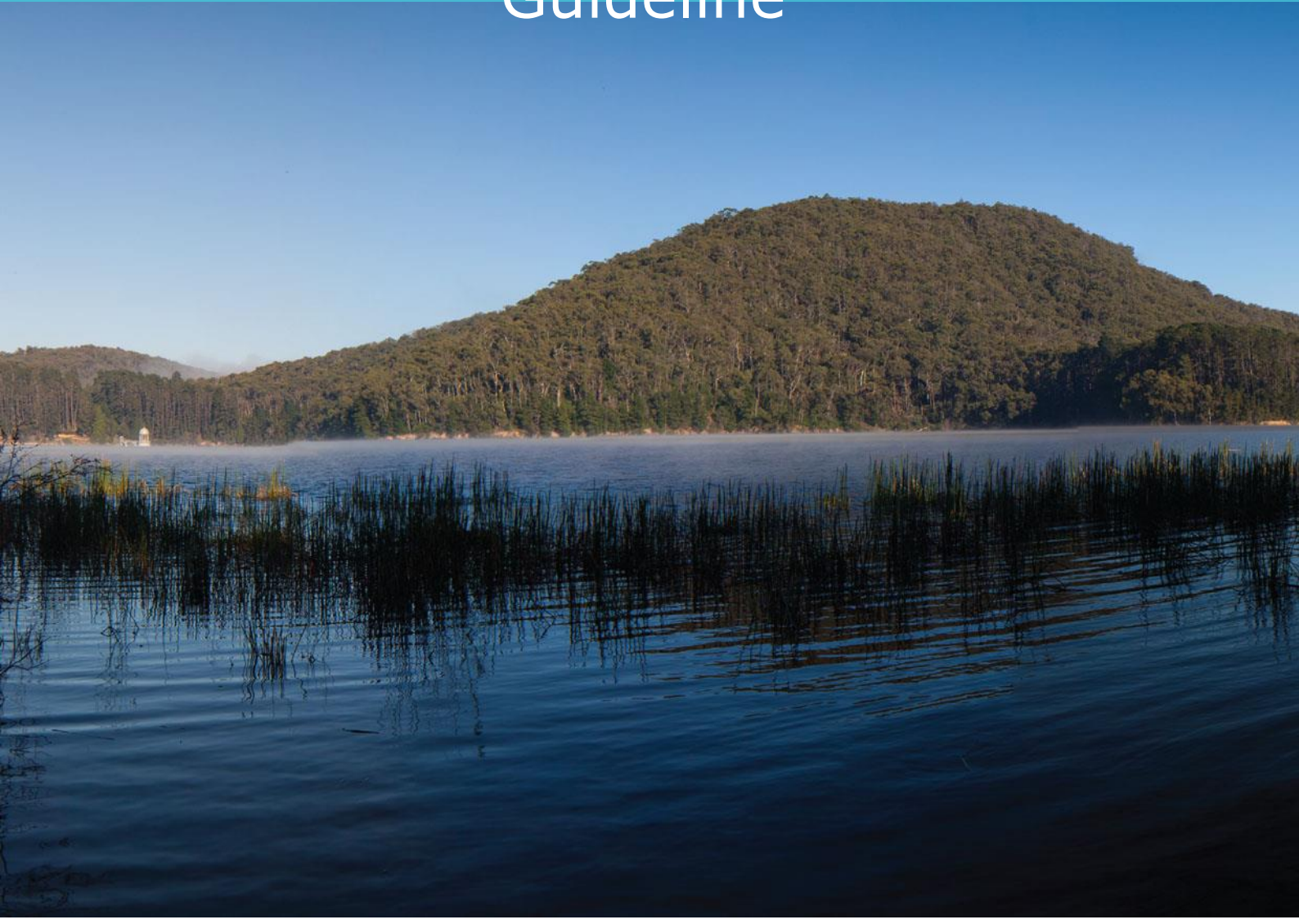
Melbourne Water Pest Animal Guideline



Melbourne Water is owned by the Victorian Government. We manage Melbourne's water supply catchments, remove and treat most of Melbourne's sewage, and manage rivers and creeks and major drainage systems throughout the Port Phillip and Westernport region.

Enhancing Life and Liveability

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Introduction

Melbourne Water is a significant landholder in the Port Phillip and Westernport region, managing approximately 33 000 hectares of land and over 8 000 kilometres of waterways. We manage around 2.5% of land contained within the Port Phillip and Westernport region. Melbourne Water currently supplies water from ten major reservoirs to the greater Melbourne area. Pest animals can significantly impact on assets, water quality, native biodiversity and economic and social values, and Melbourne Water is committed to minimising these impacts in a cost efficient manner.

Melbourne Water Responsibility

Pest animal management in Victoria is principally the responsibility of each land and waterway manager. As a land and waterway manager, Melbourne Water is responsible for controlling pest animals declared under the *Catchment and Land Protection Act 1994* (CaLP Act) on land it is responsible for managing. Pest animal legislation relevant to Melbourne Water (only) is summarized in this document.

These guidelines apply to all property owned and/or managed by Melbourne Water where pest animal management is required. This includes: catchments, reservoirs, waterways, treatment plants, storage reservoir sites, aqueducts and pipe tracks.

Pest animal management is undertaken to protect multiple organisational values, including:

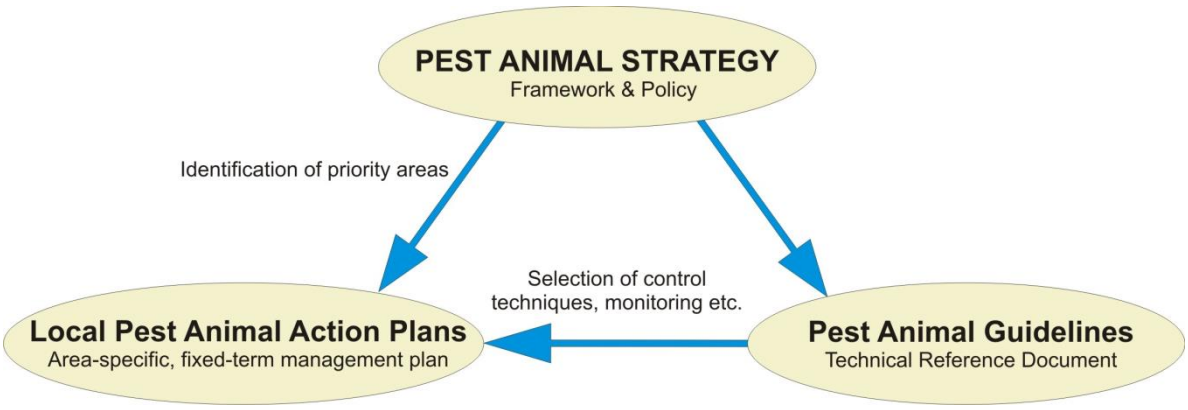
- Natural asset protection
- Physical asset protection
- Stakeholder Management
- Water quality protection
- Waterways protection

Pest Animal Strategy

Melbourne Water is committed to best practice pest animal management through the implementation of the Pest Animal Strategy (the Strategy). This strategic document provides the framework for targeted pest animal management across the land and waterways that the organisation is responsible for managing and endeavours to target control and manage where values are high and where the threat and consequences posed by pest animals is high. Values are broadly defined as natural or environmental values (*e.g*. biodiversity, water quality fauna habitat), financial values (*e.g*. Melbourne Water physical assets, agricultural production) or social values (*e.g*. public health and safety, amenity).

Local Pest Animal Action Plans (LPAAPs) are site-specific plans that outline management actions for pest species. They provide the specific details of pest animal management at a site, including the timeframe, budget, stakeholder collaboration and the monitoring protocol. The relationship between Melbourne Water pest animal management documents is shown below in Figure 1.

Figure 1 The Relationship between Pest Animal Management Documents at Melbourne Water



Guideline Objectives

The Guidelines provide Melbourne Water's technical procedures for integrated pest animal management and are based on current scientific literature.

The Guidelines are specifically designed to:

- Provide a technical reference for the safe practice of pest animal management and the selection of appropriate control techniques
- Ensure that pest animal management programs protect public health and are safe, humane, environmentally sound and cost effective
- Encourage innovation and the application of new management techniques, through both evaluation of current research and development, and the identification of collaborative and targeted research opportunities.

Desired Outcomes

The Guidelines will achieve the following outcomes:

- Reduce the incidence and consequence posed by pest animals
- Assist in maintaining and enhancing the quality and condition of important values
- Prevent new and emerging pest animals from having an impact on important values
- Ensure compliance with State legislation, regulations and policy.

It should be noted that pest animal management is a long term process, and the complete eradication of pest animals within an area may not be practical or realistic in many situations.

Principles of Pest Animal Management

The management of pest animals by Melbourne Water is based on 10 key principles of best-practice pest animal management. These principles have been developed through the review of scientific literature, consultation with experts in pest animal ecology and management, and relevant government policies:

Principle 1: Protect the areas of highest value first
Principle 2: Address high risk/threat/consequence pest species first

Principle 3:	Prioritisation of newly identified pest species or populations for early control (cost-effectiveness is maximised with early action)
Principle 4:	Monitoring must be planned and budgeted for, including both pre-control monitoring (i.e. impacts, triggers for control) and post-control monitoring (i.e. control effectiveness, non-target impacts)
Principle 5:	Management activity should be aligned with the intent of the *Australian Pest Animal Strategy* and the *Invasive Plants and Animals Policy Framework (DPI 2011)*
Principle 6:	Where there is major disturbance from pest animals or control techniques, a holistic approach should be used which includes funding for weed control, fencing, revegetation and maintenance
Principle 7:	Engage with stakeholders and adjacent landowners to understand their concerns and level of support prior to any control activity being initiated
Principle 8:	Recognise that some parts of the community have strong feelings about some pest species and that further consultation may be required with community members to better understand their issues
Principle 9:	Establish a transparent and collaborative decision-making process to focus pest animal control efforts into the future
Principle 10:	Utilise a three-tiered pest animal management approach incorporating a framework (the Strategy), a technical reference guide (the Guidelines) and area-specific management plans for action (Local Pest Animal Action Plans)

Pest Animal Management

Pest Animal Definition

The Australian Pest Animal Strategy (APAS 2007) defines pest animals 'as any animal that has, or has the potential to have, an adverse economic, environmental or social / cultural impact.' This broad definition incorporates species that vary across spatial and temporal scales. The term 'pest animal' in these Guidelines refers to 1) species that have been declared in the Prohibited, Controlled, Regulated or Established pest animal categories under the CaLP Act; and 2) species not listed under the CaLP Act but known to have major impacts upon environmental, economic or social values.

Pest Animal Impacts

Introduced species are recognised globally as the second greatest threat (after habitat destruction) to biodiversity. In Australia, pest animals are believed to be responsible for the extinction of many native vertebrates (Simberloff *et al.* 2005). Pest animals have a significant impact on primary industries, with the economic impacts of 11 major pest species valued at over $720 million (McLeod 2004) annually. Some pest animal species are also vectors for endemic diseases or potential vectors for exotic diseases (*e.g.* foot-and-mouth, rabies, *etc.*) of humans, livestock and native fauna. Furthermore, pest animals may have significant impacts upon water quality, including through erosion and increased turbidity, altering the biotic composition of aquatic habitats, and through the spread of pathogens such as *Cryptosporidium* spp. and *Giardia* spp.

These primary effects of pest animals adversely impact upon biodiversity, public health, agricultural viability, physical assets, catchment health and even entire eco-systems.

Targeted Pest Animal Species

The pest animals targeted in these Guidelines includes the following species listed as Established pest animals under the CaLP Act:

- European Rabbit (*Oryctolagus cuniculus)*
- European Red Fox (*Vulpes vulpes)*
- Feral Pig (*Sus scrofa)*
- Wild Dog (*Canis lupus)* (including wild dogs (*C. l. familiaris)* and hybrids, but excluding the Dingo (*C. l. dingo)*, listed as Threatened under the *Flora and Fauna Guarantee Act 1988*)
- Feral Goat (*Capra hircus)*
- European Brown Hare (*Lepus europaeus).*

Species not listed under the CaLP Act but considered as pest animals due to their known environmental impact include:

- Feral Cat (*Felis catus)*
- Deer (*Cervidae spp.)* - various species.

Targeted pest species are discussed in detail in Section 4.

Deer are not listed under the CaLP Act, but are managed by Melbourne Water.

These Guidelines focus on the eight target species identified above, all other species causing significant issues will be address adhoc

Other Perceived Pest Animals

There are a number of native animals present on land and waterways the organisation is responsible for managing. Some of these animals have the potential to be considered as pests due to increasing numbers and subsequent impacts upon natural and social values. These animals, including the Eastern Grey Kangaroo (*Macropus giganteus)* and the Emu (*Dromaius novaehollandiae)*, may intermittently be subjected to population control by government agencies, however their management is only considered generally within these Guidelines and specific control techniques are not discussed. If there is evidence that these animals are causing a problem, the Wildlife Act 1975 states that these animals can be controlled with authorisation from the secretary of the Department of Sustainability and Environment (DSE).

Key Pest Animal Legislation and Regulation

This section lists the key national and state legislation, guidelines and Melbourne Water publications relating to pest animal management.

- *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*. This Act primarily deals with matters of national significance including threatened species and ecological communities. The act allows for regulations to be developed to list non-native species that

threaten the long term survival of these matters. Threat abatement plans have been prepared under the EPBC Act for the fox, cat, rabbit and goat.

- *Flora and Fauna Guarantee Act 1988 (Vic)*. This Act is the key Victorian legislation for the conservation of threatened species and communities and for the management of threatening processes
- *Catchment and Land Protection Act 1994 (Vic)*. The CaLP Act establishes a basis for the control of declared pest plants and animals in Victoria. Foxes, rabbits, dogs, pigs, goats and hares are all recognised as Established pest animals under the Act. Pest animals declared under the Act must be managed and controlled on public and private land by the land manager (Part 3, Section 20)
- *Wildlife Act 1975 (Vic)*. Part 111A, Section 28A(1) of this Act specifies that the Secretary of the DSE may give written authorisation to a person to hunt, take or destroy wildlife if the secretary is satisfied that it is for the management of conservation, protection or control of wildlife or for purposes of education, research or scientific studies. This authorisation allows Melbourne Water to undertake deer culling (via an Authority to Destroy permit) in Melbourne Water catchments and reservoirs during open season, by properly authorised persons
- National Feral Animal Control Program (NFACP). The main objectives of the NFACP are to: develop integrated, strategic approaches to manage the impacts of nationally significant pest animals; improve the effectiveness of control techniques and strategies for reducing pest animal impacts; and produce guidelines for the management of nationally significant pest animals
- Victorian Pest Management – A Framework for Action 2002 (VPMF). The VPMF has been developed to provide the strategic direction for the management of declared and potential pests. As part of the VPMF, specific management strategies have been developed for weeds, rabbits, wild dogs, foxes, pigs and goats.

Other legislation and regulations which require agencies, planners and managers to act in ways to promote effective pest and hunting management either directly or indirectly includes: the *National Parks Act 1975 (Vic), Endangered Species Protection Act 1992 (Cwlth), Forests Act 1958 (Vic), Conservation Forests and Lands Act 1987 (Vic), Crown Land* (Reserves) *Act 1978 (Vic), Water Act 1989 (Vic), Prevention of Cruelty to Animals Act 1986 (Vic)*, *Safe Drinking Water Act 2003 (Vic), Biological Control Act 1986 (Vic)* and Victoria's Biodiversity Strategy 1997.

Melbourne Water has developed water supply catchment management plans, which aim to:

- Protect and conserve native animals, particularly significant species and their habitat.
- Control pest species which cause unacceptable environmental or economic damage, employing humane methods with minimal impacts to non-target species.

- Monitor populations of feral animals and roaming domestic animals due to the potential of these animals to carry human diseases, which could be transmitted via the water supply.

Integrated Pest Management

To be effective, pest animal management must be part of the holistic management of land and water resources *i.e.* it needs to be an integral component of programs designed to protect and enhance biodiversity, native vegetation, and primary production. Integrated pest management (IPM) programs are based upon information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control techniques, is used to minimise pest impacts through cost-effective means, and with the least possible hazard to people, property, and the environment. Melbourne Water is consolidating and increasing its pest animal management efforts by applying IPM across the priority areas it manages, as identified in the Pest Animal Strategy.

IPM considers the interactions between animal and plant species, whether they are pest or endemic. When a pest species is controlled, this will alter the abundance of other species (predator and prey), and the broader balance of the ecosystem. A holistic approach to pest animal management, through IPM, is essential to minimise the negative impacts and ensure effective pest animal control. These interactions are discussed further in the sections for each pest species.

- Control programs must be ongoing within the area.
- Control must be extended beyond the area of interest (i.e. collaboration with adjacent landholders), and incorporate a 'buffer' area which is subject to ongoing control.
- Immigration into the area must be removed (e.g. through exclusion fencing).
- Eradication within the region is achieved (Forsyth et al. 2003)

Control of Pest Animals

Control Techniques

Selecting control methods to manage a specific pest animal should be done on a case-by-case basis. Before choosing a technique(s), consideration needs to be given to issues including:

- Suitability and effectiveness of the technique for the target species
- Catchment or waterway characteristics, including water quality issues
- Context of the site (surrounding land title, land use, and current pest control)
- Vegetation present
- Potential Cultural Heritage considerations
- Area access considerations
- Potential impacts to non-target species
- Animal welfare issues
- Funding considerations
- Contractor skills and availability.

Pest Animal Management Considerations

Spatial Distribution

An important consideration in pest animal management programs is the consistency of control efforts spatially. An even distribution of effort can decrease the density-dependent effects which restrict the effectiveness of many control methods at low pest densities (Forsyth *et al.* 2003). Spatial consistency of pest control efforts is also an important parameter for many monitoring methods, including CPUE (Forsyth *et al.* 2003).

Ensuring spatial consistency can be achieved relatively easily, and is likely to enhance the effectiveness of pest animal management and/or monitoring programs. The grid system involves dividing a management area into smaller, similar-sized polygons, with the control and/or monitoring efforts evenly divided across these polygons. This can significantly reduce the temporal and spatial variation in control or monitoring efforts, and is particularly useful for larger management (Forsyth *et al.* 2003).

Considerations to Reduce Recolonisation

The recolonisation of a site following control activities is a key obstacle to the long term effectiveness of pest animal management programs. To reduce the likelihood of recolonisation, at least one of the four following conditions must be met:

Pest Species

The exact timing and specific techniques necessary to maximise pest animal management efforts will vary geographically, and control programs should be developed through a localised decision-making process *i.e*. an LPAAP . General guidelines for each pest species, based on current best-practice and available literature are outlined below.

European Red Fox

The European Red Fox is widely distributed throughout the Port Phillip and Westernport region, particularly in woodlands and forests. Previous pest animal management efforts have primarily used 1080 baiting, leg-hold trapping and shooting to attempt to control fox numbers, however, these efforts have been largely applied in an *ad hoc* and reactionary fashion. Whether the goal of fox management is eradication within an area or a reduction in impacts, fox control needs to be targeted according to the biology of the species, the values threatened by the species, and the context of the area including adjacent land use and title.

European Rabbit

The European Rabbit is widely distributed across the Port Phillip and Westernport region. As discussed in Section 4.1.1, rabbits are often sympatric with foxes and/or cats, and provide a substantial prey base for both of these introduced predators. The control of rabbits alone in areas where foxes and/or cats are present is likely to increase predation pressure on native animals, and is not recommended (Williams *et al.* 1995; Saunders and McLeod, 2007).

Rabbit control needs to be targeted according to the biology of the species, the values threatened by the species, and the context of the area including adjacent land-use and

title. Recolonisation occurs rapidly in areas where rabbits have been eradicated, and is related to the density of rabbits in adjacent areas (Williams *et al.* 1995). Therefore collaboration with surrounding landholders will be a key determinant in the long term success of rabbit control programs.

Wild Dog

The Wild Dog is distributed throughout much of the Port Phillip and Westernport region. Previous pest animal management efforts for control of wild dogs have focused on 1080 baiting, leg-hold trapping and shooting, and have been applied in a largely *ad hoc* and reactive fashion. Whether the goal of dog management is eradication within an area or a reduction in impacts, dog control needs to be targeted according to the biology of the species, the values threatened by the species, and the context of the area including adjacent land-use and title

Feral Cat

The Feral Cat is widely distributed throughout the Port Phillip and Westernport region. Previous pest animal management efforts have primarily used cage trapping to control cat numbers; however, these efforts have been largely based on opportunistic sightings and have not been strategically applied. Cat control programs need to be targeted according to the biology of the species, the values threatened by the species, and the context of the area including adjacent land use and title.

Feral Pig

The Feral Pig is distributed patchily across the Port Phillip and Westernport region, with infrequent sightings within several catchments. Melbourne Water considers feral pigs a significant threat to water quality and biodiversity values, therefore recorded sightings or signs of pigs should be given a high priority for management. While targeted pest animal management at low pest densities has a reduced CPUE, it is the most cost-effective long term strategy, and may result in local eradication of the pest species.

Feral Goat

The Feral Goat is distributed patchily across the Port Phillip and Westernport region, with infrequent sightings within several catchments and reservoirs. Goat sightings and records should be a high priority for management, given the need to prevent the establishment of new pest populations. While targeted pest animal management at low pest densities has a reduced CPUE, it is the most cost-effective strategy long term, and may result in local eradication of the pest species.

Deer

Victoria holds approximately a quarter of the known deer herds in Australia, most of which originated from farming escapes or deliberate introductions (Moriarty, 2004). Introduced deer have only emerged recently as an issue in Australia, due primarily to the economic value of hunting deer and the past lack of evidence of impacts to ecosystems (Dolman and Waber, 2008).

Introduced deer occurring on the land and waterways Melbourne Water manage include Sambar (*Cervus unicolour)*, Fallow Deer (*Dama dama)* and Red Deer (*Cervus*

elaphus scoticus) (Moriarty, 2004; Lindeman and Forsyth, 2008). Of these, the Sambar has the most widespread distribution and is likely to have a large impact on economic and environmental values (Lindeman and Forsyth, 2008).

Deer are known to impact agricultural crops through browsing, trampling, ring-barking and antler-rubbing (Lindeman and Forsyth, 2008). Deer may also cause environmental damage through over-grazing and trampling native vegetation, weed dispersal and erosion (Dolman and Waber, 2008). Furthermore, deer can impact upon water quality through the spread of pathogens or through death and decay in aqueducts and other water infrastructure. Deer are protected under the Wildlife Act 1975, and a permit from the DELWP is required for the control of this species.

European Brown Hare

The European Brown Hare is patchily distributed across the Port Phillip and Westernport region and is often present in areas where rabbits have been subject to control (W. Steele, pers. comm. 2009). Due to hares using surface harbour and not constructing warrens, they are generally considered to have a lesser impact upon environmental and economic values and water quality than rabbits (Sharp and Saunders, 2004r). The primary impacts of hares include impacting native vegetation, economic impacts through grazing crops and gnawing bark, competition with native fauna, and potentially facilitating the persistence or spread of introduced predators (Sharp and Saunders, 2004r).

Non-target Animals

Every effort should be made to prevent non-target species being adversely impacted by pest animal control operations. Contractors are required to understand the techniques available to increase the specificity of control methods and minimise potential impacts to non-target species. Evidence of non-target impacts is to be recorded and reported to Melbourne Water. Potential non-target impacts as a result of pest animal management will vary between areas, and these impacts should be assessed in detail during the development of LPAAPs.

Monitoring

The monitoring of pest animals, their impacts and the effectiveness of pest animal management programs is essential in meeting Melbourne Water's pest animal management objectives. Estimates of pest population sizes are rarely undertaken, and indices of pest abundance are generally used to infer population sizes and changes (Saunders and McLeod, 2007). There is also a critical need to review and monitor any control program over time to assess cost-effectiveness and efficiency. This section will discuss the four central themes of monitoring, these being operational versus performance monitoring, baseline monitoring, management monitoring and geographic information system (GIS) capability.

Operational versus Performance Monitoring

Monitoring programs can either use 'operational monitoring' which estimates changes in pest animal abundance, or 'performance monitoring' which estimates changes in impacts to the resource(s) or value(s) being protected (Choquenot *et al.* 1996).

The aim of pest animal management is to reduce the impact of the pest animals and not the abundance *per se.* Therefore, it is intrinsically preferable to monitor the resource(s) or value(s) being protected (*i.e.* performance monitoring) rather than pest numbers (*i.e*. operational monitoring) (Reddiex and Forsyth, 2006). This is particularly important in areas supporting high values such as threatened species or valuable resources. Performance monitoring can be more cost or labour intensive than the more common operational monitoring methods however, and so may not be suitable for all monitoring programs (Reddiex *et al.* 2006). Performance monitoring methods are often specific to the locality and the target pest species. Baseline Monitoring
Pest animal management programs are often conducted in a reactionary and *ad hoc* fashion, and are seldom based on reliable data of pest impacts or numbers. There is an obvious requirement for baseline data to better inform the decisions of when and where to focus pest animal management efforts (e.g. thresholds and trigger points for initiating pest animal control). Therefore monitoring should not be limited to assessing the effectiveness of pest animal management programs but should also be conducted in key areas to determine the need for pest control.

Management Monitoring

Monitoring the effectiveness of pest animal management programs is essential to meeting the objectives of pest animal management. As outlined above, this monitoring often does not accurately reflect pest animal impacts or their abundance. The inclusion of an appropriate monitoring method is necessary to provide the basis for informed decisions regarding pest animal management
To accurately estimate pest abundance or impacts, PAM programs need to incorporate a monitoring method different from the method used to control the pest (Reddiex *et al.,* 2006). The applicability of a particular monitoring method can vary by locality and target pest species.

Assessments will be made on the effectiveness and efficiency of each pest animal management program by conducting follow-up evaluation upon the completion of each program. Site Managers need to record pest animal sightings to assist in monitoring of pest populations and planning future pest animal programs.

GIS Capability

Accurate information on pest animal distributions will significantly improve the effectiveness and targeting of pest animal management programs. The use of GIS provides a powerful tool to record, map, and analyse spatial data relating to pest animals, as well as potentially predict future distributions and/or threats of particular species

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