient bait is supplied. Large boars for example will take up to nine baits and the average for a mob is often around five baits. The high target-specificity of PIGOUT® baits to feral pigs means such a baiting strategy can remain safe for non-target species.
- Poisoned PIGOUT® baits are dyed green so they are readily distinguishable from human and animal food and to reduce attractiveness to birds.
- Prepared bait must be stored and transported in a secure and safe manner in the supplied PIGOUT® pails. Access must be restricted to approved personnel only. Refer to relevant State and Territory legislation for details.

Procedures

- An ACO must conduct a risk assessment to determine if it is appropriate to supply 1080 baits to any person. Risk assessments should consider threats to non-target species particularly domestic dogs, human health and the environment.
- ACOs must conduct a risk assessment of planned group baiting programs where baiting occurs less than the prescribed minimum distances provided in the current 1080 PCO.

- Users of 1080 must always refer to specific permit, approved label and Pesticide Control (1080 Bait Products) Order for up-to-date information on conditions of use including distance restrictions, public notification and bait preparation, distribution, storage, transportation and disposal.
  - Pesticide Control (1080 Bait Products) Order: https://www.epa.nsw.gov.au/your-environment/pesticides/pesticides-nsw-overview/pesticide-control-orders
  - NSW DPI Vertebrate Pesticide Manual: https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/publications/nsw-vertebrate-pesticide-manual

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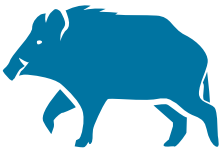

NSWPIG SOP6 Poisoning of feral pigs using HOGGONE® meSN® sodium nitrite baits

Background

HOGGONE® feral pig bait contains sodium nitrite, a compound that is highly toxic to pigs. The mode of action is similar to carbon monoxide poisoning, with sodium nitrite intoxication leading to a state of unconsciousness before death. HOGGONE® baits containing sodium nitrite do not cause secondary poisoning from eating muscle tissue, are usually not attractive to livestock and native species and are less hazardous for operators compared to other toxins.

HOGGONE® is supplied as a dense solid paste bait and is offered to feral pigs in trays. The sodium nitrite is in a microencapsulated form (meSN®) which is spread throughout the paste.

This standard operating procedure (SOP) is a guide only; it does not replace or override the relevant legislation that applies in NSW. The SOP should only be used subject to the applicable legal requirements (including WHS) operating in the relevant jurisdiction.

Individual SOPs should be read in conjunction with the overarching Code of Practice for that species to help ensure that the most appropriate control techniques are selected and that they are deployed in a strategic way, usually in combination with other control techniques, to achieve rapid and sustained reduction of pest animal populations and impacts.

Application

- Poisoning with sodium nitrite should only be used in a strategic manner as part of a co-ordinated program designed to achieve sustained effective control.
- Baiting of feral pigs is considered an effective method of reducing pig populations in conjunction with other management options.
- Poisoning is primarily used as an initial control method whilst other methods such as trapping, ground shooting and exclusion are used as follow-up techniques to keep pig numbers at a low level.
- Bait trays can only be used in target-specific bait boxes that prevent access to non-target animals.
- A dose of 250–350g per pig, as specified on the label, provides a small surplus of the minimum lethal dose required to kill the average size target animal. The additional amount of bait ensures sufficient toxin for a range of pig sizes given a mixed population with juveniles and adults is likely.

- The best time to conduct a poisoning program is when surface water is scarce, and pastures have dried off. At this time pigs will be concentrated near permanent water points and are more likely to eat bait due to hunger. It can be difficult to get feral pigs to find bait stations and to take bait when there is abundant green feed. To achieve maximum population reductions, it is also recommended that broad scale control programs be conducted prior to breeding, which usually peaks between May and October. In south-eastern Australia, summer or autumn is usually the most effective period for baiting pigs.
- Baiting of feral pigs with HOGGONE® can only be carried out under conditions set down in a specific permit issued by the Australian Pesticides & Veterinary Medicines Authority (APVMA) under Commonwealth legislation (*Agricultural and Veterinary Chemicals Code Act* 1994).

Animal welfare implications

Target animals

- Sodium nitrite works quickly in pigs, resulting in unconsciousness and death within about 1-3 hours. This is a shorter timeframe compared with other toxins currently or previously used for feral pig control in Australia such as warfarin (1–2 weeks), phosphorus (yellow phosphorus or CSSP; 2–4 days) and sodium monofluoroacetate (1080; 4-6 hours).
- Sodium nitrite primarily induces the formation of methaemoglobin which restricts the oxygen carrying capacity of red blood cells leading to central nervous system anoxia.
- Sodium nitrite poisoning progresses rapidly in pigs. Signs include progressive lethargy, incoordination, and vomiting. Closer to death the respiratory rate increases and, in some animals, severe dyspnoea, terminal seizure events and coma can occur. Pigs appear to be distressed for only a short period (5 to 10 minutes) prior to reduced consciousness.
- To minimise the animal welfare implications of leaving dependent piglets to die a slow death from starvation it is preferable not to undertake sodium nitrite baiting programs when sows have recently farrowed. This can vary with season and area.

Non-target animals

- Poisoning of non-target species can occur either directly by eating baits intended for feral pigs (primary poisoning) or through the scavenging of tissues or vomitus from a poisoned animal (secondary poisoning).
- HOGGONE® is presented in target-specific bait boxes (e.g., HOGGONE Paste Bait Hopper) which reduces the risk of primary poisoning of domestic stock and wildlife.
- Sodium nitrite is quickly metabolised, therefore residues in the meat of dead pigs pose minimal threats to non-target scavengers. Vomiting has also shown to be minimal thus further reducing the risk of secondary poisoning.
- The mode of presentation of HOGGONE® makes it somewhat target specific. However, the paste product itself remains highly toxic to working dogs and pets.

- Veterinary intervention in non-target poisoning cases aims to convert methaemoglobin back to haemoglobin (usually with methylene blue, although this too can be toxic in high doses), provide oxygen and respiratory support and to absorb toxin (with activated charcoal) and promote its excretion (with saline or sorbitol). For further information vets should refer to Blue Healer Glovebox Antidote.

Workplace health and safety considerations

- If poisoning occurs, contact a doctor or the Poisons Information Centre (Ph 13 11 26) IMMEDIATELY.
- For further information refer to the Material Safety Data Sheet (MSDS), available from the supplier.

Equipment required

- HOGGONE® bait has been developed to provide a highly-targeted and ready-to-use tool for the management of feral pigs. The paste formulation contains 100g/kg sodium nitrite.
- HOGGONE® bait must only be presented in target specific bait boxes (e.g., HOGGONE Paste Bait Hopper). The HOGGONE® bait hopper is designed to carry 6x or 12x trays. Five kg pales of poison bait are also available to replenish trays.
- A 'placebo paste' that doesn't contain any toxin is also available in 5kg pales for free-feeding with the bait hoppers.
- Notification signs must be displayed at all entry points to a baited area or property.
- Chemical-resistant gloves are required when opening HOGGONE® containers and using the bait.

Procedures

- Do not use HOGGONE bait unless within a pig-specific bait station such as the HOGGONE Paste Bait Hopper.
- Sodium nitrite is a very unstable compound that actively absorbs moisture. To retain efficacy, bait must be kept dry at all times and residual bait should not be reused.
- Place bait stations at known places where feral pigs frequent such as pads or water points. The use of free-feeding, with grain or pellets for example, will enhance site selection and bait uptake.
- When the poisoning program is finished, ensure that left-over bait is removed from the bait boxes and disposed of. Unused bait and containers should be buried at a depth of 0.5m in a disposal pit specifically marked and set-up for this purpose. Empty containers and product must not be burnt. Do NOT re-use containers for any other purpose.
- Users of HOGGONE must always refer to any specific permit and approved label for up-to-date information on conditions of use including distance restrictions, public notification and bait preparation, distribution, storage, transportation and disposal.

For further information refer to:

- NSW DPI Vertebrate Pesticide Manual
- https://animalcontrol.com.au/s/ACTA-Hoggone-meSN-Feral-Pig-Bait-brochure-2020-01.pdf

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