



CENTRE FOR
INVASIVE SPECIES SOLUTIONS

PLANNING GUIDE FOR **FOX** MANAGEMENT IN AUSTRALIA

For Farmers, Conservation Land
Managers and Community Groups



www.pestsmart.org.au

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Australian Government

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Photo: Daryl Panther

INTRODUCTION

Since their introduction in 1855, the European red fox (*Vulpes vulpes*) has spread across much of Australia, with the exception of the far north and many offshore islands. Key to its success is the broad, opportunistic diet it favours: from fruit and insects to live prey and carrion.

Evidence suggests foxes are a primary cause in the decline and extinction of many of Australia's small and medium-sized mammals. They also prey on many bird, reptile and frog species. At a meeting of Environment Ministers in October 2022, ministers agreed to better manage invasive species that are threatening protected biodiversity. Further, 'Predation by the European red fox' is listed as a key threatening process under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act).

Foxes are opportunistic predators and scavengers and have few natural predators in Australia. They may also kill more than they can consume. Foxes pose a threat to livestock, as they prey on poultry, lambs and goat kids. They have been known to cause significant stock losses. In high density areas, such as some cities and towns, they may also be a health risk to humans and pets, through the transmission of diseases such as distemper, parvo virus and mange.

Because of their impacts, foxes are declared, restricted or prohibited pests/vermin in most states and territories. As a consequence all reasonable and practical measures to minimise the spread of foxes should be taken.

ABOUT THIS GUIDE

The Centre for Invasive Species Solutions has produced this guide to help individuals, groups and organisations wanting to control foxes to identify the problem, determine the reasons for control and to step through a simple process to prepare effective plans for fox management.

The guide provides a decision template to prepare, implement and evaluate a fox management plan.

Supporting information is provided in this document to assist the plan preparation with links to more detailed information such as the [Glovebox Guide for Managing Foxes](#)¹ featured on the PestSmart website.

The recommended approach is to work through the questions and decisions contained in the guide step by step.

DECISION TEMPLATE

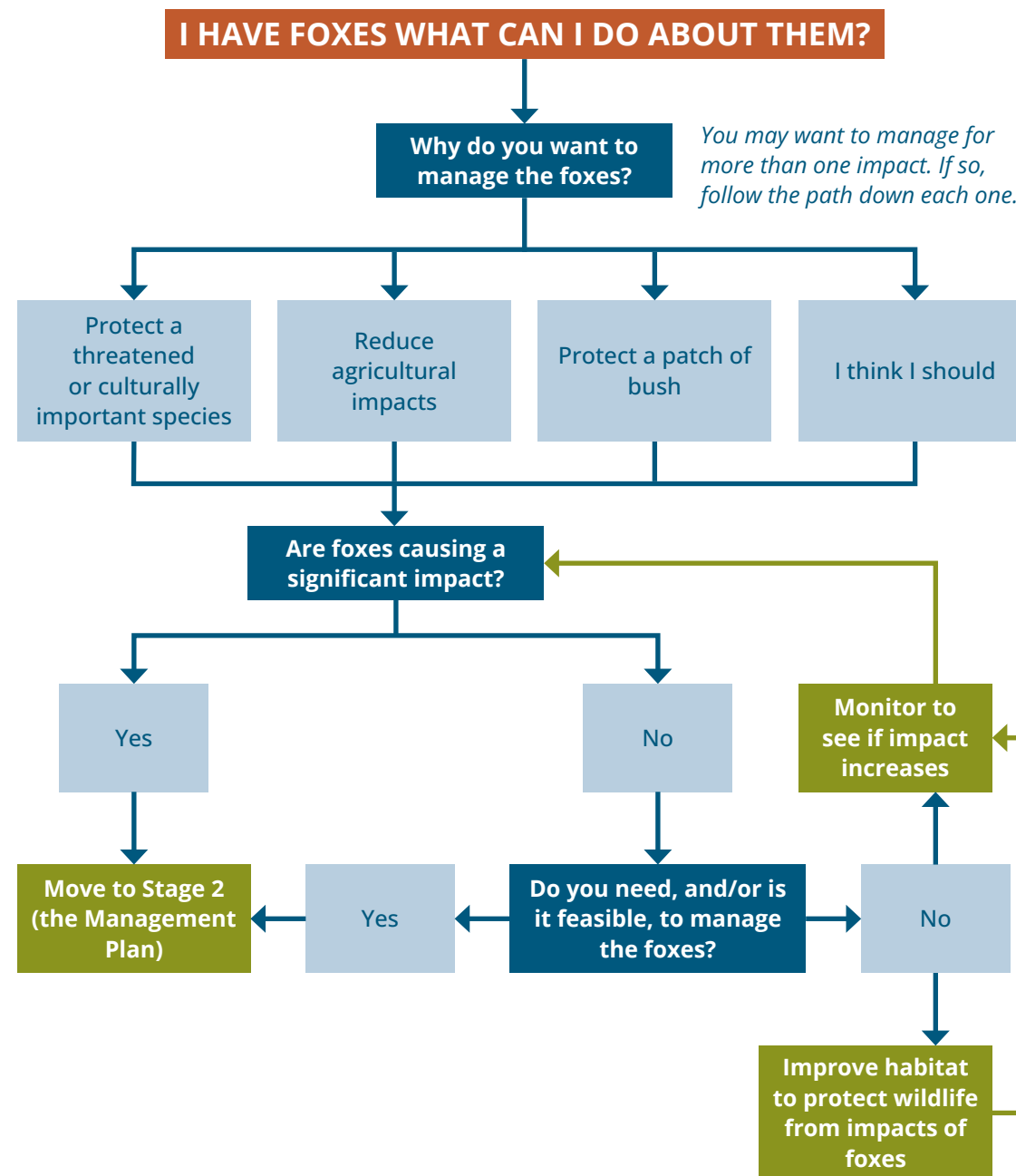


Figure 1 Flow diagram to help individuals, groups and organisations clarify why they want to manage foxes and whether an effective control program is needed or feasible.

STAGE 2 (THE MANAGEMENT PLAN)

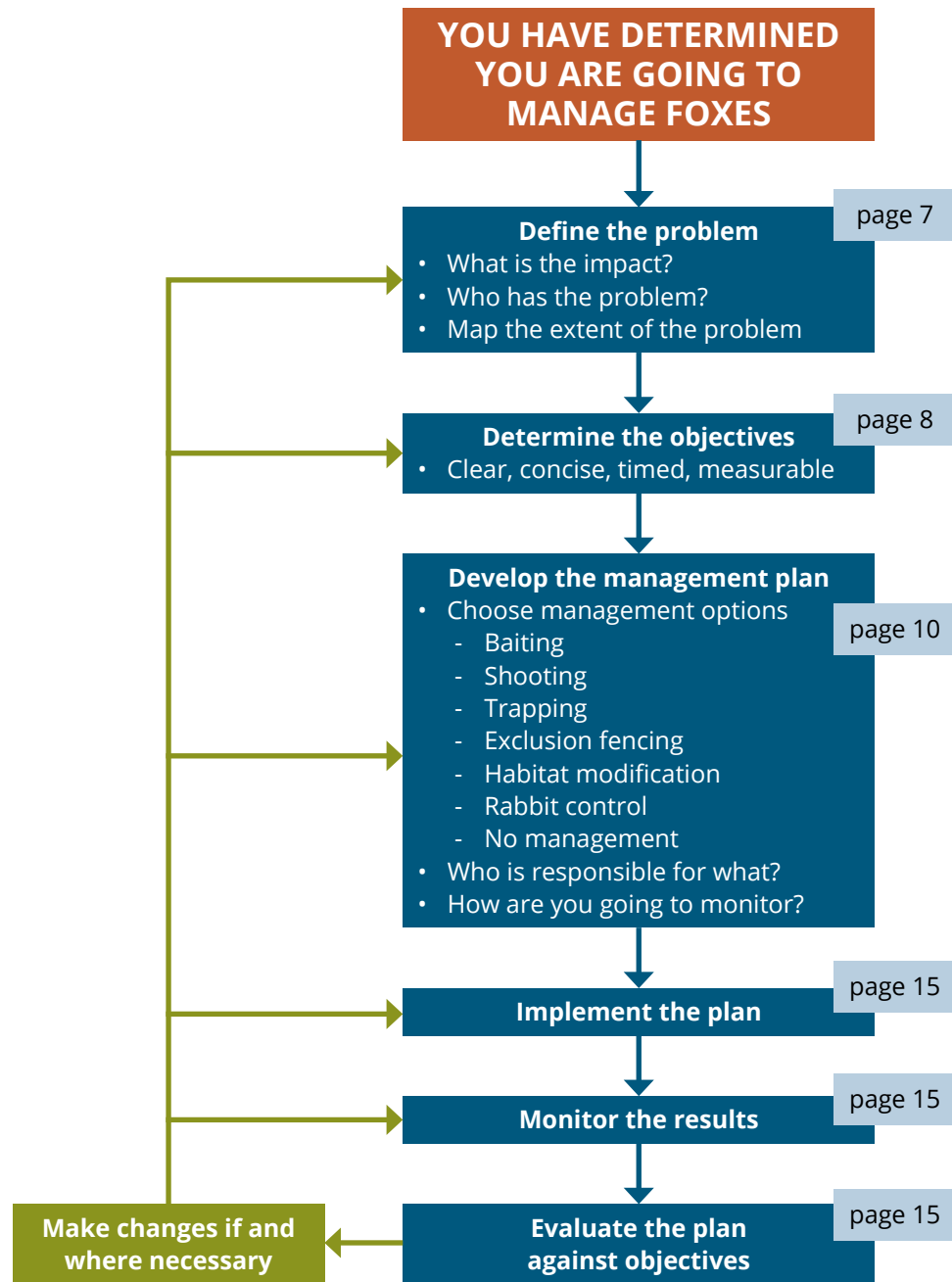


Figure 2 Decision tree to help individuals, groups and organisations wanting to develop an effective fox management plan and control program

DEFINE THE PROBLEM

What is the actual issue? If there is evidence that foxes are involved, define the problem.

Reported sightings of foxes and concern by community members, land managers, invasive animal control operators and Landcare/NRM groups? Yes — define the problem.

Reported livestock losses (lambs, poultry, goat kids)? Is it foxes? Refer to [SUPPORTING INFORMATION \(page 16\)](#) and if there is sufficient evidence that foxes are the cause, define the problem.

Reported impacts on native species? What are the species? Are these likely to be part of the diet of foxes? Is there evidence such as photographs, DNA evidence and carcass assessment? Yes — define the problem.

Define the problem clearly. This is not just that you have seen foxes, but rather what is the damage that they are doing that you want to manage. For example, it may be environmental concerns such as numbers of native animals in your area or on your property have declined, you want to protect a population of a threatened or other native species likely to be killed by foxes, or there is a wildlife re-introduction program that needs to be protected. It might be that there has been an increase in dead lambs, kid goats or poultry on your or your neighbour's property with a reduction in the number of lambs reaching marking age (note, you may be losing lambs from foxes, but not seeing the evidence of this). Or it might be community concerns.



Photo: Mary-anne Addington

Once you have defined the problem you then need to consider:

- Who has the problem / is affected? It might not be just you. Talk to others, for example: your neighbours, local agency staff, NRM and Landcare groups or pest controllers.
- Where is the problem? With the aid of maps and records, locate where the problem is occurring. Where are foxes most sighted? Where is the most evidence of kills? Where is the threatened species you are wanting to protect? Where are people's lambing paddocks?
- How severe is the problem and how critical?

If a management plan is required to deal with the fox problem, who needs to be involved in developing the plan? Remember, management over a broader area is more successful. What are your fox management objectives? What management actions are needed (integrating a range of measures works best)? Who will be responsible for carrying out the actions? And who will be accountable for making sure the actions are carried out?

Who will take responsibility for leading the fox management plan?

Who is the key person or group that will take responsibility for bringing together everyone who has a key interest in dealing with the fox problem? Identify everyone who should be involved.

What are your fox management objectives?

What do you or your group want to achieve? Objectives should be defined as desired outcomes.

If foxes are impacting on farming businesses, what change is desired? For example, do you want to eliminate or reduce losses during the lambing season, or do you want to increase lamb marking rates by a desired percentage?

For wildlife conservation, the objective needs to specify the native species being targeted and the increase in population being sought. Controlling foxes may be part of a threatened species recovery or reintroduction program.

Worthwhile tests of your objectives are:

- *Specific* — do the objectives specify what exactly will be accomplished by who, where and why?
- *Measurable* — how will success be demonstrated? This could be a percentage increase in the lamb marking rate or a percentage increase in the population of a threatened native species.
- *Achievable* — can the objectives be achieved within the resources and capabilities of the group responsible? Or can you get help in achieving them?
- *Relevant* — do the objectives relate to the group or individual's key responsibilities? Does it link to objectives of other broader plans?
- *Time-based* — do the objectives specify the timeframe in which the objectives expect to be achieved.

Can you coordinate your fox management plan with other fox management programs in place or planned?

Fox management is most successful when it is coordinated, strategic in targeting the problem, implemented across a broad area and uses an 'integrated pest management' approach that makes use of all suitable control tools. Coordinating your management program with others will deliver better outcomes for everyone.

Check if other land managers, agencies or organisations are undertaking or planning to undertake fox management in your area:

- Neighbours
- Local pest management or biosecurity group
- [State/Territory Government](#)²
- [Natural Resources Management Organisation](#)³
- Local or state Landcare group
- Local Government



What is the plan to deal with the problem?

Decide whether your plan aims to:

- Eradicate foxes in a defined area. (Note: eradication is extremely difficult unless you are on an island or within an appropriately fenced area).
- Contain the fox problem to an acceptable level defined by the group.
- Undertake sustained management of fox impacts.
- Target management on key impacts.
- Undertake a one-off action to deal with a serious issue at a particular time (noting that fox numbers will increase again after).
- Just monitor the fox situation for the time being.

What is the detail of the plan (including your selection of control options):

- Specific actions that will be undertaken.
- Who will do what, when, how and where?
- How will the actions be coordinated and integrated to achieve the management objectives?
- How will you assess outcomes of the plan?



ASSESS CONTROL OPTIONS

PREREQUISITES

Learning to understand basic fox behaviour will help you decide what is most appropriate for control measures. [Refer to SUPPORTING INFORMATION \(pages 18–19\)](#).

- Read the [Glovebox Guide for Managing Foxes](#)¹.
- Read the [Model code of practice for the humane control of foxes](#)⁴ and the Humaneness, Efficacy, Cost-effectiveness and Target Specificity of Fox Control Methods table.
- Contact relevant federal, state or territory government agencies before undertaking fox control to ensure compliance with regulations and the required permits are put in place. [Connect — PestSmart](#)².
- Assess relevant control measures and select those that are humane, target foxes with minimal impact on native wildlife, effective in achieving plan objectives and efficient with the use of available resources.



Photo: Gill Basnett



Photo: Neil Burrows

INTEGRATED PEST MANAGEMENT

The best outcomes are achieved when an 'integrated pest management' approach, that combines the use of all suitable control tools, is undertaken. Some tools are more effective at rapid knock down of foxes on a broad scale in a cost-effective way, while others may help with mop up, targeting problem animals, or undertaking ongoing management after the initial knockdown.

Indirect management such as improving wildlife habitat or reducing key prey animals such as rabbits, are also options. These measures will not rapidly reduce actual fox numbers but may reduce their impacts.

POISON BAITING

Foxes are scavengers and readily take meat baits, so this is the most effective, broad-scale method currently available for fox control.

[Refer to SUPPORTING INFORMATION \(pages 20–21\)](#) on baiting options.

- Ground baiting with 1080. Read Standard Operation Procedure [FOX001](#)⁵. Decision — Yes/No/Integrate with aerial baiting program.
- Aerial baiting with 1080. Read Standard Operating Procedure [FOX002](#)⁶. Usually undertaken by government authorities on public land or by land managers of large sparsely populated areas. Decision — Yes/No/Integrate with ground baiting program.
- Ground baiting with PAPP. Read Standard Operating Procedure [FOX007](#)⁷. Decision — Yes/No/Integrate with aerial 1080 baiting program.
- [Canid Pest Ejectors with 1080 or PAPP](#)⁸. Decision — Yes/No/Integrate with ground and/or aerial baiting program.

If any of the baiting options are to be used, outline:

- Circumstances in which baiting will be applied.
- Who is responsible?
- Locations of bait placement — use GPS, FoxScan or other appropriate tool. (Ensure you have permission from land owner/manager.)
- Dates of bait placement and baiting regime.
- State or territory regulations on baiting checked and required permits obtained.
- Has training been completed as required for Schedule 7 toxins?
- Sourcing of required baits.

- Personal safety and animal welfare briefing conducted before use.
- Record baiting activities in [FoxScan](#)⁹.

FUMIGATION OF NATAL DENS USING CARBON MONOXIDE

Best suited to localised fox problems, such as in or near lambing paddocks, or turtle nesting areas, and integrated with other control measures. It is time consuming and labour intensive so not suitable for landscape scale control. Carbon monoxide is the only fumigant registered for foxes.

- [Refer to SUPPORTING INFORMATION \(page 22\)](#).
- Read Standard Operating Procedure [FOX004](#)¹⁰.
- Consider ripping dens after fumigation.
- Decision — Yes/No/Integrate with other control measures.

If this control measure is to be used, outline:

- Circumstances in which it will be applied.
- Who is responsible?
- Locations of fumigated dens.
- Dates of actions.
- State or territory regulations checked and required permits obtained.
- Training requirements checked and undertaken if needed.
- Sourcing of proprietary product [DEN-CO-FUME](#)¹¹ which is the only prescribed means for the generation of carbon monoxide as a fumigant.
- Personal safety and animal welfare briefing conducted before use.
- Record den fumigation activities in [FoxScan](#)⁹.

GROUND SHOOTING OF FOXES

Best suited to localised fox problems such as in or near lambing paddocks, targeting problem or bait/trap shy animals and integrated with other control measures. It is time consuming, and labour intensive, so is not suitable for landscape scale control. A highly skilled shooter is required to ensure a quick and humane death. The use of thermal scopes can increase success.

- [Refer to SUPPORTING INFORMATION \(page 22\)](#).
- Read Standard Operating Procedure [FOX003](#)¹². Decision — Yes/No/Integrate with other control measures.

If shooting is to be used in your fox management plan, outline:

- Circumstances in which shooting will be applied.
- Who is responsible for managing and undertaking the shooting program?
- Availability of licenced and accredited shooters (can include professional and voluntary) with appropriate licenses, firearms and scopes, ammunition, spotlights and safety equipment.
- Locations in which shooting will take place.
- Dates when shooting takes place.
- Personal safety and animal welfare briefing conducted before use.
- Record shooting activities in [FoxScan](#)⁹.

TRAPPING

Trapping can be suitable for relatively small areas but is labour intensive and time consuming. *Only trap when you can check them within 24 hours of them being set.* It can be useful for targeting animals that do not take baits or in urban areas where other control options are limited. Needs trained experienced operators. Cage traps can be ineffective in rural and bush settings as foxes are wary of man-made structures. Leghold traps can be effective but risks to non-target animals needs to be assessed.

- [Refer to SUPPORTING INFORMATION \(page 23\)](#).
- Trapping using padded-jaw traps. Read Standard Operating Procedure [FOX005](#)¹³. Decision — Yes/No/Integrate with other control measures.
- Trapping using cage traps. Read Standard Operating Procedure [FOX006](#)¹⁴. Decision — Yes/No/Integrate with other control measures.
- Trapping using soft net traps. Read Standard Operating Procedure [GEN003](#)¹⁴. Decision — Yes/No/Integrate with other control measures.

If you plan to use trapping as part of your fox management plan, be sure to outline:

- The circumstances in which trapping will be applied.
- Who is responsible?
- Locations — use GPS, [FoxScan](#)⁹, or another appropriate tool and make sure you have permission from land owner/manager.
- Dates when trapping will be used.
- State or territory regulations on trapping checked and required permits obtained.
- Training requirements checked and undertaken if required.
- Sourcing of required traps.

- Personal safety and animal welfare briefing conducted before use. Includes euthanising methods for trapped foxes.
- Record trapping activities in [FoxScan](#)⁹.

EXCLUSION FENCING

Expensive. Usually only undertaken in high conservation areas or where subsidies have been available. Requires ongoing monitoring and maintenance to be effective. Foxes and other invasive pests still need to be removed from inside the fence.

- [Refer to SUPPORTING INFORMATION \(page 23\)](#).
- Obtain advice on fit for purpose fencing design.
- Read the [Cost Effective Feral Animal Exclusion Fencing for Areas of High Conservation Value in Australia](#)¹⁵ report along with the [catalogue of fence designs](#)¹⁶ including combined fox, feral cat and feral rabbit fences.
- Obtain fencing design and advice from exclusion fencing suppliers and/or specialist contractors.
- Consider whether exclusion fencing is a viable and feasible option.

If it is to be adopted in your fox management plan outline:

- Who is responsible for managing the fencing program?
- Location of fences.
- How negative impacts to other species affected by the fence will be reduced?
- Dates of construction.
- Methods of removing foxes and other feral predators and ensure area is fox free.
- Maintenance schedule.
- Fence monitoring.
- Data recorded in [FoxScan](#)⁹.

PROPERTY MANAGEMENT TO REDUCE FOX HABITAT

Land managers should be encouraged to remove opportunities for foxes to scavenge and aspects of the property environment that are attractive for den establishment and hiding during the day.

- [Refer to SUPPORTING INFORMATION \(page 24\)](#).

WILDLIFE HABITAT



Photo: Centre for Invasive Species Solutions

MANAGEMENT

There will be times where lethal control measures for foxes are not available or suitable. Improving habitat can increase the survival of wildlife, even in the presence of foxes, as it provides more food and shelter options. This will not remove the problem of foxes but may reduce their impacts. Habitat management options include:

- Revegetation
- Weed control
- Fire management
- Artificial habitat such as nest boxes (e.g. penguin nesting box) or floating islands.

RABBIT CONTROL

Rabbits are a major food source for foxes. When rabbit numbers are low, fox numbers are also generally low, so controlling rabbits can help control foxes. By decreasing the amount of alternative food available, rabbit control can also increase the effectiveness of fox control programs reducing the speed that fox populations can recover.

GUARDIAN ANIMALS

Guardian animals can be most useful in urban and peri-urban environments or in small, localised areas. Finding and training an appropriate animal is key — they are not a pet, but a working animal. Overall, they do not remove the problem of foxes, only move them on. It is important to thoroughly research the options to find the right species and breed for your situation. This is especially important if you are looking at a guardian dogs for wildlife as less is known about possible negative impacts of dogs on native species. For more information, read [Guardian Dogs - Best Practice Manual for the use of Livestock Guardian Dogs¹⁸](#).



Photo: Artificial penguin burrows, Gill Basnett



Photo: Rick Nash and Invasive Animals CRC

IMPLEMENT YOUR PLAN

Establish a planning calendar to ensure jobs get done at the right time. For example, do training and obtain permits before trying to get baits or start your baiting program well before lambing or target wildlife breeding seasons.

- Record:
 - What is to be done and when, across multiple control methods.
 - Where actions are to be carried out.
 - Persons or groups accountable and responsible for certain actions, coordination of effort amongst participants.
- Access the resources, equipment and materials required for the plan.
- Communicate your activities with neighbours or others involved to ensure coordination.
- Implement and record the actions.

HOW TO MONITOR RESULTS AND EVALUATE YOUR PLAN

Has the plan achieved your objectives or do changes need to be made?

It is important to monitor the progress of your fox management plan and evaluate its effectiveness against the objectives during and/or at the end of the program. Has the plan achieved your objectives or do changes need to be made?

It is recommended that [FoxScan⁹](#) be used for collecting evidence of foxes (for example, sightings, tracks and scats or stock and wildlife kills, and control activities such as baiting or trapping along with, where possible, what was caught or who took baits). This data should be recorded during

the preparation and implementation of your fox management plan. [Refer to page 25.](#)

Decide on other methods of monitoring to determine the outcome of the program on your objectives (for example, the number of lambs surviving or increase in target native species numbers). If your objectives are focused on wildlife recovery, it is strongly recommended you talk to an expert in wildlife monitoring to work out the most suitable methods for you.

Monitor regularly enough to determine whether your objectives are being met, not just at the end of the program.

Monitor the operational cost of the program.

Undertake a review of results against objectives at least annually:

- Are you meeting your objectives?
 - Effectiveness of the measures in meeting the stated objectives of the plan. Are your control measures working or do you need to change how these are applied? For example, if your baiting program is not working, do you need to change the timing, amount, area baited, or placement of your baits?
 - Appropriateness of the measures taken to achieve the objectives of the plan. Are your control measures working or do you need to change method(s) of control? For example, should your ground shooting program be complemented with the use of baits?
 - Were resources used efficiently or are there more efficient ways of using resources to meet objectives?
- Based on monitoring of results and evaluation of the plan what, if anything, needs to be changed going forward?
- [FoxScan⁹](#) is recommended for data recording during the preparation and implementation of your feral fox management plan.

SUPPORTING INFORMATION

The [Glovebox Guide for Managing Foxes](#)¹ featured on the PestSmart website is a comprehensive guide providing detailed information on fox management.

The [Model code of practice for the humane control of foxes](#)⁴ should be closely considered in addition to relevant Standard Operating Procedures for fox control methods.

National and local advice on fox management can be obtained from the Centre for Invasive Species Solutions' [National Feral Cat and Fox Management Coordinator](#)¹⁹. The Coordinator works with local, regional and state communities and stakeholders to raise awareness of feral cats and foxes to improve best practice control methods and their outcomes.

HOW TO IDENTIFY IF FOXES ARE THE PROBLEM

This first step is essential to develop an effective fox management plan. Is it only foxes causing the harm or are other predators such as feral cats, wild dogs and dingoes, or feral pigs present? Why are they having this impact?



Photo: Lamb death by fox attack, Neil Mitchell

Two ways to identify foxes as the cause are described in [Define your fox problem and assess impacts](#)²⁰ and in the Glovebox Guide:

1. Look for and identify paw prints. Paw prints may be visible in areas where there is bare soil or sand. The difference between wild dog, fox, cat and native quoll prints are shown in the reference below.

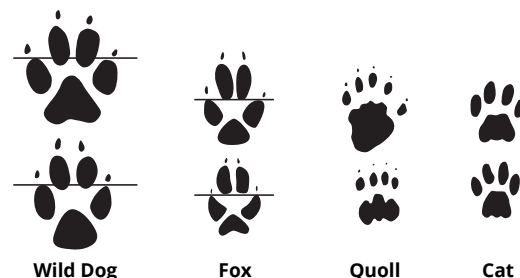


Figure 3. Dog, fox, quoll and cat paw prints (not to scale). Fox prints can be distinguished from dog prints by the separation of the pads, as demonstrated by the straight line shown. Diagram taken from 'Tracks, scats and other traces' by Barbara Triggs. 1996. Oxford University Press, Melbourne.

2. Determine the cause of death based on livestock or wildlife carcass damage as shown in [Define your fox problem and assess impacts](#)²⁰.

If foxes are identified as the problem, their impact on livestock and/or wildlife should be quantified (for example, a specific reduction in the lamb marking rate).

Other questions to address are: what is enabling foxes to cause the damage, who else in your area has a fox problem, when is it occurring and what needs to be achieved to solve it?

The impact of foxes on wildlife can also be monitored through motion sensor cameras and DNA analysis of hair and scat collections. These techniques can also help determine population densities pre and post control, dispersal distances and optimal management areas.

IDENTIFY WHO SHOULD BE INVOLVED IN YOUR PLAN

Contacting with your neighbours to see if they have a fox management plan or are undertaking any control measures can help ensure that these measures are coordinated across a wider area and therefore likely to be more effective. Or they might want to join in with your plan.

Check whether any management programs are in place at the state/territory government, local government and/or regional level. This will allow group or individual property plans to be linked to the broader plans.

Existing local biosecurity or Landcare groups, should also be contacted about their plans for fox control or other pest animal activities.

You can also set up a private group of registered FeralScan users to share information and report on fox management plans.

SETTING OBJECTIVES

Once you have established that you have a fox problem, you need to think about what you want your fox management plan to achieve.

The best objectives are clear, measurable and time bound.

Objectives should specify the outcomes sought, such as reducing the impact of foxes on livestock, native wildlife, or both. For example, highest fox impacts on livestock tend to be around lambing or kidding. So, your objective could be increase lambs at marking by 10% over 2 years. This will then determine the methods required to achieve this objective.

For wildlife conservation, the objective would need to specify the native species being protected, the increase in the population being sought, the area of habitat being protected, and the timeframe involved.

For example, an increase in the number of Plains Wander chicks surviving to fledging by 20% over 24 months.



Photo: Coordinating your management actions with others will get the best outcomes, Paul Martin

PREPARE AN INTEGRATED MANAGEMENT PLAN FOR THE CONTROL OF FOXES

Once the problem has been defined, and objectives set, a plan of action is required.

Research and long experience show that fox control requires an integrated pest management approach. This means that the best outcomes are achieved with a range of control techniques being undertaken at the same, or different times during the life of your plan compared with one technique implemented once, or continuously over a long time.

Land managers have a legislative responsibility to control pest animals and predators on their land in order to prevent impacts of those pests on neighbouring properties.

Planning is essential for dealing with fox issues. Random and one-off measures will be ineffective.

Plans can be developed by community groups or individual land managers coordinating with neighbours and broader plans.



Photo: Gill Basnett

IDENTIFY CONTROL TECHNIQUES

Select control measures that are the most humane, target specific and cost-effective available. To date, for foxes, these are baiting in combination with trapping and ground shooting although other options such as aerial shooting, exclusion fencing and habitat management are also available.

Understanding basic fox behaviour will help you decide what measures are most appropriate for control.

It is important to understand the social grouping of foxes, breeding cycles, fox territories, hunting behaviour, diet and use of the landscape to improve management success.

Foxes typically live in small family groupings, formed during the breeding season, and are very territorial marking boundaries with scents.

Fox territories range from 2 to 5 square kilometres and vary with type of habitat, population density, and availability of food. Despite this, foxes can, and do, travel long distances outside of a territory.

Females (vixens) mate once a year from mid-June to the end of July. Cubs are born in dens from early August to late September. The average sized litter is 3 to 5 cubs, although larger litters may occur when food is plentiful.

Vixens wean cubs at 5 to 8 weeks and from 8 to 10 weeks the cubs move from the den and live outside. They begin hunting for small animals at 3 months of age and become independent by January or February. Den fumigation when cubs are 4 weeks of age or more can prevent these animals learning to hunt native animals and becoming independent.

Juvenile foxes, particularly males, generally leave the natal area during Autumn when they are 6 to 9 months old. Their dispersal varies in distance depending on food availability. Young males travel 68km on average and young females 14km.

This dispersal means there is a transient population of naive young foxes during Autumn seeking territories to live and mate. This provides opportunities to target juvenile foxes as they disperse and may be less wary of human control measures. It eliminates a source of future dominant males before they breed. Whereas only eliminating existing dominant males and females may just mean subordinate foxes replace them.

Densities vary across landscapes and may range from 1 fox per square kilometre in forests, 2 to 5 per square kilometre in semi-arid habitats and 6 to 8 per square kilometre on grasslands. Higher densities occur in peri urban and urban areas that foxes inhabit.

The capacity of foxes to disperse and recolonise means long-term landscape scale programs are required to reduce and keep fox numbers below critical thresholds.

Foxes are primarily nocturnal hunters being most active from dusk to dawn. They predate a variety of birds, reptiles, medium and small mammals. They are also scavengers, consuming carrion, fallen fruit, vegetables and eggs.

Rabbits are a major food source for foxes. When rabbit numbers are reduced, fox numbers also generally decline. Therefore, controlling rabbits can help control fox numbers. Controlling foxes without also controlling rabbits can lead to an increase in rabbit numbers, which can then allow a speedier recovery of the fox population.

Foxes may travel significant distances during hunting, up to 10 to 15km in a night. During the day they rest in hides such as hollow logs, dense undergrowth and enlarged rabbit burrows.

Foxes will travel beyond their home range to congregate where seasonal food is abundant, such as lambing flocks or migratory bird breeding colonies.

Foxes also cache (bury) food for later consumption during lean times. They frequently kill more prey than they need for their immediate requirements. Caching food means foxes will take buried baits which reduces non-target species accessing these baits.

Foxes are more likely to use some areas of the environment than others, helping target baiting and trapping programs. For example, tracks and trails are commonly used as they provide the easiest path through the landscape, isolated patches of bush offer protection for foxes moving through the landscape or digging dens, water points will be a main focus in arid areas. [A Field Guide to Poison Baiting: Wild Dogs and Foxes²¹](#) provides more information on where best to place baits and can also be used for targeted trapping.

CHOOSING CONTROL METHODS

The most commonly used fox control techniques are poison baiting, den fumigation, ground shooting, trapping and exclusion fencing.

Prior to choosing control methods, the [Model code of practice for the humane control of foxes⁴](#) should be read to determine what control techniques are available to use in your local area.

The Code applies nationally. States/Territories can apply more stringent requirements and hence the Model Code should be considered along with any specific legal requirements. These may include permits needed and training and accreditation requirements to become an approved user.

Poison baiting

Poison baiting of foxes is used extensively across Australia. Foxes are scavengers and readily take meat baits, so this is the most cost-effective, broad-scale, method currently available for fox control.

Foxes are amongst the most sensitive species to the lethal effects of sodium fluoroacetate (1080) and para-aminopropiophenone (PAPP), meaning that, when done correctly, baiting can control fox numbers with minimal risk to native wildlife.

Poison baiting can be implemented more easily, and is likely to be more effective, if it is applied as a coordinated measure over large areas. At a property or smaller scale, removing individual foxes is ineffective as foxes from neighbouring areas quickly move in.

For land managers and others there are a range of manufactured, dried and fresh meat baits available including proprietary baits, lures and bait dispensers (e.g. Canid Pest Ejectors). These products are available through the rural merchant distribution network across Australia.

There are strict national and state/territory regulations and accreditation requirements associated with the use of 1080 and PAPP. Conditions of use are set down in the Australian Pesticides & Veterinary Medicines Authority (APVMA) approved label or permit.



Photo: Injecting fresh meat baits for a baiting campaign, Riccarda Brindley

Check the current rules with your state/territory government agency. Obtain baits through licensed officers or designated government agencies. There are strict guidelines on how to use and place baits. You may be required to complete specific chemical training.

The following state and territory government agencies are responsible for regulating the use of 1080:

- [Agriculture Victoria](#)
- [Australian Capital Territory Environment, Planning and Sustainable Development Directorate](#)
- [New South Wales Environment Protection Authority \(EPA\)](#)
- [Northern Territory Department of Industry, Tourism and Trade](#)
- [Queensland Health](#)
- [South Australia Department of Primary Industries and Regions](#)
- [Tasmanian Department of Natural Resources and Environment](#)
- [Western Australian Department of Primary Industries and Regional Development](#)

The options for fox baiting are above ground and buried placement or aerial dispersal.

Ground baiting involves placing either a meat bait or manufactured bait intended for foxes on or in the ground at locations where predators are likely to find them.

[A Field Guide to Poison Baiting: Wild Dogs and Foxes](#)²¹ provides detail on site selection, bait placement, monitoring and bait types.

Ground baiting of foxes with 1080.

Standard Operating Procedure [FOX001](#)⁵ provides detailed information for consideration on the benefits of, and requirements in, using this method.

Ground baiting of foxes with PAPP.

Standard Operating Procedure [FOX007](#)⁷ provides detailed information for consideration on the benefits of, and requirements in, using this method. The proprietary product is [FOXECUTE](#)²².

Aerial baiting with 1080. This is the preferred method for large, sparsely populated areas that are remotely located and inaccessible by vehicles. The relevant Standard Operating Procedure is [FOX002](#)⁶.

Baits containing PAPP are not approved for aerial application.

Baiting with Canid Pest Ejectors (CPEs) provides an alternative to traditional ground baiting with 1080, and in some States and Territories, PAPP. The components of the ejector include a stake to hold it in the ground, a piston mechanism and a capsule of 1080 or PAPP solution that sits inside a bait head encased in a lure such as dried meat to entice a feral predator, such as a wild dog or fox. When the feral predator pulls on the lure, it triggers the piston, which squirts or ejects the 1080 solution into the animal's mouth (photo top right). The benefits of using a CPE over a traditional bait are that the toxin is in a weatherproof capsule and does not break down and lose its efficacy like traditional baits; it is staked into the ground and cannot be moved; and the strength and angle required to set it off significantly reduces the chance of an animal other than a fox or dog setting it off.



Photo: Fox triggering a CPE, James Speed

Pet and working dog safety. It is important to note that 1080 and PAPP are toxic to domestic and working dogs. It is therefore important to follow strict guidelines when baiting areas where domestic dogs are likely to encounter baits: ensure sites are signposted, muzzle working dogs when using them in paddocks that have been baited, and ensure good hygiene practices when baiting to ensure none of the toxin is present when making contact with any farm or pet dog. [A Field Guide to Poison Baiting: Wild Dogs and Foxes](#)²¹ has information on working dog safety.



Photo: Greg Mifsud

Fumigation of natal fox dens using carbon monoxide. Standard Operating Procedure [FOX004](#)¹⁰. Fumigation of dens with carbon monoxide directed at cubs is a supplementary local control method used alongside baiting and shooting, particularly where vixens have been eliminated. It is also a useful measure to eliminate active dens near lambing paddocks or poultry or in areas where shooting and baiting is restricted.

Carbon monoxide is the only fumigant registered for foxes. It is a lethal gas that, with sufficiently high concentration, results in unconsciousness and rapid death. The carcasses of deceased foxes, if consumed by other scavenger species, are not toxic.

The proprietary product [DEN-CO-FUME](#)^{®11} is the only prescribed means for the generation of carbon monoxide as a fumigant.

This method should only be carried out when active dens containing young cubs older than 4 weeks of age can be located and confirmed. This will usually be around August to October and there are indicators that can be used to determine if cubs are present:

- Presence of small fox (cub) footprints in the immediate vicinity of the den and on den entrances.
- Presence of partially consumed fresh animal carcasses (for example, rabbits and birds at the den entrance).
- Strong odour, sometimes with large numbers of flies present.
- Trails and flattened vegetation characteristic of cub play areas.

Ensuring cubs are older than 4 weeks when using fumigation is because using carbon monoxide on neonatal cubs (younger than 4 weeks) is less effective as they can survive with much lower oxygen levels and is inhumane. After four weeks, cubs and vixens are also more active, making it easier to determine if a den site is being used. Use of carbon monoxide fumigation cartridges is relatively simple but has hazards that the user must consider, so it is important to read and follow the Standard Operating Procedure.

Ground shooting of foxes

Standard Operating Procedure [FOX003](#)¹². This method should be used as a supplementary local control method used alongside baiting and natal den fumigation.

Shooting is an effective and humane method of destroying foxes when it is carried out by experienced, skilled and responsible shooters. Shooters must possess suitable rifles with scopes, ammunition, spotlights and safety equipment. Refer to Standard Operating Procedure [FOX003](#)¹². Unlike coordinated baiting, shooting is not an effective control method on its own because sighting all the foxes present, or detecting them within firing range, is unlikely.

Shooting is best undertaken at night when foxes are more active.

Firearm users must strictly observe all relevant legislation and safety guidelines relating to firearm ownership, possession and use. Shooters should be familiar with the [National Firearms Safety Code](#)²³.

Animal welfare must also be considered and managed. When shooting an animal, it must be clearly visible and able to be killed with a single shot causing immediate death. Shots to the head (brain) are preferred over chest shots (heart/lung) as they are more likely to cause instant loss of consciousness. Chest shots may not render the animals instantly insensible and may result in a higher incidence of wounding. However, an accurate chest shot may be easier than a head shot. Shooting at other parts of the body is unacceptable.

If lactating vixens are shot, efforts should be made to find dependent cubs and kill them humanely by either shooting (with a single shot to the brain) or by fumigation of the den with carbon monoxide.

Trapping

Trapping of foxes may be undertaken in areas where poison baiting and shooting are dangerous such as in peri-urban and urban areas or as part of a coordinated control program. Trapping can be effective for the control of nuisance animals, but is not effective as a general fox control method.

There are a number of trapping methods:

- **Trapping using padded-jaw traps** Standard Operating Procedure [FOX005](#)¹³.
- **Trapping using soft net traps** Standard Operating Procedure [GEN003](#)¹⁵.
- **Trapping using cage traps** Standard Operating Procedure [FOX006](#)¹⁴.

All types of traps are available and can be sourced through internet searches or rural suppliers.

Trapping of animals is subject to strict regulations. Steel jaw traps (those manufactured without included padding) must not be used as they are inhumane and often illegal.

In urban and other residential areas, cage traps are preferred over leg hold traps as fewer injuries are sustained, non-target animals can be released unharmed and trapped foxes can be transported away from the area for euthanasia. Leg-hold, padded-jaw traps should only be used at sites where the animal can be killed by shooting whilst still held in the trap.



Exclusion fencing

This method is designed to minimise or eliminate fox attacks on livestock and native wildlife. Exclusion fencing is expensive in terms of materials and labour for construction and maintenance so must be carefully assessed, designed and constructed.

Fencing must also be adequately maintained and monitored to stop foxes breaching the enclosure.

Exclusion fencing is essential for free range and enclosed poultry both commercial and domestic.

It can be cost effective for lambing paddocks and conservation land managers frequently use exclusion fencing to protect native wildlife over relatively large areas.

Where more than one pest is a problem such as foxes, feral cats, wild dogs, feral pigs and rabbits then the fence design should be suitable to exclude these pests.

Foxes are excellent diggers, jumpers and climbers so the fence design must cater to overcome these capabilities.

PestSmart provides information on [Fencing for fox control — PestSmart](#)²⁴.

The [Cost effective feral animal exclusion fencing for areas of high conservation value in Australia](#)¹⁶ report of the Natural Heritage Trust provides detailed advice for land conservation managers. It includes a [catalogue of fence designs](#)¹⁷ for combined fox, feral cat and feral rabbit fences.

Some fencing contractors specialise in exclusion fencing and are a valuable source of advice on designs and costs.

Exclusion fencing can disrupt the movement of non-target native species. Ways to reduce this impact as well as how to manage potential population and genetic issues of species within the exclusion fence need to be planned for.

Fox habitat management

While the European red fox is predominantly a carnivorous predator it is also a scavenger, consuming carrion, fruits and eggs.

At the property level, removing the opportunities for foxes to scavenge is an effective measure. This includes:

- Ensuring carcasses of dead animals are buried deeply.
- Cleaning up dropped fruit.
- Not leaving waste vegetables lying in the garden, or pet food out.

In addition to removing scavenging food sources, removing aspects of the farm habitat that are attractive for den establishment and hiding during the day is a useful measure to take. This includes destroying existing or abandoned fox dens, filling in rabbit warrens, and removing woody weed infestations such as blackberry clumps. Materials such as old vehicles, building and fencing materials, etc make ideal den sites, if these can't be removed, keep an eye on them for any possible fox activity that might need to be managed.

INTEGRATED INVASIVE SPECIES MANAGEMENT

In many situations it is unlikely only one invasive animal, such as foxes, will be having impacts on agriculture and native wildlife in a region. It may be that foxes are impacting the area, along with feral cats, wild dogs, feral pigs and rabbits.

For example, an increase in rabbit populations may result in an increase in feral cat and fox populations, meaning rabbit control must be part of the solution to fox and feral cat impacts.

Similar control methods may be able to be used for several species such as 1080 baiting for foxes and wild dogs. While baiting can be used for several species, it is important to consider differences in behaviour between species such as foxes and feral cats. Foxes are far more inclined to take meat baits that are buried while cats prefer fresh kill. Species such as pigs, may eat fox baits before foxes, reducing the efficacy of your control program. Individual fox baits are not sufficiently toxic to kill a pig, so the loss of these baits to feral pigs will unfortunately not result in any benefit for feral pig management.

USE FOXSCAN TO RECORD DATA

[FoxScan](#) is a free resource for landholders, Landcare groups, community groups, local Councils, professional pest controllers and biosecurity groups.

Users can download the app on their mobile devices from [Apple App Store](#) or [Google Play](#).

When the app is opened the first time, users can register an account and login to the app.

FoxScan can be used for recording and mapping:

- Evidence of fox presence (for example, personal sightings, cameras, DNA evidence, paw prints). If it can be determined, records should include fox gender; adult, cub and juvenile; lactating vixen; GPS location (latitude and longitude); property or region and date of evidence.
- Evidence of fox activity including predation and scavenging and how this is to be gathered (for example, personal observation, cameras and DNA evidence).
- Management actions including what is being done, when, for how long and by whom. This information is not made public.
- The results of management actions.

Registered users of FoxScan are able to establish a private group, such as stakeholders involved in your Fox Management Plan, to share information and maps. This enables land managers and pest controllers to be kept informed of foxes and activities in your area.

Alerts can also be set in FoxScan so that your group and/or a pest controller gets a message when a fox is sighted in your management area.

feralSCAN 



Scan code to go to Feralscan.org.au

MONITOR AND EVALUATE YOUR MANAGEMENT PLAN

Information recorded in FoxScan and through other project monitoring, such as lamb loss rates or motion camera activity assessments, can be used to evaluate key aspects of your management plan. This should include an evaluation of the following aspects:

- The appropriateness of the measures taken to achieve the objectives of the plan.
- The effectiveness of the measures in meeting the objectives of the plan.
- Were resources used efficiently or are there more efficient ways of using resources to meet objectives?
- Are there others who should be involved in the program?



Photo: Jake Relf



Photo: Motion sensor camera used for monitoring. Paul Meek

LINKS FOR MORE INFORMATION

- ¹ Glovebox Guide for Managing Foxes (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2020/09/CISS-Glovebox-Guide-Fox-web.pdf>
- ² Connect — PestSmart <https://pestsmart.org.au/connect/>
- ³ NRM Regions Australia <https://nrmregionsaustralia.com.au/>
- ⁴ Model code of practice for the humane control of foxes — (pestsmart.org.au) <https://pestsmart.org.au/toolkit-resource/code-of-practice-fox/>
- ⁵ FOX001 - Ground baiting of foxes with sodium fluoroacetate (1080) Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2020/12/FOX001-SOP.pdf>
- ⁶ FOX002 - Aerial baiting of foxes with 1080 Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2020/12/FOX002-SOP.pdf>
- ⁷ FOX007 - Ground baiting of foxes with PAPP Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2021/02/FOX007-SOP.pdf>
- ⁸ Canid Pest Ejectors with sodium fluoroacetate (1080) — (pestsmart.org.au) <https://pestsmart.org.au/toolkit-resource/canid-pest-ejectors-with-1080/>
- ⁹ FoxScan Home (feralscan.org.au) <https://feralscan.org.au/foxscan/>
- ¹⁰ FOX004 - Fumigation of fox dens using carbon monoxide Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2021/01/FOX004-SOP.pdf>
- ¹¹ DEN-CO-FUME® Fumigation cartridges — (animalcontrol.com.au) <https://animalcontrol.com.au/products/dencofume>
- ¹² FOX003 - Ground shooting of foxes Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2021/01/FOX003-SOP.pdf>
- ¹³ FOX005 - Trapping of foxes using padded-jaw traps Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2021/01/FOX005-SOP.pdf>
- ¹⁴ FOX006 - Trapping of foxes using cage traps Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2021/02/FOX006-SOP.pdf>
- ¹⁵ GEN003 - Trapping using soft net traps Standard Operating Procedure (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2021/02/GEN003-SOP.pdf>
- ¹⁶ Cost effective feral animal exclusion fencing for areas of high conservation value in Australia ([dcceew.gov.au](https://www.dcceew.gov.au)) <https://www.dcceew.gov.au/sites/default/files/documents/fencing.pdf>
- ¹⁷ Catalogue of fencing designs ([dcceew.gov.au](https://www.dcceew.gov.au)) <https://www.dcceew.gov.au/environment/invasive-species/publications/cost-effective-feral-animal-exclusion-fencing>
- ¹⁸ Guardian Dogs Best Practice Manual for the use of Livestock Guardian Dogs. Linda von Bommel. <https://pestsmart.org.au/wp-content/uploads/sites/3/2020/06/Guardian-Dogs-web.pdf>
- ¹⁹ National Feral Cat and Fox Management Coordinator (feralscan.org.au) <https://www.feralscan.org.au/foxscan/pagecontent.aspx?page=foxes-nationalcoordination>
- ²⁰ Define your fox problem and assess impacts — (pestsmart.org.au) <https://pestsmart.org.au/toolkit-resource/define-fox-problem/>
- ²¹ A field guide to poison baiting: Wild dogs and foxes (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2021/09/CISS-Glovebox-Guide-Wilddog-baiting-web.pdf>
- ²² ACTA Foxecute booklet (pestsmart.org.au) <https://pestsmart.org.au/wp-content/uploads/sites/3/2020/06/ACTAFoxecuteBooklet2016.pdf>
- ²³ National Firearms Safety Code (nt.gov.au) https://pfes.nt.gov.au/sites/default/files/uploads/files/2019/National_Firearms_Safety_Code_1.pdf
- ²⁴ Fencing for fox control — (pestsmart.org.au) <https://pestsmart.org.au/toolkit-resource/fencing-for-fox-control/>



Photo: Casey McCallum. Fox numbers can be high where food availability is high. Removing animal carcasses from paddocks and covering/fencing carcass pits can help reduce fox numbers on your property.

