

Model code of practice for the humane control of feral pigs

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PIGCOP – revised 03 September 2012

Introduction

The aim of this code of practice is to provide information and guidance to vertebrate pest managers responsible for the control of feral pigs. Control programs aim to reduce the negative impacts of feral pigs using the most humane, target specific, cost effective and efficacious techniques available.

This code of practice (COP) is adopted nationally. Jurisdictions can apply more stringent requirements as long as they retain the principles set out in these codes. The COP should only be used subject to the applicable legal requirements (including OH&S) operating in the relevant jurisdiction.

Background

There is an expectation that animal suffering associated with pest management be minimised. The most humane methods that will achieve the control program's aims must be used. Consideration of animal suffering should occur regardless of the status given to a particular pest species or the extent of the damage or impact created by that pest. While the ecological and economic rationales for the control of pests such as the feral pig are frequently documented, little attention has been paid to the development of an ethical framework in which these pests are controlled. An ethical approach to pest control includes the recognition of and attention to the welfare of all animals affected directly or indirectly by control programs. Ensuring such approaches are uniformly applied as management practices requires the development of agreed Standard Operating Procedures (SOPs) for pest animal control. These SOPs are written in a way that describes the procedures involved for each control technique as applied to each of the major pest animal species. While SOPs address animal welfare issues applicable to each technique, a Code of Practice (COP) is also required that bring together these procedures into a document which also specifies humane control strategies and their implementation. COPs encompass all aspects of controlling a pest animal species. This includes aspects of 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 code is based on current knowledge and experience in the area of feral pig control and will be revised as required to take into account advances in knowledge and development of new control techniques and strategies.

Definitions and terms

Pest animal – 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 (Koehler, 1964).

Welfare – an animals’ state as regards its attempts to cope with its environment (Broom, 1999). 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 (Littin et al., 2004).

Humane Vertebrate Pest Animal 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 (RSPCA, 2004).

Best Practice Management – a structured and consistent approach to the management of vertebrate pests in an attempt to achieve enduring and cost-effective outcomes. ‘Best practice’ is defined as the best practice agreed at a particular time following consideration of scientific information and accumulated experience (Braysher, 1993).

Best practice pest management

From an animal welfare perspective, it is highly desirable that pest control programs affect a minimum number of individuals and that effort is sustained so that pest densities always remain at a low level. Over the last decade, the approach to managing pest animals has changed. Rather than focussing on killing as many pests as possible, it is now realised that like most other aspects of agriculture or nature conservation, pest management needs to be carefully planned and coordinated. Pest animal control is just one aspect of an integrated approach to the management of production and natural resource systems. Most pests are highly mobile and can readily replace those that are killed in control programs. Unless actions are well planned and coordinated across an area, individual control programs are unlikely to have a lasting effect. When planning pest management, there are some important steps that should be considered (after Braysher & Saunders, 2002).

1. What is 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. Who is 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. What is the problem? In the past the pest was usually seen as the problem. Hence the solution was to kill as many pests as possible. We now know that the situation is more complex. First, determine what the problem is. For example, it may be damage to crops, reduced crop yield competition with livestock or habitat degradation. Several factors impact on each of these problems and control of pests are often only part of the solution. The following questions then help define the problem:
 - Who has the problem?
 - Where is the problem?
 - How severe is the problem?
 - Will the problem change with time?
4. Identify and describe the area of concern. Sometimes it helps to remove agency and property boundaries 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. Trying to deal with the complexity of a very large area can be daunting so it often helps 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:
 - Identify as best you can, the pest animal distribution and abundance in each management unit.
 - Estimate as far as is practicable, the damage caused by the pest or pests to production and to conservation.
6. Gather and assess other relevant planning documents such as Catchment Management Plans, 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.
7. Develop the most appropriate pest management plans for each of the management units.

Implementing effective and humane pest control programs requires a basic understanding of the ecology and biology of the targeted pest species and in some cases those species affected directly (non-targets) or indirectly (prey species) by a control program. It is also essential to understand the impact created by the pest i.e. what is the problem? Managers should take the time to make themselves aware of such information by reading the recommended texts at the end of this code of practice. A brief summary follows. This information is extracted from the publication *Managing Vertebrate Pests: Feral Pigs* by Choquenot et al. (1996).

Feral pig facts

Most feral pigs in Australia are descendants of various breeds of the Eurasian wild boar or the domestic pig, which for various reasons, particularly lack of restraint and deliberate releases, reverted to living in the wild. Initially, the distribution of pigs was close to major settlements throughout Australia, but as changes occurred in the management of rural properties, many pigs were left unattended, wandered away and established truly feral colonies.

Once established, colonies of feral pigs rapidly built up in many areas. Estimates of population size vary between 3.5 million and 23.5 million, inhabiting 38% of Australia, but their distribution and abundance can vary markedly from year to year according to environmental conditions.

The biology and ecology of feral pigs are two of the major reasons why they are such an important and successful vertebrate pest in Australia. Their large robust bodies, snouts specially developed for rooting up the ground, omnivorous diet and adaptive activity patterns allow them to live in a wide range of habitats. Feral pigs are habitat generalists and have colonised subalpine grasslands and forests, dry woodlands, tropical rainforests, semi-arid and monsoonal floodplains, swamps and other wetlands in many parts of the Northern Territory, Queensland, New South Wales, and other states and territories. Their prime requirements are a reliable and adequate supply of water, food and cover. Temporal changes can occur in their use of habitats to satisfy these requirements, particularly to obtain shade and water and exploit seasonally abundant food sources.

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 pig impact

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 that the damage is at least of the order of \$100 million annually, and it may be much more.

Although feral pigs are often regarded as having deleterious effects on the environment, there is little objective information available on their impact. 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. Most perceptions of environmental damage by pigs focus on their rooting up of soils, grasslands or forest litter, particularly along drainage lines, moist gullies and around swamps and lagoons, or after rain, when the ground is softer. Their impact on different plants is largely unknown, as is the extent of their role as seed eaters or dispersers, and in spreading rootrot fungus (*Phytophthora cinnamomi*), responsible for dieback disease in native vegetation. Feral pigs readily eat animal material, but are probably not significant predators of most fauna except local populations of earthworms.

Feral pigs are the main wild animal of concern in Australia in relation to the potential spread of exotic diseases, particularly foot-and-mouth disease (FMD), the main exotic disease of concern in Australia. Feral pigs can act as hosts or vectors of several endemic and exotic diseases and parasites that can affect other animals, including domestic livestock and humans. The major endemic diseases and parasites of concern are leptospirosis, brucellosis, melioidosis, tuberculosis and sparganosis. The involvement of feral pigs in an exotic disease outbreak could delay disease detection; increase the rate and extent of disease spread; make disease eradication measures expensive, time-consuming or impossible; and have severe repercussions for Australia's livestock industries.

Feral pig control strategies

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 valued resource and source of income. Control strategies need to address both these viewpoints. By necessity, any control effort should be sustained. There are three essential requirements for a pest control technique – necessity, effectiveness and humaneness. The best strategy is to develop a plan which maximizes the effect of control operations and reduces the need to cull large numbers of animals on a regular basis.

Developing a feral pig management plan

This involves:

- *Defining management objectives.* Objectives are a statement of what is to be achieved, defined in terms of desired outcomes, usually conservation or economic benefits. Objectives should state what will be achieved (reduced impact) where, by when and by whom.
- *Selecting management options.* The management option is selected that will most effectively and efficiently meet the management objectives. The options include: eradication, containment, sustained management, targeted management, one-off action and taking no action.

- *Set the management strategy.* This defines the actions that will be undertaken: who will do what, when, how and where. It describes how the selected pest management options and techniques will be integrated and implemented to achieve the management objectives.
- *Monitoring the success of the program against the stated objectives.* Monitoring has two components, *operational monitoring* – what was done when and at what cost:- this determines the efficiency of the program, and *performance monitoring*:- were the objectives of the plan achieved and if not why not, that is the effectiveness of the program.

Choosing control techniques

Feral pig control techniques have the potential to cause animals to suffer. To minimise this suffering the most humane techniques that will achieve the control program's aims must be used. This will be the technique that causes the least amount of pain and suffering to the target animal with the least harm or risk to non-target animals, people and the environment. The technique should also be effective in the situation where it will be used (e.g. aerial shooting will have little effect in forested areas). It is also important to remember that the humaneness of a technique is highly dependant on whether or not it is correctly employed. In selecting techniques it is therefore important to consider whether sufficient resources are available to fully implement that technique.

Cooperative control

It may not be economic for a property to be independent in equipment and labour for feral pig management. Group schemes and cooperative effort provide economies of scale and social benefits that encourage sustained effort. Cooperative control is likely to be more effective than land managers working on their own and can also encourage financial support from governments.

Feral pig control techniques

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 suitable for use against feral pigs. Cost-effectiveness, humaneness and efficacy for each control technique are useful in deciding the most appropriate strategy. A brief evaluation of the humaneness of control techniques follows:

Humaneness of control techniques

Lethal baiting

Lethal baiting is considered to be the most viable and 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. Non-target animals including native species, 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 fluoroacetate (1080) and yellow phosphorus (CSSP) are the poisons currently used for feral pig control in Australia. Warfarin has also been trialled for use in feral pigs under an experimental permit.

1080

In feral pigs, poisoning from 1080 is typified by salivation, jaw chomping, vomiting, increased lethargy, and laboured respiration. 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 hours.

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. 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.

Yellow phosphorus (CSSP)

In pigs, ingestion of yellow phosphorus produces lethargy, depression and signs of gastrointestinal irritation such as reluctance to move or eat, vomiting and diarrhoea. With very large doses, pigs can die from shock within 6-12 hours of ingestion. If the dose is lower, animals may survive for a several days before dying from liver necrosis and heart failure. Most pigs die 2-4 days after ingestion. However, in some cases there may be a delay of up to 3 weeks before death occurs. Yellow phosphorus is considered to be inhumane and its use being phased out in all States and Territories.

Warfarin

With warfarin poisoning, the onset of symptoms and time to death can be highly variable and are usually dependent on the amount of warfarin ingested. Signs of warfarin poisoning are not usually apparent until 1–3 days after ingestion. Large doses of warfarin may cause massive haemorrhage into body cavities or the brain resulting in sudden death before or soon after the appearance of initial signs. Animals that receive smaller doses may take around 10 to 14 days to die after the initial dose. These animals may show signs of depression/lethargy and anorexia followed by manifestations of haemorrhage including anaemia, laboured breathing, pale mucous membranes and weakness. Bleeding may be visible around the nose, mouth, eyes and anus and animals may pass bloody faeces and urine. In pigs, bleeding into weight-bearing joints is common. The resulting swollen, tender joints cause lameness, recumbency and reluctance to move, which prevents the animal from accessing its normal feeding grounds. The discomfort and pain from haemorrhages in internal organs, muscles and joints can typically last for several days before death. Warfarin is considered to be inhumane and its use is being phased out in all States and Territories.

Shooting

Ground shooting

Shooting can be a humane method of destroying feral pigs when it is carried out by experienced, skilled and responsible shooters; the animal can be clearly seen and is within range; and the correct firearm, ammunition and shot placement is used.

Wounded animals must be located and killed as quickly and humanely as possible. If lactating sows are shot, reasonable efforts should be made to find dependent piglets and kill them quickly and humanely.

Recreational hunting of pigs with dogs is not an effective or humane method of managing feral pig populations. However, 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.

Aerial shooting

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 killed. Shooting from a moving platform can significantly detract from the shooter's accuracy therefore helicopter shooting operations do not always result in a clean kill for all animals. Follow-up procedures are essential to ensure that all wounded animals are killed.

With aerial shooting, chest shots are preferred as the heart and lungs are the largest vital area and an accurate shot is more achievable particularly within the range of unusual angles encountered when

shooting from above. Although death from a chest shot may be more certain, compared to an accurate head shot, a shot to the chest does not render the animal instantaneously insensible and time to death is slower.

Trapping

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.

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. 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.

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. cassowaries and 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 destroyed quickly and humanely.

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

Control Technique	Acceptability of technique with regard to humaneness*	Efficacy	Cost-effectiveness	Target Specificity	Comments
Exclusion fencing	Acceptable	Limited	Expensive	Can be in certain situations	Fencing can be effective for small, critical (economically or environmentally) areas, though the maintenance cost are high.
Ground baiting with 1080	Conditionally acceptable	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	Conditionally acceptable	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. Dried meat baits remain toxic for longer periods than fresh meat.	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.

Control Technique	Acceptability of technique with regard to humaneness*	Efficacy	Cost-effectiveness	Target Specificity	Comments
Yellow phosphorus (CSSP) baiting	Not acceptable			Potential risk of poisoning non-target animals	Inhumane and must not be used. Alternatives are available in all situations where yellow phosphorus could potentially be used. Yellow phosphorus usually takes several days to kill, during which time the animal experiences distress, disability and/or pain. It is therefore considered inhumane.
Warfarin baiting	Not acceptable			Potential risk of primary poisoning in non-target animals, although secondary poisoning is relatively uncommon (compared to 1080)	Inhumane and must not be used. Alternatives are available in all situations where warfarin could potentially be used. Anticoagulant poisons usually take several days to kill, during which time the animal experiences distress disability and/or pain. Warfarin is therefore considered inhumane.
Ground shooting	Acceptable	Not effective	Not cost-effective	Target specific	Labour intensive, only suitable for smaller scale operations.
Aerial Shooting	Conditionally acceptable	Effective	Relatively expensive. Can be cost-effective when pig density is high	Target specific	Provides high level medium- to long-term control of feral pig populations

Control Technique	Acceptability of technique with regard to humaneness*	Efficacy	Cost-effectiveness	Target Specificity	Comments
Trapping	Acceptable	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.

*Acceptable methods are those that are humane when used correctly.

*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.

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Standard operating procedures

For regional variations on control techniques refer to local legislation and regulations. For additional examples refer to the Humane Pest Animal Control Standard Operating Procedures (SOPs).

SOPs are currently available for the following feral pig control methods on the feral.org web site:
<http://www.feral.org.au/animal-welfare/>

- Trapping of feral pigs (PIG001)
- Aerial shooting of feral pigs (PIG002)
- Ground shooting of feral pigs (PIG003)
- Use of Judas pigs (PIG004)
- Poisoning of feral pigs using 1080 (PIG005)

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Legislation

All those involved in pest animal control should familiarise themselves with relevant aspects of the appropriate federal and state or territory legislation. The table below gives examples of some of the relevant legislation. This list is by no means exhaustive and is current at September 2012.

Commonwealth	<i>Agricultural and Veterinary Chemicals Code Act 1994</i> <i>Environment Protection and Biodiversity Conservation Act 1999</i>
ACT	<i>Pest Plants and Animals Act 2005</i> <i>Medicines, Poisons and Therapeutic Goods Act 2008</i> <i>Animal Welfare Act 1992</i> <i>Nature Conservation Act 1980</i> <i>Animal Diseases Act 2005</i> <i>Prohibited Weapons Act 1996</i> <i>Firearms Act 1996</i> <i>Environment Protection Act 1997</i>
New South Wales	<i>Prevention of Cruelty to Animals Act 1979</i> <i>Pesticides Act 1999</i> <i>Rural Lands Protection Act 1998</i> <i>National Parks and Wildlife Act 1974</i> <i>Threatened Species Conservation Act 1995</i> <i>Wild Dog Destruction Act 1921</i> <i>Game and Feral Animal Control Act 2002</i> <i>Deer Act 2006</i> <i>Non-Indigenous Animals Act 1987</i> <i>Exhibited Animals Protection Act 1986</i>
Northern Territory	<i>Animal Welfare Act</i> <i>Territory Parks and Wildlife Conservation Act</i> <i>Poisons and Dangerous Drugs Act</i>
Queensland	<i>Animal Care and Protection Act 2001</i> <i>Health (Drugs and Poisons) Regulation 1996</i> <i>Land Protection (Pest and Stock Route Management) Act 2002</i> <i>Nature Conservation Act 1992</i>
South Australia	<i>Animal Welfare Act 1985</i> <i>Natural Resources Management Act 2004</i> <i>Controlled Substances Act 1984</i> <i>National Parks and Wildlife Act 1972</i> <i>Dog Fence Act 1946</i> <i>Fisheries Management Act 2007</i>
Tasmania	<i>Animal Welfare Act 1993</i> <i>Vermin Control Act 2000</i> <i>Poisons Act 1971</i> <i>Agricultural And Veterinary Chemical (Control of Use) Act 1995</i> <i>Nature Conservation Act 2002</i> <i>Police Offences Act 1935</i> <i>Cat Management Act 2009</i>

Victoria	<i>Prevention of Cruelty to Animals Act 1986</i> <i>Catchment and Land Protection Act 1994</i> <i>Agriculture and Veterinary Chemicals (Control of Use) Act 1992</i> <i>Drugs, Poisons and Controlled Substances Act 1981</i> <i>Wildlife Act 1975</i> <i>Flora and Fauna Guarantee Act 1988</i> <i>National Parks Act 1975</i>
Western Australia	<i>Biosecurity and Agriculture Management Act 2007</i> <i>Animal Welfare Act 2002</i> <i>Agriculture and Related Resources Protection Act 1976</i> <i>Wildlife Conservation Act 1950</i>
Other relevant legislation	Firearms Acts Occupational Health and Safety Acts Dangerous Goods or Substances Acts Dog Acts Civil Aviation Acts

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

Further information

Contact the relevant federal, state or territory government agency from the following list of websites:

Australian Department of Sustainability, Environment, Water, Population and Communities

<http://www.environment.gov.au/>

Australian Department of Agriculture, Fisheries and Forestry

<http://www.daff.gov.au>

ACT Territory and Municipal Services Directorate

<http://www.tams.act.gov.au/live/environment>

NSW Department of Primary Industries

www.industry.nsw.gov.au

NT Department of Natural Resources, Environment, the Arts and Sport

<http://www.nt.gov.au/nreta/parks/>

Qld Department of Agriculture, Fisheries and Forestry

<http://www.daff.qld.gov.au/>

SA Biosecurity SA, Department of Primary Industries and Regions

<http://www.pir.sa.gov.au/biosecuritysa>

Tas Department of Primary Industries, Parks, Water and Environment

<http://www.dpiw.tas.gov.au/>

Vic Department of Primary Industries

<http://new.dpi.vic.gov.au/>

WA Department of Agriculture and Food

<http://www.agric.wa.gov.au>

Also refer to:

Invasive Animals Cooperative Research Centre <http://www.invasiveanimals.com/index.php>

and <http://www.feral.org.au>

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