

5 Investment in the management and control of invasive animals

Where is funding going and what benefits does it provide?

Evaluating the effectiveness of management decisions, control options and investment is essential. To assess the effectiveness of investments on invasive animal populations and the adverse impacts they cause, information is needed on where investments are being allocated, what control and management activities are being undertaken, which activities are successful and why, and what levels of damage are being caused by invasive animals. This information is also necessary to determine which management strategies may need to be implemented in the future to reduce the impacts of pests on the economy, environment and society.

This chapter identifies sources of information about investment and where investment is allocated. The information can be compared with the national abundance and impacts data available in this Assessment (and from other initiatives) to identify the outcomes of major investments. This can serve to identify investment priorities, and where to target investments in future activities.

Australian Bureau of Statistics surveys

National information on the costs of control of invasive animals may be obtained from the Australian Bureau of Statistics (ABS) biennial survey on 'Natural Resource Management activities and issues on Australian farms'. This survey commenced in 2004–05 and collects information on natural resource management (NRM) issues (including invasive animals and their management) from 130 000 agricultural establishments throughout Australia. It has gathered information on pest species, control activities, costs of pest management by landholders, pest animal impacts, and the proportion of land impacted. This information can be reported at state and NRM-regional levels for comparison with the extent and impact data available within this

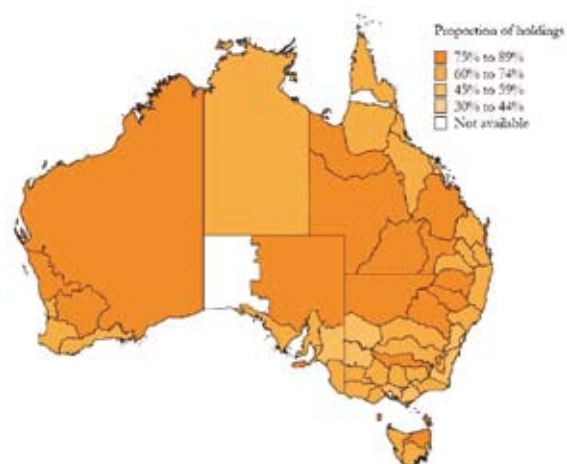
Assessment (see Figure 5.1). The next biennial survey is scheduled for reporting during 2008.

Previous natural resource management programs and future Caring for our Country initiatives

Although the new NRM initiative Caring for our Country program is scheduled to take effect from July 2008, information on investments in research and control should also be available from previous NRM programs. Previous Australian Government NRM programs have helped restore and conserve Australia's environment and natural resources by funding thousands of community group projects. These have involved important on-ground environmental activities and control of invasive animals to protect environmental assets.

Other initiatives, such as the National Feral Animal Control Program (NFACP), have funded vital research and control projects for invasive animals in Australia. Each year, NFACP funds projects that aim to develop improved approaches to controlling the impacts

Figure 5.1 Proportion of landholdings reporting invasive animal-related issues



Source: Modified from ABS (2006)

of invasive animals, improving the effectiveness of control techniques, and producing guidelines for managing nationally significant invasive animals.

Many of these projects and programs show where investment (through control) is allocated. Comparison of these information types with the national distribution, abundance and impacts information from this Assessment may reveal whether funding is targeting the correct areas, identify priorities for future funding and determine whether outcomes from funding are being reached on a national scale

Areas of active management

It is equally important to identify areas of active management to allow the outcomes of management strategies to be assessed against investment and management action targets. Information on where control is being carried out can be used to evaluate the effectiveness of major investment programs. This information can be compared with that on the extent and impact of pest species to identify strategies and resources required to manage these pests.

A number of authorities are responsible for the management and control of pest species in Australia. To evaluate major investments and programs, and to provide a representative picture of management activities, information on the areas of active management would need to be collated from many authorities at local, regional, state, territory and national levels. The main authorities undertaking control include government agencies and regional authorities, community groups and landholders. Information on the area of active management and the management options that are selected is also important for planning the allocation of resources for future management activities.

Options available for managing invasive animals include local eradication, no management, crisis management, one-off management, sustained management and targeted management (Braysher 1993). Additional information that would be important to collate in this process includes:

- where pests have been locally eradicated
- the area of control
- the levels of control
- the intensity and frequency of control activities
- the assets being protected.

Pest impacts and environmental assets

To assess how well the investments and control programs are performing, it is essential to collect and report information on the impacts of invasive pest species. Examining information on environmental, economic and social assets is also important to determine whether resources and investment are being allocated to the most important areas.

Identifying where investment is being allocated, and determining its effectiveness in reducing the impacts of invasive animals on assets requires three types of information:

- investment in control activities — available through government NRM programs (eg the Caring for our Country program)
- impacts on assets — available from ABS landholder surveys or other sources
- the area of active management — available from relevant government and non-government authorities at all levels.

The current Assessment provides a valuable tool for evaluating NRM programs and future Caring for our Country programs, and can be used to identify priorities for future investment, control activities and research. Future assessments are expected to build on the information reported in this Assessment, which will provide better information on invasive animals distribution, abundance and impacts that can be used to evaluate various investments and funding programs.

It is anticipated that the next national assessment on invasive animals will also report on five key areas to allow the effectiveness of investment strategies to be assessed. These are:

- national, state and territory investments in invasive animal control
- the areas of active invasive animal management (and associated activities)
- control costs (incorporating annual control costs by regions)
- environmental, economic and social assets being protected
- impacts of invasive animals on respective assets.



6 Building on national compilations in future assessments

This section briefly summarises a series of recommended improvements to national compilations of information about invasive animal distribution, abundance and impacts for monitoring and reporting under the National Monitoring and Evaluation Framework (National M&E Framework) described in Chapter 2. These recommendations form the basis of our recommendations for a national information system for invasive animals presented in Chapter 7 and for future directions presented in Chapter 8.

Building on existing information

Previous surveys and national assessments have provided information on the distribution and density of a number of invasive animals throughout Australia (Wilson et al 1992; NLWRA 2001, 2002). A number of other significant surveys and assessments of invasive animals have been coordinated through state and territory government initiatives. This Assessment builds on those national, state and territory achievements by capturing detailed information for a broad range of established invasive animals of national significance.

At the time of this Assessment, each state and territory jurisdiction maintained an independent database or series of information datasets on invasive animals that were used for state-level management activities. National information presented in this Assessment has been consolidated from these existing state- and territory-based datasets on the distribution, abundance and impacts of invasive animals. During this Assessment, the states and territories identified a need for further development and improvement of their datasets to provide better information at the national level. We recommend a framework of regular national assessments to support this process.

Future assessments

For future assessments and to build on the achievements of this Assessment, we present five key recommendations to improve the data available for monitoring and reporting of nationally significant invasive animals in Australia.

1. Consider and adopt (where feasible) monitoring techniques for vertebrate pests (see Mitchell and Balogh 2007) at regional and state or territory levels.
2. Adopt flexible and practical national monitoring protocols (see Chapter 2) at regional and state or territory levels.
3. Include emerging pest species within management programs as well as monitoring and reporting activities.
4. Develop ongoing data management procedures regarding invasive animal species for state or territory and national authorities.
5. Manage national data within a national information system for invasive animal species, or a complementary system.

The collection, collation and reporting of key matters for target for invasive animals provides a platform for ongoing improvements in the monitoring, evaluation and reporting of invasive animals. This Assessment provides, for the first time, national information on nationally significant invasive animals using a consistent method as a benchmark for ongoing monitoring and evaluation. Implementation of national monitoring protocols and consistent use of monitoring manuals hereafter will provide three key outcomes:

1. fundamental information for ongoing monitoring, evaluation and reporting requirements
2. more comprehensive and comparable information on invasive animals for future assessments

3. meaningful information on trends in pest populations and their impacts to evaluate the success or otherwise of investment programs, policy and management programs throughout Australia.

Requirements for future monitoring and reporting

This Assessment identified a number of specific requirements for monitoring and reporting of information on the distribution and abundance of invasive animals for the National M&E Framework. These requirements include the need for methods and procedures to:

- compile and aggregate relevant fine-scale datasets within a centralised database that maintains the integrity of state- and territory-based data and associated attribute fields
- formalise data access and establish exchange agreements for accessing state and territory datasets for national compilations

- address jurisdictional border discrepancies and resolve conflicting data
- develop products for review (and endorsement) by respective authorities
- verify qualitative information through ground-truthing surveys, and for reporting the level of accuracy and precision of collected data.

Increased and continued use of field-based techniques for monitoring invasive animals, as defined by monitoring technique manuals (see Mitchell and Balogh 2007) and the adoption of the national monitoring protocol (see Chapter 2), will significantly improve the quality and reliability of future national datasets. Future assessments will provide data of higher quality and allow trends in populations throughout Australia to be reported more accurately.

A commitment to providing adequate resources to monitor and report invasive animals and their impacts ensures a capacity to report fundamental information on invasive animals to address key matters for target under the National M&E Framework.



Invasive pest species can damage Matters of National Environmental Significance such as Ginini Flats Ramsar wetland, ACT (photo by Peter West)



7 Information management and a national information system

This section briefly describes the importance of national information management for invasive animals, as well as the information systems available for ongoing information management and reporting.

A number of systems have been developed, or are under development, by governments to manage information and to deliver information products to decision makers. Two existing systems that could be considered for the delivery of products and data regarding invasive animals include the Australian Natural Resources Atlas and Australia's Resources Online (ARO). The third option under consideration is the development of a national information system for invasive species. These options are briefly described below.

The Australian Natural Resources Atlas and associated Data Library

The Australian Natural Resources Atlas²³ provides information to aid decision making across all aspects of natural resource management. It covers the broad topics of water, land, agriculture, people and ecosystems. The atlas presents information nationally, by state or territory and by region, and also by information topic. Users of the atlas can prepare a map (using the Map Maker facility) or search hundreds of reports (using the Data Library facility). The atlas also provides access to various 'theme reports' (accessed through the link 'Natural resource topics' on the Atlas website). This service may provide some of the functional requirements for reporting national invasive species information to a range of decision makers within state and national governments. However, this system may not have the capacity to collect, collate, manage or update complex state-administered datasets for invasive species.

²³ <http://www.anra.gov.au> (Accessed 15 May 2008)

Australia's Resources Online

The ARO²⁴ reporting mechanism is being developed as part of the Australian Natural Resource Atlas. Where possible it will use interoperable systems. This would provide access to currently available natural resource data compiled from distributed data sources, which are managed by the respective custodians of the data. ARO will also provide information on resource condition and trend at the national, state and, where possible, regional scales, as well as links to information on project- or output-level reporting systems. ARO aims to strengthen the links between monitoring and reporting activities. This service may also perform functions required for collection of relevant information about invasive species and delivery of various products to end-users, although it may not have the capacity to address requirements stipulated by the National Monitoring and Evaluation Framework (National M&E Framework), or all the needs of state, territory and national governments for monitoring and reporting of invasive animals.

A national information system for invasive species

The third option for information management is the development of an invasive species-specific national information system, or the development of an invasive species component of an existing national information system.

This Assessment has produced the first nationally consistent dataset of significant invasive animals in Australia. The state and territory jurisdictions and regions that have contributed to the Assessment have expressed significant interest in maintaining and updating the dataset at regular intervals through further national assessments. There is a need to expand the list of species assessed to accommodate those relevant

²⁴ <http://www.anra.gov.au/aro/index.html> (Accessed 15 May 2008)

specifically to states and territories, as well as emerging species that may present significant problems in the future. A national information system could address these needs, as well as the requirements to monitor and report under the National M&E Framework.

This Assessment coincided with unanimous agreement by relevant authorities at national, state or territory, and regional levels of the need for a national invasive species information system.

The national coordinating committees for invasive animals and weeds — the Australian Vertebrate Pests Committee and the Australian Weeds Committee collectively recommended that:

- It is a priority to develop or adopt an information system for invasive species information management.
- A national information system will allow improved coordination and reporting on invasive animal issues and trends, which are required to implement the Australian Pest Animal Strategy.
- A detailed assessment is required regarding the suitability of existing systems (and those under development) to manage invasive species information.

Urgent need for a national information system

There are four fundamental reasons why a national invasive species information system is imperative for invasive animal management in Australia.

1. There is a critical need for consistency in the way information is collected and reported for delivery of meaningful state, territory and national products for decision makers and policy development.
2. There is an urgent need for a platform for monitoring and reporting information on invasive species matters under the National M&E Framework. Each state and territory has committed to reporting on invasive animal matters for target. A national information system could address these and

many additional needs nominated by relevant authorities (eg the need for information on emerging species, areas of investment, control activities, impacts on assets, and areas of active management).

3. State, territory and national information requires validation to support decision-making. A national information system could supply a platform for inclusion of detailed survey information and better use of information from the present and future assessments.
4. Existing protocols and monitoring practices are likely to evolve over time to incorporate better techniques and procedures developed through research and operational activities. A national information system is required to manage, maintain and update invasive animals datasets to ensure that the most up-to-date information is available for decision makers and reporting.

Key issues

The key issues regarding state and territory data and information management that need to be addressed in the development of a national information system are:

- Jurisdictions presently use different information systems for monitoring and reporting on invasive pests.
- Datasets often reside within several agencies within jurisdictions, requiring data to be consolidated from several state or territory agencies.
- Consolidation of information into a central location was feasible for this Assessment; however, there are currently few mechanisms in place for generating state- and territory-wide datasets as part of normal state or territory activities.

Chapter 8 discusses the way forward for the development and adoption of a national information system for invasive animals in Australia.



8 Future directions

This section briefly describes the priorities and future directions for monitoring, evaluating and reporting of nationally significant invasive animals in Australia.

This Assessment provides, for the first time, national information on significant invasive animals in Australia and serves as a benchmark for ongoing monitoring and evaluation. It also provides information that can be used broadly as a measure of the success, or otherwise, of management policy and programs in place throughout Australia.

The indicator protocols (see Chapter 2) developed during the course of this Assessment provide guidance for state, territory and regional groups for monitoring and reporting under the National Monitoring and Evaluation Framework (National M&E Framework). Implementation of these national protocols will provide more comprehensive information on invasive animal distribution and abundance, as well as additional information on trend in invasive animal abundance and the quality of the available information about pest species. When compared with the current Assessment, future assessments will show accurate trends in pest populations and their impacts.

Species of national significance

To assess the effectiveness of management strategies and investment in invasive animal management (using distribution, abundance and impacts information) requires monitoring of a consistent list of species throughout all jurisdictions. The Australian Vertebrate Pests Committee (VPC) recommended 10 species as 'species of national significance' for monitoring and reporting activities at the state, territory and national levels under the National M&E Framework. The list was based on current state, territory and national priorities.

VPC is presently developing criteria for nominating established invasive animals of national significance, which may be used to guide ongoing monitoring and reporting activities. The proposed list is based on priorities, as well as legislation, management and policy. It is important that the species selected for

monitoring and reporting represent state, territory and national priorities (as recommended by VPC and relevant Australian Government authorities).

During this Assessment, we identified a number of ways to improve the list of species recommended for monitoring and reporting under the National M&E Framework. These recommendations were:

- include emerging as well as established species in monitoring and reporting activities
- include additional pest fish species (also referred to as alien fish) in the list because pest fish present a significant threat to the environment and fishery industries
- include additional pest birds in the list because pest birds cause significant impacts on agricultural production and the environment
- ensure that the final list represents those species where the success of management can be measured and determined.

Involving stakeholders

The current Assessment engaged relevant groups from local government, regional bodies, state and territory governments, and the Australian Government to collate detailed data and information on invasive animals. Further engagement of natural resource management (NRM) regional groups is required to incorporate detailed local- and regional-level information, and to ensure an enduring system is in place to monitor and report on invasive animals in Australia. Adequate resources are required for NRM regional bodies to develop and implement invasive animal management and monitoring strategies to facilitate these tasks.

Where appropriate, additional stakeholders or groups (such as community groups and non-government organisations) were involved and may be able to provide additional information in the future on the extent and impacts of invasive animals.

Monitoring protocols

Monitoring and reporting activities under the National M&E Framework are guided by nationally agreed indicators for significant invasive animals, using accompanying monitoring protocols. The protocols are intended to form the basis for monitoring within regional areas, under the guidance of state or territory authorities. Two monitoring protocols were prepared under the guidance of VPC for the following two national indicators for significant invasive vertebrate pests.

1. Distribution and abundance of significant invasive vertebrate pests
2. Impacts of significant invasive vertebrate pests.

The protocol for distribution and abundance was endorsed by VPC and the Audit Advisory Council, and formed the basis of this Assessment (see Chapter 2 and Appendix 1).

The protocol for impacts (see Chapter 2 and Appendix 2) recommends the use of case studies to demonstrate, monitor and report invasive animal impacts, and also forms the basis of reporting for this Assessment. However, it was further recommended that the impacts protocol requires refinement for reporting meaningful information about invasive animal impacts that can reflect management and investment outcomes.

During this Assessment, we identified a number of recommendations for implementing the two monitoring protocols for invasive animals. We specifically recommend the:

- adoption of field-based monitoring technique manuals (such as Mitchell and Balogh 2007) at local and regional levels to maintain accurate information in national datasets
- validation of qualitative and anecdotal information contained in this Assessment through field-based verification surveys
- implementation of national monitoring protocols in an ongoing capacity to provide more detailed information on invasive animal populations, trends over time, and detailed impacts information required to assess the effectiveness of management and investments
- review of the reporting scale at which monitoring and reporting is undertaken, with the purpose of providing more detailed information for reporting changes in populations in response to management actions

- refinement of the indicator monitoring protocols if emerging species, alien fish species or pest bird species are included under the invasive animals indicator
- development of an impact monitoring framework to complement the existing impact monitoring protocol that can be used for monitoring and reporting the impacts of invasive animals, that can
 - facilitate ongoing and consistent monitoring of impacts information Australia-wide
 - evaluate the effectiveness of management and investment
 - prioritise management resources to where they are most needed
 - increase the effectiveness of best-practice control strategies
 - increase awareness of research requirements including innovative techniques
 - improve the knowledge and education of the impacts of invasive animals in Australia.

A trial phase to test how well the current indicators and monitoring protocols address the goals of the National M&E Framework will be important and should investigate their ability to:

- assess the status of invasive animals and their impacts in Australia
- monitor the success of management and investments using tangible means.

Roles and responsibilities

This Assessment developed and implemented consistent monitoring protocols to report national information on significant invasive vertebrate pests. To ensure an enduring process of monitoring, reporting, evaluation and program improvement, the ongoing roles and responsibilities of relevant regional, state and national authorities must be clarified. Methods for monitoring invasive animals and delivering information about their impacts to decision makers must be timely, accurate and precise.

Ongoing and reliable monitoring, reporting and information management rely on:

- agreement by relevant authorities on the fundamental information required to manage invasive vertebrate pests and their impacts
- agreement by authorities on who should be responsible for the required monitoring and reporting tasks at all levels

- agreement on data management, intellectual property and infrastructure
- institutional arrangements and data-sharing agreements
- funding and investment of ongoing monitoring and reporting activities.

A commitment is required through government NRM programs, such as the new Caring for our Country initiative, to funding of essential monitoring, evaluating, reporting, and program-improvement activities at state, territory and national levels to address the increasing problems caused by invasive animals in Australia.

Future assessments

The current Assessment should be used as one of many mechanisms to evaluate investment programs, NRM initiatives and future Caring for our Country programs. This Assessment may also be used, with appropriate supporting information, to identify priorities for future investment, control activities, management planning and research.

During the Assessment, state and territory jurisdictions and regions recommended the regular updating of information and datasets on invasive animals to maintain their usefulness to management authorities. Although ongoing monitoring and reporting activities are needed to maintain the underpinning information, a process of consolidating data into state and national formats should be developed through ongoing assessments.

Future assessments should be undertaken as recommended by the relevant national coordinating committee, being VPC. As a guide, we recommend that the next assessment should be undertaken within two to four years and that the indicators and monitoring protocols should be reviewed for their capacity to:

- assess the status of invasive animals and their impacts in Australia
- evaluate the effectiveness of management and investments over time.

It is anticipated that future assessments will build on the achievements of the current Assessment and, with the adoption of relevant monitoring protocols, will provide more detailed and increasingly valuable information on invasive animals and their impacts in Australia.

Future assessments should provide information on:

- the rate of spread at the invasion front for a number of species
- the spread of emerging species across various jurisdictions
- fluctuations in the distribution and abundance of established species
- trends in the populations of invasive animals in response to control programs.

These aspects are imperative to identify whether management actions and investments are having the desired effect on invasive animal populations and their associated impacts.

Additional information

During this Assessment, the states, territories and regions recommended that it should be a priority to maintain the invasive animal distribution and abundance datasets. A number of additional information types were identified that should be collected to determine the effectiveness of various investments and management programs, and there is a clear need to identify which authorities have the capacity to report on these matters. Specific information requirements for future assessments include:

1. **Updated information** — information is needed on the distribution, abundance and impacts of invasive animals for comparison with the current Assessment.
2. **Assets** — information on economic, social and environmental assets is required to assess whether investment is mitigating the impacts of invasive animals and to identify whether investment is targeting the best areas. Information on environmental assets can potentially be sourced from state, territory and national governments.
3. **Investment** — it is critical to determine whether allocated investment is targeting the best areas and whether it is having a positive outcome. Information on investments (including costs of control activities) could be identified from various sources, including government NRM programs (eg future Caring for our Country programs).
4. **Impacts** — information on the impacts of invasive animals and the effectiveness of control programs is critical to identifying whether investment is having the desired effect. The development of an impact-

monitoring framework is recommended to facilitate consistent reporting. Detailed information on the impacts of invasive animals can be obtained from research and monitoring programs. Reports of impacts from landholders can also be obtained from the Australian Bureau of Statistics' biennial surveys.

5. **Area of active management** — management authorities require information on management actions, control and associated activities to make informed decisions and to measure the effectiveness of investments in reducing invasive animal populations and their impacts. Active management information can be collated from the relevant authorities at all levels.
6. **Occurrence of new and emerging species** — to assess the effectiveness of management and investment on established species, information is required on their occurrence, distribution and abundance. However, for emerging species, and those still colonising new areas, occurrence information alone is sufficient as a measure of the effectiveness of management programs, strategies and investment.

A national invasive species information system

Agreement was reached during the course of this Assessment on the need for a national information system for invasive species in Australia to address future national reporting.

It is important to identify a clear strategy for the development (and adoption) of a national system for managing invasive species information, and it is

equally important to identify ways to improve the collection, collation and reporting on an invasive animal's distribution, abundance and impacts information, and the communication of this information to decision makers. Any future national information system must address these needs as relevant to the states, territories and the Australian Government.

A national information system may provide a means for consolidating all state and territory data for ongoing access and use. However, a national information system for invasive animals also needs to:

- have an enduring capacity and allow for ongoing reporting requirements
- have an ability to consolidate all relevant state, territory and national datasets to report national information
- address current and future state, territory and national management and reporting needs, particularly National M&E Framework issues
- address data-access arrangements between the states and territories and the Australian Government for monitoring, evaluation and reporting activities.

The National Land & Water Resources Audit, the Australian Weeds Committee (AWC) and VPC should continue to work towards developing an information system for invasive species in Australia. The national biosecurity program — Biosecurity, Surveillance, Incident Response and Tracing (BioSIRT) — is currently under review for its suitability for ongoing monitoring and reporting of invasive species.