Australian Pest Animal Strategy

A national strategy for the management of vertebrate pest animals in Australia

Natural Resource Management Ministerial Council
Developed by the Vertebrate Pests Committee

Australian Pest Animal Strategy – A national strategy for the management of vertebrate pest animals in Australia

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Cover images: Red fox. Photo: J. Lochman, Lochman Transparencies; Feral pigs caught in a trap. Photo: P. Fleming, Department of Primary Industries, New South Wales; Rabbit. Photo: G. Chapman; A heard of feral goats caught in a pen. Photo: Q. Hart, Bureau of Rural Sciences.

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Executive Summary

The vision for the Australian Pest Animal Strategy is that: *Australia's biodiversity, agricultural assets and social values are secure from the impacts of vertebrate pest animals.*

The focus of the Strategy is to address the undesirable impacts caused by exotic vertebrate animals (mammals, birds, reptiles, amphibians, and fish) that have become pests in Australia, and to prevent the establishment of new exotic vertebrate pests.

In Australia, pest animals have major economic, environmental and social impacts. Many pest animals cause significant damage to crops and seriously affect Australia's livestock industries by preying on stock and competing for pasture. Pest animals also cause severe land degradation by promoting soil erosion, stream turbidity and the spread of weeds. Competition, habitat destruction and predation by pest animals threaten the survival of many of Australia's native plants and animals.

Australian private and public landowners and users spend considerable time and money addressing the impacts of pest animals. For example, it has been estimated that eleven of Australia's major pest animals (wild populations of foxes, pigs, rabbits, mice, goats, carp, dogs, cane toads, camels, cats and horses) have negative impacts in Australia valued at over $720 million per annum (McLeod 2004).

The Australian Pest Animal Strategy is a vital part of Australia's integrated approach to national biosecurity under the Australian Biosecurity System for Primary Production and the Environment (AusBIOSEC). It complements existing and new strategies, covering weeds, marine pests and animal welfare. The Australian Pest Animal Strategy is based on 12 key principles:

1. Pest animal management is an integral part of the sustainable management of natural resources for the benefit of the economy, the environment, human health and amenity.
2. Combating pest animal problems is a shared responsibility that requires all parties to have a clear understanding of their roles and responsibilities.
3. The development, monitoring and review of integrated pest animal management strategies need to be underpinned by good science.
4. Setting priorities for, and investment in, pest animal management must be informed by a risk management approach.
5. Prevention and early intervention are the most cost-effective techniques for managing pest animals.
6. Pest animal management requires coordination among all levels of government in partnership with industry, land and water managers and the community, regardless of land tenure.
7. Effective pest animal management requires capacity-building across government, industry, land and water managers and the community.
8. Management of established pests should aim to address actual rather than perceived problems, and to reduce impacts rather than simply pest animal numbers.
9. Management should be strategic in terms of determining where management should occur, timing of management, being proactive and using appropriate techniques.
10. Where there is a choice of methods, there needs to be a balance between efficacy, humaneness, community perception, feasibility and emergency needs.
11. The benefits of management should exceed the costs of implementing control.
12. As part of an integrated pest animal management program, commercial harvesting may offset management costs.

Feral camel in central Australia. Photo: B. Rose, Department of the Environment and Water Resources.

The Australian Pest Animal Strategy identifies the following goals and objectives to realise its vision:

Goal 1 Provide leadership and coordination for the management of pest animals

Objective 1.1 To develop the capacity and processes for effective delivery of pest animal management.

Objective 1.2 To ensure nationally consistent pest animal management approaches are in place at all scales of management.

Objective 1.3 To improve public awareness of pest animals, research coordination and its support for pest management at the national level, and adoption of best practice management methods.

Goal 2 Prevent establishment of new pest animals

Objective 2.1 To prevent the introduction of new animals with pest potential.

Objective 2.2 To ensure early detection of, and rapid response to, new incursions of exotic animals.

Objective 2.3 To reduce the spread of pest animals to new areas within Australia.

Goal 3 Manage the impacts of established pest animals

Objective 3.1 To identify established pest animals of national significance.

Objective 3.2 To identify and manage the impacts of pest animals on key assets.

Objective 3.3 To coordinate the management of established pest animals across Australia.

These objectives will be implemented through a set of strategic actions, with progress to be measured against specific outcomes.

Feral cat devouring a crimson rosella. Photo: C. Potter.

1. Introduction

1.1 The introduction of exotic animals into Australia

During the past 200 years, hundreds of exotic (non-native) animals have been deliberately imported into Australia, both legally and illegally, for pastoral production, transportation, pets, pest control or simply to make early settlers feel more 'at home' (Bomford and Hart 2002). In addition, a few have been imported accidentally, for example in cargo. Some species (e.g. fox and rabbit) were released into the wild legally, others (e.g. goat and pig) escaped domestication or captivity, and some (e.g. Indian mynah) were released illegally (Bomford and Hart 2002).

Exotic animals that become established in the wild typically have a history of doing so in many places, and often have the following attributes (Bomford and Hart 2002):

- high fecundity;
- generalised diet;
- an ability to live in modified landscapes; and
- a climatic match between Australia and the place where they occur naturally.

In mainland Australia, wild populations have become established by at least 73 species of introduced vertebrates, including 25 mammal species, 20 birds, four reptiles, one amphibian and at least 23 freshwater fish (Bomford 2003). Of other introduced species, seven birds, one mammal and two reptiles are established in the wild on Australian offshore islands. Fortunately, many imported species originally planned for release into the wild, including more than 50 species of birds, have not become established.

Feral pig. Photo: B. Cowled, Invasive Animals CRC.

Feral pigs dig over wide areas for roots. This causes extensive damage to ground level vegetation. Photo: Department of Primary Industries, New South Wales.

1.2 Australia's pest animal problem

A pest animal is defined as any animal that has, or has the potential to have, an adverse economic, environmental or social/cultural impact. Many introduced animals that have established wild populations have become pests. The owners and users of private and public lands spend considerable time and money addressing the impacts of pest animals.

Pest animals have many impacts in Australia. Some species cause significant damage to crops and seriously affect Australia's livestock industries by preying on stock, competing for pasture or causing severe land degradation by promoting soil erosion, stream turbidity and the spread of weeds. Many pest animal species threaten the survival of native plants and animals through competition, habitat destruction and predation. Pest animals may also act as reservoirs for diseases that affect native wildlife, domestic stock or people. Eleven of Australia's major pest animal species (wild populations of foxes, pigs, rabbits, mice, goats, carp, dogs, cane toads, camels, cats and horses) are conservatively estimated to have impacts valued at over $720 million annually (McLeod 2004). The cost of other significant pests, including exotic birds such as starlings, sparrows and Indian mynahs, as well as deer and donkeys, makes the overall economic impact much greater.

Pest animals also have considerable social impacts, including being a nuisance, damaging infrastructure or culturally important sites, causing traffic accidents, as well as having important (but largely unreported) social and psychological effects on primary producers and their families.

1.3 Managing pest animals

Methods used to control pest animals must be effective against species that adapt well to changing conditions, have good dispersal abilities and can quickly increase population size. These control methods should also pose few risks to non-target animals or other assets, cause minimal contamination of soil, crops and waterways, and satisfy animal welfare criteria.

The most useful pest animal control methods are:

- killing or removal (e.g. baiting, shooting, trapping or mustering);
- exclusion (e.g. fencing or netting);
- biological or fertility control;
- habitat manipulation (e.g. removal of surface refuges); and
- changes in land use including agricultural practices (e.g. timing of lambing or planting different crops).

In the past 50 years, we have learned much about pest animals, their impacts, and how to control them. For example, the rabbit plagues of the 1920s to 1940s caused severe land degradation and loss of productivity. Introducing the myxomatosis and rabbit haemorrhagic disease viruses, warren ripping, and selective use of baiting have resulted in great decreases in rabbit populations across Australia. Intensive control of foxes, cats, goats and rodents on offshore islands and in mainland areas (e.g. Western Australia's Western Shield Program and Bounceback in the Flinders Ranges of South Australia) has resulted in larger populations of small threatened native marsupials, birds, reptiles and invertebrates.

Useless Loop community members assessing maintenance requirements for the 2.8 kilometre barrier fence that excludes foxes and feral cats from the 1200 hectare Heirisson Prong reserve for threatened mammals in Western Australia. Photo: J. Short, Wildlife Research and Management, Western Australia.

1. Introduction

1.4 Challenges for pest animal management

Despite increased understanding and better control methods, there are still significant challenges to face in minimising the impact of pest animals in Australia. These challenges include:

Regulatory challenges

- addressing increases in the illegal trading and keeping (or desire to keep) of potential pest animals;
- making greater use of regulatory provisions while recognising stakeholders' limited economic incentives or capacity to manage pest animals;

Response challenges

- facilitating rapid responses to new pest animal problems;
- improving coordination and planning of response and management;
- addressing pest animal management within the broader context of natural resource and catchment management and across rural and urban areas;
- using current resources more efficiently and effectively, and accessing new resources if required;

Education/training challenges

- improving awareness of problems and solutions, including improving knowledge of pest species distribution, ecology and impacts, and developing alternative management techniques;
- ensuring the availability of training for those involved in pest management;
- greater acceptance of stakeholders' perceptions, responsibility and priorities for pest animal management;
- acknowledging the benefits provided by pest animals as well as their costs;

Research challenges

- better understanding costs of environmental impacts;
- addressing all pathways of introduction and spread;
- understanding changes in risk posed by pest animals due to climate change;
- continuing to provide improved methods and knowledge for optimising pest animal management;

Socio-political challenges

- ensuring adequate resources for ongoing targeted control programs;
- ensuring continued availability of current pesticides, including addressing any animal welfare, concerns with the use of such pesticides; and
- learning to live with some pests.

The cane toad was originally introduced as a biocontrol agent only to become a pest in its own right. Photo: D. McRae.

1.5 Why do we need a national pest animal strategy?

Although past management has significantly reduced both the numbers and impacts of some pest animals in some parts of Australia, many problems persist. More research and development is therefore essential. Some populations of established pests are expanding into new areas and there have been recent incursions of new exotic species with major pest potential (e.g. red eared slider turtle). The management of some pest animals (e.g. cane toads) remains thwarted by a lack of effective management tools while other species (e.g. feral cat) need a wider range of management approaches. Pest animal management could certainly be improved by using control measures more strategically. This could involve targeting key areas to facilitate both the control of existing species and surveillance for new ones; implementing control at more appropriate times; using a combination of techniques; adopting long-term planning; and more effective communication among stakeholders.

It is important to recognise that the prevention of incursions, or an early response to them, can be very cost-effective in managing potential pest impacts. For this to occur, the efforts of all stakeholders—including all levels of government, industries, landholders, community groups and the general public—need to be better integrated. For example, many people in the wider community have little awareness of pest animals, as their impacts are often less visible than those of other threats to environmental and production values, such as salinity or weeds.

A well-targeted community education program could help prevent new incursions of exotic animal species with pest potential and increase support for existing control programs.

The Australian Pest Animal Strategy provides guidance to address these pest animal management concerns across Australia.

1.6 Who are the stakeholders in this Strategy?

There are many stakeholders in pest animal management, from both the government and non-government sectors, most of whom have specific responsibilities.

Government Stakeholders

The Australian Government has responsibilities to:

- provide a mechanism by which pest issues of national significance can be identified and addressed;
- coordinate, facilitate and promote national pest animal management policies and programs;
- provide leadership, coordination and resources for research, evaluation and education in relation to public awareness-raising about pest animal issues of national significance;
- provide leadership and coordination for emergency responses to pest animals of national significance;
- encourage and support the development and integration of effective pest animal management strategies at all levels of management;
- manage pest animal problems on Australian Government land in a responsible way, in co-operation with other landowners;
- facilitate, in co-operation with the states and territories, the development of an economic, social and cultural framework that encourages pest animal management as an integral part of sustainable natural resource management; and
- provide a legislative framework, including quarantine and environmental legislation, to minimise the risk of new pest animal species becoming established.

Ranger inspecting a trapped feral cat. Photo: Department of Sustainability and Environment, Victoria.

State and territory governments have responsibilities to:

- manage pest animal problems on government land and waterways in a responsible way, in co-operation with other landowners;
- exercise statutory responsibilities to encourage responsible pest animal management;
- enhance co-operation and coordination of pest animal management at local, regional and state levels;
- encourage responsible pest animal management by;
  - o providing a suitable institutional and legislative framework;
  - o developing and implementing effective policies and programs; and
  - o providing positive support through financial incentives and assistance schemes as well as appropriate standards and regulations.
- provide leadership, coordination and resources for research, evaluation, advisory services and education programs about pest animals;
- encourage the development of effective pest animal management strategies at local, regional, state and national scales; and
- provide a legislative framework to minimise the risk of new pest animal species becoming established.

1. Introduction

Local governments, in some jurisdictions, have a role in:

- assisting with data collection and information exchange;
- assisting with the coordination of community pest animal management programs;
- representing community interests in pest animal management;
- supporting the activities of local self-help groups undertaking pest animal management;
- exercising statutory duties to encourage responsible pest animal management; and
- managing pest animal problems on local government land in a responsible way, in co-operation with other landowners.

Non-Government Stakeholders

Individual landowners and land users have responsibilities to:

- recognise that pest animals can have significant impacts on agriculture and biodiversity;
- detect and report new pest animal occurrences;
- understand land use systems and the cause-and-effect relationships that apply to pest animal problems;
- apply their knowledge and skills to improve pest animal management;
- manage pest animal problems on their own land; and
- cooperate and, where relevant, plan pest animal management activities jointly with neighbours.

Community and industry organisations have responsibilities to:

- represent members' interests in pest animal management;
- provide their members with information on pest animal issues and their management;
- contribute to the funding of research and development of improved pest control methods;
- participate in the development of codes and policies that improve the effectiveness of pest animal management; and
- provide leadership and direction.

Regional natural resource management groups have responsibilities to:

- coordinate and implement regional and catchment-based pest animal planning programs;
- represent community interests in pest animal management; and
- work with landholders and government to develop effective regional pest animal management programs.

Keepers of exotic species have responsibilities to:

- minimise the risk of escape of invasive species;
- seek approval to import new species;
- report all escapes; and
- register all licensed exotic species where this is a requirement.

Communities have a role in:

- improving education about pest animal problems, particularly raising awareness;
- coordinating local group development and action on pest animal problems;
- encouraging local involvement in the management of public land and waterways; and
- participating in local and regional pest animal management programs.

Feral goats now occur in all Australian states and on many offshore islands, but are most common in the rocky or hilly semi-arid areas of western New South Wales, South Australia, Western Australia and Queensland. Photo: SXC.

1.7 Scope of the Strategy

The scope of the Strategy is to address the undesirable economic, environmental and social impacts of terrestrial vertebrate animals (mammals, birds, reptiles, amphibians and fish). The Strategy recognises that some species may also have positive impacts, so that management of these species will need to consider both kinds of impacts. While the focus of national cooperation under the Strategy will be on exotic species, the strategies are generic rather than taxon-specific, and can be applied to other species as appropriate.

1.8 How does the Strategy fit within the national framework?

The Australian Pest Animal Strategy sits under the overarching Australian Biosecurity System for Primary Production and the Environment (AusBIOSEC), which integrates activities with respect to all invasive plants, animals and disease-causing organisms of terrestrial, freshwater and marine environments that impact on primary industries and on natural and built environments. AusBIOSEC establishes a policy framework for greater national collaboration on biosecurity issues, both within and across jurisdictions, and with key stakeholders in the primary production and environment sectors. AusBIOSEC is providing common principles and guidelines to ensure consistency of biosecurity arrangements across sectors and jurisdictions, and will be implemented through an intergovernmental agreement.

The goals, actions and outcomes specified in the Strategy are consistent with AusBIOSEC, and with approaches which may enhance it.

Appendix 1 provides a table of programs, strategies and policies at all scales of vertebrate pest management in Australia.

Laying of fox baits for the East Pingelly Dwarlacking Catchment Group, Western Australia. Part of the coordinated community baiting program, "Red Card for the Red Fox". Photo: G. Farrelly, WWF-Australia.

1. Introduction

1.9 Key principles

The Australian Pest Animal Strategy is based on the following 12 key principles:

1. Pest animal management is an integral part of the sustainable management of natural resources for the benefit of the economy, the environment, human health and amenity.
2. Combating pest animal problems is a shared responsibility that requires all parties to have a clear understanding of their roles and responsibilities.
3. The development, monitoring and review of integrated pest animal management strategies need to be underpinned by good science.
4. Setting priorities for, and investment in, pest animal management must be informed by a risk management approach.
5. Prevention and early intervention are the most cost-effective techniques for managing pest animals.
6. Pest animal management requires coordination among all levels of government in partnership with industry, land and water managers and the community, regardless of land tenure.
7. Effective pest animal management requires capacity-building across government, industry, land and water managers and the community.
8. Management of established pests should aim to address actual rather than perceived problems, and to reduce impacts rather than simply pest animal numbers.
9. Management should be strategic in terms of determining where management should occur, timing of management, being proactive and using appropriate techniques.
10. Where there is a choice of methods, there needs to be a balance between efficacy, humaneness, community perception, feasibility and emergency needs.
11. The benefits of management should exceed the costs of implementing control.
12. As part of an integrated pest animal management program, commercial harvesting may offset management costs.

The feral buffalo has been a major environmental disaster in the wetlands of the Top End. When the population was at it highest, from the 1960s to the 1980s, the feral buffalo grossly altered the character of the northern floodplains. Photo: B. Downs, Lochman Transparencies.

2. The Strategy in outline

Vision

Australia's biodiversity, agricultural assets and social values are secure from the impacts of vertebrate pest animals.

Goal 1 — Provide leadership and coordination for the management of pest animals		
Objective	**Actions**	**Outcomes**
1.1 To develop the capacity and processes for effective delivery of pest animal management.	1.1.1 Establish an implementation group to oversee delivery of the Australian Pest Animal Strategy. 1.1.2 Establish a mechanism for stakeholder consultation. 1.1.3 Establish the position of Coordinator, Australian Pest Animal Strategy. 1.1.4 Develop an implementation plan for the Strategy. 1.1.5 Develop processes to resolve potential conflicts between environmental, economic and social values.	• Australia has institutional arrangements in place for implementing and assessing progress under the Australian Pest Animal Strategy. • Australia recognises and balances diverse views on pest animal management.
1.2 To ensure nationally consistent pest animal management approaches are in place at all scales of management.	1.2.1 Improve the consistency and effectiveness of pest animal management legislation across Australia. 1.2.2 Develop integrated pest animal management plans that are consistent with the principles of the Strategy at national, state, territory, regional and property levels. 1.2.3 Develop nationally consistent codes of practice and standard operating procedures for pest animal management.	• Australian, state, territory and local governments, regional groups and land managers have in place consistent legislation and plans that manage the impacts of pest animals effectively. • Nationally-consistent and regionally appropriate approaches guide pest management.
1.3 To improve public awareness of pest animals, research coordination and its support for pest management at the national level, and adoption of best practice management methods.	1.3.1 Raise awareness of pest animal impacts among landholders and the general community and their support for pest management through a communication plan to increase engagement in reducing pest animal threats. 1.3.2 Produce a shared research and development plan to improve the development and adoption of best practice pest animal control methods, and facilitate adoption of this plan by all stakeholders. 1.3.3 Increase land manager awareness of integrated pest animal management and monitoring methods and their value, including the delivery of training programs.	• Improved education, extension, training and community awareness support efficient and coordinated national pest animal management. • Nationally coordinated research improves Australia's capacity to develop pest animal control techniques.

2. The Strategy in outline

Goal 2—Prevent establishment of new pest animals		
Objective	**Actions**	**Outcomes**
2.1 To prevent the introduction of new animals with pest potential.	2.1.1 Work with Australia's trading partners, countries of origin of human visitors and near neighbours to minimise the risk of introducing pest animals into Australia. 2.1.2 Maintain approaches for assessing the pest animal risk of all new animal imports. 2.1.3 Minimise the risk of escapes of legally held captive or pet exotic species.	• Measures are in place to minimise the risk of new potential pest animals becoming introduced into Australia.
2.2 To ensure early detection of, and rapid response to, new incursions of exotic animals.	2.2.1 Develop and maintain nationally agreed lists of high-risk animal species for surveillance and national response. 2.2.2 Maintain and improve the resources available for identifying potential pest animals. 2.2.3 Establish and maintain nationally consistent processes for surveillance, reporting and identification of new invasive species incursions. 2.2.4 Develop a pest animal incursion response plan. 2.2.5 Guided by feasibility and cost/benefit assessments, conduct eradication programs for new incursions.	• Australia is better equipped to detect the introduction of new exotic species. • Australia has nationally-coordinated procedures to respond effectively to new exotic species incursions. • Australia successfully carries out eradication campaigns for newly introduced pest animals.
2.3 To reduce the spread of pest animals to new areas within Australia.	2.3.1 Reduce the risk posed by legally held species through containment and contingencies in case of release or escape. 2.3.2 Through education and enforcement, control the natural spread or translocation of pest animals. 2.3.3 Assess the threat of 'sleeper' or other isolated populations, and eradicate or contain these according to assessments of feasibility, costs and benefits	• The spread of pest species within Australia is minimised.

Goal 3—Manage the impacts of established pest animals		
Objective	**Actions**	**Outcomes**
3.1 To identify established pest animals of national significance.	3.1.1 Identify established pest animals of national significance as the subjects of nationally coordinated action.	• Resources are focused on addressing the highest priority pest animal problems.
3.2 To identify and manage the impacts of pest animals on key assets.	3.2.1 Ensure control programs give priority to key assets under threat from pest animals. 3.2.2 Develop and implement site-based approaches to managing pest animal threats to key assets.	• Key assets are protected from pest animals.
3.3 To coordinate management of established pest animals across Australia.	3.3.1 Develop national guidelines for managing pest animals of national significance. 3.3.2 Develop management plans for pest animals of national significance	• The impacts of pest animals of national significance are reduced.

3. Actions under the Strategy in detail

Goal 1—Provide leadership and coordination for management of pest animals

Objective 1.1 To develop the capacity and processes for effective delivery of pest animal management

Effective implementation of the Australian Pest Animal Strategy will require strong ownership and commitment from all stakeholders, good coordination and adequate resourcing, which will be achieved through the following actions.

1.1.1 Establish an implementation group to oversee delivery of the Australian Pest Animal Strategy

The Vertebrate Pests Committee will convene a Strategy Implementation Group to oversee implementation of the Strategy. The Strategy Implementation Group will be responsible for the regular review of progress and evaluation of the Strategy's implementation and evaluation of its effect.

1.1.2 Establish a mechanism for stakeholder consultation

Key stakeholders need to have input into the Strategy's implementation to ensure it is undertaken effectively. The Vertebrate Pests Committee will establish mechanisms for consultation with key stakeholders to ensure their participation.

1.1.3 Establish the position of Coordinator, Australian Pest Animal Strategy

A funded coordinator position is essential to ensure effective implementation. This position will have the following responsibilities:

- acting as first point of contact for the Strategy;
- supporting the Strategy Implementation Group (see action 1.1.1), especially in developing and implementing subsidiary plans and strategies under the Australian Pest Animal Strategy, such as the communications plan (action 1.3.1);
- supporting the Strategy Implementation Group in evaluating progress and effectiveness in implementing the Strategy;
- facilitating necessary meetings, consultation, and other contact with stakeholders during implementation; and
- managing programs to integrate and coordinate education, training and research about pest animals.

1.1.4 Develop an implementation plan for the Strategy

The goals of the Australian Pest Animal Strategy will be achieved by implementing specific actions. The Strategy Implementation Group will expand on the Strategy's goals and objectives to develop an appropriate implementation plan, which may include subsidiary plans and strategies, such as a communications plan.

1.1.5 Develop processes to resolve potential conflicts between environmental, economic and social values

Different stakeholders may hold different opinions on pest animal issues, and negotiations may be required to set and implement management objectives for particular species. The Vertebrate Pests Committee will develop a model approach for resolving such conflicts among stakeholders.

Feral horses (brumbies) in the Barmah State Forest, Victoria. Photo: J. Baker, Department of the Environment and Water Resources.

3. Actions under the Strategy in detail

Objective 1.2 To ensure nationally consistent pest animal approaches are in place at all scales of management

Effective implementation of the Australian Pest Animal Strategy will require a commitment to improving consistency across all relevant legislative and institutional frameworks, which will be achieved through the following actions.

1.2.1 Improve the consistency and effectiveness of pest animal management legislation across Australia

States and territories have legislation to exclude new species and to enforce control of pest animals. However, the legislation in some jurisdictions differs in important ways, for example in giving access to private land to respond to new pests or those that do not affect primary production. Similarly, inconsistencies in regulations for the legal holding of potential pest animals can undermine law enforcement in stricter jurisdictions. The Strategy Implementation Group will therefore work towards improving the consistency of legislative provisions across jurisdictions, harmonising the exotic animals which can be legally-held.

The Strategy Implementation Group will also investigate the feasibility of legislation and policy approaches in all jurisdictions reflecting the need for concerted approaches to identified national priority pest animal species, while still allowing flexibility to manage pests significant at state, territory or regional levels. The use of nationally-consistent approaches to accrediting premises, certifying holders and identification tagging would decrease the risk of held animals becoming pests.

1.2.2 Develop integrated pest animal management plans that are consistent with the principles of the Strategy, at national, state, territory, regional and property levels

The development of national plans for responding to both new and established pest animals (objectives 2.2 and 3.3 respectively) will need to be supported by enabling provisions and plans at state and territory levels, as well as by the development of lists of priority species (actions 2.2.1 and 3.1.1).

States often have several agencies involved in pest animal management. The management of fisheries and of the impacts of pest animals on conservation areas, for example, are rarely the responsibility of the same agency. Research and extension can also be spread across several agencies or, in jurisdictions with purchaser-provider models, performed within the same agency but under different management and direction. All jurisdictions will need to ensure that their pest animal management activities are well coordinated among relevant agencies. Integrated planning will ensure that resources are allocated and work undertaken at the appropriate national, state, regional or local level. Pest management should be linked to, and integrated with, local and regional natural resource and catchment management activities.

1.2.3 Develop nationally consistent codes of practice and standard operating procedures for pest animal management

Nationally-supported model codes of practice and standard operating procedures will provide the basis for ensuring best practice management, including the humane treatment of pest animals. Individual jurisdictions can either adopt or adapt such national codes and procedures for their own use.

Wild dog captured by a foot trap, which have recently been under scrutiny. Codes of practice can guide appropriate feral animal control methods. Photo: CSIRO.

Objective 1.3 To improve public awareness of pest animals, research coordination and its support for pest management at the national level, and adoption of best practice management methods

Australia will never be free from the impacts of pest animals. New problems will arise by animal species slipping through even the strongest quarantine procedures, or from animals escaping captivity and establishing wild populations. Addressing existing and future pest animal impacts effectively will require actions related to education, communication, training and research. This will be facilitated by the appointment of the Australian Pest Animal Strategy National Coordinator (objective 1.1), responsible to the Vertebrate Pests Committee.

1.3.1 Raise awareness of pest animal impacts among landholders and the general community and their support for pest management through a communication plan to increase engagement in reducing pest animal threats

The effective implementation of the Strategy will require the support and participation of all stakeholders. In particular, it will be critical to involve public and private landholders in undertaking relevant pest animal control on their land. Industry and community groups also have important roles to play. Those who hold, breed and trade potential pests can play an important role in preventing the spread of pest animals, for example by not releasing such animals into the wild under any circumstances, and by reporting all escapes.

1.3.2 Produce a shared research and development plan to improve the development and adoption of best practice pest animal control methods, and facilitate adoption of this plan by all stakeholders

Although control options are available for many pest animal species, there is a need both to continually refine the techniques available and to develop additional techniques. For some species (e.g. feral cats, fish), there are few practical techniques currently available, so further research and development is essential. Research programs should especially address the lack of ecological knowledge for some species and the poor understanding of the social components of pest management. To coordinate national research in high priority pest research areas, a pest animal research and development plan will be developed as a critical component of the implementation plan. The research plan will identify current impediments to research and ways in which they could be overcome.

It is important that governments support new control techniques: these may currently be under-used because of a lack of knowledge, lack of formal training (e.g. Agricultural Chemical Users Permit certification), lack of funds, or a reduced capacity to manage pest animals following the decline in rural populations. The research and development plan will canvass approaches for more widespread adoption of new, more effective control methods.

1.3.3 Increase land manager awareness of integrated pest animal management and monitoring methods and their value, including by delivering training programs

Pest management involves more than just the killing of pest animals. Tertiary institutions need to provide future managers and researchers with knowledge across a range of fields, including ecology, chemistry, wildlife and landscape management, and socio-economics. Specific pest management education and training programs are needed for natural resource managers, secondary and tertiary students, and the broader community. Existing programs linked to adult training include the Companion Animals' Industry national training package and the National Conservation and Land Management training package.

A plague of mice take bait laid in a farm shed. Photo: Queensland Department of Primary Industries and Fisheries.

3. Actions under the Strategy in detail

Goal 2 Prevent establishment of new pest animals

Objective 2.1 To prevent the introduction of new animals with pest potential

Preventing new introductions into Australia is the primary and most cost-effective way to manage invasive species. It is therefore advisable to implement a holistic approach, including identification of sources and pathways, and interception before entry, to deal with invasive species that are potential pests but not yet established in Australia.

2.1.1 Work with Australia's trading partners and near neighbours to minimise the risk of introducing pest animals into Australia

As a country with pest management expertise, Australia should play a role in assisting its near neighbours to strengthen their abilities to manage invasive species, not least because action at the source of a potentially invasive organism reduces the risk posed to Australia. For example, South East Asia is home to many animal species potentially invasive to Australia, such as cobras, monkeys, house crows and black-spined toads. Some of these species have been spread across Asia deliberately as food or pets, or accidentally as hitchhikers. Actions to reduce the spread of pest animals in South East Asian countries may reduce the risk of spread to Australia.

Pest management assistance to neighbouring countries may occur through direct program delivery, assistance in training or the provision of technical expertise. For example, weed biological control programs have reduced the impact of weeds such as Siam weed (*Chromolaena odorata*) in countries to Australia's north, and the Northern Australian Quarantine Strategy currently assists in the surveillance of plant and animal pests in Indonesia, Papua New Guinea and Timor-Leste.

2.1.2 Maintain approaches for assessing the pest animal risk of all new animal imports

Effective management of potential pathways for animal introduction into Australia involves knowledge of all modes of entry: these may include legal importation, smuggling, 'hitchhiking', or illegal but accidental importation caused by contamination or a lack of knowledge. It is possible to reduce both intentional and unintentional introductions by assessing the risk of one or more species entering via a particular pathway.

To date, Australia's strong quarantine barrier has generally prevented unintentional pest animal entry, not least because border activities overseen by the Australian Quarantine and Inspection Service under the Quarantine Act 1908 have been designed to detect stowaways. Thus most of the exotic animal species used in agriculture or kept as companion animals or by hobbyists or commercial breeders in Australia have been imported deliberately.

Agricultural and medical research requires continuing experimentation with introduced species. The Environment Protection and Biodiversity Conservation Act 1999 and the Quarantine Act 1908 provide for risk assessments of candidate species for import. The Strategy Implementation Group will assess the need to harmonise related legislation and policies at state and territory levels, as these also act to regulate the import or keeping of animal species in different jurisdictions (see also action 1.2.1). The Strategy Implementation Group will assess the need for further harmonisation of provisions for importing species, as is already being done in the context of aquarium fish species.

2.1.3 Minimise the risk of escapes of legally captive or pet exotic species

Some of the species of highest risk of becoming potentially established in the wild are already in Australia, in legal or illegal captive holdings. It is therefore important to have in place effective legislation and other measures to discourage and prevent the release of these species into the wild.

Released pet goldfish are now naturalised through most of south-east Australia. Photo: J. Lochman, Lochman Transparencies.

Objective 2.2 To ensure early detection of, and rapid response to, new incursions of exotic animals

Effective implementation of the Australian Pest Animal Strategy will require a commitment to improving detection and rapid response to new incursions, which will be achieved through the following actions.

2.2.1 Develop and maintain nationally agreed lists of high-risk animal species for surveillance and national response

The Strategy Implementation Group will oversee the development of the following lists of important species not currently in Australia to provide a focus for national operations:

- A National Surveillance list of species, to be identified through pathway analysis of species at risk of arriving in Australia and assessment of the risk posed by potential establishment in the wild. This list will be a focus for national surveillance activities (action 2.2.3).
- A National Alert list, to cover species already established in Australia with the potential for further spread. These species will be the subject of assessments for eradication or containment (action 2.3.3).

Note that a list of Established Pest Animals of National Significance is to be developed as the basis for nationally-cooperative ongoing management for established pest animals (see action 3.1.1).

Early detection of a potentially invasive species is often crucial if eradication, or at least containment, is to be feasible. The timely identification of new incursions can be supported by improved training, new techniques to identify high-risk species, and targeted distribution of identification materials to people in a position to detect new incursions. These tools should be directed towards species identified on lists developed under action 2.2.1.

Case Study: Fish incursions in Australia

The need to improve community awareness of the risks of releasing exotic species into the Australian environment is illustrated by fish introductions. Fish species constitute a significant proportion of vertebrates with wild populations in Australia.

No fewer than 12 different pathways for human-assisted entry and dispersal of fish species have been identified. The aquarium industry has been the major pathway, with 22 species originating from this source. Before the 1920s, most alien fish were introduced by acclimatisation societies for sport fishing: species included roach (*Rutilis rutilis*), redfin perch (*Perca fluviatilis*), rainbow trout (Oncorhynchus mykiss) and carp (*Cyprinus carpio*). In the past 40 years, several species imported for aquarium or aquaculture use have been released deliberately or accidentally, including Atlantic salmon (*Salmo salar*), several African cichlids (*Amphilophus*, *Archocentrus* and other genera) and tilapia (*Tilapia zilii* and *Orechromis mossambicus*).

With an estimated 12 per cent of Australians now keeping aquarium fish, it is not surprising that releases of exotic species have occurred. Risk management requires nationally-consistent regulation, including the prevention of high risk species from entering the country, surveillance programs of high risk waters, and effective education campaigns on responsible pet ownership, including best practice disposal.

Introduced carp are now the most abundant large freshwater fish in the Murray-Darling Basin and are the dominant species in many fish communities in south-east Australia. Photo: G. Schmida, Lochman Transparencies.

3. Actions under the Strategy in detail

2.2.3 Establish and maintain nationally consistent processes for surveillance, reporting and identification of new invasive species incursions

A nationally-coordinated approach to surveillance is required to ensure that new incursions of existing pest species, or species with pest potential, are detected as early as possible. This should focus on species of concern, particularly those on the National Surveillance list (action 2.2.1), and on sites of concern (such as in and around ports and transit depots, islands or research facilities).

Governments, industry, non-government organisations and the general community all have complementary roles to play in an integrated national surveillance program. Processes should be put in place so that all levels of government can share information in a timely manner on pest species incursions, interceptions and outbreaks. This will facilitate better analysis of potential pathways, prevention and early response. As part of a national surveillance network, education programs should encourage individuals to report new pest species. Various community and industry reporting systems have already been developed for identifying and reporting invasive species of weeds and crop pests. These programs could be extended to pest animals, for example through the development of internet sites for reporting new species. However, current impediments to reporting need to be resolved. Of particular note is the shortage of trained taxonomists. Correct identification of species is crucial to effective surveillance, but Australia's capacity in this area has declined. New agreements or protocols to assist in species identification in Australia or overseas may be required.

2.2.4 Develop a pest animal incursion response plan

Procedures developed by the Strategy Implementation Group will give effect to processes to be agreed under the AusBIOSEC, including for nationally cost-shared responses. At the national level, response procedures are already in place for new non-vertebrate pest and pathogen incursions that affect primary production, such as new animal diseases or crop-affecting insects and diseases. These procedures include national committees to assess risks, conduct cost-benefit analyses of possible responses and oversee the required resourcing of staff actions and expertise. To avoid Australia being caught unprepared, similar response planning needs to be put in place for new pest animal incursions. One model could be the Alaskan 'rat spill' program, where fishers and other people visiting remote Alaskan islands are given the skills and equipment to respond to new rat infestations stemming from shipwrecks.

2.2.5 Guided by feasibility and cost/benefit assessments, conduct eradication programs for new incursions

Eradication is the elimination of an entire population of an invasive species. Although eradication may be expensive, and requires long-term resource allocations, it is the preferred response to any new incursion with a potentially serious impact. Jurisdictions need to ensure that staff are adequately trained in eradication response methods for a range of vertebrate pests.

The macaque, native to south-east Asia, is a potential invasive pest for Australia. They are highly adaptable, generalist feeders who prefer disturbed habitats near humans and can range from sea level to 1200 metres in tropical areas. Photo: SXC.

Case Study: The war against island invaders

Islands cover 3 per cent of the Earth's surface but provide habitat for some 45 per cent of bird, plant and reptile species. Since 1600, as many as 90 per cent of the world's bird and reptile extinctions, and up to half its plant and mammal extinctions, have occurred on islands. A major reason for this has been the introduction of exotic species, which have caused enormous damage to many island ecosystems and continue to endanger endemic species.

Work in New Zealand has identified seven principles of action that ensure successful eradication of pest species from islands:

1. Natural re-invasion of the island should not be possible;
2. Pest individuals should be removed from the population at a rate greater than that at which they can re-populate;
3. All individuals of the target species should be put at risk in as short a time period as possible;
4. All methods and techniques must be proven in trials or actual projects before use;
5. Absolute attention to planning and implementation detail is required;
6. Skilled and dedicated staff are required at both planning and implementation stages; and
7. There must be full commitment to the project at all levels of the relevant management agency.

Following these principles, New Zealand's Department of Conservation has successfully undertaken several programs to eradicate pest animals from islands, including logistically challenging programs in the Southern Ocean.

One high profile program has been the eradication of kiore (*Rattus exulans*) from Tiritiri Matangi Island in the Hauraki Gulf near Auckland. This eradication program, and the restoration of much of the native vegetation previously cleared for farming, made it possible to establish Tiritiri Matangi as an open sanctuary and island ark for the tuatara (*reptile*) as well as for many endangered bird species, including the red-crowned parakeet, North Island saddlebacks, whitehead, brown teal, takahe, North Island robin, little spotted kiwi, stitchbird, kokako, fernbird, and the North Island tomtit. In addition, tuis have subsequently self-established on the island.

Prior to 1984 Tiritiri Matangi in the foreground looked much like looked much like the mainland in the background of this photo. Since then, eradication of kiore and the restoration of native vegetation have successfully transformed the island. Photo: F. Keenan.

Rare native birds have been returned to Tiritiri Matangi including the North Island robin (toutouwai). Photo: F.Antram.

3. Actions under the Strategy in detail

Objective 2.3 To reduce the spread of pest animals to new areas within Australia

2.3.1 Reduce the risk posed by legally held species by containment and contingencies in case of release or escape

Several animal species originally introduced for primary production have subsequently established populations in the wild. Current activities, such as the translocation of both native and exotic fish species or the use of new breeds of grazing animals, can lead to new pest populations becoming established in the wild. Regulatory agencies therefore need to assess the risks of permitting the use of new species or strains where they could escape into the wild.

Some exotic animals currently kept in Australia in captivity pose a high risk of becoming established in the wild if sufficient numbers were to escape. To reduce this risk, special conditions should be applied to species in zoos, circuses, captive breeding or other forms of containment. All species require a risk assessment, and nationally agreed standards, including escape response strategies, should be developed for the keeping of animals in these facilities.

2.3.2 Through education and enforcement, control the natural spread or translocation of pest animals

The borders of states and territories provide opportunities for the spread of invasive species, particularly through unintentional carriage of pests in motor vehicles, but also for their control. Reducing the spread across jurisdictions will be enhanced by improved consistency between jurisdictions in legislative controls on the sale and holding of species (action 1.2.1). Natural boundaries also provide opportunities for quarantine controls. For Western Australia, for example, the Nullarbor provides a natural limit to spread. The isolation of Tasmania and offshore islands also provides opportunities for quarantine measures to control the introduction of new pest animals. Measures are in place, for example, to limit the spread of cane toads to offshore Northern Territory islands.

States and territories need also to put in place practicable measures to reduce the translocation of pests to new areas within their boundaries. This includes discouraging the deliberate stocking in the wild of pest species for hunting and recreational fishing.

Case Study: Starling management in Western Australia

As an invasive pest, few bird species compare to the Common Starling (*Sturnus vulgaris*) in their ability to colonise continents, wreak havoc on many agricultural industries and adversely impact biodiversity. Starlings were introduced to south-eastern Australia from 1857 onwards and are now widespread in all states and territories except the Northern Territory and Western Australia. The management of starlings in Western Australia shows how maintaining a long-term quarantine barrier, in this case the natural barrier of the Nullabor plain, can prevent the spread of an invasive pest species.

In Western Australia, starlings were first sighted in 1917 at Albany. Since then, an ongoing campaign has been waged to keep starlings out of the state. During a 30 year period, the starling control program removed more than 55,000 potential invaders from the western front of the starlings' range and from within Western Australia. The control program faced many challenges, but has had major successes, including stopping two major westward incursions at Manypeaks (1987–1988) and Bremer Bay (1988–1991). The program continues, increased in both size and intensity, with the latest infestation discovered in 2001.

The common starling is widespread in Australia except in the Northern Territory and Western Australia. Photo: SXC.

2.3.3 Assess the threat of 'sleeper' or other isolated populations and eradicate or contain these according to assessments of feasibility, costs and benefits

A few pest animal species currently exist in Australia only in small, isolated populations. Some of these species can be considered 'sleepers', in that they constitute a potential future risk from a population explosion: these include red-eared slider turtles in south-east Queensland and Polynesian rats on Western Australian islands. Sleeper species on the 'National Alert' list would be targeted for eradication to reduce the risk to other parts of Australia. Eradication of pest animals at key assets should also be assessed for feasibility and cost effectiveness (objective 3.2).

Goal 3 Manage the impacts of established pest animals

Objective 3.1 To identify established pest animals of national significance

Many of the 73 or so species of introduced vertebrates which have established populations in mainland Australia do not meet the criteria to justify eradication effort. For these species, the management options are containment, control or no management.

Some non-eradicable vertebrate pests have restricted populations (e.g. turtle doves) and their impacts are localised; other species (e.g. rabbit, fox) have wide distributions and their impacts are extensive and of national significance. Investment in the management of established pests should be largely directed to those species deemed to be having major impacts at the national level which can be mitigated cost-effectively.

3.1.1 Identify established pest animals of national significance as subjects of nationally coordinated action

The Strategy Implementation Group will oversee the identification of a List of Established Species of National Significance. This list can guide coordinated action by states and territories to more effectively control these established key pests (see Action 3.3.2).

The black rat impacts on biodiversity through eating small animals and birds, eggs, fruits, and other plant material. Photo: J. Lochman, Lochman Transparencies.

3. Actions under the Strategy in detail

Case Study: Western Shield Fauna Recovery Program

During the past 100 years, Australian native mammals have declined significantly in number and range. In Western Australia (WA), 11 species have become extinct, five species have disappeared from the mainland but remain on a few offshore islands, and 29 species remain on the mainland but have declined significantly or are threatened with extinction. This impact has been almost entirely confined to 'Critical Weight Range (CWR)' mammals—those that have a mean adult body weight between 35g to 8kg and are at risk from introduced predators.

Research in the 1980s by scientists from WA's Department of Environment and Conservation (DEC) showed that, for many species, the effective control of the European Red Fox leads to a recovery of native mammals in terms of population abundance and an increase in range. Fox control allows the re-introduction of species into areas of their former range and is the most effective method of recovering CWR mammals, as well as some other threatened species.

In 1994 an aerial fox control and research program called Operation Foxglove was initiated by DEC across about 570,000 hectares of the northern jarrah forest. Based on this success, in 1996 the Western Shield Fauna Recovery Program was launched. Western Shield is a broadscale program aimed at reducing fox density on DEC-managed lands to allow for the recovery of existing native animals and the re-introduction of others. Western Shield covers an overall area of 3.6 million hectares, extending from Esperance in the state's south-east to Karratha in the north, and including the national parks and forests of the south-west as well as numerous wheat belt reserves. Fox control is achieved by laying dried meat baits, containing three milligrams sodium fluoroacetate (1080), from the air or on the ground at an intensity of one bait to every 20 ha (five baits/km2), four times a year. Smaller reserves are ground-baited monthly.

Preparing 1080 poison baits for fox and feral dog control. Photo: B. Johnson.

European red fox in a trap. Photo: D. Peacock.

Western Shield and WA's previous large-scale fox control programs have proven successful: in 1996, the Woylie (*Bettongia penicillata ogilbyi*) was removed from WA's Threatened Species List and the National List, and in 1998 the Tammar Wallaby (*Macropus eugenii derbianus*) and Quenda (*Isoodon obesulus fusciventer*) were removed from the WA list. Western Shield research continues, refining its methods for effective cat control, and its monitoring techniques for cats and foxes, and exploring the concept of mesopredator release, where removal of the top predator in the ecosystem may increase the abundance of subordinate predators.

Objective 3.2 To identify and manage the impacts of pest animals on key assets

3.2.1 Ensure control programs give priority to key assets under threat from pest animals

In addition to the identification of species of national significance there is a need to identify key assets under threat from pest animals. The identification of key assets should include economic, social and conservation considerations and are likely to differ between states. For this reason, control of widespread species should focus on areas where impacts are greatest. For example, it may be better to invest more heavily in feral pig control in areas with high value crops than in areas with crops of lesser value. It may also be more important in some states to protect some high value assets from pest animal species of lower national significance (e.g. rats). The Strategy Implementation Group will assess the benefits of developing guidelines to identify and rank key assets for pest animal control.

Geographically discrete and isolated populations of pest animals can be found on mainland Australia and Tasmania, as well as on offshore islands. Such populations, particularly on offshore islands, provide important opportunities for pest eradication to support long-term biodiversity conservation. Jurisdictions need to identify isolated pest animals populations that impact on nationally important biodiversity values, and to assess the feasibility and cost-effectiveness of eradication and of then maintaining the area free of the pest.

Local ranger, conducting one of the biannual aerial baiting of Carrarang Station to the South of Heirisson Prong in Western Australia to create a buffer zone free of foxes adjacent to the core research area. Photo: J. Richards.

3.2.2 Develop and implement site-based approaches to managing pest animal threats to key assets

It is not feasible to manage the impacts of pest animals across large areas where key assets have been identified. In these situations targeted control in priority areas (site-based approach) will provide better management outcomes. While pest animals may be widespread, rarely are they uniformly spread across the landscape. Population densities and impacts can be quite different in different ecosystems. For this reason, control of widespread species should focus on areas where impacts are greatest or where the return for effort is greatest. Management programs should be focussed at locations where site characteristics (e.g. natural barriers to reinvasion, better access, presence of cooperative landowners) improve the likelihood of success. Thus the NSW Fox Threat Abatement Plan identifies priority areas for fox control across all land tenures to support biodiversity conservation, while the programs Western Shield in Western Australia, Southern Ark in Victoria and Operation Bounceback in South Australia all direct resources to priority areas.

Further research and field practice will assist in developing approaches to better manage pest animal threats to different types of key assets (such as populations of threatened small mammal species predated by pest animals).

3. Actions under the Strategy in detail

Objective 3.3 To coordinate the management of established pest animals across Australia

3.3.1 Develop national guidelines for managing established pest animals of national significance

National guidelines may be appropriate for the management of pest animals of national significance. Existing documents, such as the Bureau of Rural Sciences Guidelines and Department of the Environment and Water Resources threat abatement plans, could be adapted for this purpose.
The development of nationally consistent Codes of Practice and Standard Operating Procedures (objective 1.2) will also assist the coordination of pest animal control activities.

3.3.2 Develop management plans for established pest animals of national significance

The Strategy Implementation Group will oversee the development of national plans for the management of established pests of national significance. Where these plans address species listed as key threatening processes under the Environment Protection and Biodiversity Conservation Act 1999, these plans will also fulfil the requirements for national threat abatement plans in addressing the following:

- providing a clear statement of the pest animal problem;
- outlining objectives and actions;
- involving all stakeholders in establishing roles and responsibilities;
- integrating the plan with other natural resource management plans;
- considering the suitability and availability of all available tools, including control methods (e.g. chemical, commercial harvesting, mechanical and biological control management practices), training, education, legislation and regulation, incentives and penalties;
- promoting coordinated community action (following the Landcare approach); and
- providing an approach for monitoring and evaluation.

State, territory and regional natural resource management agencies or groups will be encouraged to develop and implement complementary plans to give effect to the national plans.

Preparing free-feeding bins for feral pigs in the Conondale Range, Queensland. Photo: D. Stewart.

4. Glossary

Terms in this glossary have been collected from various documents. Terminology to describe invasive species have not yet been standardised internationally.

Biosecurity	The management of risks posed by organisms to the economy, environment and people's health through exclusion, mitigation, adaptation, control and eradication (Global Invasive Species Program).
Containment	Keeping an invasive species within regional barriers (Global Invasive Species Program).
Emergency response	The detection and reporting of an invasive species where an immediate response decision and management action is required (Adapted from the AusBIOSEC glossary).
Endemic	Native to a particular area and found nowhere else (Australian State of the Environment Report, 2001).
Eradication	The removal of the entire population of an alien species in a managed area: eliminating the invasive species completely (Global Invasive Species Program).
Establishment	The process of a species in a new habitat successfully reproducing at a level sufficient to ensure continued survival without infusion of genetic material from outside the system (Global Invasive Species Program).
Exotic	Not native to a particular country, ecosystem, or eco-area (applied to invasive species intentionally or accidentally introduced as a result of human activities) (International Standards for Phytosanitary Measures, Glossary of Phytosanitary Terms).
Feral population	An animal species that has reverted to the wild from domestication. The mere keeping of a species in captivity does not imply domestication, so the term should never be used to refer to wild, non-domesticated species (European Communities 2004).
Introduction	The movement by humans of a species outside its natural range, both within a country or between countries (International Union for the Conservation of Nature and Natural Resources—the World Conservation Union, 2000).
Invasive species	A non-native species, the establishment and spread of which threatens ecosystems, habitats or other species with economic or environmental harm (Global Invasive Species Program).
Native species	A species within its natural range (past or present), including any area which it can reach and occupy by its own legs, wings, wind/water-borne or other dispersal systems, even if it is seldom found there (Global Invasive Species Program).
Pathway	The means by which invasive species move. Possible pathways include air, surface water, groundwater, plants, animals and humans (adapted from the Australian Weeds Strategy).

4. Glossary

Pest animal	Any animal having, or with the potential to have, an adverse economic, environmental or social impact.
Quarantine	Legal restrictions imposed on a place, plant, animal, vehicle, or other things limiting movement (Adapted from the Australian Veterinary Emergency Plan (AusVETPLAN)).
Sleeper	Exotic species that have established, but are believed to have not yet reached their potential to form large and widespread populations in Australia, despite being established for some years. They are regarded as having the potential to assume major significance as invasive species (Adapted from the Australian Weeds Strategy).
Surveillance	An official process which collects and records data on pest occurrence or absence by survey, monitoring or other procedures (International Standards for Phytosanitary Measures, Glossary of Phytosanitary Terms).
Translocation	The deliberate transfer of species or regenerative material from one place to another. Translocation can be used to enhance existing populations, reintroduce a species to a site where it formerly occurred, and to introduce a species to a site where it hasn't been recorded previously (Australian National Botantical Garden).

5. Bibliography

Australian Weed Strategy (2006, in press)

Bomford, M. (2003). Risk assessment for the import and keeping of exotic vertebrates in Australia, Bureau of Rural Sciences: Canberra.

Bomford, M. and Hart, Q. (2002). Non-indigenous vertebrates in Australia. Pp. 25–45 in D. Pimental (Ed.): Biological Invasions: Economic and Environmental Costs of Alien Plant, Animal, and Microbe Species. CRC Press, Boca Raton, Florida.

Braysher, M. (1993). Managing vertebrate pests: principles and strategies. Commonwealth of Australia.

Commonwealth of Australia (1997). The national weeds strategy. Agriculture and Resource Management Council of Australia and New Zealand, Australian and New Zealand Environment and Conservation Council and Forestry Minsters, Canberra.

Commonwealth of Australia (2005) Australian Animal Welfare Strategy Australian Government Department of Agriculture, Fisheries and Forestry, Canberra.

Department of Natural Resources and Mines (2005). Vertebrate pest manual: A guide to pest animal management in Queensland. Department of Natural Resources and Mines, Queensland.

Global Invasive Species Programme. Founded by the IUCN (the World Conservation Union), CAB International and the Scientific Committee on Problems of the Environment (SCOPE). www.gisp.org

McLeod, R. (2004). Counting the cost: impact of invasive animals. Cooperative Research Centre for Pest Animal Control, Canberra.

Appendix 1 Other relevant strategies and activities

This strategy is supported by many other state, territory and national strategies and activities that share goals in the management of pests, biosecurity and natural resources. The range of scale, scope and inter-relationships are illustrated by the examples in the following table

Scope/scale	Biosecurity management/ resource management	Pest management	Species management
National	Australian Biosecurity Strategy for Primary Production and the Environment. National Animal Health Strategy. National Plant Health Strategy. National Aquatic Animal Health Strategy.	Australian Weed Strategy. National System for the Prevention and Management of Marine Pest Incursions. A Strategic Approach to the Management of Ornamental Fish in Australia.	Threat abatement plans for species such as feral cats, foxes, rabbits, goats and pigs. National pest management guidelines.
State	State biodiversity Strategies State biosecurity strategies	State invasive species framework / targets / indicators. State pest animal strategy.	Individual pest animal strategies e.g. wild dogs, rabbits, feral pigs. Threat abatement plans for individual species. Individual species reference groups.
Regional/ Catchment	Natural resource management strategies for regions.	Regional / Board Pest Management Plans. Regional pest management strategies.	Regional management plans for individual species such as wild dogs, deer, feral pigs and rabbits.
Local	Local biosecurity plans	Local government area pest management plans.	Local and community group programs.
Property	Property management plans.	Property pest management plans.	Individual property pest animal management actions.