

NATIONAL CODE OF PRACTICE FOR THE EFFECTIVE AND HUMANE MANAGEMENT OF FERAL AND WILD DEER

Endorsed by the Environment and Invasives Committee 31 January 2023

Reference as:

Terrestrial Vertebrate Working Group. 2023. National Code of Practice for the Effective and Humane Management of Feral and Wild Deer. Australia.

Available for download at pestsmart.org.au/toolkits/feral-deer/

Associated documents (referred to as associated SOPs) relating to the National Code of Practice for the Effective and Humane Management of Feral and Wild Deer include:

- National Standard Operating Procedure: Aerial Shooting for Feral and Wild Deer
- National Standard Operating Procedure: Ground Shooting for Feral and Wild Deer
- National Standard Operating Procedure: Trapping for Feral and Wild Deer

This document outlines best practice guidelines for the effective and humane management of feral and wild deer in Australia.

The Code of Practice (COP) outlines humane control strategies and their implementation while standard operating procedures (SOPs) describe control techniques, their application, and strategies to minimise any harmful impacts.

The national COP and SOPs comprise model guidelines that set minimum animal welfare standards. They do not override COPs and SOPs in jurisdictions where these documents have been developed, prior to or after the endorsement of these documents, to address specific management issues or to comply with relevant legislation. For example, the national-level COP and SOP for the management of feral and wild deer are not relevant in New South Wales, which currently has both state-level COP and SOPs in place (Sharp *et al.* 2022).

This COP along with associated SOPs will be reviewed by the Terrestrial Vertebrate Working Group (TVWG) within 12 months of when they were endorsed, to manage any potential risks to operations throughout the country.

Jurisdictions conducting operations for feral and wild deer control are encouraged to submit reports to the TVWG secretariat for discussion at either the 12 monthly review, or sooner if there are urgent matters that need to be raised. The reports should include:

- whether the national COP and SOPs were implemented in their jurisdiction
- whether the national COP and SOPs were effective
- apparent mistakes or oversights in the national COP and SOPs
- unintended consequences or adverse events that occurred when implementing the national COP and SOPs
- new techniques or modifications to existing techniques as a result of research or registration

These reports will form the basis of reviews by the TVWG.

This revision of the COP for feral deer management builds on the extensive work conducted by NSW over several years (see Sharp et al. 2022), which provided the springboard for expansion to a national approach. Guidance, input and reviews were provided by the multi-jurisdictional membership of the TVWG. Consultation and input were also provided by the RSPCA, veterinary experts, contractors, and operational and policy government staff.

This document has been endorsed by the Environment and Invasives Committee.

Definitions and terms

Best practice management – 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 principles and techniques based on both scientific information and experience (e.g. Braysher 2017).

Euthanasia – meaning ‘good death’ when used in pest animal control terms; it refers to how the animal is killed rather than the reason for killing it (Morton 2010; American Veterinary Medical Association 2020).

Humane – The ‘humaneness’ of a pest animal control method refers to the overall welfare impact that the method has on an individual animal. A relatively more humane method will have less impact than a relatively less humane method (see PestSmart 2021).

Pest animal – native or introduced, wild or feral, non-human species of animal that is 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.

Welfare – the physical and emotional state of an animal; pain and suffering are important aspects of poor welfare outcomes; assessing welfare of animals will consider their nutritional, environmental, health, behavioural, and mental needs (e.g., Broom 1999; Littin *et al.* 2004).

CONTENTS

Preface	8
Introduction	9
Best practice in pest animal management	9
Animal welfare and humaneness	10
Management of feral deer.....	11
Background	11
Primary and supplementary control techniques	11
Humaneness of control techniques.....	11
Trapping	13
Exclusion fencing	13
Lethal baiting	14
Summary.....	15
Relevant legislation.....	16
References	21

PREFACE

The Code of Practice (COP) provides information and guidance to government agencies, land managers, and pest animal controllers who are managing feral and wild deer (hereafter ‘feral deer’) in Australia. The aim is for pest control programs to be conducted in a way that reduces feral deer impacts using the most humane, target-specific, and effective means as practicable.

Previously published COP and associated SOPs for feral deer management are available via the PestSmart website (<https://www.pestsmart.org.au/>). This revision of the COP for feral deer management builds on the extensive work conducted by NSW over several years (see Sharp *et al.* 2022), which provided the springboard for expansion to a national approach. This national COP and associated SOPs provide the most relevant and up-to-date information to support best practice approach to feral deer management for all regions.

This COP and associated SOPs also cover the activities of recreational or sporting shooters in some jurisdictions, but not in others, as specified by jurisdictional legislation. This COP also recognises that differences exist among jurisdictions in their approaches to managing feral deer. For example, access to suppressors for firearms varies among jurisdictions. Variations and modifications to pest control techniques among jurisdictions will be reflected in jurisdiction-specific COP and SOPs, which take precedence over the national versions.

INTRODUCTION

Pest animal management activities aim to minimise animal suffering while optimising the population impact of a pest control program. Minimising animal suffering is a priority regardless of the status given to a particular pest species or the extent of the damage or impact they create.

A **Code of Practice (COP)** provides overarching context for the management of feral and wild deer in Australia. The COP encompasses 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 pest control technique, and how to effectively implement management programs. This COP provides guidelines for feral deer management and is based on current knowledge and experience of feral deer control programs. Importantly, it includes information on relatively new control methods, based on current knowledge.

The **Standard Operating Procedures (SOPs)** associated with this COP will provide procedural details for pest animal control and ensures a humane approach (including the recognition of, and attention to, the welfare of animals directly or indirectly affected by pest control programs) is applied. SOPs are written for each pest control technique in a way that describes the procedures involved for specific control methods, as applied to a nominated pest animal species, and the relevant animal welfare issues. They provide a guide to support and improve pest control programs.

BEST PRACTICE IN PEST ANIMAL MANAGEMENT

From an animal welfare and management perspective it is desirable that pest control programs are efficient, effective, and coordinated. These attributes are required to reduce or eradicate pest populations and avoid the need for repeated large-scale killing for pest control. The approach to managing pest animals continues to evolve as lessons are learned and new tools and information become available. The emerging best-practice approach aims to reduce or eradicate pests based on measurable economic and environmental cues.

Pest animal control is one aspect of an integrated approach to the management of production and natural resource systems; management of other factors may be required to achieve a desired result. For example, lamb production may be affected by weed control and nutrition in addition to predators. When planning pest animal management, important steps to consider include identifying:

1. triggers for undertaking pest animal management. Are there community or political pressures to act or not act on pests, an expectation that pest animals should or should not be controlled? Pest control is unlikely to be effective unless strong local or broader will exists for action, including committing the necessary resources
2. the lead agency to take responsibility for bringing together and engaging with all stakeholders including other relevant government departments, animal welfare regulators, relevant community groups, landholders, shooting associations
3. the problem. Pest management is complex and understanding the nature of the problem is important for planning purposes. For example, the problem could be impacts on native plants or animals, agricultural productivity, or aesthetic impacts (e.g., landscaping). Many factors, in addition to pest control, will intersect with the problem
4. the area of concern. It can help to remove agency and property boundaries (nil tenure) so that the problem is viewed at the landscape-level, rather than at the level of individuals, groups, or agencies. Landscape-scale assessment is also required because pest animals move large distances and can cross jurisdictions. Property and agency boundaries can be addressed when agreement is reached on the approach

5. management units for planning and prioritising efforts. Units will be determined by water bodies, mountain ranges, fences, habitat preferences, vegetation, resources, urban density, and other landscape features. While it is preferable to work in units that will restrict the movement of pests, it may not be practicable

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-target animals), or indirectly (e.g., prey species of pest carcasses) by a pest control program. Managers should make themselves aware of such information (see [references](#) at the end of this document for recommended reading). Pest animal control programs are usually not implemented until the impacts of the pest animal are no longer tolerated. However, pest animal control programs that are implemented prior to this point, when the population of the target pest are low, have a greater opportunity to be successful in eradication from that area. Proactively targeting pests with low population densities also reduces the overall number of animals controlled, compared to reactive controls, which is an important animal welfare consideration.

ANIMAL WELFARE AND HUMANENESS

The humaneness of a pest control technique is influenced by the experience and skills of the pest controller. Attention to detail is necessary for delivering effective programs with humane outcomes. Details should be followed for the timing and coordination of the pest control, bait delivery methods, lethal dose rates, and type or calibre of firearm and ammunition used in pest control programs. This COP and the associated SOPs provide a guide to the application of pest control methods, which will minimise and prevent the risk of negative welfare impacts for target and non-target animals.

Sharp and Saunders (2008; 2011) and PestSmart ([2021](#)) provide resources for assessing the relative humaneness of each pest animal control method. The assessment can be applied to any pest control technique. A 'humaneness assessment' can also be conducted to evaluate the impact of a pest control technique on individual animals; the humaneness assessment is based on:

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. Psychological – 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 factors

Compromise in one or all the physical indicators (i.e., nutrition, environment, health, behaviour) is used to infer potential negative psychological impacts. The assessment can be applied to different methods and the outcomes used to inform management.

Another important animal welfare consideration when conducting pest control programs is to target the pest populations when they are small. This approach will reduce the overall number of animals destroyed in the pest control, compared to enacting programs only after the impacts become problematic. Most people consider the management of pest animals to be acceptable if the activities are humane and justified (e.g., Mellor & Littin 2004). Pest controllers also need to continuously improve their approach to pest control, including trialling and updating techniques with new, increasingly humane, and cost-effective approaches as they emerge.

MANAGEMENT OF FERAL DEER

Background

Australia has wild populations of six deer species: fallow deer (*Dama dama*); red deer (*Cervus elaphus*); sambar deer (*C. unicolor*); rusa deer (*C. timorensis*); chital deer (*Axis axis*); hog deer (*A. porcinus*). These species differ in their habitat preferences, reproductive biology, population growth rates, group size, and movements (Forsyth *et al.* 2017). Different species, and assemblages of species, occur among the states and territories. Evidence of population growth exists for multiple species in many regions; for example, increases in distribution and abundance are reported for NSW, QLD, VIC, TAS, and SA. It is estimated that feral deer populations in Australia increased from a total of 200,000 in 2000 to 2 million in 2021.

Impacts from feral deer include damage to native plants, competition with native animals, economic losses to primary industries (crops, pastures, horticulture, plantations), and human safety risks from vehicle collisions. Further, feral deer are potential reservoirs and vectors of exotic animal diseases, such as foot-and-mouth disease.

Further information:

- PestSmart: <https://pestsmart.org.au/resources/>
- Invasive Species Council: <https://invasives.org.au/our-work/feral-animals/feral-deer/>

Primary and supplementary control techniques

Primary techniques are those used to achieve rapid population knockdowns over large areas in a cost-effective manner. Supplementary techniques help to suppress the population in the longer term.

Aerial shooting of feral deer is a primary technique as it removes many animals quickly over large areas. Ground shooting of feral deer can also be a primary control technique when it is conducted as part of a coordinated and intensive program. Supplementary techniques include trapping and opportunistic shooting.

Spatial scale is important and will influence pest control planning and technique selection. To achieve cost efficiencies the area of pest control will usually comprise many adjoining land managers. This network is particularly important for highly mobile pests, such as feral deer.

Poorly executed pest control programs can become on-going operations that are ineffective, do little to achieve long-term beneficial outcomes, and require more animals to be killed. Common reasons for poorly executed programs include an insufficient intensity of the pest control activities using primary techniques and programs being conducted on small spatial scales of controls, leaving safe havens from which pests can breed and reinvade the control zones.

A rotation of primary and supplementary techniques may also be important. Pest animals can become familiar with particular technique (e.g., spotlight aversion), which may require use of another method (e.g., aerial shooting). Another factor to consider is the timing of pest controls; operations should exploit biological weaknesses of pest animals (e.g., a period of food and water stress, or before young are born to remove a generation). Controls may also align with the need for primary production assets to be protected when it is most vulnerable (e.g. targeting controls to minimise impacts at harvest time).

Humaneness of control techniques

Shooting

Ground shooting

Shooting is a humane pest control method when it is carried out by competent and responsible shooters. The correct combination of firearm, ammunition, and shot placement are necessary. The target animal must be within range and seen clearly – thermal and night-vision scopes can improve visibility. Wounded animals must be promptly located and euthanised. Head shots are preferred for shot placement, when conditions allow (e.g., stillness of target; DeNicola *et al.* 2019).

Dependent young should be euthanised quickly if the mother is shot. To avoid poor welfare outcomes, the intensity of shooting programs may increase before fawns are born or occur after they are weaned. This approach is not possible in all cases, particularly for species of deer without synchronised, seasonal breeding.

Rifles are the most common firearm used in ground shooting because they allow for an accurate shot over a greater distance compared to other firearm types. However, shotguns are also used in some circumstances (e.g., for feral deer caught in a trap).

In urban and peri urban areas, tranquilising darts with satellite tracking capacity can be used to sedate and locate the animal for effective removal. Sedation must only be used under the guidance of veterinarian. Hampton *et al.* (2019) has conducted a review of chemical restraints and dosage amounts for deer species in Australia. When a feral deer is anaesthetised, a captive bolt may be used in urban areas where firearm restrictions apply. Carcasses of feral deer tranquilised prior to being shot are disposed of, through burial or incineration, to eliminate the risk of secondary impacts to non-target animals.

Aerial shooting

All aerial shooting programs must adhere to jurisdictional requirements, including agency SOPs and the requirements of the Civil Aviation Safety Authority (CASA 2020). Pilots and shooters undertaking aerial programs must be assessed as competent by an appropriate accreditation process relevant to the jurisdiction.

Aerial shooting of feral deer from a helicopter is a humane pest control method when:

- it is conducted by highly skilled and experienced shooters and pilots for the aerial shooting operation being undertaken
- pursuit times are minimised
- the correct firearm, ammunition, and shot placement are used
- wounded animals are promptly located and euthanised
- correct procedures are applied such as implementing a ‘flyback’ to confirm kill
- a minimum 2 shots per animal policy with the aim of ensuring a quick death

Aerial shooting programs allow for the delivery of multiple shots in quick succession to ensure a rapid death. Hampton *et al.* (2021) found that operations that mandate multiple shots per target, as well as fly-back procedures, will maximise welfare outcomes. Shots to the head can be difficult and so chest shots are typically used as well. Head shots may be taken when conditions are ideal. Aiming for other parts of the body must not be undertaken.

Rifles and shotguns are both used in aerial shooting operations, for feral deer, in Australia (PIRSA 2022; Hampton *et al.* 2021) and New Zealand (Forsyth *et al.* 2013). Both types of firearms bring different capabilities to an aerial shooting operation. Recent experience in aerial shooting programs, for feral deer, indicates that the ability to safely carry a rifle and a shotgun, allowing the shooter(s) to change guns based on the terrain and conditions, can be beneficial (PIRSA 2022).

Aerial shooting programs can use thermal equipment to enhance the detectability of feral deer and reduce risks to non-target animals (Cox *et al.* in preparation). Thermal equipment also improves the visibility of shot

deer, including under vegetated canopies, enabling delivery of rapid follow-up shots as part of a minimum two shot policy and fly back procedures. The use of thermal equipment also provides immediate and detailed motion and heat signals to confirm death. Thermal equipment can be used by the shooter and/or a dedicated thermal operator.

A minimum of two shots per animal, one being a chest (heart-lung) shot, is required for aerial shooting programs. In some programs, two people are required to verbally confirm the death of each animal before moving to the next target. A confirmation of death is based on seeing no visible signs of life, such as attempting to lift head, any coordinated body movement, and eye blinking or breathing.

Trapping

Traps can be important for controlling deer in urban areas, where firearms may not be permitted or safe, and in rural areas. Clover traps can be used for trapping individual feral deer, and larger traps (corral and paddock) can be used for trapping groups of deer. Deer caught in a trap may injure themselves if they make frantic attempts to escape. Non-target animals that are caught in traps can be released unharmed; however, some animals, such as kangaroos, may suffer from capture myopathy.

Clover traps are small (around 2 m × 1 m and 1.5 m in height) and are constructed with a metal or wooden box frame with nylon netting sides and a door that slides closed when triggered. Corral and paddock traps are large (area of 0.04-4.00 ha or 400-40,000 m²) and can be permanent or portable with hessian or shade cloth sides. The door is triggered either by remote device or trip wire; a one-way entrance can also be used. Drop net traps comprise a large square of nylon netting (about 10 cm mesh) suspended on poles by pulleys, which release the net when triggered.

Trapped animals can suffer from exposure, thirst, starvation, shock, capture myopathy, and predation; to avoid these impacts, traps should be protected from weather and inspected daily. Trapped animals must have access to water and feed when in corral and paddock traps for more than 24 hours. Traps should be established away from the view of people to prevent deer being spooked from people and their pets (e.g. dogs) that may approach the trap. Trapped animals should be approached quietly to minimise panic, stress, and risk of injury. Trapped deer should be culled as quickly and humanely as possible with a shot to the brain from a suitable firearm or by a captive bolt if firearm restrictions apply. If there are multiple animals in a trap tranquilising darts can be used to sedate the animals prior to culling under the direction of a veterinarian. Other options to reduce stress, if multiple animals are within a trap can be found in the associated SOP. If lactating females are caught in a trap dependent fawns should be killed quickly and humanely. Non-target animals should be released at the trap site unless they are injured, in which case veterinary treatment may be required. Severely injured non-target animals should be destroyed quickly and humanely.

The animal welfare outcomes of trapped deer are still poorly understood; ongoing reporting and review is required to continue to hone a best-practice approach (e.g. Hampton *et al.* 2019).

Exclusion fencing

Exclusion fencing is typically a humane, non-lethal alternative to lethal pest control. The high costs of establishing and maintaining deer-proof fences limits this technique to areas that have a significant and persistent deer problem or for the protection of small, valuable conservation or primary production assets. Exclusion fencing is an effective barrier to deer, but it can impact non-target animals by altering movement and foraging patterns and causing entanglement and electrocution. It can also create a hazard to native animals in the event of a bushfire (e.g., Long & Robley 2004).

Lethal baiting

In some jurisdictions, pesticide control trials for feral deer are underway. Pesticides are currently only approved for use on feral deer under Minor Use and Research Permits from the Australian Pesticides and Veterinary Medicines Authority. Research in New Zealand and Australia has identified several potential pesticides, which may have future application for feral deer management. Prior to any widespread baiting, pesticides will be required to be both target specific and produce consistent and humane results.

Summary

The key attributes of each pest control technique are summarised in Table 1.

Table 1 Humaneness, efficacy, cost-effectiveness, and target specificity of pest control methods (Sharp *et al.* 2022)

Method	Humaneness ¹	Efficacy	Cost-effectiveness	Specificity	Comments
Aerial shooting <i>Primary</i>	Acceptable Score: 4C (chest)	Effective	Cost-effective. More cost-effective if deer density is high	Target specific	Suitable over large spatial scales and in inaccessible country. Most effective way of achieving quick, large-scale shooting
Ground shooting <i>Primary</i>	Acceptable Score: 3A (head), 3D (chest)	Effective in low density areas	Cost-effective at low densities	Target specific	Differences in the behaviour of deer species makes some difficult to locate and shoot. Only suitable over small spatial scales
Exclusion fencing <i>Supplementary</i>	Acceptable Score: N/A	Limited	Expensive	Target specific in certain situations	Useful for protection of threatened species or high value crops. Expensive over large spatial scales
Trapping (clover traps) <i>Supplementary</i>	Acceptable Score: N/A	Not effective	Not cost-effective	May catch non-target animals	Variations in trap suitability between species. Not practical over large spatial scales. Can be used to remove problem animals
Trapping (corral and paddock traps) <i>Supplementary</i>	Acceptable Score: N/A	Effective in some situations	Cost-effective in some situations	May catch non-target animals	Variations in trap suitability between species. Can be used to remove large groups of animals

¹ Assessments conducted using a model to assess the relative humaneness of pest animal control methods (Sharp and Saunders 2011). 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: [Feral / wild deer control methods humaneness matrix - PestSmart](#)

Lethal baiting <i>Not available</i>	Unknown, in trials Score: N/A	Unknown	Unknown	Depends on toxin and delivery method	No pesticides are registered for use
--	----------------------------------	---------	---------	--	--------------------------------------

RELEVANT LEGISLATION

Vertebrate pest controllers should familiarise themselves with relevant Commonwealth, state, or territory legislation (Table 2).

Table 2 The most relevant legislation for each jurisdiction and strategic plans for the management of feral deer.

Legislation	Intent relating to feral deer
Commonwealth	
<i>Environmental Protection and Biodiversity Conservation Act 1999</i>	Deer are included under the EPBC Act-listed Key Threatening Process (KTP) 'novel biota and their impacts on biodiversity' due to competition, herbivory and habitat degradation impacts. A process is considered a KTP, and eligible for listing under the EPBC Act, if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community https://www.environment.gov.au/biodiversity/threatened/key-threatening-processes/novel-biota-impact-on-biodiversity
South Australia	
<i>Landscape South Australia Act 2019</i> <i>Landscape South Australia Regulations 2020</i>	Declarations and control notices (under regulations) and the Declared Animal Policy – Feral deer (2021) for feral deer specify it is an offence to release deer into the wild; fencing and tagging standards are required for keeping of domestic deer; and land managers are required to destroy all feral deer on their land https://www.pir.sa.gov.au/biosecurity/weeds_and_pest_animals/animal_pests_in_south_australia/established_pest_animals/feral_deer
<i>Animal Welfare Act 1985</i> <i>Animal Welfare Regulations 2012</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way

New South Wales	
<i>NSW Biosecurity Act 2016</i> <i>Biosecurity Regulation 2017</i>	Invasive species management is a shared responsibility for all community members. For feral deer, landowners (both private and public) are required to control feral deer to the extent necessary to minimise the risk of any negative impacts on their lands or that of their neighbours. Priority areas to reduce the impacts of feral deer are guided by the NSW Biosecurity Strategy 2013-2021 https://www.dpi.nsw.gov.au/biosecurity/managing-biosecurity/nsw-biosecurity-strategy-2021 and regional strategic pest animal management https://www.ils.nsw.gov.au/help-and-advice/pests,-weeds-and-diseases/pest-control/pest-species-control/wild-deer
<i>Game and Feral Animal Control Act 2002</i>	On specified public lands, deer may be hunted under a licence and with written permission issued by Department of Primary Industries NSW (via online booking system) Private land hunters, with permission to hunt from a landholder or occupier, do not require a game hunting licence, but do need a firearm licence (where firearms are used)
<i>Threatened Species Conservation Act 1995</i>	Feral deer (all species) are listed as a Key Threatening Process for herbivory and environmental degradation
<i>Prevention of Cruelty to Animals Act 1979</i> <i>Prevention of Cruelty to Animals Regulation 2012</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way
Western Australia	
<i>Biosecurity and Agriculture Management Act 2007</i> <i>Biosecurity and Agriculture Management Regulations 2013</i> <i>Biosecurity and Agriculture Management (Identification and Movement of Stock and Apiaries) Regulations 2013</i>	All deer species are declared pests in WA. While fallow and red deer (including wapiti and elk) may be kept under a permit, all other species of deer are prohibited organisms. Fallow and red deer are assigned a Control Category of C3 - Management, requiring landholders control them on their property to alleviate their harmful impacts. It is an offence to release deer into the wild; fencing and identification standards are required to be met for keeping of deer. Land managers are required to recover escaped deer
<i>Animal Welfare Act 2002</i> <i>Animal Welfare (General) Regulations 2003</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way

Victoria	
<i>Flora and Fauna Guarantee Act 1988</i>	Sambar deer are listed as a Potentially Threatening Process for the reduction in biodiversity and survival of native plant taxa and ecological communities
<i>Wildlife Act 1975</i>	Hog, red, sambar, fallow, rusa, chital, sika and wapiti deer are defined as protected wildlife. Six species (hog, red, sambar, fallow, rusa, chital) are also declared game species for the purpose of the <i>Wildlife (Game) Regulations 2012</i> . Deer (excluding hog deer) demonstrably causing damage on private property are subject to an 'unprotection order' and can be destroyed without a licence or permit in accordance with specified conditions. Similarly, an authorisation order under the Wildlife Act enables public land managers, police officers and veterinarians to control deer when causing damage on public land in certain circumstances and in accordance with specified conditions. All other deer control activities not authorised under the 'unprotection order' and public land authorisation order require an Authority to Control Wildlife Permit.
<i>Wildlife (Game) Regulations 2012</i>	Deer declared to be game can be hunted under a licence where harvest method is specified (e.g. firearms, hounds). Year-long hunting season and unrestricted bag limit for all game deer species, except hog deer (one month season, limit of one male and one female). Other restrictions may apply on public land
<i>Catchment and Land Protection Act 1994</i>	All deer except chital, hog, red, wapiti, sika, sika-red deer hybrids, fallow, rusa and sambar, are listed as prohibited pest animals.
<i>National Parks Act 1975</i>	Exotic animals (including deer) in National and State parks, Wilderness Parks, and other reserves, must be exterminated or controlled
<i>Prevention of Cruelty to Animals Act 1986</i> <i>Prevention of Cruelty to Animals Regulations 2019</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way

Queensland	
<i>Biosecurity Act 2014</i>	Unless kept in a deer-proof enclosure, chital, fallow, red, rusa and hog deer are restricted invasive animals and are subject to control. They must not be, moved, fed, given away, sold, or released into the environment. All other deer species are prohibited matter subject to an eradication program if they are considered a significant biosecurity threat. It is an offence to deal with prohibited matter or fail to report its presence. Prohibited matter permits are available for a limited number of purposes. This Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control (a general biosecurity obligation)
<i>Animal Care and Protection Act 2001</i> <i>Animal Care and Protection Regulation 2012</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way
<i>Nature Conservation Act 1992</i>	Applies (primarily) to National Parks, and also other classes of protected areas. National Parks are to be managed “to provide, to the greatest possible extent, for the permanent preservation of the area’s natural condition and the protection of the area’s cultural resources and values” including the management of non-native species. Activities related to the management of non-native species, including deer, must have written approval of the Chief Executive.
<i>Forestry Act 1959</i>	Applies (primarily) to State forests, and also other classes of protected forest areas. State forests are to be managed for “the permanent reservation of such areas for the purpose of producing timber and associated products in perpetuity and of protecting a watershed therein” including the management of pest species. Activities related to the management of pest species, including deer, must have written approval of the Chief Executive.
Australian Capital Territory	
<i>Pest Plants and Animals Act 2005</i>	<i>Cervus, Dama, Axis</i> and <i>Rusa</i> deer are listed as pests on the Pest Plants and Animals (Pest Animals) Declaration 2005 list No obligations exist for land managers to undertake control programs for feral deer
<i>Nature Conservation Act 2014</i>	No deer species can be kept as livestock without a licence
<i>Animal Welfare Act 1992</i> <i>Animal Welfare Regulations 2001</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way

Tasmania	
<i>Vermin Control Act 2000</i>	A Wild Fallow Deer Management Plan for Tasmania highlights a need to minimise impacts of deer in areas with significant natural values and in peri-urban areas, as well as manage impacts of deer where distributions are growing. https://dpiwve.tas.gov.au/agriculture/game-services-tasmania/wild-fallow-deer-management-plan
<i>Nature Conservation Act 2002</i>	Feral deer are classified as Wildlife under the <i>Nature Conservation Act 2002</i> and partly protected wildlife under the <i>Wildlife (General) Regulations 2010</i>
<i>Wildlife (General) Regulations 2010</i>	Fallow deer may be hunted under a licence in specified autumn hunting season (1-month antlered males, 2-month antlerless deer). Each hunter has a bag limit of 1 male and 1 antlerless deer or 2 antlerless deer. First-year males are protected and cannot be taken. Only rifle hunting is permitted. A Crop Protection Permit (CPP) is required for controlling problem deer (any sex/age) on private land where commercial crops are produced. CPP for adult male deer require a site visit by the State Department to assess damage. CPP generally not issued for antlerless deer between November to March when females are pregnant or have dependent young
<i>Animal Welfare Act 1993</i> <i>Animal Welfare (General) Regulations 2013</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way
Northern Territory	
<i>Territory Parks and Wildlife Conservation Act 2006</i>	Feral deer are classified as a pest (feral – prohibited entrant)
<i>Animal Welfare Act 1999</i> <i>Animal Protection Act 2018</i> <i>Animal Welfare Regulations 2000</i>	Prohibits cruelty to all animals; ensures animals are controlled in a humane way

REFERENCES

- American Veterinary Medical Association (2020). AVMA Guidelines for the euthanasia of animals. AVMA, available: <https://www.avma.org/sites/default/files/2020-01/2020-Euthanasia-Final-1-17-20.pdf>
- Braysher, M. (2017). *Managing Australia's Pest Animals: A Guide to Strategic Planning and Effective Management*. CSIRO Publishing, Melbourne.
- Broom, D. (1999). The welfare of vertebrate pests in relation to their management. Pp 309-329, in P Cowan and C Feare (eds.) *Advances in Vertebrate Pest Management*. Filander Verlag, Fürth.
- CASA (2020). Part 138 (Aerial Work Operations) Manual of Standards 2020. Australian Government, Canberra.
- Cox, T., Matthews, R., Paine, D., O'Dwyer-Hall, E., Blumson, T., Florence, B., Fielder, K., Tarran, M., Korcz, M., Wiebkin, A., Hamnett, P.W., Bradshaw, C.J., Page, B. (2022). Thermal-assisted aerial culling (TAAC) for the improved control of vertebrate pest animal populations. Unpublished.
- DeNicola, A.J., Miller, D.S., DeNicola, V.L., Meyer, R.E., Gambino, J.M. (2019). Assessment of humaneness using gunshot targeting the brain and cervical spine for cervid depopulation under field conditions. *PLoS One*, **14**: e0213200.
- Forsyth D.M., Ramsey D.S. L., Veltman C.J., Allen R.B., Allen W.J., Barker R.J., Jacobson C.L., Nicol S.J., Richardson S.J., Todd C.R. (2013) When deer must die: large uncertainty surrounds changes in deer abundance achieved by helicopter- and ground-based hunting in New Zealand forests. *Wildlife Research* **40**: 447-458
- Forsyth, D., Pople, T., Page, B., Moriarty, A., Ramsey, D., Parkes, J., Wiebkin, A., Lane, C. (2017). National Wild Deer Management Workshop Proceedings, Adelaide. Invasive Animals CRC, Canberra.
- Hampton J.O., Bengsen A.J., Pople A., Brennan M., Leeson M., Forsyth D.M. (2021) Animal welfare outcomes of helicopter-based shooting of deer in Australia. *Wildlife Research* **49**, 264-273.
- Hampton, J.O., Finch, N.A., Watter, K., Amos, M., Pople, T., Moriarty, A., Jacotine, A., Panther, D., McGhie, C., Davies, C., Mitchell, J., Forsyth, D.M. (2019). A review of methods used to capture and restrain introduced wild deer in Australia. *Australian Mammalogy*, **41**.
- Littin, K., Mellor, D., Warburton, B., Eason, C. (2004). Animal welfare and ethical issues relevant to the humane control of vertebrate pests. *New Zealand Veterinary Journal*, **52**: 1-10.
- Long, K., Robley, A. (2004). Cost effective feral animal exclusion fencing for areas of high conservation value in Australia. Department of the Environment and Heritage, Australian Government, Canberra.
- Mellor, D., Littin, K. (2004). Using science to support ethical decisions promoting humane livestock slaughter and vertebrate pest control. *Animal Welfare*, **13**: 127-132.
- Morton, D.B. (2010). Euthanasia. In *The encyclopedia of applied animal behaviour and welfare*. DS Mills and JN Marchant-Forde (eds.). CABI, Wallingford, UK.
- PestSmart (2021). Feral/wild deer control methods humaneness matrix. Centre for Invasive Species Solution. Available: <https://pestsmart.org.au/toolkit-resource/feral-deer-control-methods-humaneness-matrix/>
- PIRSA (2022). Trialling the use of a shotgun to cull feral deer from a helicopter. PIRSA (Department of Primary Industries and Regions), Government of South Australia, Adelaide.

- Sharp, T., Saunders, G. (2008). A model for assessing the relative humaneness of pest animal control methods. Department of Agriculture, Fisheries and Forestry, Canberra.
- Sharp, T., Saunders, G. (2011). A model for assessing the relative humaneness of pest animal control methods. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.
- Sharp, T.M., Cope, H., Saunders, G. (2022). New South Wales Code of Practice and Standard Operating Procedures for the Effective and Humane Management of Feral Deer. NSW Department of Primary Industries, Orange, NSW.