



Discussion paper: Effective citizen action on invasive species The institutional challenge

> Professor Paul Martin Professor Darryl Low Choy Dr. Elodie LeGal Dr. Kylie Lingard 2016









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Professor Paul Martin, University of New England Professor Darryl Low Choy, Griffith University Dr. Elodie Le Gal, University of New England Dr. Kylie Lingard, University of New England

> Contact: Professor Paul Martin University of New England Armidale, 2351 Paul.Martin@une.edu.au

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Executive Summary

Invasive plants, animals, fish and other species cause significant harm and put human values at risk. Invasive animal control is often difficult because invasive species breed, adapt and expand exponentially. Control methods are often costly and can result in non-targeted economic, social and environmental impacts. Invasive animal management is a 'wicked' policy problem because it is a highly complex environmental issue. Control efforts are often insufficient to ensure full and long-lasting eradication. The effectiveness of invasive species management is also jeopardised by the geographical and often catastrophic dimension of this unique challenge. Australia, which is a continent characterised by a mega-biodiversity and a relatively small population density, particularly in rural and remote areas, faces unique institutional challenges to effective community engagement for invasive species management.

Yet, the control of established invasive species depends significantly on private citizens: as landholders or observers who detect incursions; as landholders and volunteers who control these incursions; as activists for or against control; and as voters who shape political preferences. Invasive species management is affected by the 'Invasive Species System' which encompasses the many overlapping rules, resourcing arrangements and bureaucratic structures that support or impede effective community action for protecting Australian's biodiversity and agricultural values. The Australian institutional environmental also determines how the economic, social and environmental costs and benefits are distributed amongst the urban, peri-urban and rural population. Invasive species management can raise significant distributive issues that can contribute to widening the gap between the urban rich and the rural poor.

Australia's federal and state government policies emphasise reliance on private citizens to detect and manage hazardous invasive species once they enter Australia. To support citizen action, farm organisations have increased their financial assistance to landholders for fighting the invasive species threat. Voluntary land management and conservation programs are also growing to develop effective community capacity-building mechanisms. However, with climate change and global warming issues, the pressures of invasive species upon natural, agricultural and humans systems are increasing and the resources for effective community-driven control strategies are chronically inadequate. Thus, whilst the invasive species issue seems to seldom discussed in the media and political arena, the need to ensure that institutional arrangements support effective citizen action is of national importance.

This report summarises the key areas where reform is needed and 'puts on the table' priorities and proposals that should be considered. Its focus is institutional issues that affect voluntary citizen action for the control of invasive species (particularly major vertebrate pests) in rural and peri-urban areas. Complementary publications from the Invasive Animals Cooperative Research Centre Program 4 ("Facilitating Effective Citizen Action on Invasive Species") provide further analysis. These documents include our report on the extensive community consultations that informed this Discussion Paper and our report on reform recommendations.¹ The overall purpose of these evidence-based reports is to stimulate discussion, agreement and eventual reform to strengthen community resilience against the

¹ Martin, P. and Low Choy, D. 2016. *Recommendations for the reform of invasive species management institutions*. IACRC: Canberra.



economic, social and environmental costs from the devastating spread of invasive species/animals.

The content of this report has been developed over three years. Other researchers who contributed to earlier versions are Dr. Graham Marshall and Katrina Dickson. This version benefited from the assistance of Dr. Kip Werren, Roxane Blackley and Vivek Nemane. Many other people provided us with advice. Those mistakes that remain are our own. Naturally, the views expressed in the report may not coincide with those of the people who have been consulted or the organisations to which they belong.

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V1.2	1 October 2014	General circulation for community comment and feedback
Final	3 May 2016	Final discussion paper



Glossary

Term	Glossary
Biosecurity	Measures to protect human welfare and property from harms from the entry and spread of pests and diseases.
Citizen	A person with legal rights to live within a country. The term infers private freedoms, and obligations on government and others to respect those rights.
	Citizens are involved in invasive animal control as landholders and land managers, volunteers, voters and activists. They vary in their motivations, their capacity to carry out or cooperate in control work, and in the challenges they face.
Community	A group of people with a common interest, such as living together or participating in a political or social movement. The term does not infer any particular legal status or rights.
Human dimensions of NRM	Aspects of natural resource management (NRM) concerned with the behaviour of citizens and communities that are an increasing area of research and practice specialisation. Relevant aspects include participation and engagement, communications and institutional arrangements.
Indigenisation	The process through which a plant or animal (including human) becomes adapted to an environment and viable within that environment.
Invasive species (IS), including invasive animals (IA)	A potentially harmful species, not indigenous to the area where it is harmful. In this report, we focus mainly on invasive animals, particularly vertebrate pests. Where we refer to both plant and animal issues, we use the term 'invasive species'.
Institution	A social structure that shapes how people relate to each other, and in particular, how information and resources flow between them. Analysis generally emphasises rules (e.g. legislation and private rules such as contracts) and the organisations that shape, make or implement these rules.
	Institutions include those of government (e.g. Parliament, government agencies, police), markets (e.g. banks, corporations, exchanges), and community (e.g. non-governmental organisations, community groups and religious organisations).
	Institutions can also mean enduring norms or beliefs that shape how people relate to each other. For example 'the institution of marriage'.
Institutional arrangement	A set of institutions that work together, or a process involving a number of institutions. For example, an institutional arrangement can refer to a set of instruments (e.g. the instruments used by banks to charge interest and secure or enforce loans) or a network of institutions, organisations and/or instruments (e.g. the total property financing system).



Institutional impediments	Where institutional arrangements make it more difficult or costly for landholders, volunteers and extension or control workers to take desirable action. Examples include problems in obtaining money, ensuring that activities are properly coordinated and maintaining projects long enough to be effective.	
Natural resource governance	A system for directing or controlling how natural resources are exploited, protected or restored. The system involves government and non-government institutions participating in activities such as regulation, market transactions and community action.	
NRM	Natural resource management (NRM) refers to the methods and institutions intended to ensure the sustainability of environmental resources.	
Paradigm	A generally accepted way of interpreting patterns from within a discipline or a society. For example, the paradigm in the physical sciences has shifted over the centuries from philosophical and religious inferences to measurable phenomena with minimal reliance on abstract considerations.	
Polycentric or nested governance	A governance system in which diverse sources of authority operate at the same time, governing the same or similar issues. Australia's federal system, with three levels of government and regional catchment management illustrate this form of governance. Whilst structural complexity has costs, it can be associated with benefits such as local autonomy, opportunities for innovation and resilience.	
Problematisation	The process of defining a phenomenon as a problem in need of solution.	
Red tape	A populist term used to describe excessive bureaucracy or adherence to official rules and formalities. The term 'green tape' is a label for environmental red tape.	
Transaction costs	NRM is carried out through transactions (decisions and dealings that lead to a flow of resources or information). All transactions involve activities that do not directly contribute to achieving the intended outcome. Examples include finding people to transact with and monitoring, negotiating and writing contracts. The costs of these activities are known as 'transaction costs'. Transaction costs that are not essential to the transaction are generally perceived as inefficient.	
Voluntary action	Any action that is not directly the result of a credible threat of enforceable obligation. These range from purely non-voluntary actions (forced by regulation), to voluntary but self-interested actions (protecting a private interest), to privately motivated voluntary actions (satisfying a private aesthetic or other value) to purely public-spirited actions (volunteering with no personal benefit).	



1. Introduction

This paper discusses the institutional issues affecting landholders, land managers, volunteers, businesses, community groups and other non-government organisations² (NGOs) managing harm from invasive animals. It concerns the control of established pests (where most citizen action takes place). It does not address the institutional challenges of preventative biosecurity, product registration and licensing, or urban invasive species.

There are many aspects of Australia's pest animal management system to celebrate: sophisticated biosecurity arrangements, the regional NRM system, funding programs at the federal, state and local levels, the good work of land managers and volunteers, major scientific efforts, and features of community-based management. However, because our concern is improvement, we must focus on the problems.

This work is part of the Invasive Animals Cooperative Research Centre (IACRC) Program 4, "Facilitating Effective Community Action". Program 4 has four parts: improving community involvement in invasive species control; using behavioural psychology to improve communications; improving institutional arrangements and maximising the impact of the research. We have benefited from partnerships with organisations, communities and individuals across Australia to address the human aspects of invasive animals. These include "Communities of Practice" piloting community engagement and communication strategies, and students researching effective community action.³ We have established collaborations with human dimension researchers from three United States universities.

Although the work of the IACRC concentrates on terrestrial vertebrate pests, there are many institutional issues shared between invasive invertebrates and plants. Where appropriate, this report considers other types of invasive species.

1.1 Evidence

Invasive species strategies and policies should be evidenced-based. However, there are limits to objectivity:

- 1. Invasive animal policy involves judgements about expectations and values (viz. priorities and trade-offs between interests). For example, people have different expectations about climate, economics and community. They also have different views about issues, such as the trade-off between environmental protection and economic production, or the needs and methods for controlling pest species.
- 2. For many matters, objective data may not be available or measurements may not be feasible. For example, we lack reliable answers to basic questions such as, "How much is spent on managing invasive species?", "What is the full cost to society of invasive species?", or, "When do education or market instruments work better than regulation?" Human behaviour and social outcomes change with circumstances and are difficult to predict; we often rely on estimates and judgements to make invasive species management decisions.
- 3. Policy problems have many aspects that must be managed simultaneously; it is often unrealistic to wait for objective data or to limit analysis to matters that have reliable

² In some states, this includes regional natural resource management organisations.

³ For details, see Resource A: Invasive Animals CRC "Facilitating Effective Community Action.



objective evidence. There is a need to address real-world problems even if there are limits to evidence.

- 4. A lack of information can indicate an institutional issue. For example, the absence of important information or reliable methods might be evidence for a conclusion that filling this intelligence gap should lead to improved results.⁴
- 5. There is substantial overlap among invasive species issues, and between invasive species issues and natural resource management (NRM). Overlapping issues include biosecurity, animal welfare, agriculture, rural development and aspects of social welfare.

For these reasons, policy researchers tend to use scientific approaches where feasible but weigh the objective evidence using judgement-based analysis.⁵ We have adopted this 'purposeful enquiry' approach in this report and the associated report, "*Recommendations for the Reform of Invasive Species Management Institutions*". We have documented the research and issues as discussion points and hypotheses. This approach is consistent with the nature of the work and (we believe) most likely to stimulate useful discussion.

We have made the information in this Discussion Paper widely available to those who have participated in the extensive IACRC Program 4 consultations. Initial evidence gathering involved consultation with invasive species management experts from governments, community organisations and scientific bodies. Drafts of this Discussion Paper were circulated and discussions held with experts. Community consultation was then carried out using a two-stage Delphi survey and a two-stage 'scenario planning' workshop process in four mainland states. The results of this survey will be reported in a separate publication in the near future. Community members and experts helped refine the issues, 'brainstorm' strategic options and identify barriers and supports for reform. This intelligence provided the basis for proposals intended to stimulate constructive consideration of possible reforms.

The combined results of those consultations and the information in this Discussion Paper form the basis of the associated report, *"Recommendations for the Reform of Invasive Species Management Institutions"*. We have considered data on regional NRM, government funding, research and development, weeds, biosecurity and related issues. We have reviewed the policies of political and other invasive animal stakeholders, and the legal and organisational arrangements in effect across Australia.⁶ We have had many discussions and attended key invasive species conferences. The formal evidence underlying this Discussion Paper is contained in the attached Resource files.

1.2 Invasive animals: A strategic problem for Australia

Problems such as the destruction of turtle eggs, loss of livestock, and the presence of rabbits and inland river carp may not directly affect many Australians. Even people who see the effects first-hand may not understand how particular issues combine to create a major national problem. The impacts of invasive animals are disguised because their impacts are dispersed, and because the risks are not well understood.

⁴ See Resource G: Addressing Human Dimensions.

⁵ Young, K., Ashby, D., Boaz, A., and Grayson, L. 2002. 'Social Science and the Evidence-based Policy Movement'. Social Policy and Society: 1(3): 215-224; Head, B. 2008. 'Three Lenses of Evidence-Based Policy'. Australian Journal of Public Administration. 67(1): 1-11; Majchrzak, A. 1984. Methods for Policy Research: Applied Social Research Methods. Sage Publications: California.

⁶ See Resource D: Australian Laws, Regulations, Policies and Programs.



Invasive animals threaten many Australian economic and environmental interests. Examples of economic threats include the destruction of agricultural lands and crops by rabbits and fire ants, and the killing of livestock by foxes, wild dogs and pigs. The economic costs can be broken into three categories:

- 1. Direct economic losses, such as crop loss and loss of stock;
- 2. Opportunity costs in managing the risks of invasive animals; and
- 3. Control costs (including risk management) and costs of recovery after incursion.

A 'back of the envelope' calculation suggests that the economic cost of invasive animals significantly exceeds the AUD\$1 billion per year identified by the National Land and Water Resources Audit in 2008.⁷

Figure 1: The reported presence of wild pigs, wild dogs, feral cats, rabbits and foxes across Australia



The map shows the location of just five of the many invasive animal species present in Australia.⁸ All cause some economic, social or ecological harm, but only some impacts are tangible (such as direct economic losses) and not all impacts have been estimated. For

⁷ For details see Resource B: Resourcing Community Action.

⁸ Prepared by Tom Barrett and Priyakant Sinha, NSW Office of Environment and Heritage, 2013 using ABARES MCAS-S datasets. The shading indicates how many species are reported. Other vertebrate pest species not shown on this map include many other mammals (e.g. wild camels), fish (e.g. carp), insects (e.g. fire ants), or birds (e.g. starlings).



example, the economic value of risks to health, welfare and environment are significant but have not been estimated. The opportunity costs of invasive animals include the alternative uses of funds and labour, and the consequences of some landowners being forced out of their preferred land use (such as sheep grazing). The biodiversity effects of invasive animals are not fully understood and are inestimable. The economic and strategic significance of invasive animals for Australia is not well understood.

Invasive animals are difficult to control. They breed and adapt, and their intelligence allows some to learn how to increase their range and avoid control. Methods of control are not always available or understood, and can be difficult to implement. Tackling one problem can lead to others. For example, wild dog reduction may allow for an increase in cats or foxes, increasing damage to small native mammals; control of foxes may contribute to an increase in rabbits. Animal mobility also makes control difficult. For example, species like horses, dogs, pigs and birds can travel quickly over large ranges. This makes it hard to determine who should be responsible for control, appropriate control methods and boundaries, and where to reduce animal habitats. There is limited private incentive for people to take action for harms that are not financially significant for them (like control of feral cats). Regulation is politically and economically hard to enforce, partly because of limited resources for monitoring and policing and difficulties in effective prosecution. Government has little real power to force the sustained coordinated efforts that are needed for effective control.

Social factors can also limit people's willingness to support control. These include emotional attachments to some species, especially dogs and cats, and ethical concerns with control methods, such as the humaneness of shooting, poisons or traps. Other social factors include scientific debates about control issues and the potential economic benefit of some invasive animals. These include the training and sale of wild horses, the harvesting of wild goats, the hunting value of deer and pigs and the use of feral animals as food.

We have provided information on invasive animal impacts in Resource B: Resourcing Community Action.

1.2.1 How effectively is Australia dealing with invasive species?

It is difficult to be completely objective in answering this question. There have been major successes, such as the rabbit Calicivirus disease and programs that have had significant impacts (such as the recent feral camel control program). We cannot quantify the success of preventative and bio-control programs, nor evaluate what would have been the harm from invasive animals without ongoing control work. Clearly all these efforts have made a significant contribution to protecting environmental and production values.

Despite these contributions, the 2011 State of the Environment Report (SoE 2011)⁹ is pessimistic about the management of invasive species. The report discusses invasive species in two places. "Section 3.4: Pests and Invasive Species as Pressures on Inland Waters" suggests that the impacts of invasive species on inland waters are 'high' and conditions are deteriorating.¹⁰ "Section 3.9: Invasive Species and Pathogens as Pressures on Biodiversity" proposes that the impacts of invasive species and pathogens on biodiversity are 'high' to 'very high' and conditions are deteriorating. The SoE 2011 further notes, "There are very limited

⁹ Hatton, J. et al. 2011. *State of the Environment 2011 ('SoE 2011')*. Australian State of the Environment Committee: Canberra.

¹⁰ Ibid pp. 232-235.



data on which to assess whether efforts to address problems are having an impact".¹¹ SOE 2011 expands this observation:

It is extremely difficult to assess the effectiveness of management in relation to invasive species and pathogens from some reports from most states and territories...These reports mostly list plans, strategies and inputs to management, but rarely report on the effectiveness of processes or on outputs and outcomes...Some SoE reports state that actions are not achieving desired results, while this conclusion is implicit in other SoE reports since the effects of invasive species are assessed as getting worse. Some SoE reports conclude that there is not enough information to assess trends or the magnitude of effects.¹²

The SoE report notes that for invasive species and pathogen control:

- 1. 'Understanding' is substantially ineffective but improving;
- 2. 'Planning' is substantially ineffective but improving;
- 3. 'Inputs' into control are both ineffective and declining;
- 4. 'Processes' are ineffective but improving; and
- 5. 'Outcomes' are ineffective but improving.¹³

Many invasive species problems are likely to become worse with climate change.¹⁴

Harm to rock wallabies and quolls by wild dogs and foxes, and to the eggs of endangered turtles by foxes and pigs, demonstrate the environmental impacts of invasive animals. Examples of some of the ecological costs not counted in impact assessments include competition for nesting sites, food and water, contamination of rivers and water holes, harm to habitats, and disruption of ecosystems. Increases in invasive pressures interact with climate change and increased production demands on landscapes. These matters suggest systemic threats to important environmental and agricultural values. Some of these issues are particularly important to Indigenous Australians.

1.3 The unique characteristics of the problem

Pest animals are not just a collective action problem; many species breed rapidly once established and continually adapt through evolution or intelligence. Some animals are also highly mobile. Because of these characteristics, effective control requires continuing investment and close coordination, often over large areas spanning many land titles and land uses. A landholder who has exercised all possible diligence on their own lands may still find himself or herself with an invasive species problem. There may be relatively little that they can do about this by themselves. The problem has 'wicked' characteristics in that what seems to be a sensible solution may be impractical or result in perverse consequences because of other system issues. A landholder may be economically incapable of continuing to invest at

¹¹ Ibid p. 641.

¹² Ibid p. 665.

¹³ Ibid pp. 666-7.

¹⁴ Hellman, J., Byers, J., Bierwagen, B. and Dukes, J. 2008. 'Five Potential Consequences of Climate Change for Invasive Species'. *Conservation Biology*. 22: 534-543; Invasive Species Council. *Climate Change and Invasive Species*. Available at: <u>http://invasives.org.au/project/climate-change-invasive-species/</u>.



the level required, even if they have not caused the problem that imposes the costs upon them. There are practical limits to effective 'shared responsibility'.¹⁵

Overlaid on this are complicated human variables. These include increasing difficulties in securing a community consensus around the need for control or the methods of control. There are many aspects to this 'community attitudes' dimension of the challenge. The political difficulties of this issue are increasingly fraught. This results in difficulties in securing 'landscape-scale' co-ordinated collective action and the commitment of government agencies to take necessary action, and in maintaining approval for technologies and methods of control. A related issue of community consensus is support for enforcement. Anecdotally, it appears that government agencies are often loath to enforce existing regulation partly because of difficulties of enforcement and partly because of rural community objections to regulatory action.

1.4 Management effectiveness

Management effectiveness is an outcome of two variables: control methods and technologies, and human behaviour. While there are many problems with control methods, substantial research investment has resulted in more effective control technologies and management methods. These continue to be refined using a scientific approach in a systematic manner.

However, a strong scientific regime does not yet exist for the human dimensions of invasive species management. Citizen engagement interventions are often based on informal knowledge and personal experience rather than well-specified and tested theory. That is not to say that current interventions are low quality, or that the people who are responsible for them lack sophistication.¹⁶ A lot of community-based engagement work is sophisticated and carried out by competent people. However, there is not an established culture of scientific continuous improvement leading to established best practices for the human dimensions of invasive species management.¹⁷

A second dimension of effectiveness is the limits to the functional capacity of public and private landholders. Statistically, private rural landholders are substantially less wealthy, older and more disadvantaged than the average citizen is. Often, they are responsible for very large areas where there are few people and little money per hectare. This is particularly the case with Indigenous landholders. The requirement that effective control be coordinated and span land tenures means that pest species work goes beyond conventional stewardship of property. Many issues are similar for public landholders. Put simply, people and organisations cannot do the work required of them if they do not have the money to do what is required.

There are many difficulties to overcome:

1. Government funding must secure substantial resources from other sources, rather than (merely) subsidise on-ground work. For government, this suggests three interconnected priorities:

¹⁵ The systemic challenges are detailed in Martin, P. and Williams, J. 2016. 'Next Generation Rural Natural Resource Governance: A Careful Diagnosis' in Legal Aspects of Sustainable Development Horizontal and Sectorial Policy Issues. Mauerhofer, V. (ed.). Springer: New York.

¹⁶ Martin, P. et al. 2013. *Measuring the Impact of Managing Invasive Species*. Australian Government: Canberra (unpublished).

This issue is not unique to invasive species issues. It is characteristic of natural resource management in general.



- a. Public investments must stimulate ongoing voluntary action and investment by citizens, industry and community organisations;
- b. Technological research, development and extension must provide costeffective solutions and feasible 'tools' for citizens; and
- c. Institutional improvement must reduce the risks of reliance upon substantial ongoing public investment.
- 2. There is both synergy and competition for resources for publicly funded invasive animal control activities. These include:
 - a. Preventative actions, such as pre-border and border interception;
 - b. Developing control technologies and methods;
 - c. Frontline work by government agencies;
 - d. Support for frontline control by the community;
 - e. Community capacity building;
 - f. Administration and coordination;
 - g. Knowledge and data sharing; and
 - h. Measurement, evaluation, and intelligence gathering.
- 3. Decisions about management involve social, resourcing, technological and animal behaviour factors, taking into account variables like climate and enterprise characteristics and management issues. Effectiveness largely depends upon:
 - a. Whether the strategy fits the social and ecological conditions;
 - b. How it gathers and uses economic and human resources; and
 - c. Implementation, reflecting commitment, skill and coordination.
- 4. An invasive species program can operate at various levels (e.g. short-term local, long-term national, animal control versus social strategy etc.). Programs management will vary based on whether the outcome goal is short-term or long-term, and whether the program is for control at a particular site or across a landscape.
- 5. 'Boundaries' between issues are deceptive (e.g. invasive animals, invasive plants, biodiversity, NRM and indigenous community development). Invasive animal control is often part of a biodiversity or production initiative, or control might be part of a community engagement or Indigenous enterprise development plan.
- 6. Laws and cultural traditions in Australia impose limits on what government can do, even without budget limitations. With the possible exception of some bio-controls and preventative actions, strategies for invasive species control generally require voluntary involvement.
- 7. There are practical limits to the usefulness of regulation. The cost of detecting breaches of the law is high and investigation resources are limited. The law requires evidence for a successful prosecution, court action is costly, and prosecutions can fail or result in token penalties. Excessively tough regulation can result in community opposition, but weak enforcement can cause community disquiet. Voluntary stewardship reduces the need for regulation and is likely to be more efficient. However, regulation is important to 'underpin' other approaches.
- 8. Organisations (and citizens within them) often pursue many goals at the same time, and individuals have complex reasons for taking (or not taking) action. Strategies that do not take into account diverse motives may encounter unexpected difficulties.



2. Citizen focus: The blind spot?

Policy research is generally designed to meet the needs of those in charge of the management system. Our research program is based on a commitment to work 'with' and 'for' the citizens who are at the frontline of invasive species control. This gives a different view of institutional performance compared to other studies.

Little of the formal intelligence about invasive species or natural resource management institutions treats the citizen as more than the object of management by others. This is despite the fact that the voluntary investment of time and money is essential to invasive animal control. A focus on the citizen as the 'client', 'customer' or 'partner' (whose willing commitment must be maintained) should unlock improvements in invasive species programs and institutions,¹⁸ much as a 'customer focus' drives business innovation. The lack of formal attention to the institutional 'customer' contrasts with the attitude of many government and regional NRM personnel we have spoken to, who value and respect their community partners.

2.1 Institutional performance and citizen action

Effective invasive species control requires a lot of sustained voluntary action by many people. Whilst the impacts of institutional arrangements on the economy and the effects of 'red tape' or 'green tape' on industries are important, we also need to focus on the issues at the citizen level that shape everyday behaviour.

Invasive species issues affect people in many (sometimes surprising) ways. Apart from financial costs, the emotional costs to farmers whose crops and animals are destroyed (sometimes in distressing ways) are not generally appreciated. Volunteers and landholders who care for biodiversity can be deeply upset by the harm to the natural assets that they try to protect. Hard work over many years to protect a nesting site, or to foster a small population of threatened marsupials, can be undone in a night by foxes, dogs or pigs. Involved citizens are affected by the need to maintain constant vigilance and hard work. Adding to the economic and emotional costs are the institutional difficulties in winning funds or obtaining control technologies. These include the time spent in (sometimes fruitless) consultation and coordination with uncooperative people who frustrate landscape-scale management.

Invasive animal issues demand resources not only for frontline control, but also for policymaking and coordination, extension, regulation and enforcement, administration and research. Resource D identifies more than 80 pieces of legislation relevant to invasive animal management, implemented by at least 35 government organisations with varied responsibilities.¹⁹ All levels of government, and many public authorities, regional natural resource management organisations, researchers and non-government bodies, are part of the complex institutional system. We have not been able to estimate how much governments or citizens invest in invasive animal management, how much of the total investment is used for frontline control work or how much might be really needed for effective control.²⁰

¹⁸ This program is detailed in Resource A: Invasive Animals CRC "Facilitating Effective Community Action" Program.

¹⁹ For an overview of the weed governance system in Australia, see Martin, P., Verbeek M., Bartel, R. and Le Gal, E. 2012. *Innovations in Institutions to Improve Weed Funding, Strategy and Outcomes*. RIRDC: Canberra.

²⁰ See Resource B: Resourcing Community Action.



Many organisations, laws and administrative frameworks are involved in the flow of information, funds and labour for invasive species management. Some of these (such as rules to ensure humane and safe control) are specific to invasive animals, but many have a broader purpose. An important example is the institution of private property that results in complex arrangements to obtain voluntary participation across tenures. Many institutional arrangements, such as those arising from the Australian Constitution, are probably unchangeable. However, governments often change their administrative and coordinating arrangements for managerial, efficiency or political reasons. This suggests that improvement is probably achievable if there is political commitment to do so.

Administration, paperwork, licensing and training requirements all have a purpose, such as protecting human health or animal welfare and ensuring efficient use of public resources. However, these arrangements can also frustrate people working 'at the frontline' on invasive species, and can be counterproductive. We do not know how much this weakens citizen action on invasive animals, but during discussions, may people suggested that institutional barriers do discourage citizen actions.

2.2 Why supporting citizen action is essential

Australian governments do not have (nor are they ever likely to have) enough money to comprehensively control invasive animals.²¹ Currently, governments contribute through relatively small amounts of strategic funding, and persuasion and support through regulation, subsidy, extension and public education. Citizen action, especially by landholders, is essential to avoiding risks, investing in land management activities and working together. Some central aspects of citizen action include:

- Taking precautions against the introduction or spread of invasive animals, or reporting when problems emerge. Voluntary action may be as simple as deciding not to keep a pet cat or rabbit or as complex as running a pest species monitoring system or community education program.
- Implementing control can require sophisticated management, capital and labour investment over a long time. For example, to control wild pigs or dogs, farmers may need to employ hunters and carry out broad-scale baiting over many properties and thousands of hectares for many years. Community groups control species as diverse as foxes, pigs, Indian Mynah birds, wild cats, carp, rabbits and others.
- Cooperating with neighbours or natural resource management organisations is voluntary. Cooperation may involve compromising self-interest or personal values. For example, a farmer with cattle (who may have valuable working dogs that could accidentally be poisoned) does not suffer economically from foxes but may agree to baiting over her property; or a person who opposes the killing of dogs or cats may accept a control program for the benefit of neighbours or native species.

It is normal for policy analysis to reflect a top-down perspective, focusing on government or industry (or possibly NGO) concerns.²² There is a lot of attention on program design, economics, governance and management. Much of the work is research 'on' community, rather than 'with' or 'for' community. Often, the role of the citizen (as landholder, volunteer or regulated person) falls into the background. We believe that by making the citizen

²¹ Ibid.

²² See Resource C: Key Studies and Reports. Note the limited use of a citizen perspective in prior studies.



perspective more prominent, some strategies that seem efficient (i.e. reducing administrative expenditures by government, web-based communications or recovering direct costs) would be seen as counterproductive (i.e. adding complexity or effort for the community or practitioner). A focus on total system effectiveness, including efficiency from the perspective of affected citizens, may highlight opportunities for improvement.

2.2.1 The limits to government authority and capacity

Australia is not alone in having to rely upon voluntary action, but we do face some unique challenges. What many Australians may not fully understand is that our spatial, economic and population characteristics create a unique sustainability challenge compared to many other developed economies. There are large areas where there are very few people, very little wealth and many invasive animals.²³

There has been a lot of effort directed towards understanding pest biology and ecosystem or production impacts, and developing innovative control methods and technologies. In Australia, relatively little effort has been directed towards understanding what it takes to secure large-scale effective action by citizens or motivate voluntary investments of money and effort.

Even if Australian governments had more money to spend on invasive species management, they have limited legal power to force actions on approximately two thirds of the continent under private ownership.²⁴ Australian governments' ability to detect what is happening on private lands, particularly in sparsely settled areas, is also limited. Other legal and management factors limit pest species management on Indigenous lands, state owned lands and national parks. Every action not motivated by the likelihood of prosecution, and any work that goes beyond legal or production requirements, is fundamentally voluntary.

2.3 Institutions shape citizen behaviour

There are many types of institutions of government, industry and society involved in invasive species management. There is constant interaction between landholders, community groups, regional natural resource management organisations, and state and federal funding or extension bodies around projects and programmes. Substantial effort goes into designing programmes, obtaining and administering funds, designing control approaches and reporting. Many organisations participate in developing and administering projects and complying with funding and implementation rules. Less obvious to grass-roots practitioners are the institutional arrangements that affect frontline capacity and control techniques. These include capacity-building and extension services, arrangements to develop and provide controls, and coordination to ensure the use of effective techniques.²⁵

Frustrations with 'the system' are often discussed but rarely treated as an important strategic concern. Some institutional difficulties relate to control technologies such as poisons and delivery systems. As well as issues of animal and human welfare, these difficulties can reflect debates over the humaneness and cost-effectiveness of control methods, or the killing of animals in general. Contested issues, such as animal welfare and hunting, add to the mix of

²³ See also Resource H: Selected International Comparisons

²⁴ Limitations include the Australian Constitution (section 51(xxxi)), and many court decisions that limit the power of government in civil, criminal and administrative matters.

²⁵ See Resource B: Resourcing Community Action.



difficulties that can result in inefficiencies in invasive animal control. Also affecting frontline invasive species control are 'big picture' issues, including community values and attitudes and competing preferences for the uses of public resources.²⁶ Other issues with institutional roots include the ineffectiveness of legal or social pressure to force land stewards to control 'their' pest animals; or (on the other hand) perceptions of heavy-handed enforcement by policing authorities; or the difficulties that agencies have with enforcement or frontline control. A popular discussion topic is the perceived reduction in government human resources in rural extension.

There is evidence to suggest that apparently minor difficulties can frustrate desirable behaviour and that small supports can trigger positive behaviours.²⁷ If a citizen potentially involved in invasive animal control says, "I could not be bothered with the paperwork", "I could not work out how to apply for the grant", or, "It was too much trouble to get the license", then institutional barriers are discouraging him or her. Our expectation is that if institutional arrangements better supported desired (or effectively discouraged undesired) behaviour, invasive animal control would be more efficient and effective.

²⁶ See Resource F: Media Reports on Political and Social Dimensions.

²⁷ See for example Fulton, A et al. 2003. Agricultural Extension, Learning and Change. RIRDC: Canberra; Shogren, J. 2012. Behavioural Economics and Environmental Incentives. OECD: Geneva; McKenzie-Mohr, D. and Smith, W. 1999. Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing. New Society Publishers: Vancouver.



3. The behavioural effects of institutions

There is a link between institutions, voluntary actions and invasive species control. People partly drive the spread or control of invasive species, and people's decisions are shaped by the institutional arrangements for biosecurity, research, development, extension, natural resource management and funding. The 'invasive animal management system' involves many people, organisations, beliefs and relationships. There are possible ways to improve the system.

3.1 A systems perspective

'Systems thinking' is useful to understanding situations where many things interact. It requires identifying elements that interact, and the dynamics of these interactions, in order to predict, intervene or alter the outcomes. Our approach focuses on understanding the transactions involved in creating and trying to solve invasive species problems. A transaction requires the making of a decision that determines how resources are obtained or used, or how information is gathered or used. After identifying relevant transactions, we can then consider what institutions shape the decisions and the impacts of those institutions on the outcomes.

- 1. Two things flow within what we will call the 'Invasive Species System'. These are material flows (species, equipment, funds and people) and signals (data, information, intelligence and communications).
- 2. The Invasive Species System involves interactions between biophysical things (biological material and the physical environment) and human things (socio-economic, cultural and managerial aspects, and institutions).
- 3. Information flows (e.g. data, intelligence, instructions) feed decisions and communications. Important information flows include intelligence (e.g. field investigation, scientific analysis), rules (e.g. laws, administrative arrangements), communications (e.g. marketing, public relations), education (e.g. extension, formal and informal study, 'best management practice' instruction), coordination (e.g. instructions, committees) and monitoring. If we change information, we can change how the system works.
- 4. The flow of resources is important. The pursuit of resources motivates action (e.g. incentives and subsidies, or the risk of penalties), and the flow of resources notably labour and funds is how decisions are implemented (e.g. quarantine inspection and control, or implementing control programs and monitoring). Changing incentives and resources are two key ways to alter how the system works.
- 5. In nature, structures (e.g. geological formations, rivers etc.) shape the pattern of flows. In the human parts of the system, institutions change how resources and signals flow between people and organisations, and where and how data and resources are collected. Signals come together as knowledge through decision-making structures (e.g. science, management structures, computer or administrative systems, culture), and resources accumulate as capital (e.g. wealth, infrastructures).

The following diagram demonstrates these elements in the Invasive Species System. The example is the control of weeds that may arise from biofuel plantations. We have chosen this example because it clearly illustrates the approach.



Figure 2: Bio-fuel plantation system²⁸



From a policy and institutions perspective, loosely related management silos dominate the Invasive Species System. These include biosecurity, natural resource management, research and development, extension, funding, human resourcing, and forms of resource use such as conservation, farming, mixed peri-urban and rural, Indigenous, mining and urban.

²⁸ Adapted from Martin, P. and Le Gal, E. 2010. 'Concepts for Industry Co-Regulation of Bio-fuel Weeds'. IUCN Academy of Environmental Law eJournal. 1: 1-13.



Figure 3: Invasive Species System management silos



Figure 3 reflects government program arrangements. However, it conceals many challenges that span all aspects of invasive species management. It is not enough for each program to be operating well. The total should achieve effective and efficient (and fair) results.

3.2 How should we evaluate invasive species institutions?

In many areas of natural resource management, Australia pursues improvements using performance evaluations based on measurable objectives or criteria. Institutional evaluations must identify a perspective from which to judge performance, as each perceptive is likely to differ. For instance, a manager or worker may consider reducing services or operating hours as desirable, but these may be undesirable for a client. Satisfying the interests of one stakeholder can harm the interests of another, and power relationships created by institutions may be acceptable to the powerful but not the client.

Invasive species institutional studies generally focus on management perspectives of subsystems, such as biosecurity and regional natural resource management systems. There is little consideration of citizen perspectives. For instance, most studies do not provide citizen perspectives on citizen experiences or the capacity of current institutional arrangements to support citizen actions. In a context where citizen engagement is (arguably) the critical variable for the success of invasive species management programs, evaluation of institutional arrangements should reflect both a top-down (management) and a bottom-up (citizen) perspective. We propose four criteria for a 'top-down' evaluation, and two 'bottom-up' criteria:



Table 1: Proposed management ('top-down') criteria for invasive species institutions

Pe	rformance criteria	Comments
1.	Strong accountability, at two levels:a. 'Closed loop' accountability for risks or harms;b. Management accountability, including program management.	 An effective risk control system should provide reward or punishment incentives to those who cause (or might cause) harm. Good program and project management should ensure clear accountability for management effectiveness.
2.	Effectiveness in securing and distributing resources	Public funds will generally be insufficient to ensure enough resources for effective management. The amount and distribution of total resources secured (perhaps measured as leverage on public investment) is likely to be an important determinant of outcomes.
3.	Effectiveness in securing community engagement in key roles and activities	Beyond mere legal compliance, there is a need for citizen investment of funds, or volunteered human and economic resources, for action across property boundaries, political support for action and ongoing monitoring.
4.	Effective and efficient coordination	Effective control often requires coordination across public and private lands and between agencies at three or more levels (including regional arrangements). High transaction costs, rivalries, insufficient skills and ineffective relationships can prevent effective coordination.

Table 2: Proposed citizen-focused ('bottom-up') criteria for invasive species institutions

Pe	rformance criteria	Comments
1.	Respect for citizen contributions (time, effort and resources), roles and knowledge	Central to effective engagement is a mindset that the citizen is a valued partner, rather than just the subject of management. Thus, it is important that government and scientific institutions show respect for citizen knowledge. Ideally, institutional arrangements should optimise the quality of the citizen experience.
2.	Administrative requirements that are efficient and feasible for the citizen	Good administrative design and implementation should reduce the frustrations with, and transaction costs of, citizen interactions. This requires concern for the capacities and preferences of citizens.



The following section discusses some issues that we identified as relevant to improved performance along the dimensions indicated by the above criteria. The conclusions are opinions (hypotheses for further consideration and debate) based on discussions with stakeholders and the evidence in the attached Resource files. The issues below have also been explored in the community consultation stage of the research.

3.2.1 The accountability gap

If a person or an organisation makes a decision that might cause invasion harms to another person, or to the public interest, then there should be a reasonable prospect that they will be liable for those harms. (In an ideal world, those who control harms that others create should also benefit from doing so). For example, within the Invasive Species System as described above, a potential liability should apply to those who import or approve importation, or those who distribute, establish, propagate and (fail to) control invasive species in ways that cause harm. In principle, agencies responsible for managing the Invasive Species System should also be accountable to the affected communities for the effectiveness of their work.

The risk of legal liability is a strong motivation to control harms. The potential for civil liability has stimulated many ways to manage risk including insurance, risk consultancies and business risk-management methods. The lack of liability risk in Australia's invasive species management limits the incentive of those with the power to prevent or control harm to manage the problems they might create.

There are practical barriers to more direct accountability. For civil liability, it is necessary to prove a clear connection between the action and the harm. Many invasive species problems cannot be traced to a particular decision, or to a specific person's failure. This is particularly the case with invasive animals. Often the cost of fixing or preventing the possible harm is beyond the resources of those who ought to be accountable, so legal accountability may be of little practical value.²⁹ As a result, practical responsibility for the harms is borne by others or by the environment. Public funding partly distributes the costs across society. Ultimately, much of the cost is borne by citizens who are harmed (such as those who lose production through invasive species, or those who have to invest in controls for problems not of their own doing), or by society through public funding, environmental damage and economic losses.

Modern commercial risk management (for issues other than invasive species) allows many risks to be managed without necessarily having all the costs fall upon people who may not have the capacity to meet that obligation. Management arrangements include insurance, collective management and risk pooling, and risk management specialisations. Few risk management instruments are used in managing invasive species, although some risk innovations have been proposed.³⁰ This suggests the potential for innovation in accountability for invasive species.

²⁹ For a discussion of possible approaches to the invasive species liability issue, see Martin, P. and Le Gal, E. 2010. 'Concepts for Industry Co-Regulation of Bio-fuel Weeds'. *IUCN Academy of Environmental Law eJournal*. 1: 1-13[.]

³⁰ Proposals to count the environmental benefits of carp control within the environmental flows of the Murray Darling Basin is a further indication of the potential to find new market opportunities for funding control programs. See also Martin, P. 2006. 'Weeds: New Strategies for an Old Problem in Managing Weeds in a Changing Climate' in Van Klinken, R. et al. (eds.) 15th Australian Weeds Conference. Weed Management Society of SA: Adelaide; Martin, P. 2008. 'Cross Pollination or Cross-Contamination? Directions for informing the Management of Invasive Species with Market-economy Concepts' in Van Klinken, R. et al. (eds.) 16th Australian Weeds Conference. Queensland Weeds Society: Brisbane; Martin, P. and Le Gal, E. 2010. 'Concepts for Industry Co-Regulation of Bio-Fuels Weeds'. *IUCN*



In summary, we suggest the following accountability arrangements:

- a. There are aspects of invasive species management where improved accountability should be possible, though there are significant difficulties.
- b. Innovations in the management of risks and accountability might permit improvement in invasive species institutions.

3.2.2 The resources gap

The potential invasive animal problem is daunting. The resources needed to minimise its effects will be significant. Although we cannot provide realistic estimates of the economic scale of this challenge, available resources fall well short of what will be needed.

Resources can come from public, private and voluntary sources. We rely heavily upon good people doing good work at the local level, often having to overcome funding and institutional problems. Whilst funding programs exist for government and regional programs,³¹ there is no overall investment approach for invasive species. Projects are conducted (or not) depending upon the resources and motivation of government agencies, citizens and organisations. This is unlikely to be optimal given how important sustained management is to the effectiveness of controls.

Natural resource management innovations suggest the possibility of new resourcing opportunities.³² Market instruments and environmental philanthropy are being applied in biodiversity, water and atmospheric emissions management but not yet to invasive animal management, although there has been some interest in the possibility, for example, in the use of carbon credits to help fund camel control.³³

For resourcing, we offer the following conclusions:

- a. There is a significant (and likely to increase) gap in resourcing invasive animal control because of the nature of the problem and demographic and economic trends.
- b. The emergence of new market instruments, and novel philanthropic or other funding schemes, suggests there is potential for innovation in invasive species management funding.

3.2.3 Citizen engagement

Effective community engagement in invasive animal control means more than having people and organisations prepared to support a grant application or turn up to a field day. Effective engagement means having the support of the right people, at the right time and place, motivated and able to do the right thing. The right people, time and place, and what they need to be competent and committed, varies with the invasive animal challenge and strategy being used. Effective community action also requires resources, and often the ability to tap into experts and collaborators.

As well as those who are involved to protect their economic interests, there are many volunteers involved in invasive animal management. Many are competent and use

Academy of Environmental Law eJournal. Available at: <u>http://www.iucnael.org/en/e-journal/previous-issues/97-issue-2010-1.html</u>.

³¹ See Resource D: Australian Laws, Regulations, Policies and Programs.

³² For example, Landcare Australia has used 'crowd sourcing' as a funding mechanism.

³³ For examples of different market instruments, see the OECD Database of instruments used for environmental policy. Available at <u>http://www2.oecd.org/ecoinst/queries.</u>



sophisticated approaches. Despite this, there are often failures in community engagement. Some of the evidence supporting this opinion includes:

- Opposition to some invasive animal control projects indicates that community awareness of and support for invasive animal management is 'patchy';
- Difficulties in securing 'whole of landscape' involvement in invasive control is widely acknowledged; and
- The capacity of community groups to conduct invasive animal control is uneven and always under pressure.³⁴

The community engagement literature suggests that effective engagement is different to technical knowledge extension or community participation. It involves a partnership philosophy in which power is shared, expertise is mutually respected, programs are jointly developed and implemented, and commitments and accountability are well-balanced between government and citizens. Although 'engagement' language is often used, many capacity development and support programs still reflect 'science-push' models of communication and 'top-down' program philosophies. Regional natural resource management models suggests a commitment to citizen partnerships with the potential for power and knowledge sharing, but the degree of 'true engagement' varies.

Governments are perceived to be reducing face-to-face extension investment and there is a move towards delivery of information through 'the web'. It is unclear whether and how digital technologies can create effective engagement.

We have reached the following conclusions about engagement effectiveness:

- a. Invasive animal risk control and harm remediation objectives require effective engagement at the national, state and local (policy and project) level.
- b. There are examples of effective community engagement practice and knowledge available to inform better practices. However, institutional arrangements do not adequately support systematic improvement in this aspect of resource governance.

3.2.4 Effective coordination

Because landowners and enterprise managers have different incentives and capabilities, frontline workers in natural resource management and extension (whether paid or volunteer) do a lot of difficult coordination. The complexity of invasive species institutions creates administrative challenges. Administrative disruption to programs and responsibilities result from (re)structuring decisions, leading to confusion, discontinuity and wasted effort. There will always be room for improvement in the impacts of administration on those being administered.

The coordination issues change across the government hierarchy, from local to state and national governance. The higher level challenges include coordination of programs (and within projects or across programs), issues arising from the complexity of rules and administration, and competition (or potential synergies) between levels of government and agencies of government and between competing non-government organisations. The public sector 'architectural' complexity is detailed in Resource D: Australian Laws, Regulations, Policies and Programs. This suggests that the public system is excessively fragmented, but the issues are not simple.

³⁴ Resource B: Resourcing Community Action.



Different views can be taken about the complexity of invasive species management. Economic efficiency, 'red tape' and 'green tape' reports argue that having many rules and organisations to administer them is expensive and unduly restricts innovation and economic activity. The argument that restrictions on the citizen should be minimised is supported by libertarian philosophies. Behavioural economics and social marketing research suggest that seemingly minor institutional impediments (e.g. complex tax forms) can deter desirable behaviour. To these arguments, we would add that administrative complexity can simply be unfair to some citizens because the burden is likely to fall on volunteers carrying out public good work, landholders genuinely trying to meet their obligations, and those with disadvantages such as limited resources or education.

However, 'streamlining', 'simplification' or 'de-regulation' is not without risks. Many laws and administrative complexities are designed to prevent significant harms. For example, some types of complexity can generate conditions for innovation or reduce risk through 'system redundancy', and many complexities in invasive animal administration arise from institutions that provide public benefits, notably our federal system of government. Invasive animal program administration must protect public funds, human safety, biodiversity, environmental values and animal welfare. This underpins arguments by some advocates of self-organising communities, 'nested governance' and 'poly-centricity' that complexity is often beneficial.³⁵ Complexity can be associated with community resilience and creativity, and poly-centricity can be a stimulus for innovation. These competing views about institutional fragmentation suggest the need for a degree of legal and administrative complexity to protect the public interest.

The Australian federation comprises a federal government, six state governments, two territories and around 560 local governments (although the local government level is not constitutionally recognised). Regional natural resource management bodies have also evolved, often covering invasive species management. In government, natural resource management and related responsibilities are divided among departments (e.g. quarantine and biosecurity, environmental and resource conservation, natural resource use, animal welfare, product registration and use licensing, policing, and so forth). There are possible benefits from the splitting of roles (notably risk-reduction and innovation), but also the costs of complexity and fragmented authority.³⁶

Different approaches to the structure of invasive species management have been adopted at a national and state level, particularly for biosecurity, regional natural resource management, government agency organisational arrangements and legislation. Alternative possibilities include a single national invasive species or environmental law, a single coordinating agency and administrative reorganisation.

We draw the following conclusions from these considerations:

a. Some institutional complexity is inevitable to protect public and private values.

³⁵ For a recent discussion see Aligica, P. D., and Tarko, V. 2012. 'Polycentricity: From Polanyi to Ostrom, and Beyond'. *Governance*. 25(2): 237-262. However, the same scholarly tradition also support the case for minimal external control: see Boettke, P. 2010. 'Is the Only Form of "Reasonable Regulation" Self Regulation? Lessons from Lin Ostrom on Regulating the Commons and Cultivating Citizens'. *Public Choice*. 143:283-291. In the Australian context, see Marshall, G. R. 2008. 'Nesting, Subsidiarity and Community-based Environmental Governance Beyond the Local Level'. *International Journal of the Commons*. 2: 75-97.

³⁶ For a discussion of rural regulatory complexity and reform issues see Martin, P. et al. 2007. *Developing a Good Regulatory Practice Model for Environmental Regulations Impacting on Farmers*. Australian Farm Institute and Land and Water Australia: Canberra.



- b. Institutional complexity and polycentric governance may foster resilience and local innovation.
- c. The complexity of invasive species institutions can frustrate frontline efforts, and be unfair.
- d. This complexity requires investments of human and economic resources that might otherwise be used.
- e. The challenge is to minimise the costs of complexity upon citizens without sacrificing the benefits. However, substantial improvement does seem possible.

3.2.5 Respecting citizens

A desire for citizen support is different to institutionalising respect for citizens. Institutionalised respect is shown by how an organisation communicates with citizens, how seriously individual views are treated, whether programs are shaped collaboratively, how information is gathered about and from citizens, how contributions are acknowledged, and the tone of personal or impersonal interactions.

Smaller NGOs are citizen run. We expect that they usually know that their success depends upon the community, and that often they will enjoy rich personal relationships. We also expect that those that thrive demonstrate respect for the contributions of members (but it is unlikely that they will formally evaluate this).

For government organisations or bodies with many members, respect for citizen contributions may be less tangible, formalised in planning and consultation processes and strategies implemented across regions or communities or delegated to a local team. Where respect for citizen contributions is a core value of such organisations, we would expect to see evidence in processes of interaction, communications that acknowledge contributions, citizen satisfaction surveys, staff training etc. The lack of published reports or conference papers dealing with these things would suggest that they are not seen as strategic priorities, but it may also be that these are addressed internally within these bodies.³⁷ The use of (and respect for) 'citizen science' in natural resource management has been the subject of discussion, but the extent to which invasive species management institutions use community knowledge is unclear.³⁸

We lack intelligence to allow us to confidently assess how well existing invasive species governance arrangements respect citizen contributions. Further investigation is needed.

3.2.6 Administrative feasibility

Biosecurity, product registration, grant applications and acquittals, and licenses (such as licenses to use poison and pest control qualifications) all have administrative elements. Some arrangements are complicated. It is a concern if administrative requirements become a barrier to citizen action. Anecdotal indications suggest that complicated poison use licensing requirements, and grant applications and acquittals, may be impeding citizen action.

Paperwork and administration barriers are a well-recognised management problem, and there are methods and specialists that can help reduce these difficulties. There are also likely to be

³⁷ It may also be that human dimensions science in Invasive Species management is imported from other fields such as the NRM or rural extension/engagement literature. However our investigation thus far does not suggest this.

³⁸ For examples of citizen science-based projects for environmental protection see Roy, H.E. et al. 2012. *Understanding Citizen Science and Environmental Monitoring*. NERC Centre for Ecology and Hydrology and Natural History Museum: London.



opportunities to consolidate processes to reduce complexities and the substantive requirements that give rise to administrative complexity (viz. 'green tape' or 'red tape').

In relation to improving administration for citizens, we believe the following:

- a. Administrative complexities are probably creating impediments and frustrations for citizens who engage in (or would otherwise wish to engage in) invasive animal action.
- b. There is a need for further analysis to identify how to reduce these impediments, but we anticipate substantial improvement is possible.



4. Directions for institutional innovation

People involved in invasive species often talk about institutional problems. They talk about their problems with administrative complexity and resourcing, and their difficulties in achieving landholder cooperation. System-changing solutions are possible, to encourage constructive involvement in improving institutional approaches.

We highlight four interconnected issues that affect invasive animal management, where the potential for significant improvement deserves serious consideration. The discussion is a stimulus for further conversations on how to achieve improvement.

4.1 Managing behaviour

The biofuel weed systems map (above) highlights the many transactions involved in invasive species spread and control. To change the performance of the Invasive Species System, we must change the decisions and thus the behaviour of many people. The map also highlights that institutions are important because they alter how and to whom intangible signals and tangible resources flow.

For example, political decisions determine the allocation of public funds, policy settings for importation risks, enforcement mechanisms and the management of public lands. Political activism, policy development and lobbying, public relations and 'cause marketing' can change the pattern of these decisions. Decisions by public agencies and land managers shape how resources are applied, the design, implementation and monitoring of work programs, and outbreak responses. These decisions respond to incentives, disincentives, information and social influences. Decisions can be altered by incentives (e.g. market rewards, social recognition or sanctions, regulatory or market penalties), by altering processes, or by changing the weight given to different interests. In addition, citizens make choices about how they invest their resources (e.g. what pets they keep and what causes they support) and their time (e.g., whether they volunteer or engage in activism). Changing or reinforcing these decisions might involve marketing and public relations, education, community engagement and capacity building. With many aspects of the Invasive Species System, intermediaries shape decisions. These include wholesalers and retailers, the media and publishers, and political actors such as political parties and non-government organisations.

Many behaviours respond to institutions. The direct impact of law is obvious - it shifts prohibitions and permissions, alters civil liabilities and adjusts administrative approvals. Less obvious are the indirect impacts, such as how rules can contribute to altering the price or availability of resources, or change who has what forms of power. Institutions also affect citizen behaviours. For instance, private property or civil liability rules can impede collective action. Even the media as an institution is relevant for controlling pest animals, promoting responsible pet ownership or contributing to outrage over a control program (as has occurred with wild horse control). Developments in 'responsible consumerism' can generate community pressure to reduce environmental impacts and alter the pattern of market rewards towards better stewardship.

A lot of expertise is applied to behaviour management in the business sector. This is not merely consumer research or communications strategy within a marketing department. Many firms see consumer, citizen or community behaviour as fundamental to their strategic position. Significant efforts are made to put the consumer or citizen at the heart of the organisations thinking. Well-paid careers can be the reward of those who understand how to achieve behavioural outcomes. Professions such as consumer researchers, strategic



marketers, public relations experts, political strategists and media managers and (more recently) customer experience managers illustrate the professionalism of modern behavioural strategies.

Even though behavioural issues are central to effective invasive species control, the human dimensions are given little attention compared to biophysical and program management issues in natural resources management. Resource G: Addressing Human Dimensions discusses these issues.

Innovation could help to align behaviour to invasive species goals. Adapting behavioural methods from specialisations such as consumer marketing or public health is a possible direction.³⁹ Another is the adoption of the scientific approach to continuous improvement, which occurs with the technical aspects of invasive animal management. Shifting from an 'extension' to an 'engagement' approach with community is also worth deeper consideration. There is no lack of options to innovate to tackle systemic problems of behaviour. What is lacking are the institutional structures, including investment, and (perhaps) the desire for change.

4.2 Creating incentives

Incentives can be positive (e.g. economic or social rewards) or negative (e.g. the risk of a loss or penalty). They can involve economics, regulation and inspection, and social arrangements.

A natural positive incentive is when markets (or perhaps government or citizens) offer a financial reward for action. A negative incentive might be a fine, or loss of livestock or crop production. Markets can provide a financial incentive with invasive species, such as if weed presence leads to a quality downgrade of grain or wool, or rats or mice contaminate product, or pigs or other pest animals reduce the volume of production. Where invasive animal problems affect biodiversity but not income or cost, market incentives for control exist only in a few situations (e.g. eco-tourism or environmental issues with political importance).

The absence of economic incentives (the 'missing markets' problem) is a barrier to invasive species control. A lack of markets does not necessarily have to be permanent. Market incentives for environmental stewardship include environmental certification or branding, biodiversity credits and biobanking, payments for environmental services and development offsets. There are also many voluntary covenant and philanthropic programs. In principle, institutional innovations of this sort could help reduce the economic motivation deficit for invasive animal control.

Negative incentives might also be made more effective. The risk of civil liability is small under existing legal arrangements, and regulatory enforcement is limited because of the risk of political backlash, the costs of policing and legal difficulties. These problems could be overcome, but positive incentives are likely to be more politically attractive. Innovations worth considering include stewardship-based licenses such as lease conditions or conditional

³⁹ See for example Rubik, F. and Frankl, P. 2005. *The Future of Eco-Labelling: Making Environmental Product Information Systems Effective*. Greenleaf Publishing: London; Parikh, P. S. 2009. *Harnessing Consumer Power: Using Certification Systems to Promote Good Governance*. Environmental Law Institute: Washington.



access to public resources, weed condition inspections prior to property transfer,⁴⁰ weed liability insurance and landholder and land manager duties.

Social incentives can also be powerful. Existing invasive species control depends on public good motivations. The people who voluntarily improve land stewardship include volunteers, and land managers who go beyond what is required for production benefits or to avoid penalties. If the community values these outcomes, there is an incentive for politicians and public servants to focus on improved invasive management. An increasing feature of social incentives is industry self-standards to support the 'social license' of an industry or corporation. These options have not been fully exploited to strengthen incentives for invasive species control.

In an ideal world, markets would close the accountability gap automatically by pricing environmental risk and penalising harms. In the real world, this is not likely without intervention. Innovations such as environmental market-based instruments are conceivable in invasive animal management.

4.3 Improved resourcing

The management of invasive species requires labour, expertise and technology, funds and management coordination. Institutional arrangements determine how much resource is available, how it is allocated and how it is used and accounted for. Issues such as the taxation of environmental expenditures, how banks value natural assets for loans, government budget and program management, and how the market values (or not) sustainability in production systems are all relevant to resourcing invasive species management.

Resource B: Resourcing Community Action considers the financial and economic aspects of invasive species management. This is a preliminary analysis. Underlying any analysis of resource needs are the answers to questions such as, "What level of invasive animal harm is acceptable to Australians?", "What strategies should be used to achieve sufficient control?", and, "How quickly should this be pursued?" Identifying how much is invested involves deciding (with limited data) how much landholders spend on invasive animals, how much government funding is ultimately used for frontline work and the value of unpaid work. Resource B demonstrates the uneven spread of resourcing challenges across the country and the diversity of issues and community characteristics across the landscape. Measuring the funding gap is difficult partly because of a lack of agreement about what degree of control is sufficient and partly because of the difficulty of predicting future conditions and control options.

Fund availability reflects the extent of public and private resources allocated to invasive species control compared to other demands. Thus, the challenge is largely institutional and reforms could improve the flow of resources. The funding paradigm is that landholders pay for control work on their own lands from their own resources, supported or motivated by public funds and/or non-government volunteers. Government is mainly responsible for interception (biosecurity) and for work on public lands using public funding and community involvement. In conversations about resources, a common view is that the government should do more and that less responsible landholders should be more legally accountable. We believe this paradigm (or any version of it) is risky because of the probability of: (1) a decline in

⁴⁰ For a discussion see Martin, P. 2008. 'Cross Pollination or Cross-contamination? Directions for Informing the Management of Invasive Species with Market-economy Concepts' in Van Klinken, R. et al. (eds.) *16th Australian Weeds Conference*. Queensland Weeds Society: Brisbane.



public resources because of economic and political pressures; (2) reduced rural capacity due to ageing and declining population; (3) economic pressures on rural landholders; (4) the incapacity of government agencies to enforce strong legal accountabilities.

These probabilities suggest the need for new approaches that depend less on public funds and spread the financial and labour load further. Although no possible solution is easy, it is possible to consider options which when combined into a funding 'cocktail' improve the overall approach.

In no particular order (and with the expectation that the cocktail will be different for different issues and regions), conceivable directions include:

- Innovative approaches to public funding: possibilities might reflect a more comprehensive inclusion of invasive species control conditions in payments for ecological services, stewardship conditions for land licenses or public funding, or tax deductibility rules.
- New market instruments, particularly risk-based instruments: possibilities include invasive animal risk insurance schemes, industry collective responsibility, and inclusion of invasive species issues in biobanking or other environmental market instruments.
- Better use of private philanthropy and voluntarism: possibilities include the inclusion of invasive species issues in private conservation programs and new incentives to support volunteer work.

There is no simple solution to the resourcing challenge. However, it is excessively limiting to believe that the existing approach is unchangeable. Whilst the conventional beliefs about funding have the comfort of familiarity, they do not point towards more human or financial resources for invasive species control. Not all of the possibilities have been exhausted.

4.4 Reducing fragmentation

Best management practice for invasive animals generally requires a systemic approach, often over a large area and sustained for a long time. 'Stop/start' or incomplete work can be worse than useless because of the rebound effect or because of the risk of creating opportunities for other problems.⁴¹ Half-hearted interventions can be demotivating, and fragmented efforts across many projects and programs add to the difficulties of coordination.

One 'natural' source of fragmentation is the values and interests in the community. Different land uses are sensitive to different invasive animal problems, people value different things, and private property rights give these differences institutional importance. For instance, a cattle farmer may have few economic reasons to invest money and work in controlling wild dogs or foxes on their property, even if they are a problem for a nearby woolgrower. He or she may view the wild dogs as top predators that contribute to healthy biodiversity. A person committed to animal welfare may believe that killing cats is unethical and be less sensitive to the loss of native animals that another person sees as a major concern. A particular problem for landscape-scale control is the diversity of interests that exist alongside differences in citizen capacity to take action. For example, within any region there will be different

⁴¹ The rebound effect refers to the potential for accelerated increases in the target species, or other harmful species, once control measures are implemented. For example, it is sometimes argued that removing foxes will lead to an increase in feral cats.



motivations and values and different economic and skill capacities that fluctuate with age, health, wealth and seasons.

Interacting with this natural state are institutional arrangements. Jurisdictional and management structures lead to many programs and instruments for (sometimes competing) different purposes, splitting the resource. All institutions compete for resources, and investment in management activities competes with investment in frontline work. Likely effects upon citizens from this fragmentation include difficulties in identifying obligations and opportunities, administrative costs, and effort in grant seeking and administration (including the opportunity costs of failed attempts).⁴²

Fragmentation will not disappear: people will continue to have different capabilities, motivations and attitudes; our constitutional structure is likely to remain stable; and public-sector programs will change in response to new information or political needs. However, there are ways to reduce the problem. These include improved incentives and behaviour management strategies to help with landscape-level coordination, more attention to invasive species in industry-led programs, the creation of 'omnibus' legislation or harmonised laws, unified departments and one-stop-shop administration, and improved citizen interactions with bureaucracy. Innovations in land-use planning may create options to integrate the requirements of different levels of government and emphasise coordinated landscape management. Fragmentation may always exist, but its impacts can be reduced.

⁴² The efficiency benefits of contestability for government management are well known, but the efficiency costs of contestability to the community, in terms of wasted effort and motivational impacts, are less well considered.


5. Conclusions

This paper has highlighted four aspects of management institutions where significant improvement could support citizen-based invasive animal control. We can point to solutions that have been tried (often with success) in other aspects of natural resource management.

Achieving institutional improvement is rarely easy. Institutional change is challenging even without difficulties such as the nature of invasive animals, resourcing limitations and complex human motivations and beliefs. The scholarly literature mirrors our human experience that competing interests, greed and ignorance, habits, insufficiency of resources and politics all make institutional improvement difficult.⁴³

A recent report on weed institutional reform suggests that whilst it is possible to imagine better institutions for managing the growing problem of invasive species, the challenges are not trivial:

Proposing ways to change the weed governance system involves questioning the fundamentals of how decisions are made, how resources are won and allocated, who has power, and who is accountable in the management of weeds. Major change to weeds governance will not be simple to achieve. There are many political, institutional and economic impediments to a more efficient and effective management system. Some who read this report will find it easier to dismiss reform concepts as unrealistic rather than to consider what might happen if they were implemented.⁴⁴

Respectful dialogue and shared problem solving are needed to tackle such issues. This document is part of a consultative process that aims to achieve the following:

- a. Consensus about where institutional improvement is most required: through investigation, feedback and discussion we hope to involve stakeholders in deciding what improvements will have a strong positive impact in supporting effective citizen action on invasive animals.
- b. Identification of opportunities for improvement: we intend to create a menu of possibilities through workshops with stakeholders to 'brainstorm' improvement options and a specialists' workshop to explore possible radical responses to the challenges.
- c. Agreement on the priority improvements that may yield the best results: our intention is that this will involve collaborative problem solving and consensus decisions, leading to actions to improve invasive animal management.

Not every problem can be solved, but some can, and most can be reduced. Accepting the *status quo* is not likely to result in better invasive animal management outcomes for primary production or the environment. How far we can go depends on who wants to work to achieve improvement and how hard we work to achieve it.

⁴³ See Le Gal, E. 2012. 'The Effects of Institutional Path Dependence, Political Dynamics and Transaction Costs on the Potential for "Smart" Regulatory Innovation: An Illustration Utilising the Biofuel Weed Risk Case Study'. *Australasian Journal of Natural Resource Law and Policy*. 15(2): 219-254.

⁴⁴ Martin, P., Verbeek M., Bartel, R. and Le Gal, E. 2012. *Innovations in Institutions to Improve Weed Funding, Strategy and Outcomes*. RIRDC: Canberra.



6. Appendixes

Please note:

- All references to dollars are to Australian dollars
- All hyperlinks are current as of 1 March 2016

6.1 Resource A: Invasive Animals CRC "Facilitating Effective Community Action" (Program 4)

Program 4 Leader: Paul Martin, University of New England

A summary of program goals, approaches, partnerships and key contacts.

Program Purpose

The goal of Program 4 is to implement an effective science-based approach to improved management of the human dimensions of invasive animal control/management, focused around:

- 1. The creation of human-science informed 'best management practices' for improved communication and engagement to achieve effective 'whole of landscape' action;
 - a. The development of a viable cohort of leaders and practitioners using these practices for implementing improved communication strategies, informing action, and motivating involvement; and
 - b. The proposal and negotiation of improved legal, resourcing, coordinating and continuous improvement arrangements for management of invasive animals.
- 2. The program reflects our philosophy of working 'for' and 'with' (not 'on') frontline practitioners through two forms of partnerships:
 - a. 'Communities of Practice', to advance behavioural science and communications and citizen engagement knowledge and practice; and
 - b. Regional/species control partnerships.

The four projects

Facilitate Collective Action (Lead: Ted Alter, Penn State University)	4E 1
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The overall research objective is an effective system to support ongoing effective community-led invasive animal control at a landscape scale spanning private and public tenures. This system must be able to able to continue independently of the Invasive Animals Cooperative Research Centre (IACRC). A subordinate objective is to create a professional cohort of community engagement practitioners.

The research plan is based on a combination of (1) deeply engaged action research, working with at least two communities in two states, dealing with two challenging invasive animal issues, (2) the development of a support platform based on stakeholders' needs analysis and consultation, and (3) integration of this research into community-led work.



Triggers for Effective Action (Lead: Don Hine, University of New England) 4E 2

This project focuses on developing, implementing and evaluating improved communications strategies to facilitate the uptake of best practices for the control of invasive animals.

These strategies will draw on the behavioural sciences: 'best practice' principles for the behavioural effectiveness of communication strategies (such as the use of social marketing principles) and precise targeting of messages to different 'segments', based on the analysis of survey data.

The outcomes of the project will be

- An improved understanding of the potential use of behavioural sciences to improve targeting and communications for interventions in invasive animals control;
- The application of relevant behavioural science in case study problems, and objective evaluation of the effectiveness of this application; and
- The formulation of research and practice directions to use behavioural science to improve the effectiveness of invasive species communications.

Reduction of Legal and Institutional Impediments (Lead: Paul Martin, 4E 3 University of New England and Darryl Low Choy, Griffith University)

The objectives are:

- To improve understanding of the effects of legal and institutional arrangements on effective invasive animal control and management;
- Enable advocacy of law and policy reform proposals to improve the effectiveness of invasive species governance arrangements;
- Develop a policy briefing paper that provides input into government reviews of invasive animal control/management.

The outcomes of this research project are to identify and advocate reforms to institutional arrangements that could:

- Increase active community engagement in the prevention or control of pest animal problems;
- Better enable such action with knowledge and resources needed to make this effective; and
- Improve the overall cost-effectiveness and efficiency of invasive animal management laws and institutions.

Action Driven Coordination (Lead: Paul Martin, UNE)

4E 4

The role of project 4E4 is:

- Support and coordinate the other three projects (4E1, 4E2 and 4E3), and
- Lead research on the question: What research and research management methods are most likely to ensure that trans-disciplinary and engaged research projects are effective, efficient and fulfilling?



Working through strong partnerships

- Queensland: Queensland Murray Darling Commission (QMDC)
- Victoria: Department of Environment and Primary Industries (DEPI)
- Tasmania: Department of Primary Industries, Parks, Water and Environment (DPIPWE)
- Western Australia: Department of Agriculture and Food (DAFWA)
- New South Wales and Queensland: NSW Department of Primary Industries (DPI), Queensland Department of Agriculture and Fisheries (QDAFF)
- National: Invasive Species Council
- New York: Cornell University
- Texas: Sam Houston University
- Industry: Meat and Livestock Australia

Key Contacts

- Program Leader: Professor Paul Martin, Paul.Martin@une.edu.au
- Project 4E1 Postdoctoral researcher, Dr. Tanya Howard, thoward9@une.edu.au
- Project 4E2 Postdoctoral researcher: Dr. Patty Please, pplease@une.edu.au
- Project 4E3 Postdoctoral researcher: Dr. Kylie Lingard, klingar2@une.edu.au
- Project 4E3 Postdoctoral researcher: Dr. Elodie Le Gal, elegal2@une.edu.au



6.2 Resource B: Resourcing community action

A summary of intelligence about the likely resources for invasive animal control.

Overview

Australia's ability to control invasive species and to protect or restore natural resources from their impacts depends on many things. These include the nature of the invasive species and the environment where they are found, land management and control practices, the available technology, interactions between the introduced and native species, and the dynamics and values of the affected communities. Interacting with all of these variables is the question, "How much resource do we have to manage the problem?"

Without skilled, dedicated people and money, little can be achieved in invasive species management. The following questions are fundamental to determining viable strategies:

- 1. What are our tangible goals for invasive species management, since the ambition of the goal will indicate the types of strategies needed and therefore the resources required?
- 2. What human and economic resources are currently available and what might be made available in the future, and from what sources?
- 3. What are the resource requirements of the possible strategies, as alternative approaches require different human skills, information, capital and expenditures?
- 4. What resourcing approaches will secure the essential human and economic resources, at the right time and place, to implement our management strategies?

Each of these issues involves many variables and the answers involve judgements and estimates. Future investment depends on unknown conditions and priorities that are not yet determined, so history is only a partial guide to the likely future.

The purpose of this document is to sketch out, as best we can, what we know about key aspects of the resourcing challenge. The purpose is to support discussion about what is feasible and possible, and what resourcing approaches will enable more effective community action on invasive species.

What do invasive animals cost Australia?¹

Studies suggest the cost of invasive animals is high:

• Invasive animals cost over \$1 billion per year because of the economic, environmental and social damage they cause. The main culprits are foxes, wild dogs, feral cats, rabbits and feral pigs. The Invasive Animals Cooperative Research Centre (IACRC) estimates that rabbits cost the nation \$206 million per year, wild dogs \$48.5 million per year, foxes \$21.2 million per year and feral pigs \$100 million per year.²

¹ Part of this information is derived from Martin, P. et al. 2013. *Measuring the Impact of Managing Invasive Species*. Department of Sustainability, Environment, Water, Population and Communities: Canberra (unpublished).

² Gong, W., Sinden, J., Braysher, M. and Jones, R. 2008. *The Economic Impacts of Vertebrate Pests in Australia*. Invasive Animals CRC: Canberra.



- In New South Wales, invasive animals impact 40% of threatened species. "These 388 threatened species at risk include 154 plants, 186 animals, 17 endangered populations and 31 endangered ecological communities. A total of 29 individual pest animal species were identified as placing 322 threatened species at risk".³
- There is significant overlap between invasive animal populations and environmental assets of national importance in all state and territories of Australia. For example, feral pigs prey on up to 70% of sea turtle nests in North Queensland, foxes are significant predators of a wide range of native fauna, such as potoroos, bandicoots, chuditch, pied oyster catchers and little terns.
- Invasive animals significantly impact agricultural productivity. Feral pigs are known to cause substantial production losses to sugar cane and bananas in North Queensland, costing hundreds of thousands of dollars.⁴ Rabbits significantly affect native vegetation, particularly the regeneration of native plants, because they ringbark trees and shrubs and prevent regeneration by eating seeds and seedlings.⁵

The unquantified health and welfare risks associated with invasive species include the spreading of diseases present in Australia, such as the spreading of hydatids by wild dogs,⁶ and the spreading of diseases not yet present, such as rabies. Other health and welfare concerns arise from the impact of iconic species loss on tourism,⁷ and the stress on farmers from stock loss and forced land use changes from predation.

Where costs are privately borne, who bears them depends on the type of enterprise or landuse activity. Thus, wild dog or fox predation might impose significant costs upon sheep graziers, with the neighbouring crop or cattle producer failing to perceive any economic impact. The uneven spread of costs results in mixed incentives among land managers to control invasive animals upon their lands.

Available estimates are not reliable indicators of the actual private and public costs of invasive species. For example, available estimates do not include the costs of unpaid community work or the lost opportunity costs of diverting resources to control invasive species. Neither do they fully account for the many economic, environmental and social impacts that link through complex pathways.⁸

The National Land and Water Resources Audit 2008 cites a direct economic cost of invasive animals to agriculture of \$1 billion per annum.⁹ Some of the costs omitted from this estimate are:

- Investments by volunteers, including NGOs;
- Lost opportunity costs; and
- Economic costs from abandoning an enterprise, such as sheep production.

³ Coutts-Smith, A.J., Mahon, P., Letnic M. and Downey, P. 2007. *The Threat Posed by Pest Animals to Biodiversity in New South Wales*. Invasive Animals CRC: Canberra.

⁴ McGaw, C. and Mitchell, J. Feral Pigs (Sus scrofa). Queensland Government: Brisbane.

⁵ Department of Sustainability Environment Water Population and Communities. 2011. *Feral European Rabbit* (Oryctolagus Cuniculua). Australian Government: Canberra.

⁶ Lee, A. 2012. Zoonotic Disease risk: Feral Pigs. NSW Government: Sydney.

⁷ Environment Australia. 2003. *Recovery Plan for Marine Turtles in Australia*. Australian Government: Canberra.

⁸ Fitzgerald, G. and Wilkinson, R. 2009. *Assessing the Social Impact of Invasive Animals in Australia*. Invasive Animals CRC: Canberra.

⁹ National Land and Water Resources Audit and Invasive Animals Cooperative Research Centre. 2008. Assessing Invasive Animals in Australia. NLWRA: Canberra.



Invasive species are one of the top three threats to biodiversity in Australia, and the major cause of animal extinction.¹⁰ Environmental impacts have not been costed.

Social impacts are also significant but difficult to guantify.¹¹ Omitted from most of the existing and available data are impacts such as:

- The emotional impacts on farmers whose stock suffer predation;¹² and
- The substantial investment made by NGOs in operations and coordination.

The following table summarises six reports that attempt to itemise costs and/or recommend further work in this area. Gong et al (2009) consider financial impacts and agricultural losses.¹³ The other publications consider financial, environmental and social impacts. These reports conclude that environmental and social impacts are not well understood or recognised, and difficult to quantify. A recent report by Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) explored the psychological impacts of wild dogs on farmers. It concluded that more work was needed to understand these impacts.

Author	Method	Main aim	Major Findings	Gaps/constraints/ recommendations
McLeod, R. 2004. ¹⁴	Desktop review	This review estimated social, environmental and economic impacts of 11 pest species. Economic impacts were assessed in terms of agricultural loss and control costs.	Cost impact of 11 species estimated at \$720 million per annum, lower than previously estimated. Difficult to assess social benefits.	The review does not include social and environmental costs of most species. Assessment of social impacts limited to impact on employment and traffic accidents. No consideration of stress or difficulties associated with accessing funding.
Norris, A., McMahon, S. and Murphy, E. 2006. ¹⁵	Workshop	This paper reported on a workshop intended to highlight knowledge gaps and improvements in impact assessment	Single social issues have cascading effects. Indirect and induced impacts should be included in the	There is a need to determine the most appropriate methodologies for reporting economic, environmental and social

Table 1: Studies that consider the impacts of invasive animals

¹⁰ Low, T. 2009. Invasive Species: One of the Top Three Threats to Australian Biodiversity. Invasive Species Council: Canberra.

¹ McLeod, R. 2004. Counting the Cost: Impact of Invasive Animals in Australia. Cooperative Research Centre for Pest Animal Control: Canberra; Norris, A., Henderson, W., McMahon, S. and Murphy, E. 2006. Costing the Impacts of Invasive Animals. Invasive Animals CRC: Canberra; Fitzgerald, G. and Wilkinson, R. 2009. Assessing the Social Impact of Invasive Animals in Australia. Invasive Animals CRC: Canberra. ¹² See Wicks, S., Mazur, K., Please, P., Ecker S. and Buetre B. 2014. An Integrated Assessment of the Impact of Wild

Dogs in Australia. Commonwealth: Canberra.

¹³ Gong W., Sinden J., Braysher, M. and Jones, R. 2009. The Economic Impacts of Vertebrate Pests in Australia. Invasive Animals CRC: Canberra.

¹⁴ McLeod, R. 2004. Counting the Cost: Impact of Invasive Animals in Australia. Cooperative Research Centre for Pest Animal Control: Canberra.

¹⁵ Norris, A., Henderson, W., McMahon, S. and Murphy, E. 2006. Costing the Impacts of Invasive Animals. Invasive Animals CRC: Canberra.



Author	Method	Main aim	Major Findings	Gaps/constraints/ recommendations
		and reporting techniques.	calculation of economic impacts.	impacts. There is a need to gather more data on social and environmental impacts. There is a need to collect information that enables prioritisation in investment.
National Land and Water Resources Audit. 2008. ¹⁶	Review of existing data sets	This review aimed to provide information on the distribution of 10 invasive animal species as a baseline for future monitoring and reporting.	Invasive animals cause \$1 billion damage a year. Foxes, rabbits, wild dogs and feral cats inhabit more than 70% of the country. Feral deer, cane toads, carp and starlings are colonising new areas. Adverse impacts are nationally significant but not well identified. Invasive animals are major threat to environmental assets.	Co-ordinated control efforts are required. There is a need for more information on the extent and impacts of invasive animals to guide policy and strategy development. There is a need to evaluate investment outcomes. There is a need for a national monitoring and reporting system. There are significant knowledge gaps to address.
Gong, W., Sinden, J., Braysher, M. and Jones, R.2008. ¹⁷	Calculation of losses to agriculture based on 2007-08 data	This paper aimed to determine the impacts of six invasive species on four agricultural sectors and horticulture	Overall loss in agriculture and horticulture of \$620.8 million. Estimations included some volunteer labour costs. Estimations omitted environmental, emotional and community costs.	Estimations limited by lack of data. Authors found expenditure of landholders difficult to estimate. Authors recommended extending study to understand the real size of the invasive animal problem. Authors recommended an evaluation of investment returns from techniques and research.

 ¹⁶ National Land and Water Resources Audit and Invasive Animals CRC. 2008. Assessing Invasive Animals in Australia. NLWRA: Canberra.
¹⁷ Gong, W., Sinden, J., Braysher, M. and Jones, R. 2008. The Economic Impacts of Vertebrate Pests in Australia. Invasive Animals CRC: Canberra.



Author	Method	Main aim	Major Findings	Gaps/constraints/ recommendations
Fitzgerald, G. and Wilkinson, R.2009. ¹⁸	Review of previous studies	This paper conducted a case study in the Hunter Valley NSW using a new cost assessment framework.	Developed improved framework for measuring the social costs of invasive animals. Case study identified the social impacts of invasive animals and links between environmental, economic and social impacts. Authors identified potential for a national quantitative survey on social impacts.	The paper identified gaps in the estimate of social impacts by McLeod (2004). The authors suggested that not all social impacts are quantifiable. The authors found social performance accounting was not an appropriate measure for the social impacts of invasive animals. The case study method did not allow for the full assessment of social impacts, so limited application to other regions.
Wicks, S., Mazur, K., Please, P., Ecker S. and Buetre B. 2014. ¹⁹	3 case study regions Choice modelling survey Quantitative survey	This paper assesses the economic, environmental and social impacts of wild dogs.	There are positive net economic returns and environmental and social benefits to wild dog management. These two last categories of benefits are insufficiently taken into consideration by landholders when deciding how much to invest on wild dog management.	The report calls for more research on the three factors essential to the improved management of wild dogs in Australia: - The benefits associated with Government and industry bodies providing a coordination role in the 'nil-tenure' approach; - The potential role for governments to monitor the extent of the psychological impacts of wild dogs and ensure an adequate support-system for those affected; - Assessment of the social and environmental costs of wild dog management.

 ¹⁸ Fitzgerald, G. and Wilkinson, R. 2009. Assessing the Social Impact of Invasive Animals in Australia. Invasive Animals CRC: Canberra.
¹⁹ Wicks, S., Mazur, K., Please, P., Ecker S. and Buetre B. 2014. An Integrated Assessment of the Impact of Wild Dogs in Australia. Commonwealth: Canberra.



Funding invasive animal control

Funding for invasive animal control comes from many sources, including the three Australian levels of government (federal, state/territory and local), land managers and NGOs. Frontline NGO contributions come in many forms, including conservation investment by formal environmental organisations and the work of local informal pest animal control groups or onground environmental teams. Not only is it hard to identify funds and fund sources, but it is also not possible to distinguish reliably between 'private good' and 'public good' investments. Specific government investments in invasive species control are difficult to identify as they are often hidden within general budgets for environmental protection and natural resource management. Even at the local government level, invasive species investments are not clearly identified. This partially reflects the reality that invasive species work is often interwoven with other activities, such as production and biodiversity protection.

Even if invasive species control funding can be quantified, care is required in totalling these figures due to the risk of double-counting. For example, a proportion of funds expended by state governments are provided by the federal government, who may also count this funding as part of its expenditure on invasive species control. A similar problem may also arise at a local government and community level.

Data is generally not available for funds and other resources contributed by landholders and community groups, particularly where these contributions are in-kind. In-kind contributions include the time taken to prepare grant submissions (which may or not receive funding) and the time and resources required to implement projects (e.g. laying baits and travel expenses). This data is especially difficult to collect as many people do not record the time or other resources (e.g. fuel) spent on invasive animal control. Even where the time investment is recorded, converting this to an economic value involves assumptions about the economic value of foregone opportunity.

The following section outlines some key funding sources that we can readily identify which offer some financial support for invasive species control.

Federal funding

Figure 1 outlines the recent history of federal government funding for natural resource management:





Figure 1: Commonwealth Government funding for NRM²⁰

Biodiversity Fund

From 2011 to 2014, the Australian Government awarded over \$280 million in funding to biodiversity initiatives in six Australian regions.²¹ Funded projects included those aimed at managing invasive species.²²

Emissions Trading Fund

The Emissions Reduction Fund builds on the Carbon Farming Initiative (CFI).²³ The objective of the Emissions Reduction Fund is to help achieve Australia's 2020 emissions reduction target of five per cent below 2000 levels by 2020. The Government has provided an initial \$2.55 billion to the Fund, with further funding to be considered in future budgets.²⁴ The fund, among other things, supports projects that reduce emissions of methane from introduced animals.²⁵

Australian Government. 2014. Biodiversity Fund: 2013-14. Available at: http://www.environment.gov.au/cleanenergyfuture/biodiversity-fund/round-2/pubs/bf-r2-successful-all.pdf; Australian Government. 2013. Biodiversity Fund 2011-2012. Available at: http://www.environment.gov.au/cleanenergyfuture/biodiversity-fund/round-1/index.html 2014. Biodiversity Fund: 2013-14. Available Australian Government. at: http://www.environment.gov.au/cleane nergyfuture/biodiversity-fund/round-2/pubs/bf-r2-successful-all.pdf; Australian Government. 2012. Biodiversity Fund. Available at: http://www.environment.gov.au/cleanenergyfuture/biodiversity-fund/round-1/index.html. ²³ Australian Government. 2015. Carbon Farming Initiative project transition into the Emissions Reduction Fund. Available at: http://www.environment.gov.au/climate-change/emissions-reduction-fund/carbon-farming-initiativeproject-transition. 2016. Australian Government. About the **Fmissions** Reduction Fund. Available at: http://www.environment.gov.au/climate-change/emissions-reduction-fund/about. 2012. Initiative. Available at: Australian Government. About the Carbon Farming http://www.environment.gov.au/climate-change/emissions-reduction-fund/cfi/about.

²⁰ Martin, P. et al. 2013. Measuring the Impact of Managing Invasive Species. Department of Sustainability, Environment, Water, Population and Communities: Canberra (unpublished).



National Landcare Programme

The National Landcare Programme complements funding for the Reef 2050 Plan,²⁶ the Green Army Programme,²⁷ and the Land Sector Package.²⁸ It comprises a \$1 billion investment for national NRM initiatives and regional NRM initiatives (delivered through Australia's 56 natural resource management organisations).²⁹ Strategic objectives include initiatives to manage invasive species which threaten ecosystems, habitats or native species.

Local Government Funding

The Australian Bureau of Statistics produced a report on the environmental expenditure of local government in 2004 (based on data on 2002-03 data). The report does not provide an expenditure subset for invasive species. It reports that local government environmental protection expenditure for 2004 exceeded \$2.6 billion, with an additional \$1.5 billion spent on NRM.³⁰

Landholder NRM practices

The Australian Bureau of Statistics conducted a survey into NRM practices in agribusinesses in 2007.³¹ The survey asked agricultural businesses managers "to identify the extent and type of weed, pest, and land and soil problems present on their land, and the activities they undertook to prevent or manage them. It also asked managers of agricultural businesses to provide details of the costs and effort spent on addressing these problems".³²

In 2006-07, 94.3% of Australian agricultural businesses reported undertaking NRM activities to prevent or manage weeds, pests, and land and soil. In total, undertaking these activities cost almost \$3 billion, or \$21,094 per agricultural business or \$7,522 for each 1000 ha under management. A total of almost 9.4 million person days was spent addressing these problems, an average of 66 person days per agricultural business reporting NRM activities or 24 person days per 1,000 ha under management. Agricultural businesses in New South Wales spent the most overall on weed, pest, and land and soil activities (\$933 million, or 31.2% of NRM expenditure nationally). On an individual basis, agricultural businesses in Western Australia spent the most on weed, pest, and land and soil activities, averaging \$41,094. In comparison, agricultural businesses in Victoria and Tasmania spent an average of \$16,156 and \$14,193 respectively. However, on average, agricultural businesses in Tasmania and Victoria spent the most managing these NRM problems per thousand hectares (\$38,644 and \$44,822 respectively). These two states also spent the most amount of time per thousand hectares managing their weed, pest, and land and soil problems, both averaging 137 person days per 1,000 hectares.³³

²⁷ Australian Government. 2016. Green Army. Available at: <u>http://www.environment.gov.au/land/green-army</u>.

³³ Ibid.

²⁶ Australian Government. 2015. *The Reef 2050 Plan*. Available at: <u>http://www.environment.gov.au/marine/gbr/long-term-sustainability-plan</u>.

²⁸ Australian Government. 2013. Land Sector Package. Available at: http://www.environment.gov.au/cleanenergyfuture/land-sector/.

²⁹ Australian Government. 2015. *Australian Landcare Programme*. Available at: <u>http://www.nrm.gov.au/national-landcare-programme</u>.

³⁰ Australian Bureau of Statistics. 2004. Environment Expenditure: Local Government, Australia 2002-03. ABS: Canberra.

 ³¹ Australian Bureau of Statistics. 2008. Natural Resource Management on Australian Farms, 2006-07. ABS: Canberra.
³² Ibid.



Innovative funding options

As will be discussed below, the willingness and the wherewithal of government to make the required investments in invasive animal control is far from assured. The major restraint on how much invasive animal control can be undertaken is cost. Land managers may have to turn to innovative funding options in order to cover the costs of managing invasive animals on an extensive spatial scale.

Biodiversity Offsetting

Biodiversity offsetting is a market-based mechanism that takes various forms e.g. biobanking and biodiversity credit schemes.³⁴ The mechanism allows land developers to compensate for the loss of biodiversity in one location by protecting or restoring land in another location. Degraded land can be enhanced by controlling invasive species. Norton and Warburton argue that biodiversity offsetting has the potential to fund invasive species control if the following seven key conditions are met:³⁵

- 1. It is technically feasible to decrease invasive species to levels that enhance biodiversity outcomes;
- 2. It is cost effective in that it compensates the land manager for adverse impacts and provides positive value to the developer paying for the offset;
- 3. The control program applies to land sufficiently large enough to offset the biodiversity loss from development;
- 4. The program is flexible enough to adapt to new technical developments while supporting the originally agreed upon biodiversity outcomes;
- 5. The program acknowledges the uncertainty of managing invasive species and is able to adapt to manage the risks associated with uncertainty;
- 6. The program incorporates a risk assessment that identifies the consequences of failure so that the cost of failure falls on the developer rather than the community; and
- 7. The program provides in-perpetuity funding to ensure continuing pest control management.

Payment for Environmental Services by the Local Community

Natural resources provides food, water, clean air, energy, biodiversity, medicines, habitat protection, conservation capacity, minerals, nutrient cycling, carbon sequestration, waste decomposition, disease control, cultural services and recreation. Private landholders manage natural resources in ways that produce environmental services. For the most part, the provision of these services goes unrewarded.

³⁴ NSW Government. 2016. *BioBanking: A Market-based Scheme*. Available at: <u>http://www.environment.nsw.gov.au/biobanking/;</u> Victorian Government. 2014. *Native Vegetation Offsets*. Available at: <u>http://www.depi.vic.gov.au/environment-and-wildlife/biodiversity/native-vegetation/native-vegetation-permitted-clearing-regulations/native-vegetation-offsets</u>

³⁵ Norton, D. A. and Warburton, B. 2015. 'The Potential for Biodiversity Offsetting to Fund Effective Invasive Species Control'. *Conservation Biology*. 29: 5-17.



Payments for environmental services (PES) are incentives paid to land managers to manage their land in a way that produces a targeted environmental service. The majority of PES programs are financed by governments. ³⁶ However, PES can also be funded by local communities.

Crowdfunding

Crowdfunding offers a new potential source of financing for environmental undertakings. It can also generate awareness and foster support for invasive species control. A venture can be funded by soliciting a large number of individuals through a crowdfunding internet platform. Those interested in an environmental project can donate funds. Crowdfunding platforms that foster environmental campaigns include:

- Chuffed: <u>https://www.chuffed.org/</u>
- Pozible: http://www.pozible.com/
- Causes: https://www.causes.com/
- Greenfunder: <u>http://www.greenfunder.com/</u>
- Kickstarter: https://www.kickstarter.com/
- Indiegogo: https://www.indiegogo.com/

Are there enough resources for effective action?

An objective answer to this question requires a decision about what standard of protection or restoration is enough, and a decision about what strategies would deliver this standard and at what cost. There is no consensus about these matters or reliable estimate of how much is already being invested. Notwithstanding these important uncertainties, the indications are that there is a very significant shortfall between what is needed and what is being invested.

In spite of funding programs such as Landcare, the 2011 State of the Environment Report (*SoE* 2011)³⁷ notes that the public and private resources available for invasive species control are grossly insufficient and continue to decline.³⁸ The demand for resources to control invasive animals is part of the overall demand for investment in natural resource management. There are many pressures on NRM funds, including demands for resources to rehabilitate soils and manage waterways, public lands and Indigenous lands (given the limited economic capacity of the landholder and extent of Indigenous land holdings). The impact of climate change seems likely to increase all NRM resourcing requirements.³⁹

The decline in available resources makes it imperative to address data issues relevant to resource allocation decisions, particularly the availability of data on the costs of social and environmental impacts of invasive species, the resources needed to achieve particular objectives, and public and private sources of money.

³⁶ See e.g. Swallow, S. K., Anderson, C. M., and Uchida, E. 2012. *The Bobolink Project: Selling Public Goods from Ecosystem Services Using Provision Point Mechanisms*. Department of Agricultural and Resource Economics: Connecticut.

³⁷ Hatton, J. et al. 2011. *State of the Environment 2011 ('SoE 2011')*. Australian State of the Environment Committee: Canberra.

³⁸ lbid pp 666-667.

³⁹ Hellman, J. J., Byers, J. E., Bierwagen, B. G. and Dukes, J. S. (2008). 'Five Potential Consequences of Climate Change for Invasive Species'. *Conservation Biology*. 22: 534-543; Invasive Species Council. *Climate Change and Invasive Species*. <u>http://invasives.org.au/our-projects/climate-change-and-invasive-species/</u>.</u>



Variability in human and economic capacity to address target pest species

There are limitations on the capacity of land managers and communities to fund invasive species control. Current data suggests that the human and economic capacity of land managers and communities varies considerably across the Australian landscape.⁴⁰ In intensively settled areas with substantial human and economic capacity, the pest species challenge might conceivably be resourced by harnessing community resources with only a marginal call on government. There is likely to be a greater need for government resources in sparsely settled and economically challenged communities.

A generic funding model that relies on community action may not be feasible in areas of low population and limited wealth. In such areas, invasive species control will remain dependent upon the public purse until significant new sources of funding are found. However, the willingness of government to make the required investments in invasive species control is far from assured. Governments of all continue to highlight the likely inability of the public purse to fund many investments that Australians have come to expect. Whilst Australia is a low-taxing country compared to most developed countries, there is little apparent political appetite to change that status. Demographic and fiscal trends suggest that our national capacity to fund the public good is more likely to decline than to increase. Figure 2 supports this conclusion:⁴¹



Figure 2: Federal Treasury Intergenerational Report (IGR) Projected Fiscal Gap

Whilst forecasts are only ever indicative, the message from Australian treasurers is that less rather than more money will be allocated to 'discretionary' expenditures, such as invasive species control, in the future.

⁴⁰ See e.g. Australian Bureau of Statistics. 2006. *Data Availability: Population Density 2002-2006*. ABS: Canberra; Australian Bureau of Statistics. 2006. *Socio-Economic Indexes for Areas (SEIFA), 2006*. ABS: Canberra.

⁴¹ Australian Treasury. 2010. *Australia to 2050: Future Challenges*. Commonwealth: Canberra. p xi.



Further research

Researchers working on the IACRC Program "Facilitating Effective Community Action" are conducting research on the following matters to help inform public and private resource decision-making:

- What public and private resources are applied to the frontline control of invasive animals?
- What insights can we obtain about the 'sufficiency' of these resources?
- What transaction issues influence the efficiency, effectiveness and fairness of resource flows?
- What innovations might be effective in improving the flow of resources to citizens to control invasive animals?

The researchers in program 4 are using a stepped process to better understand the flow of funds in the invasive species system. This includes the following stages:

- 1. A preliminary overview of federal government funding for NRM, to help estimate the funds going to frontline invasive animal control;
- 2. A preliminary assessment of the portion of federal NRM funding going to invasive animals work (the assessment method will be determined in consultation with relevant departmental and funding program staff);
- 3. A preliminary assessment of state resource allocations to NRM and invasive animal control, using New South Wales as a case study; and
- 4. An in-depth examination of a specific control problem in a specific NRM region, for example wild dogs in Western NSW. This case study will inform a preliminary assessment of:
 - a. Inflows and outflows of financial resources for frontline control;
 - b. Citizen in-kind contributions;
 - c. Relevant transaction issues (e.g., those relating to administration, management, communications, monitoring, reporting and data management)
 - d. The consequences of these issues for the efficiency, effectiveness and fairness of invasive animal control programs; and
 - e. The sufficiency of current resource allocations.

We do not expect the investigation to result in a simple, clear answer to any of the basic questions; its purpose is to support a more informed discussion in the future. We expect that the preliminary research will provide insights into the underlying resource challenges of invasive species control, which can be refined by further in-depth investigation.

The policy focus of our investigation is frontline invasive animal control, with a concern for matters that influence the effectiveness and efficiency of citizen activities. This necessities some effort to measure in-kind contributions in dollar value. For example, labour is a significant investment in invasive species management. While quantification raises debateable assumptions, the alternative approach (excluding the labour component) would be misleading.



The transaction effectiveness issue

Many transactions govern the flow and use of resources for invasive animal control. Human and resource expenditures involved in the creation and management of transactions are termed 'transaction costs'.⁴² These are distinguished from the resource expenditures embedded in the transaction itself. Thus, a transaction to buy a house involves the price of the house and the cost of the documentation and administration. The latter two costs are the transaction costs.

Various types of rules, and the organisations that create and implement them, create transaction costs. Transaction costs of invasive species control include team and community group coordination, development of skills, project management, and grant or other funding arrangements. It is inevitable that resources will be consumed in such activities. It is also necessary to invest resources into accountability, particularly where public resources are involved.

Some activities that create transaction costs add value to the invasive species system by ensuring that resources are properly allocated and used. However, the benefits from some invasive animal control arrangements are less than the transaction costs of making the arrangement. Such arrangements reduce the effectiveness of the underlying transactions and can be considered wasteful as they weaken the capacity of the invasive animal system to deliver 'value for money'. It can be difficult to decide which transactions are wasteful and which are beneficial.

Transaction arrangements can also provide value to some stakeholders but reduce value to others. For example, administrative safeguards in public governance can create costs for community groups that impact different stakeholders in different ways. For example, the costs of attending a project review meeting in a state capital will be higher for a remote stakeholder than for a nearby citizen. For these reasons, transaction costs impact upon the effectiveness of the use of invasive species resources, upon the amount of resources 'consumed' in management (either value creating or wasteful), and upon the fairness of how resources are allocated.

Further analysis of transaction issues for citizens will draw upon the research we have outlined above and investigations being conducted by Dr. Jacqueline Williams of the Australian Centre for Agriculture and Law into the transaction costs of landholder participation in regional natural resource management arrangements. The investigation has a number of elements that contribute to identifying transaction costs in different NRM contexts. It includes the following elements:

- Public good NRM contributions by Tamar Valley Farmers in Northern Tasmania: this survey identifies the transaction costs of the current NRM approach for farmers.
- NRM grant transaction costs survey: this survey was designed to identify the transaction costs of the current grant system. This survey was undertaken in 2014.
- Regional NRM surveys: these surveys have collected broad transaction costs data from NRM organisation CEOs on the ratio of funds (cash and in-kind) spent on

⁴² The term transaction costs can also include 'intangible' issues like the effects of uncertainty or discomfort, which can also be a barrier to people engaging in otherwise desirable transactions. Thus, when regulatory or market structures are not trusted this can be a 'transaction cost' of using them; or some groups may have particular values that prevent them engaging in particular transactions such as the Islamic prohibition on lending or borrowing money for interest.



administration, on-ground work and monitoring from 2002 to 2011. There is also data relevant to current monitoring tools and scientific, economic and social indicators.



6.3 Resource C: Key studies and reports

Resource C: Key Studies and Reports

This resource summarises key studies on institutional aspects of invasive species control and/or management. They have been selected on the basis of their evidentiary value.¹

The resources are reported in descending chronological order under six themes:

- Government dimensions
- Social dimensions
- Resource dimensions
- International dimensions
- Biophysical and economic dimensions
- NGO and industry dimensions

We have provided hyperlinks, where available.

Government dimensions

Recent government discussion papers and reports

Natural Resources Commission. 2016. Shared problems, Shared Solutions: Pest Animal Management Review Draft Report. Sydney: Natural Resources Commission, NSW. http://www.nrc.nsw.gov.au/pest-animal-management

This draft report explores finds that local communities are the heart of pest management, and that cross-tenure work needs to be supported by on-ground coordinators, strategies and plans, strong enforcement and research.

National Biosecurity Committee. 2015. *Discussion Paper: Modernising Australia's Approach to Managing Established Pests and Diseases of National Significance*. Department of Agriculture: Canberra.

http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/epdns-discussionpaper.pdf

This discussion paper provides an overview of a proposed approach to managing pests and diseases of national significance that have become established in Australia. It intends to trigger stakeholders' feedback to help the Department of Agriculture determine which established pests and diseases should be considered nationally significant.

Natural Resource Commission. 2015. *State-wide Review of NSW Pest Animal Management (Issues Paper)*. Sydney: NRC.

http://www.nrc.nsw.gov.au/pest-animal-management

This paper outlines guiding principles for pest animal management, current agency responsibilities for pest management, and specific issues, barriers, opportunities and solutions related to pest management in NSW.

¹ Evidentiary value was indicated by a report or study being a source of primary data (or having policy 'weight' (such as a commissioned policy study, report or legal analyses).



NSW Department of Primary Industries. 2015. *Biosecurity Act 2015 Discussion Paper: Wild Dogs*. NSW Government: Sydney.

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/587364/Discussion-Paper-Wild-Dogs.pdf

This discussion paper outlines a proposal to move the regulation of wild dogs to the Biosecurity Act 2015 (NSW) in response to the imminent repeal of Part 10 of the Local Land Services Act 2013 (NSW).

NSW Department of Primary Industries. 2015. *Biosecurity Act 2015 Discussion Paper: Non-Indigenous Animals*. NSW Government: Sydney.

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/587365/Discussion-Paper-Controlled-Category-Non-Indigenous-Animals.pdf

This discussion paper outlines a proposal to move the regulation of non-indigenous animals to the Biosecurity Act 2015 (NSW) in response to the imminent repeal of the Non-indigenous Animals Act 1987 (NSW).

NSW Department of Primary Industries. 2015. *Biosecurity Act 2015 Discussion Paper: Management of Widespread Pest Animals*. NSW Government: Sydney. <u>http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/587363/Discussion-Paper-Widespread-pest-animals.pdf</u>

This discussion paper outlines a proposal to move the regulation of wild rabbits, feral pigs, feral camels, foxes and a number of locust species to the Biosecurity Act 2015 (NSW) in response to the imminent repeal of Part 10 of the Local Land Services Act 2013 (NSW).

NSW Department of Primary Industries. 2015. *Biosecurity Act 2015 Discussion Paper: Queensland Fruit Fly*. NSW Government: Sydney.

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/587357/Discussion-paper-Queensland-Fruit-Fly.pdf

This discussion paper outlines a proposal to move the regulation of Queensland Fruit Fly to the General Biosecurity Duty in the Biosecurity Act 2015 (NSW), in response to the imminent repeal of Plant Diseases Act 1924 (NSW).

NSW Department of Primary Industries. 2015. *Biosecurity Act 2015 Discussion Paper: Carp and Eastern Gambusia*. NSW Government: Sydney.

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/586834/Discussion-Paper-Carpand-Eastern-Gambusia.pdf

This discussion paper outlines a proposal to move the regulation of Carp and Eastern Gambusia to the General Biosecurity Duty in the Biosecurity Act 2015 (NSW), in response to the imminent repeal of parts of the Fisheries Management Act 1994 (NSW).

NSW Department of Primary Industries. 2015. *Biosecurity Act 2015 Discussion Paper: Aquatic pests and diseases*. NSW Government: Sydney. http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/586835/Discussion-Paper-Aquatic-

<u>Pests-and-Diseases_final.pdf</u> This discussion paper outlines a proposal to move the regulation of aquatic pests and diseases to the General Biosecurity Duty in the Biosecurity Act 2015 (NSW), in response to the imminent repeal of parts of the Fisheries Management Act 1994 (NSW).



Agriculture Victoria. 2012. *Discussion Paper - Invasive Species Management Bill*. Agriculture Victoria: Melbourne.

http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/protecting-victoria-frompest-animals-and-weeds/legislation-policy-and-permits/new-invasive-species-managementlegislation/discussion-paper-invasive-species-management-bill

This discussion paper was a key step in the development of new legislation in Victoria. Written submissions were considered and assisted the former Department of Primary Industries in their strategy to develop stand-alone invasive species management legislation.

Submissions to recent government inquiries

Western Australia Farmers Federation. 2016. Submission to Law Reform Commission of Western Australia: Review of the Firearms Act 1973 (WA). Perth: WA Farmers. http://www.wafarmers.org.au/wp-content/uploads/2013/11/20160215_LRC_FireArmsAct-final1.pdf

Australian Deer Association. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management Issues Paper. Sydney: Natural Resources Commission.

http://www.nrc.nsw.gov.au/PDF/Statewide%20review%20of%20pest%20animal%20management/Submissions%20-%20Issues%20paper/Australian%20Deer%20Association.pdf

Australian Pig Doggers and Hunters Association. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management Issues Paper. Sydney: Natural Resources Commission. <u>http://www.nrc.nsw.gov.au/PDF/State-</u> <u>wide%20review%20of%20pest%20animal%20management/Submissions%20-</u> %20Issues%20paper/Australian%20Pig%20Doggers%20and%20Hunters%20Association%20Inc.pdf

Brindabella and Wee Jasper Valleys Wild Dog and Fox control Working Group. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management Issues Paper. Sydney: Natural Resources Commission. <u>http://www.nrc.nsw.gov.au/PDF/State-</u> <u>wide%20review%20of%20pest%20animal%20management/Submissions%20-</u> <u>%20lasues%20pest%20pest%20per%20pe</u>

%20Issues%20paper/Wild%20Dog%20and%20Fox%20Control%20Working%20Group.pdf

Federation of Hunting Clubs. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management Issues Paper. Sydney: Natural Resources Commission.

http://www.nrc.nsw.gov.au/PDF/Statewide%20review%20of%20pest%20animal%20management/Submissions%20-%20Issues%20paper/Federation%20of%20Hunting%20Clubs%20Inc.pdf

Game Management Council of NSW Incorporated. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management Issues Paper. Sydney: Natural Resources Commission.

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Invasive Species Council. 2015. Problems with Feral Animal Management in New South Wales: Submission to NRC Issues Paper on Pest Management in NSW. Victoria: Invasive Species Council.

http://invasives.org.au/files/2015/12/ISC-BLA-NCC-submission-to-NSW-pest-review-FINAL.pdf

Invasive Species Council. 2015. *Response to National Marine Pests Biosecurity Review*. Victoria: Invasive Species Council. http://invasives.org.au/files/2015/05/Response-to-Marine-Pests-Review-May-2015-final.pdf

Invasive Species Council. 2015. Submission to Discussion Paper: Modernising Australia's Approach to Established Pests and Diseases of National Significance. Victoria: Invasive Species Council.

https://invasives.org.au/files/2015/07/Established-pests-paper-submission-31-Jul-2015.pdf Invasive Species Council. 2015. Submission to Draft Threat Abatement Plan for Predation by Feral Cats. Victoria: Invasive Species Council. http://invasives.org.au/files/2015/07/Submission-to-draft-feral-cat-TAP-Jul-2015.pdf

Invasive Species Council. 2015. Submission to Draft NSW Invasive Species Plan 2015-22. Victoria: Invasive Species Council. http://invasives.org.au/files/2015/09/Submission-NSW-invasive-species-plan-2015-22.pdf

Invasive Species Council. 2015. Submission to Draft Western Australian State Biosecurity Strategy. Victoria: Invasive Species Council. http://invasives.org.au/files/2015/05/WA-Biosecurity-Strategy-ISC-submission-May-2015.pdf

Invasive Species Council and Queensland Conservation. 2015. *Joint Submission to Queensland Biosecurity Capability Review*. Victoria: Invasive Species Council. <u>http://invasives.org.au/publications/submission-to-queensland-biosecurity-capability-review-aug-2015/</u>

National Farmers' Federation. 2015. Submission to the National Biosecurity Committee in Response to Discussion Paper: Modernising Australia's Approach to Established Pests and Diseases of National Significance. Canberra: National Farmers' Federation. http://www.nff.org.au/submissions-search.html?subcategoryid=3659

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National Parks Association of NSW. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management: Issues Paper. Sydney: Natural Resources Commission.

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NSW Aboriginal Land Council. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management Issues Paper. Sydney: Natural Resources Commission.

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NSW Farmers' Association. 2015. Submission to the Natural Resources Commission (NRC) Statewide Review of NSW Pest Animal Management Issues Paper. Sydney: Natural Resources Commission.

http://www.nrc.nsw.gov.au/PDF/Statewide%20review%20of%20pest%20animal%20management/Submissions%20-%20Issues%20paper/NSW%20Farmers'%20Association.pdf

Queensland Farmers Federation. 2015. Submission to the Queensland Biosecurity Capability Review. Brisbane: Queensland Farmers Federation. <u>http://www.qff.org.au/wp-content/uploads/2011/10/Queensland-Biosecurity-Capability-</u> Review-QFF-Submission.pdf

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Other articles and reports

Ponce Reyes, R., Firn, J., Nicol, S., Chadès, I., Stratford, DS., Martin, TG., Whitten, S. and Carwardine, J. 2016. *Priority Threat Management for Imperilled Species of the Queensland Brigalow Belt*. Brisbane: CSIRO.

http://gisera.org.au/publications/tech_reports_papers/Brigalow-Belt-PTM-study.pdf This report presents a costed and prioritised set of feasible threat management strategies for protecting 179 of the most threatened native plant and animal species of the Brigalow Belt bioregion. The strategies were designed in consultation with 40 experts and stakeholders, using the best available scientific data and expert knowledge.

Western Australian Local Government Association. 2016. *Biosecurity Management: Local Government Discussion Paper*. Perth: Western Australian Local Government Association. <u>http://www.walga.asn.au/MemberResources/EnvironmentWasteManagement.aspx</u> *This discussion paper was written to help the Western Australian Local Government Association (WALGA) to: inform its biosecurity policy position; identify gaps in information/ tools/ support for local government that need addressing; identify opportunities to collaborate with other stakeholders; and determine WALGA's future actions.*



Western Australian Local Government Association. 2016. Biosecurity Management: Local Government Discussion Paper. Perth: Western Australian Local Government Association. http://www.walga.asn.au/MemberResources/EnvironmentWasteManagement.aspx This discussion paper was written to help the Western Australian Local Government Association (WALGA) to: inform its biosecurity policy position; identify gaps in information/ tools/ support for local government that need addressing; identify opportunities to collaborate with other stakeholders; and determine WALGA's future actions.

Department of Agriculture and Water Resources. 2015. *Review of National Marine Pest Biosecurity*. Canberra: Australian Government.

http://www.agriculture.gov.au/SiteCollectionDocuments/pests-diseases-weeds/marinepests/review-national-marine-pest-biosecurity.pdf

This report presents the findings of the Australian Government Department of Agriculture and Water Resources' review into national marine pest biosecurity arrangements.

Senate Environment and Communications References Committee. 2015. *Environmental Biosecurity*. Canberra: Commonwealth.

http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Com munications/biosecurity/Report

This report considers the adequacy of arrangements to prevent the entry and establishment of invasive species likely to harm Australia's natural environment, including recent biosecurity performance and Australia's state of preparedness for new environmental incursions.

Cattanach, A., Harris, A., and Horne, J. 2013. *Mapping Australia's Weed Management System*. Canberra: RIRDC.

https://rirdc.infoservices.com.au/items/13-019

This report provides a broad overview of the institutional system for weed management in Australia.

Martin, P. and Verbeek, M. 2013. Measuring the Impact of Managing Invasive Species: Report for the Department of Agriculture, Forestry and Fisheries. Armidale: Unpublished. This study analysed the practices used by a sample of invasive animal project teams funded by the Caring for Our Country program, and evaluated the outcome of these investments.

Department of Agriculture, Fisheries and Forestry. 2012. *Reform of Australia's Biosecurity system: New Biosecurity Legislation*. Canberra: Commonwealth. <u>http://www.daff.gov.au/SiteCollectionDocuments/biosecurity/new-legislation/reform-of-australias-biosecurity-system-new-biosecurity-legislation.pdf</u>

This report provides an overview of the different aspects of the new biosecurity legislation against the Beale review recommendations, articulating how the new biosecurity legislation contributes to their implementation.

Department of the Environment. 2012. *Threat Abatement Plan for Competition and Land Degradation by Rabbits: Review*. Canberra: Commonwealth. https://www.environment.gov.au/system/files/resources/7097f100-4a22-4651-b0e1df26e17c622c/files/tap-review-rabbit.pdf

This review assesses the progress and effectiveness of the 2008 Threat Abatement Plan for Competition and Land Degradation by Rabbits (TAP) in reducing the impacts of rabbits on biodiversity by protecting nationally listed threatened species and communities, or



preventing further species and communities from becoming threatened, through research, management and other actions.

Research, Development and Extension Working Group. 2012. National Biosecurity Research and Development Capability Audit: Intergovernmental Agreement on Biosecurity. Canberra: Commonwealth.

http://www.daff.gov.au/__data/assets/pdf_file/0006/2292414/Biosecurity_R,D_and_E_Capa bility_Audit.pdf

An audit of biosecurity research and development (R&D) capability undertaken over the period January to July 2012 to investigate capacity (both personnel and infrastructure) and government investment in biosecurity related research and development.

Riley, S. 2012. Law is Order, and Good Law is Good Order: The Role of Governance in the Regulation of Invasive Alien Species. Environmental and Planning Law Journal. 29(1):16-44. https://opus.lib.uts.edu.au/bitstream/10453/18108/1/2011002014.pdf

This article examines complications stemming from governance of IAS regimes in federal systems where law-making power is shared.

Grice, T., Friedel, M., Setterfield, S., Ferdinands, K., Clarkson, J., Rolfe, J. and MacLeod, N. 2011. *Best Practice for Making Strategic Decisions about Invasive Plants of Commercial Value*. Canberra: RIRDC.

https://rirdc.infoservices.com.au/items/11-055

This report identifies approaches to a thorough analysis of economic, environmental and social costs and benefits of invasive plants with commercial value. It explores policy, regulatory and management options for dealing with species that are both invasive and beneficial.

HC Coombs Policy Forum and Fenner School of Environment and Society. 2011. HC Coombs Policy Forum NRM initiative: Natural Resource Management Policy and Planning in Australia. Canberra: ANU.

https://crawford.anu.edu.au/public_policy_community/research/nrm/NRM_Ref_Group_Comb ined.pdf

This document presents a synthesis of issues and opportunities for integrated regional natural resource management policy and planning in Australia.

Victorian Auditor-General. 2010. *Control of Invasive Plants and Animals in Victoria's Parks*. Melbourne: Victorian Government.

http://www.audit.vic.gov.au/publications/2009-10/20100526-Invasive-Plants-Full-Report.pdf This report examines the effectiveness of invasive species programs in national and state parks. In particular, the audit examined the governance arrangements, information systems, planning frameworks and on-ground activities targeting invasive species across the park network.

Burgman, M., Walshe, T., Godden, L., and Martin, P. 2009. *Designing Regulation for Conservation and Biosecurity*. Australasian Journal of Natural Resources Law and Policy. 13(1): 93-112.

This article explains why quarantine and invasive control laws, which extensively rely on lists of species, have limited effectiveness in protecting biodiversity values.



Miles, R. L., Kinnear, S., Friedel, M., Grice, A. C., Van Klinken, R. D., Setterfield, S. and Herpich, M. 2009. *Policy, Institutional and Managerial Considerations in Managing Weeds with a Commercial Value*. Canberra: Land and Water Australia.

http://lwa.gov.au/products/pn22362

This document discusses opportunities for adopting an integrated approach to managing commercial weeds.

National Land and Water Resources Audit. 2008. Significant Invasive Species (vertebrate pests): Status of Information for Reporting against Indicators. Canberra: Commonwealth. <u>http://www.pestsmart.org.au/wp-</u>

content/uploads/2010/03/NLWRA_Invasive_Animals_Booklet.pdf

This booklet is part of a series that describes the status of data and information relevant to national indicators agreed under the National Natural Resource Management Monitoring and Evaluation Framework.

Roger, B., Fairbrother, J., Inglis, A. and Trebeck, D. 2008. One Biosecurity: A Working Partnership: The Independent Review of Australia's Quarantine and Biosecurity Arrangements. Canberra: Commonwealth.

http://www.daff.gov.au/quarantinebiosecurityreview/report_to_the_minister_for_agricultur e_fisheries_and_forestry

This report, often known as the Beale report, is a comprehensive, independent review of Australia's quarantine and biosecurity arrangements. Australian Governments revised their biosecurity arrangements in response to this report.

Vertebrate Pest Committee. 2007. Australian Pest Animal Strategy: A National Strategy for the Management of Vertebrate Pest Animals in Australia. Canberra: Commonwealth. <u>http://www.environment.gov.au/biodiversity/invasive/publications/pest-animal-</u> <u>strategy.html</u>

This document details the Australian Pest Animal Strategy to address the impacts caused by exotic vertebrate animals (mammals, birds, reptiles, amphibians, and fish) and to prevent the establishment of new exotic vertebrate pests.

Department of Environment and Water resources. 2007. *Australian Government Response to the Turning Back the Tide: The Invasive Species Challenge Report*. Canberra: Commonwealth. <u>http://www.environment.gov.au/system/files/resources/a5b856a5-63d4-4c97-ad02-368ab502528b/files/invasive-challenge.pdf</u>

This report presents the Australian Government's response to the Senate Committee's report on the regulation, control and management of invasive species and the Environment Protection and Biodiversity Conservation Amendment (Invasive Species) Bill 2002 (Cth).

Martin, T. G., and Van Klinken, R. D. 2006. Value for Money? Investment in Weed Management in Australian Rangelands. The Rangeland Journal: 28(1): 63. This article analyses weed investment efforts in relation to the level of funding, the types of weeds targeted, the range of projects undertaken and the effectiveness of weed management projects within Australia's rangelands.



Bellamy, J., Metcalfe, D., Weston, N., & Dawson, S. 2005. Evaluation of Invasive Species (Weeds) Outcomes of Regional Investment. Brisbane: CSIRO. http://nrmonline.nrm.gov.au/catalog/mgl:2587

This report assesses the likely effectiveness of the Australian Government's regional investment through the Natural Heritage Trust Extension (NHT2) program in preventing or controlling the introduction and spread of weeds.

House of Representatives Standing Committee on Agriculture, Fisheries and Forestry. 2005. *Taking Control: A National Approach to Pest Animals*. Canberra: Commonwealth. <u>http://www.aph.gov.au/parliamentary_business/committees/house_of_representatives_committees?url=primind/pestanimals/report.htm</u>

This report discusses the impact of pest animals on agriculture, with recommendations for improving pest management in Australia.

Norris, A., Low, T., Gordon, I., Saunders, G., Lapidge, S., Lapidge, K., Peacock, T. and Pech, R. 2005. *Review of the Management of Feral Animals and their Impact on Biodiversity in the Rangelands: A Resource to Aid NRM Planning*. Canberra: PAC CRC. http://nrmonline.nrm.gov.au/catalog/mql:358

This report reviews feral animal management for biodiversity outcomes in the Rangelands.

Glanznig, A. and Kessal, O. 2004. Invasive Plants of National Importance and their Legal Status by State and Territory. Sydney: WWF.

http://assets.wwfau.panda.org/downloads/sp087_invasive_plants_of_national_importance_1j un04.pdf

This report assesses the legal status of invasive plants of national importance (IPNI) under respective State and Territory laws.

Glanznig, A., McLachlan, K., and Kessal, O. 2004. Garden Plants that are Invasive Plants of National Importance: An Overview of their Legal Status, Commercial Availability and Risk Status. Sydney: WWF.

http://awsassets.wwf.org.au/downloads/sp088_garden_plant_invasive_of_national_importan ce_1aug04.pdf

This report presents evidence of how poorly coordinated legislative controls for invasive plants of national importance (IPNI) enable weeds to be widely distributed through the gardening industry.

Senate Standing Committee on Environment, Communications, Information Technology and the Arts. 2004. *Turning Back the Tide: The Invasive Species Challenge*. Canberra: Commonwealth.

http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Completed_inquiries/2004-07/invasivespecies/report/index

This report addresses the terms of reference of the Senate Inquiry into the regulation, control and management of invasive species and the Environment Protection and Biodiversity Conservation Amendment (Invasive Species) Bill 2002.

Doelle, M. 2003. 'The Quiet Invasion: Legal and Policy Responses to Aquatic Invasive Species in North America'. International Journal of Marine and Coastal Law. 18: 261-294. This study surveys the legal tools available to address aquatic invasive species, and suggests possible responses.



Shine, C., Williams, N. and Gündling, L. 2000. A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species. Gland: IUCN.

http://www.iucn.org/about/work/programmes/environmental_law/elp_resources/elp_res_p_ublications/?uPubsID=2249

This guide provides national law and policy makers with practical tools to develop and strengthen their legal and institutional frameworks on alien invasive species, consistent with Article 8(h) of the CBD and pertinent obligations under other international instruments.

Human dimensions

Carlos, E., Gibson, M. and Weston, M. 2014. Weeds and Wildlife: Perceptions and Practices of Weed Managers. Conservation and Society. 12: 54-64. http://dro.deakin.edu.au/eserv/DU:30067804/carlos-weedsandwildlife-2014.pdf This article reports on a survey of weed managers from different organisations to better understand their perceptions about wildlife and weed management in Victoria and improve the decision-making process.

Davis, D. and Carter, J. 2014. Finding Common Ground in Weed Management: Peri-urban Farming, Environmental and Lifestyle Values and Practices in South East Queensland, Australia. The Geographical Journal. 180: 342-352.

http://onlinelibrary.wiley.com/doi/10.1111/geoj.12034/full

This paper discusses a case study involving landholders in weed management in South East Queensland and highlights the significance of understanding the values and practices for weed management.

Aslin, H. J., Kruger, H., Thompson Lyndal-Joy, and Duncan, A. 2013. Systematic Review of Australian Weed-related Social Surveys. Canberra: RIRDC. https://rirdc.infoservices.com.au/items/13-018

This report reviews Australian social survey research related to weeds.

Thompson, L., Aslin, H., Ecker, S., Please, P. and Trestrail. C. 2013. Social Impacts of Wild Dogs: A Review of Literature. Canberra: ABARES.

http://www.wool.com/globalassets/start/on-farm-research-and-development/sheep-healthwelfare-and-productivity/pest-animals/wild-dogs-foxes-and-

pigs/wp525_wild_dog_management_in_australia.pdf

This review assesses the social impacts of wild dog attacks, barriers to control and factors important to collaborative control.

Thompson, Lyndal-Joy; Kruger, H. 2013. Who's Involved with Weeds? A Social Network Analysis of Funding and Information Networks for Weed Management. Canberra: RIRDC. https://rirdc.infoservices.com.au/items/13-065

This report examines networks for managing weeds in Australia, in particular those providing funding and information.

Cardinia Shire Council and Johns Hill Landcare Group. 2012. Why Don't They Manage their Weeds? A Community Based "Behaviour Change" Research Project.

http://www.johnshill.org.au/documents/Whydonttheymanagetheirweeds.pdf This document records the progress of a "behaviour change" research project that has examined, through a variety of research methods, the barriers and benefits to landholders carrying out weed control work on private land.



Decker, D. J., Riley, S. J., & Siemer, W. F. 2012. *Human Dimensions of Wildlife Management*. (D. J. Decker, S. J. Riley, & W. F. Siemer (eds). Johns Hopkins University Press: Maryland. <u>https://jhupbooks.press.jhu.edu/content/human-dimensions-wildlife-management</u> *This book explores the concepts and principles underlying the human dimensions of wildlife management and considers applications from many facets of wildlife conservation*.

Kruger, H. 2012. Biosecurity Engagement: Proposed National Action Plan for Community Involvement in Plant Biosecurity - Consultation Summary Report. Canberra: ABARES. <u>http://data.daff.gov.au/brs/data/warehouse/napbed9abps001/napbed9abps00120120302/BiosecNatActPlanSummary_v1.0.0.pdf</u>

This document details a research project by ABARES to inform a national action plan for community engagement about plant biosecurity.

Martin, P. Verbeek, Miriam. Riley, S., Bartel, R., and Le Gal, E. 2012. *Innovations in Institutions to Improve Weed Funding, Strategy and Outcomes: Proposals for a National Weed Institutions Research Agenda*. Canberra: RIRDC.

https://rirdc.infoservices.com.au/downloads/12-091

This report proposes a research agenda to support the development of a long-term effective institutional system in Australia for the management of weeds.

Bohnet, I., Roberts, B., Harding, E and Haug, K. 2011. A Typology of Graziers to Inform a more Targeted Approach for Developing Natural Resource Management Policies and Agricultural Extension Programs. Land Use Policy. 58: 629-637. doi:10.1016/j.landusepol.2010.12.003

The paper particularly emphasises the significance of a grazier typology based on their values and motivations to improve communications messages and the effectiveness of NRM policies and agricultural extension programs.

Greiner, R. and Gregg, D. 2011. Farmers' Intrinsic Motivations, Barriers to the Adoption of Conservation Practices and Effectiveness of Policy Instruments: Empirical Evidence from Northern Australia. Land Use Policy. 28: 257-265. doi:10.1016/j.landusepol.2010.06.006

In this case study, surveys were conducted of farmers in three regions within the tropical savannas of Northern Australia, where land-use systems are characterized by large-scale broad-acre beef grazing enterprises. Inter alia, these surveys collected data on graziers' motivations, impediments to adoption of conservation practices, and perceived effectiveness of policy instruments in overcoming impediments.

Pannell, D. and Vanclay, F. 2011. Changing Land Management: Adoption of New Practices by Rural Landholders. Canberra: CSIRO.

http://www.publish.csiro.au/pid/6483.htm

This report provides key insights from past and cutting-edge research to support decisionmakers in their efforts to change their land management practices.

Southwell, D., Mccowen, S., Mewett, O., and Hennecke, B. 2011. Understanding the Drivers and Barriers Towards the Adoption of Innovative Canid Control Technologies: A Review. Canberra ACT: Invasive Animals CRC.

http://www.feral.org.au/adoption-of-innovative-canid-control-technologies/



This paper reviews innovation diffusion models to understand the drivers and barriers to adopting innovative pest control strategies, specifically Para Amino Propiophenone (PAPP) products.

Brown, M., Munckton, C. 2010. Scoping Study on Training and Capacity Building in Vertebrate Pest Management. Canberra: Invasive Animals CRC.

http://www.feral.org.au/wp-content/uploads/2011/01/TrainingScopingStudy2010.pdf The study identifies significant variation in the content and modes of delivery of vertebrate pest management training across Australia.

Kruger, H., Stenekes, N., Clarke, R. and Carr, A. 2010. *Biosecurity Engagement Guidelines: Practical Advice for Involving Communities*. Canberra. Bureau of Rural Sciences. <u>http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.461.6935&rep=rep1&type=pdf</u> *This document explains how effective community engagement in biosecurity can be undertaken and is based on practical experiences within Australia. The approach acknowledges the wide range of circumstances in which biosecurity engagement operates in terms of local context, available resources and stakeholders.*

Department of Environment. 2009. Invasive Species Threat Abatement Planning: Consultation with Indigenous Communities. Canberra. Commonwealth. https://www.environment.gov.au/system/files/pages/fa564fd1-b2ed-4e32-b994d2c1e457ff8e/files/indigenous-consultation-guidelines.pdf

This guide sets out the principles and processes for Indigenous consultation which will enable the development of realistic and sustainable actions to manage the threats caused by invasive species and which are in accord with Indigenous roles and interests.

Fitzerald, G. 2009. *Public Attitudes to Current and Proposed Forms of Pest Animal Control*. Canberra: Invasive Animals CRC.

http://www.feral.org.au/public-attitudes-to-current-and-proposed-forms-of-pest-animalcontrol/

This report reviews Australasian and international research on public attitudes towards different forms of control for invasive animals.

Martin, P. 2008. Cross Pollination or Cross-contamination? Directions for Informing the Management of Invasives with Market-economy Concepts. In R. D. Van Klinken et al. (eds). 16th Australian Weeds Conference. pp. 6-13.

http://www.caws.org.au/awc/2008/awc200810061.pdf

This paper suggests that the weed challenge may be addressed by a sophisticated mix of regulatory and market interventions rather than pure regulatory approaches.

White, P. C. L., Ford, A. E. S., Clout, M. N., Engeman, R. M., Roy, S., and Saunders, G. 2008. *Alien Invasive Vertebrates in Ecosystems: Pattern, Process and the Social Dimension*. Wildlife Research. 35: 171-179.

http://www.publish.csiro.au/paper/WR08058.htm

This paper identifies opportunities for enhancing the social dimensions of invasive species research and increasing stakeholder participation in the decision-making process regarding alien invasive species.



D. J. Pannell, G. R. Marshall, N. Barr, A. Curtis, F. Vanclay and R. Wilkinson. 2006. Understanding and Promoting Adoption of Conservation Practices by Rural Landholders. Australian Journal of Experimental Agriculture. 46: 1407-1424. <u>http://www.publish.csiro.au/?act=view_file&file_id=EA05037.pdf</u> This report examines motivations for land managers to adopt control measures.

Agtrans Research. 2005. *Review of Progress on Invasive Species*. Brisbane: Agtrans Research. <u>https://www.environment.gov.au/system/files/resources/b3fc09c0-6969-41dc-ab47-</u>29373d6f267f/files/review-full.pdf

This review addresses the impacts of invasive species, the distribution and abundance of invasive species, and reports activities undertaken in Australia in relation to prevention of entry, surveillance, emergency response and eradication, and containment and control.

Aslin, H., Kelson, S. and Smith, J. 2004. *Peri-Urban Landholders and Biosecurity Issues: A Scoping Study*. Canberra: Bureau of Rural Sciences.

This report provides the results of an initial scoping study on peri-urban dwellers, their characteristics, where they live, what their motivations are, and how best to communicate with them.

Oliver, J., & Walton, C. 2004. *Pests in Queensland: Baseline Survey 2003*. Brisbane: Department of Natural Resources, Mines and Energy.

This survey reports on the pest management perceptions and knowledge of primary producers and residents of regional centres and large country towns across Queensland in mid-2003.

Robbins, P. 2004. Comparing Invasive Networks: Cultural and Political Biographies of Invasive Species. Geographical Review: 94(2): 139-156.

<u>http://onlinelibrary.wiley.com/doi/10.1111/j.1931-0846.2004.tb00164.x/abstract</u> This article explores the cultural and political conditions under which species become successful invaders.

McNeely, J. A. (ed). 2000. The Great Reshuffling: Human Dimensions of Invasive Alien Species. Gland: IUCN.

www.vliz.be/imisdocs/publications/142047.pdf

This publication explores the significance of adopting a human dimension to IAS problems, Cape Town, South Africa on 15-17 September 2000.

Resource dimensions

Department of the Environment. 2016. Draft Varied Threat Abatement Plan for Competition and Land Degradation by Rabbits. Australian Government: Canberra. <u>http://www.environment.gov.au/biodiversity/threatened/threat-abatement-plans/rabbits-</u> 2015

This plan identifies the research, management and other actions needed to ensure the longterm survival of native species and ecological communities affected by rabbits.

Department of the Environment. 2016. Draft Revised Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs (Sus scrofa). Australian Government: Canberra.



http://www.environment.gov.au/biodiversity/threatened/threat-abatement-plans/feralpigs-2015

This plan identifies the research, management and other actions needed to ensure the longterm survival of native species and ecological communities affected by feral pigs.

Department of the Environment. 2015. *Background Document: Threat Abatement Plan for Competition and Land Degradation by Rabbits*. Australian Government: Canberra. <u>http://www.environment.gov.au/system/files/resources/894e20fe-fb31-4b48-88b5-</u>e2ee4e9012eb/files/draft-varied-tap-rabbit-2015-background.pdf

The document provides information on rabbit characteristics, biology and distribution; the impacts on environmental, economic, social and cultural values; and current management practices and research findings.

Department of the Environment. 2015. Background Document: Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs (Sus scrofa). Australian Government: Canberra.

http://www.environment.gov.au/system/files/resources/e8344ac9-5527-4402-aca9cc0c4b533b3a/files/draft-tap-feral-pigs-2015-background.pdf

The document provides information on rabbit characteristics, biology and distribution; the impacts on environmental, economic, social and cultural values; and current management practices and research findings.

Reeve, I., Coleman M. and Sindel, B. 2015. *Factors Influencing Rural Landholder Support for a Mandated Weed Control Policy*. Land Use Policy. 46: 314-323. <u>http://www.sciencedirect.com/science/article/pii/S0264837715000836</u> *This article explores landholder attitudes to mandated weed control*.

Ruttledge, A., Whalley, R. D. B. A., Reeve, I., Backhouse, D.A. and Sindel, B.M. 2015. Preventing Weed Spread: A Survey of Lifestyle and Commercial Landholders about Nassella Trichotoma in the Northern Tablelands of New South Wales, Australia. The Rangeland Journal, 37: 409-423.

http://www.publish.csiro.au/paper/RJ15010.htm

This article reports on a survey of rural property owners in NSW that examined the use of measures to prevent new outbreaks of the weed.

Steel, J., Weiss, J. and Morfe, T. 2014. To Weed or not to Weed? The Application of an Agent-based Model to Determine the Costs and Benefits of Different Management Strategies. Plant Protection Quarterly. 29: 101-110.

http://search.informit.com.au/fullText;dn=951651557210253;res=IELHSS

This article critiques the use of cost and benefit analyses of weed management strategies and find them lacking in their capacity to consider different landscapes and different costs and benefits at specific locations. The authors test an agent-based weed dispersal model in NetLogo with in-built economic evaluation and management strategies components.

Bayliss, H. R., Stewart, G. B., and Andrew Wilcox, N. P. R. 2013. A Perceived Gap between Invasive Species Research and Stakeholder Priorities. NeoBiota. 19: 67-82. This journal article explains why invasive species research is not sufficiently geared towards delivering practical solutions.



Department of Primary Industries. 2013. Information and Communication Services: Capacity and Engagement of Weeds Professionals in NSW. Department of Primary Industries. Unpublished.

This survey provides insight into the capacity and engagement of weeds professionals in NSW in the context of information and communication services.

Invasive Species Council. 2013. Media Report - Survey: Who's Tackling Invasive Species in Australia.

http://www.hopeaustralia.org.au/uploads/media/Survey.pdf This survey should identify those involved with invasive species management across

Australia. It points to institutional challenges that prevent effective community action.

Marsh, J. and Brown, A. 2013. Understanding the Capacity of NRMs to Manage Invasive Animal Impacts: Results from the 2013 National NRM Survey

http://www.pestsmart.org.au/2013-national-nrm-survey/

This NRM survey collects views from staff that deals directly with pest animals within 54 regional NRM agencies across Australia.

Oscar, C. 2012. Valuing Community Engagement in Biosecurity Surveillance. Armidale: University of New England.

<u>http://www.acera.unimelb.edu.au/materials/endorsed/1004B_OID7_Report.pdf</u> This report presents background information and hypotheses regarding the role of community surveillance in the management of biological invasions.

Rural Industries Research and Development Corporation. 2012. National Weeds Research: A Summary of Research Outcomes from the National Weeds and Productivity Research Program 2011-2012. Canberra: RIRDC.

https://rirdc.infoservices.com.au/downloads/12-079

This report provides a summary of key research projects, results and outcomes from the National Weeds and Productivity Research Program 2011-2012.

Campbell, A. 2011. *Towards a more Durable Institutional Base for Invasive Animals R & D*. Canberra: Invasive Animals CRC.

http://www.feral.org.au/durable-institutional-base-for-invasive-animals-rd/

This report discusses the challenges and opportunities around the institutional arrangements for invasive species research and management.

Carrion, V., Donlan, J., Campbell, Karl., Lavoie, C. and Cruz, F. 2011. Archipelago-Wide Island Restoration in the Galápagos Islands: Reducing Costs of Invasive Mammal Eradication Programs and Reinvasion Risk. PLoS One. 6.5

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0018835

This article discusses Project Isabela, the world's largest island restoration effort to date to eradicate goats and highlights the key institutional issues to effective invasive species control.

Chudleigh, P., Simpson, S. and Lai, J. 2011. *Economic Analysis of the National Wild Dog Facilitator project*. Canberra: Invasive Animals CRC. http://www.feral.org.au/economic-analysis-national-wild-dog-facilitator/

The purpose of this economic analysis is to demonstrate the value of the facilitator model to manage wild dogs in the Australian context.



Henderson, W. and Bomford, M. 2011. *Detecting and Preventing New Incursions of Exotic Animals in Australia*. Canberra: Invasive Animals CRC.

http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Com munications/biosecurity/Additional_Documents

This report presents data on incursions and interceptions of exotic vertebrates in Australia that have occurred within the country and at the national border over the past 10 years.

Roberts, A. and Pannell, D. 2009. Piloting a Systematic Framework for Public Investment (SIF3) in Regional Natural Resource Management: Dryland Salinity in Australia. Land Use Policy. 26: 1001-1010

doi:10.1016/j.landusepol.2008.12.004

This study discusses the significance of the use of a decisions framework such as the SIF3 to improve the decision-making process in the context of community-based environmental management organisations.

West, P. 2008. Assessing Invasive Animals of Australia. Canberra: National Land & Water Resources Audit.

http://www.feral.org.au/assessing-invasive-animals-in-australia-2008/

This study reports impact indicators for 10 invasive animal species, compiled from datasets using nationally agreed methods. It also identifies key informational research gaps in invasive species management.

International dimensions

Committee for the Evaluation of the Landscape Conservation Cooperatives et. A. 2016. *A Review of the Landscape Conservation Cooperatives*. Washington: National Academy of Sciences.

In 2014, the United States National Research Council convened a committee to examine the Landscape Conservation Cooperatives (LCC) program. The span of expertise of the resulting review reflects the need to encompass a view as wide ranging as that of a landscape-scale approach to conservation.

Genovesi, P., Carboneras, C., Vilà, M and Walton, P. 2015. EU Adopts Innovative Legislation on Invasive Species: A Step Towards a Global Response to Biological Invasions? Biological Invasions. 17:1307-1311.

http://link.springer.com/article/10.1007%2Fs10530-014-0817-8

This paper explores the new laws in Europe on invasive species that could signal a change in the global response to biological invasion threats.

Ohsawa, T. and Osawa, T. 2014. *Quantifying Effects of Legal and Non-legal Designations of Alien Plant Species on their Control and Profile*. Biological Invasions. 16: 2669-2680. <u>http://link.springer.com/article/10.1007%2Fs10530-014-0695-0#page-1</u> *This article explores the impacts of US legal classifications of IAS on the research process*.

European Environment Agency. 2012. *The Impacts of Invasive Alien Species in Europe*. Geneva: European Environment Agency.

http://www.eea.europa.eu/publications/impacts-of-invasive-alien-species

This report aims to raise awareness among key stakeholders, decision-makers, policymakers and the general public about the environmental and socioeconomic impacts of IAS.


European Environment Agency. 2012. Invasive Alien Species Indicators in Europe: A Review of Streamlining European Biodiversity (SEBI) Indicator 10. Geneva: European Environment Agency.

http://www.eea.europa.eu/publications/streamlining-european-biodiversity-indicators-sebi This reports looks at the legal definition of terms in the invasive animal space, and amendments to methodologies that might move the EU closer to their biodiversity policy goals and developments.

European Commission, (DG ENV). 2011. A Comparative Assessment of Existing Policies on Invasive Species in the EU Member State.

http://ec.europa.eu/environment/nature/invasivealien/docs/BIO_IASPolicies2011.pdf This Commission funded study provides an overview of policies on invasive alien species in the 27 EU Member States, as well as in four OECD countries - Australia, Canada, New Zealand and the United States.

Department of Environment and Heritage. 2000. Australian Thematic Report on Alien Species, Case Study and Comments on Principles (Report to Convention on Biological Diversity). Canberra: Environment Australia.

https://www.cbd.int/doc/world/au/au-nr-ais-en.pdf

This submission outlines Australia's response to a decision of the Conference of the Parties to the Convention on Biological Diversity regarding alien species that threaten ecosystems, habitats or native species.

Biophysical and economic dimensions

Llewellyn, R., Ronning, D., Clarke, M., Mayfield, A., Walker, S. and Ouzman, J. 2016. *Impact of Weeds on Australian Grain Production - The Cost of weeds to Australian Grain Growers and the Adoption of Weed Management and Tillage Practices*. Canberra: GRDC. <u>https://grdc.com.au/Resources/Publications/2016/03/Impact-of-weeds-on-Australian-grain-production</u>

Comprehensive industry study into the cost of weeds, including yield loss and the costs of weed management practices.

CSIRO. 2015. Priority Threat Management of Invasive Animals to Protect Biodiversity in Lake Eyre Basin. Canberra: CSIRO.

https://publications.csiro.au/rpr/download?pid=csiro:EP154809&dsid=DS9

This report sets out a set of strategies for managing the negative impacts of invasive animals on the threatened flora and fauna of Australia's iconic Lake Eyre Basin, one of largest internally draining river systems in the world, comprising one-sixth of the Australian continent.

Davidson, A., Hewitt, D., Hewitt, C. and Kashian, D. 2015. Understanding Acceptable Level of Risk: Incorporating the Economic Cost of Under-Managing Invasive Species. PLoS One. 10: 1-12.

http://search.proquest.com/docview/1730269961/fulltextPDF?accountid=17227

This article explores the resources required to monitor biosecurity risks. The authors conclude that available biosecurity resources may be insufficient to attain stated and desired risk reduction, and that there is a need to consider the feasibility of risk reduction goals when making invasive species policy and management directives.



Hafi, A., Addai, D., Zhang, K. and Gray, E. 2015. *The Value of Australia's Biosecurity System at the Farm Gate: An Analysis of Avoided Trade and On-farm Impacts*. Canberra: Commonwealth.

http://data.daff.gov.au/data/warehouse/9aab/2015/fgvbsd9aab/FarmGateValueBiosecServic es_v1.0.0.pdf

The report considers the effect on annual farm enterprise profits (or gross margins, defined as gross revenue from an activity less the variable costs incurred) of an outbreak of six potentially significant threats to Australian agriculture: foot-and-mouth-disease (FMD), Mexican feather grass, citrus greening, highly pathogenic avian influenza (HPAI), Karnal bunt and red imported fire ants (RIFA).

Spring, D. and Kompas, T. 2015. *Managing Risk and Increasing the Robustness of Invasive Species Eradication Programs*. Asia and the Pacific Policy Studies. 2: 485-493. http://apo.org.au/files/Resource/app5105.pdf

This article argues that focusing on known and quantifiable risks can increase the vulnerability of eradication programs to known but non-quantified risks.

Gordon, C.K. 2014. The Economic Cost of Weeds in NSW: Research Report. Sydney: Grain Growers Ltd.

http://www.nrc.nsw.gov.au/weed-management

This study looks at the total cost of weeds estimated for agricultural lands in NSW, and expenditure by public agencies on public non-agricultural lands.

Gregory, S., Henderson, W., Smee, E. and Cassey, P. 2014. *Eradications of Vertebrate Pests in Australia: A Review and Guidelines for Future Best Practice*. Canberra: Invasive Animals CRC.

http://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/biosecurity/Additional_Documents

This report examines best practices in eradicating vertebrate pest through examination of qualitative and quantities data collected from attempts to eradicate vertebrate pests on offshore islands. The authors aim to 'equip policy and decision-makers' with the information needed to prioritise areas where eradication is likely to have the highest chance of succeeding.

Wicks, S., Mazur, K., Please, P., Ecker S. and Buetre B. 2014. *An Integrated Assessment of the Impact of Wild Dogs in Australia*. Canberra: Commonwealth.

http://data.daff.gov.au/data/warehouse/9aai/2014/AssessWildDogs/AssessWildDogs2014042 8v.1.1.0.pdf

This paper evaluates the economic, environmental and social impacts of wild dogs in Australia and assesses the costs and benefits of investing in wild dog management to prioritise future investments. It uses a cost-benefit analysis framework applied to three case study regions.

Buetre, B., Wicks, S., Kruger, H., Millist, N., Yainshet, A., Garner, G., Duncan, A., Abdalla, A., Trestrail, C., Hatt, M., Thompson, L. and Symes, M. 2013. *Potential Socio Economic Impacts of an Outbreak of Foot and Mouth Disease in Australia*. Canberra: ABARES. http://webcache.googleusercontent.com/search?q=cache:tQilKFxUKXYJ:data.daff.gov.au/data/warehouse/research_reports/9aab/2013/RR13.11PotSocEcoImpctOfFMD/RR13.11PotSocEcoImpctOfFMD_v1.0.0.docx+&cd=2&hl=en&ct=clnk&gl=au&client=firefox-a An outbreak of Foot and Mouth Disease in Australia is expected to generate large adverse

An outbreak of Foot and Mouth Disease in Australia is expected to generate large adverse economic impacts to producers and other industries, also having social impacts.



Cox, T, Strive T., Mutze, G., West, P. and Saunders, G. 2013. *Benefits of Rabbit Biocontrol in Australia*. Canberra: Invasive Animals CRC. http://www.feral.org.au/wp-content/uploads/2014/03/RabbitBiocontrol.pdf

Ninti One Limited. (2013). Managing the Impacts of Feral Camels Across Remote Australia: Final Report of the Australian Feral Camel Management Project. Alice Springs: Ninti One Ltd. http://www.nintione.com.au/resource/ManagingImpactsFeralCamels_OverviewAFCMP.pdf This report discusses the Australian Feral Camel Management Project (AFCMP) a partnership of 20 organisations, contracted in 2010 to reduce the density of feral camels at 18 sites in remote Australia.

Roberts, P. D., Diaz-Soltero, H., Hemming, D. J., Parr, M. J., Wakefield, N. H. and Wright, H. J. 2013. What is the Evidence that Invasive Species are a Significant Contributor to the Decline or Loss of Threatened Species? A Systematic Review Map. Environmental Evidence. 2(1): 5.

http://www.environmentalevidencejournal.org/content/2/1/5

This journal article provides a systematic review map of the evidence that demonstrate the importance of invasive species on US threatened species.

Van Ham, C., Genovesi, P. and Scalera, R. 2013. *Invasive Alien Species: the Urban Dimension* (*Case Studies on Strengthening Local Action in Europe*). Brussels: IUCN. <u>http://webcache.googleusercontent.com/search?q=cache:HiKFgKxVNT0J:www.iucn.org/dbtw</u> <u>-wpd/edocs/2013-027.pdf+&cd=1&hl=en&ct=clnk&gl=au&client=firefox-a</u> *This publication discusses case studies from more than 15 European countries around urban initiatives to address the invasive alien species challenge*.

Lowry, E., Rollinson, E. J., Laybourn, A. J., Scott, T., Aiello-Lammens, M., Gray, S., Mickley, J. and Gurevitch, J. 2012. *Biological Invasions: A Field Synopsis, Systematic Review, and Database of the Literature*. Ecology and Evolution: 3(1): 182-96. The authors describe and categorise aspects of the literature on biological invasions, to understand what is known, highlighting well-studied areas and important gaps.

Please, P., Ecker, S. and Maybery, D. 2011. Assessing the Social Impacts of Wild Dog Management. In G. Saunders and C. Lane (eds), Security from the Impact of Vertebrate Pest Animals. Sydney: Invasive Animals CRC.

http://www.feral.org.au/proceedings-of-the-15th-australasian-vertebrate-pest-conference/ This paper details the framework, progress and results of a social impact assessment of wild dog management as part of a larger study of the benefits of investing in wild dog management.

2010

De Milliano, J., Woolnough, A., Reeves, A. and Shepherd, D. 2010. *Ecologically Significant Invasive Species: A Monitoring Framework for Natural Resource Management Groups in Western Australia*. South Perth: WA Government.

http://archive.agric.wa.gov.au/objtwr/imported_assets/content/pw/vp/rcm_esis_monitorin g_framework.pdf

This report discusses the invasive species monitoring framework for Western Australia with the rationales underpinning the design.



Lightfoot, C. 2010. Social Benefit Cost Analysis: Wild Dog Management in Victoria. Melbourne: Department of Primary Industries Victoria. <u>http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-animals/wild-dogs/wild-dog-management-social-cost-benefit-report</u> The purpose of this study is to document the benefits and costs of wild dog management in Victoria.

Cororaton, C. B., Orden, D. and Peterson, E. 2009. *A Review of Literature on the Economics of Invasive Species*. GII Working Paper No. 2009-1. http://www.researchgate.net/publication/228438724_A_Review_of_Literature_on_the_Economics of Invasive Species/file/3deec514b9e9404bc0.pdf

This paper reviews methodological developments over the past decades that enhance integration of pest risks with economic considerations.

Fitzgerald, G. and Wilkinson, R. 2009. Assessing the Social Impact of Invasive Animals in Australia. Canberra: Invasive Animals CRC.

<u>http://www.feral.org.au/assessing-the-social-impact-of-invasive-animals-in-australia/</u> This report summarises social research done for the Invasive Animals Cooperative Research Centre research project: "Measuring the social, environmental and economic impacts of vertebrate pests".

Gong, W., Sinden, J., Braysher, M. and Jones, R. 2009. *The Economic Impacts of Vertebrate Pests in Australia*. Canberra: Invasive Animals Cooperative Research Centre. <u>http://www.feral.org.au/the-economic-impacts-of-vertebrate-pests-in-australia/</u> *The economic impacts of invasive animals on agriculture in Australia, and the expenditures by governments and landholders on pest management, administration and research, are estimated.*

Hewitt, L. 2009. *Major Economic Costs Associated with Wild Dogs in the Queensland Grazing Industry*. Brisbane: Blueprint for the Bush and Agforce. http://www.agforceqld.org.au/file.php?id=262&open=yes

This study reports the major economic costs associated with wild dogs, calculated by combining survey information from producers, saleyards, processors, and State and Local governments.

Hellmann, J. J., Byers, J. E., Bierwagen, B. G. and Dukes, J. S. 2008. *Five Potential Consequences of Climate Change for Invasive Species*. Conservation Biology. 22(3): 534-43. <u>http://www.researchgate.net/publication/5279379_Five_potential_consequences_of_climate_change_for_invasive_species/file/9fcfd505757852721b.pdf</u>

The authors use the "invasion pathway" to identify five nonexclusive consequences of climate change for invasive species

Sindel, B., Meulen, A. Van Der, Coleman, M. and Reeve, I. 2008. *Pathway Risk Analysis for Weed Spread within Australia: Final report to Land and Water Australia*. Armidale: University of New England. http://www.une.edu.au/research/research-centres-and-institutes/irf/institute-

<u>http://www.une.edu.au/research/research-centres-and-institutes/irf/institute-publications/reports/?a=23936</u>

This report considers how weeds spread within Australia. It assesses the relative threats or risks of different sources and pathways of spread.



West, P. 2008. Assessing Invasive Animals of Australia. National Land & Water Resources Audit. Canberra: Invasive Animals CRC.

http://www.feral.org.au/assessing-invasive-animals-in-australia-2008/

Indicators of the impact of 10 invasive animal species, compiled from datasets using nationally agreed methods. It also identifies key informational research gaps in invasive species management

West, P. 2008. Significant Invasive Species (Vertebrate Pests): Status of Information for Reporting Against Indicators under the National Natural Resource Management Monitoring and Evaluation Framework. Canberra: Land and Water Australia.

http://lwa.gov.au/files/products/national-land-and-water-resourcesaudit/pn20700/pn20700.pdf

Reports on information relating to the indicators "distribution and abundance of significant invasive vertebrate pests" and "impacts of significant invasive vertebrate pests".

National Invasive Species Council. 2007. *Training and Implementation Guide for Pathway Definition, Risk Analysis and Risk Prioritization*. National Invasive Species Council: United States.

http://digitalcommons.unl.edu/natlinvasive/27/

This report discusses the significance of risk pathway analysis for invasive species management.

Norris, A., Henderson, W., McMahon, S. and Murphy, E. 2006. *Costing the Impacts of Invasive Animals*. Canberra: Invasive Animals CRC.

<u>http://www.feral.org.au/costing-the-impacts-of-invasive-animals/</u> This paper highlights the gaps in knowledge on how assessments can be improved and potential techniques and indicators for assessing and reporting impacts.

Number, P., Title, P., Leader, P. and Date, E. M. 2006. *International Issues and Implications of Using Genetically Modified Organisms for Biocontrol of Vertebrate Pests*. Canberra: Invasive Animals CRC.

http://www.feral.org.au/international-issues-and-implications-of-using-genetically-modifiedorganisms-for-biocontrol-of-vertebrate-pests/

This report provides an overview of current research, regulations and issues concerning genetically modified organisms (GMOs) for use as biological controls of vertebrates.

Page, A. R., Lacey, K. L., & Group, A. E. C. 2006. *Economic Impact Assessment of Australian Weed Biological Control*. Adelaide: CRC for Australian Weed Management. <u>http://www.swnrm.org.au/ihub/economic-impact-assessment-australian-weed-biological-control</u>

This report examines the return on investment of the Australian weed biological control (biocontrol) effort.

McLeod, R. 2004. Counting the Cost: Impact of Invasive animals in Australia 2004. Canberra: Invasive Animals CRC.

http://www.feral.org.au/counting-the-cost-impact-of-invasive-animals-in-australia-2004/

This report estimates the economic, environmental and social impacts of 11 introduced pest animal species.



Rural Management Partners. 2004. Economic Assessment of the Impact of Dingoes/Wild Dogs in Queensland. Brisbane: Department of Natural Resources and Mines QLD. <u>http://www.feral.org.au/economic-assessment-of-the-impact-of-dingoeswild-dogs-inqueensland/</u>

This reports estimates the cost of dingoes and wild dogs to Queensland's rural industries, particularly the grazing industry, focused on rural fringes/semi- urban communities and the merits of control methods.

Sinden, J. A., Jones, R., Hester, S., Odom, D., Kalisch, C., James, R. and Cacho, O. 2004. *The Economic Impact of Weeds in Australia*. Adelaide: CRC for Australian Weed Management. http://www.researchgate.net/publication/236935376_The_economic_impact_of_weeds_in_A ustralia/file/3deec52dc8d1566048.pdf

This report attempts to estimate the economic costs of weeds across Australia.

Eldridge, S. R., Shakeshaft, B. J., and Nano, T. J. 2002. *The Impact of Wild Dog Control on Cattle, Native and Introduced Herbivores and Introduced Predators in Central Australia*. Canberra: Invasive Animals CRC.

http://www.feral.org.au/the-impact-of-wild-dog-control-on-cattle-native-and-introducedherbivores-and-introduced-predators-in-central-australia/

This study discusses the impacts of wild dog control on livestock losses and damage and the abundance of rabbits.

NGO and industry dimensions

Ecker, S., Aslin, H., Zobel-Zubrzycka, H. and Binks, B. 2015. *Participatory Wild Dog Management: Views and Practices of Australian Wild Dog Management Groups*. Canberra: ABARES.

https://www.wool.com/globalassets/start/on-farm-research-and-development/sheep-healthwelfare-and-productivity/pest-animals/wild-dogs-foxes-and-pigs/abaresparticipatory_wild_dog_management_report.pdf

This report reviews the structures and processes of wild dog management groups.

Wool Producers Australia. 2014. *National Wild Dog Action Plan*: Adelaide: Wool Producers Australia.

http://www.pestsmart.org.au/national-wild-dog-action-plan/

This plan details the national action plan developed by industry stakeholders to combat the economic, social and environmental impacts caused by wild dogs across rural Australia.

The Invasive Species Council. 2013. *How Do Our Political Parties Stack up on Invasive Species*. Canberra: Invasive Species Council.

<u>http://invasives.org.au/law-policy/how-do-our-political-parties-stack-up-on-invasive-species/</u> This survey highlights the limited engagement of Australian political parties on invasive species issues.

Department of Sustainability, Environment, Water, Population and Communities. 2012. *Model Codes of Practice and Standard Operating Procedures for the Humane Control of Invasive Animals*. Canberra: IA Cooperative Research Centre. http://www.pestsmart.org.au/animal-welfare/humane-codes/



A model Code of Practice (COP) for each of the key pest animal species provides general information on best practice management, control strategies, species biology and impact, and the humaneness of current control methods.

Eason, C., Fagerstone, K., Eisemann, J., Humphrys, S., O'Hare, J. and Lapidge, S. 2010. *A Review of Existing and Potential New World and Australasian Vertebrate Pesticides with a Rationale for Linking Use Patterns to Registration Requirements*. International Journal of Pest Management. 56(2): 109-125.

http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1897&context=icwdm_usdanwrc This article explains an approach to facilitate the development and delivery of increasingly humane, species-targeted, low residue pesticides in the New World.



6.4 Resource D: Australian Laws, Regulations, Policies and Programs

The Australian legal and institutional framework for invasive animal management is characterised by complex and overlapping laws, regulations, policies, private arrangements and non-binding instruments (e.g. codes of practice and management plans). This resource examines the Australian regulatory framework for terrestrial vertebrate pests.

There is a section on each jurisdiction. The first part of each section tables key departments and instruments relevant to the management of terrestrial invasive animals. The second part outlines pending changes to those arrangements, and key agreements, policies, strategies and plans relevant to current arrangements.

There are many instruments forming part of the Australian legal and regulatory framework for invasive animals. It would be unwieldy to list all relevant instruments, so some decisions were necessary regarding which instruments to list. The authors drew on advice from a small group of expert stakeholders (mainly within State and Federal agencies), and a desktop study of government documentation.

Any errors or misinterpretations are the sole responsibility of the authors of this report.

Please note: The contact details provided in this report are those provided by the relevant government.



Commonwealth

Commonwealth laws and regulations

Department	Relevant Mandate	Legislation	Area Regulated
Department of the Environment	Nature conservation	Environment Protection and Biodiversity Conservation Act 1999 Environment Protection and Biodiversity Regulations 2000	Live specimen imports Threats to matters of national environmental significance Threat abatement plans
Department of Agriculture and Water Resources	Primary industries, imports, exports and biosecurity	Animal Health Council (Live- stock Industries) Funding Act 1996 Natural Resources Management (Financial Assistance) Act 1992 Primary Industries Research and Development Act 1989	Funding and research related to pests affecting primary industries
		Agricultural and Veterinary Chemicals Act 1994 Agricultural and Veterinary Chemicals Code Act 1994 Agricultural and Veterinary Chemicals Code Regulations 1995	Use and sale of agricultural and veterinary chemicals
		Export Control Act 1982 Imported Food Control Act 1992 Quarantine Act 1908 Quarantine Regulations 2000 Biological Control Act 1984	Exports, imports and biological control agents Rural industry inspections
Department of Employment	Workplace health and safety	Work Health and Safety Act 2011 Work Health and Safety Regulations 2011	Health and safety in Commonwealth workplaces, including pesticide use

Key agreements, policies, strategies and plans

National biosecurity agreements

National biosecurity plans and agreements provide for cost sharing and emergency control measures in response to disease and pest incursions. Key plans and agreements include:

Intergovernmental Agreement on Biosecurity (IGAB)

Emergency Animal Disease Response Agreement

Emergency Plant Pest Response Deed

National Environmental Biosecurity Response Agreement



Australian Veterinary Emergency Plan

The Intergovernmental Agreement on Biosecurity (IGAB) is the national policy statement. The others are operational agreements. The IGAB aims to strengthen the partnership between Commonwealth, state and territory governments. The roles and responsibilities of Commonwealth agencies are detailed in two partnership agreements:

<u>Memorandum of Understanding: An arrangement for the collaborative working relationship</u> <u>between the Department of Health and the Department of Agriculture</u>

<u>Memorandum of Understanding between the Department of Agriculture and the Australian</u> <u>Customs and Border Protection Service</u>

National strategies relevant to invasive animals

Australia's Biodiversity Strategy 2010-2030

Australian Pest Animal Strategy 2007

Australian Animal Welfare Strategy 2008

Biosecurity Compliance Strategy 2012

National Biosecurity Engagement and Communication Framework 2013

National Surveillance and Diagnostic Framework 2014

National codes of practice for the humane shooting of kangaroos and wallabies 2008

Animal Biosecurity RD & E Strategy 2014

National Wild Dog Action Plan 2014 (Wool Producers Australia)

National Threat Abatement Plans

Threat abatement plans establish a national framework to guide Australia's response to key threatening processes registered under the *Environment Protection and Biodiversity Conservation Act 1999*. There are Threat Abatement Plans in place for the following invasive animals:

 Feral Cats 2015

 Feral Pigs 2005

 Rabbits 2008

 Unmanaged goats 2008

 European red fox 2008

 Tramp ants 2006

 Feral Camel

 There are draft Plans open for public comment. These will replace the existing plans for Rabbits and Feral pigs.



Model codes of practice and standard operating procedures

In 2009, the Australian Government contracted the New South Wales Government to develop <u>model Codes of Practice and Standard Operating Procedures</u> for the humane control of key pest animals. The model Code of Practice for each key pest species provides information on best practice control methods. Standard Operating Procedures discuss animal welfare impacts, control techniques and health and safety issues.

National register of non-native pest outbreaks

<u>Outbreak</u> reports on pests and diseases that are exotic to Australia, and are under national cost-shared eradication programs.

Key funding programs

The Australian Government funds <u>Landcare</u> and <u>56 regional natural resource management</u> (NRM) organisations to support local environments and agriculture, including through the management of invasive animals.

Recent or pending changes

The federal *Biosecurity Bill 2014* received royal assent in June 2015. The *Biosecurity Act 2015* (Cth) will commence in June 2016. The *Biosecurity Act 2015* (Cth) will replace the *Quarantine Act 1908* (Cth). Until commencement, the *Quarantine Act 1908* (Cth) remains the primary piece of biosecurity legislation in Australia.

The Australian Government has released a number of draft Biosecurity Regulations for public comment. These include Regulations on the following:

Biosecurity Import Risk Analyses (BIRA)

Inspector-General of Biosecurity

Enforcement (Infringement notices)

First Points of Entry

These Regulations will replace existing Quarantine Regulations upon commencement.

In June 2015, the <u>National Biosecurity Committee</u> released a discussion paper: <u>Modernising</u> <u>Australia's approach to managing established pests and diseases of national significance</u>. Key features of the proposed approach include:

- A move away from reliance on enforcement as a means to manage pests;
- Emphasis on assisting industry and community to manage the effects themselves;
- Collaboration between governments and stakeholders affected by established pests; and
- Government participation when sustained action is led by industry or community.

The National Biosecurity Committee is in the process of finalising the new national framework for managing established pests and diseases of national significance.



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Australasian Legal Information Institute. http://www.austlii.edu.au/

Department of Agriculture. 2015. *Animals, Plants and Pests*. <u>http://www.agriculture.gov.au/animals-plants-pests</u>

Department of the Environment. 2015. *Invasive Species*. <u>https://www.environment.gov.au/biodiversity/invasive-species</u>

Department of the Environment. 2015. *Model Codes of Practice and Standard Operating Procedures for the Humane Capture, Handling or Destruction of Feral Animals in Australia*. <u>https://www.environment.gov.au/biodiversity/invasive-species/publications/model-codes-practice-feral-animals</u>

Contacts

Community Information Unit Department of the Environment GPO Box 787 Canberra ACT 2601 Phone: 1800 803 772 FREE Email: <u>ciu@environment.gov.au</u>



Australian Capital Territory

Australian Capital Territory laws and regulations

Department	Relevant Mandate	Legislation	Area Regulated
Territory and Municipal Services	Invasive species, urban wildlife and animal	Pest Plants and Animals Act 2005	Pests and pest declarations
<u>Directorate</u>	health	Pest Plants and Animals Declaration 2005 (No 1)	
		Animal Welfare Act 1992 Animal Welfare Regulation 2001	Humane trapping and poisoning of animals Codes of Practice for humane pest control
		Animal Diseases Act 2005 Animal Diseases Regulation 2006	Animal diseases Land manager obligation to notify diseases in pest animals, prevent spread of disease and/or destroy pests
Environment and Planning	Nature conservation	Nature Conservation Act 2014	Impacts of pests on nature
<u>Directorate</u>		Nature Conservation Regulations 2015	
		Environment Protection Act 1997	
		Environment Protection Regulation 2005	
Commissioner for Sustainability and the Environment	Environmental investigations and State of Environment reports	Commissioner for the Environment Act 1993	Identification of new pests Recommendations on management approaches
Justice and Community Safety	Administration of justice	Prohibited Weapons Act 1996	Use of firearms
<u>Directorate</u>		Prohibited Weapons Regulation 1997	
		Firearms Act 1996	
	Workplace health and safety	Work Health and Safety Act 2011	Workplace health and safety, including pesticide
		Work Health and Safety Regulations 2011	use



Key policies, strategies and frameworks

Pest Animal Management Strategy 2012-2022 Nature Conservation Strategy 2013-2023 Nature Conservation Strategy Implementation Plan 2013-2018 Bush Capital Legacy: Plan for Managing the Natural Resources of the ACT 2009 Best Practice Management Guide for Rabbits in the ACT 2015

Recent or pending changes

Between November 2015 and January 2016, the ACT Government invited public comment on the list of pest animals in the *Pest Plants and Animals Declaration 2005 (No 1)*. New declarations include deer species established in the ACT, cats not owned by people and the European Red Fox.

References

Australasian Legal Information Institute. <u>http://www.austlii.edu.au/</u>

ACT Government. 2016. Proposed changes to the Pest Animals Declaration. http://www.timetotalk.act.gov.au/consultations/?engagement=proposed-changes-to-thepest-animals-declaration

Environment and Planning Directorate. 2012. *Pest Animal Management Strategy 2012-2022*. <u>http://www.environment.act.gov.au/__data/assets/pdf_file/0008/575117/PAMS_WEB.pdf</u>

Invasive Animals CRC. 2015. *Legislation and Management of Pest Animals*. <u>http://www.pestsmart.org.au/legislation-management-of-pest-animals/</u>

Contacts

None nominated.



New South Wales

New South Wales laws and regulations

Department	Relevant Mandate	Legislation	Area Regulated
Department of Primary Industries (Biosecurity NSW)Primary Hi Hi	Primary industries Hunting Animal welfare	Animal Diseases and Animal Pests (Emergency Outbreaks) Act 1991 Animal Diseases and Animal Pests (Emergency Outbreaks) Regulation 2012	Animal disease outbreaks
		Game and Feral Animal Control Act 2002 Game and Feral Animal Control Regulation 2012	Hunting of game animals and some pest species on public land
		Wild Dog Destruction Act 1921 Wild Dog Destruction Regulation 2009	Wild dogs in Western NSW
			Wild Dog Destruction Board
			Dog fence in Western NSW
		Prevention of Cruelty to Animals Act 1979	Humane trapping, handling and
		Prevention of Cruelty to Animals Regulation 2012	destruction of animals
		Deer Act 2006	Captive deer
		Deer Regulation 2008	
		Non-indigenous Animals Act 1987 Non-Indigenous Animals Regulation 2012	Keeping and movement of controlled species
<u>Local Lands</u> <u>Service</u>	Pest management and support	Local Land Services Act 2013 Local Land Services Regulation 2014	Control of pest animals across NSW
	services		Support to landholders to eradicate pests,
			work with neighbours and make pest plans
			Inspection of properties
Office of	Nature	National Parks and Wildlife Act 1974	Pests on public land
<u>Environment</u> and Heritage	conservation	National Parks and Wildlife Regulation 2009	
		Threatened Species Conservation Act 1995	Impacts of pests on nature
		Threatened Species Conservation Regulation 2010	
		Pesticides Act 1999 Pesticides Regulation 2009	Use of pesticides
		resticides Regulation 2009	



Department	Relevant Mandate	Legislation	Area Regulated
NSW police force	Police services	Firearms Act 1996 Firearms Regulation 2006	Use of firearms
Department of Finance, Service and Innovation	Workplace health and safety	Work Health and Safety Act 2011 Work Health and Safety Regulations 2011	Workplace health and safety, including pesticide use

Key policies, strategies and frameworks

NSW Biosecurity Strategy 2013-2021

NSW Invasive Species Plan 2008-2015 (under review)

NSW Animal Biosecurity and Welfare Strategic Plan 2015-2018

Policy on the Management of Wildlife Disease and Pest Incidents 2013

Procedural Statement on the Management of Wildlife Disease and Pest Incidents 2013

Regional Pest Management Strategies

Codes of Practice and Standard Operating Procedures for Key Pest Species

Pest Control Order - Rabbits

Pest Control Order - Wild Rabbits

Pest Control Order - Feral Dromedary Camels

Pest Control Order - Feral Pigs

Pest Control Order - Wild Dogs

Pest Control Order - European Red Fox

Non-indigenous Animals Regulatory Activity Policy (under review)

NSW Government Wild Dog Management Strategy

Local Land Service Wild Dog Policy

Recent or pending changes

The NSW Government is developing new regulations, policies and procedures to align with the *Biosecurity Act 2015* (NSW) on its commencement in 2017. The *Biosecurity Act 2015* (NSW) mirrors the Biosecurity Strategy 2013-2021 principle that "biosecurity is a shared responsibility between governments, industries and individuals, and provides for a range of tools and powers that can be used to support risk based management and allow for increasing efficiency and decreasing regulation."¹ The *Biosecurity Act 2015* (NSW) will consolidate existing legislation (e.g. *Local Land Services Act 2013* (NSW) and *Wild Dog Destruction Act 1921* (NSW)).

¹ See NSW Government. 2015. *Biosecurity Legislative Framework to Protect NSW*. Available at: <u>http://www.dpi.nsw.gov.au/biosecurity/biosecurity-act-2015</u>



The NSW Government Department of Primary Industries has released a range of related discussion papers for public comment, including papers on:

Widespread pest animals

Non-indigenous animals

Wild dogs

The public comment period closed in February 2016. The NSW Biosecurity Advisory Committee intends to oversee the development of new regulations, instruments, policies and procedures.

The Natural Resource Commission recently undertook a <u>review of the NSW Invasive Species</u> <u>Plan 2008-15</u>. In response, the Commission drafted the <u>NSW Invasive Species Plan 2015-22</u>. The public comment period on the draft plan has closed. A final recommendations report scheduled for June 2016. The findings and recommendations contained in the report may affect the proposed management approach set out in the aforementioned Department of Primary Industry discussion papers.

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NSW Government Local Land Service. 2015. *Biosecurity*. http://www.lls.nsw.gov.au/biosecurity

NSW Department of Primary Industries. 2015. *Biosecurity NSW*. http://www.dpi.nsw.gov.au/biosecurity

NSW Office of Environment and Heritage. 2016. *Pests and Weeds*. http://www.environment.nsw.gov.au/pestsweeds/

Invasive Animals CRC. 2015. *Legislation and Management of Pest Animals*. http://www.pestsmart.org.au/legislation-management-of-pest-animals/

Contacts

Jane Frances Manager Invasive Species Strategy and Planning, Port Stephens 0249163904

Nathan Cutter Technical Specialist Vertebrate Pests, Orange 0263913174



Northern Territory

Northern Territory Laws and regulations²

Department	Relevant Mandate	Legislation	Area Regulated
Department of Primary	Primary industries, biosecurity, interstate	Livestock Act 2008 Livestock Regulations	Detection, prevention and control of stock diseases
Fisheries	quarantine	Agricultural and Veterinary Chemicals (Control of Use) Act 2004 Agricultural and Veterinary Chemicals (Control of Use) Regulations Biological Control Act	Sale and use of chemicals and biological organisms to control pests
		Animal Welfare Act 2000 Animal Welfare Regulations	Humane trapping, handling and destruction of pest animals
Parks and Wildlife Commission of the Northern Territory	Wildlife, parks and reserves	Territory Parks and Wildlife Conservation Act 2006 Territory Parks and Wildlife Conservation Regulations	Feral animal management
Police Civil Employment Unit	Police services	Firearms Act Firearms Regulations	Use of firearms
Department of Business	Workplace health and safety	Work Health and Safety (National Uniform Legislation) Act 2011 Work Health and Safety (National Uniform Legislation) Regulations	Workplace health and safety, including pesticide use

Key policies, strategies and frameworks

Northern Territory Department of Primary Industry and Fisheries Industry Development Plan 2013-2017

National Feral Camel Action Plan 2010

National disease surveillance and control programs

Managing the impact of wild dogs program

² In 2008, the Desert Knowledge CRC released a review of legislation relating to feral camel management in Northern Territory. The listed laws are relevant to other invasive animals: see Carey, R. et al. 2008. *Review of Legislation and Regulations Relating to Feral Camel Management*. DKCRC: Alice Springs.



Recent or pending changes

The Northern Territory Government has <u>drafted a new Biosecurity Strategy 2015-2025</u>. The public consultation period has closed and the final version is pending.

References

Australasian Legal Information Institute. http://www.austlii.edu.au/

Department of Primary Industry and Fisheries. 2015. *Biosecurity and Animal Welfare*. <u>http://www.nt.gov.au/d/Primary_Industry/index.cfm?header=Biosecurity%20and%20Animal%2</u> <u>OWelfare</u>

Department of Land Resource Management. 2016. Feral Animals. http://lrm.nt.gov.au/feral

Invasive Animals CRC. 2015. *Legislation and Management of Pest Animals*. <u>http://www.pestsmart.org.au/legislation-management-of-pest-animals/</u>

Contacts

Andrew Tomkins Director, Biosecurity and Product Integrity, Department of Primary Industry and Fisheries andrew.tomkins@nt.gov.au

Ian Curnow Executive Director, Department of Primary Industry and Fisheries Ian.curnow@nt.gov.au

Glenn Edwards Director, Wildlife Use Department of Land Resource Management <u>Glenn.edwards@nt.gov.au</u>



Queensland

Queensland laws and regulations

Department	Relevant Mandate	Legislation	Area Regulated
Department of Agriculture, Fisheries and Forestry	Primary industries Agricultural chemicals	Exotic Diseases in Animals Act 1981 Exotic Diseases in Animals Regulation 1998	Exotic animal diseases
TOTESCIY	Animal welfare Biosecurity	Stock Act 1915 Stock Regulation 1988	Stock disease
		Land Protection (Pest and Stock Route Management) Act 2002 Land Protection (Pest and Stock Route Management) Regulation 2003	Pests, pest declarations and pest plans Dog and rabbit fences
		Animal Care and Protection Act 2001 Animal Care and Protection Regulation 2012	Humane trapping, handling and destruction of animals
Department of Environment and Heritage Protection	Nature conservation	Nature Conservation Act 1992 Nature Conservation (Wildlife) Regulation 2006 Nature Conservation (Wildlife Management) Regulation 2006 Nature Conservation (Macropod) Conservation Plan 2005 Forestry Act 1959	Impacts of pests on nature
Queensland Health	Public health	Health Act 1937 Health Regulation 1996 Health (Drugs and Poisons) Regulation 1996	Use of poisons
		Pest Management Act 2001 Pest Management Regulation 2003	Pest control measures
Queensland Police Service	Police services	Weapons Act 1990 Weapons Categories Regulation 1997 Weapons Regulation 1996	Use of firearms
Department of Infrastructure, Local Government and Planning	Local pests	Local Government Act 2009	Local pests and local pest plans
Department of Justice and Attorney-General	Workplace health and safety	Work Health and Safety Act 2011 Work Health and Safety Regulations 2011	Workplace health and safety, including pesticide use



Key policies, strategies and frameworks

Queensland Pest Animal Strategy 2002-2006 (under review)

Queensland Wild Dog Management Strategy 2011 - 2016

Model Code of Practice for the Welfare of Animals: Feral Livestock Animals

Trapping Policy 2005

Bounties Policy 2007

Property pest management plans

Regional pest management plans

Local Government pest management plans

Pest animal guidelines

Protocol for the Production of 1080 Meat Baits

Guidelines for the use of Sodium Fluoroacetate (1080)

Queensland Feral Deer Management Strategy 2013 - 2018

National Code of Practice (Commercial and Non-commercial) for the Humane Shooting of Kangaroos and Wallabies 2008

<u>Queensland Wildlife Trade Management Plan for Export of Commercially Harvested Macropods</u> 2013-2017

Recent or pending changes

The *Biosecurity Act 2014* (QLD) commences on 1 July 2016. The Queensland Government is in the process of developing new biosecurity regulations and policies. The Biosecurity Act will replace and amalgamate much of the legislation listed above. The new Act contains a "general biosecurity obligation" on "individuals and organisations whose activities pose a biosecurity risk" to "take all reasonable steps to ensure they do not spread a pest, disease or contaminant".³

Property owners and other affected parties are being invited to provide feedback on the <u>Queensland Weed and Pest Animal Strategy (draft) 2016-2020</u>, in preparation for the Biosecurity Act 2014 commencing on 1 July 2016. The consultation period closed on 26 April 2016.

A review of the Nature Conservation (Macropod) Conservation Plan 2005 began in 2014, and the Plan expired in September 2015. The Nature Conservation (Administration) Regulation 2006; Nature Conservation (Wildlife Management) Regulation 2006 and the Nature Conservation (Wildlife) Regulation 2006 are due to expire in September 2016 and are also under review.

³ Queensland Government. 2015. *General Biosecurity Obligation*. Available at: https://www.daf.qld.gov.au/biosecurity/about-biosecurity/Biosecurity-Act-2014/overview-and-foundationprinciples/general-biosecurity-obligation.



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Department of Agriculture, Fisheries and Forestry. 2016. *Have Your Say: Weed and Pest Animal Management in Queensland*. <u>https://www.daf.qld.gov.au/services/news-and-updates/plants/news/have-your-say-weed-and-pest-animal-management-in-queensland</u>

Department of Agriculture, Fisheries and Forestry. 2014. *Weeds, Pest Animals and Ants*. https://www.daf.qld.gov.au/plants/weeds-pest-animals-ants/legislation-policies-permits

Department of Agriculture, Fisheries and Forestry, 2016. *Biosecurity Act 2014*. https://www.daf.qld.gov.au/biosecurity/about-biosecurity/Biosecurity-Act-2014

Invasive Animals CRC. 2015. Legislation and Management of Pest Animals. http://www.pestsmart.org.au/legislation-management-of-pest-animals/

Queensland Government. 2016. *Queensland Weed and Pest Animal Strategy*. <u>https://www.getinvolved.qld.gov.au/gi/consultation/2908/view.html</u>

Contacts

John Robertson Department of Agriculture, Fisheries and Forestry (Biosecurity Queensland) 07 3087 8065 John.Robertson@daff.qld.gov.au



South Australia

South Australian laws and regulations

Department	Relevant Mandate	Legislation	Area Regulated
Department of Primary Industries	Biosecurity Animal health	Livestock Act 1997 Livestock Regulations 2013	Exotic disease in livestock
<u>and Regions</u> <u>SA</u> (Biosecurity <u>SA</u>)	Pest management Food safety Chemical use	Agricultural and Veterinary Products (Control of Use) Act 2002 Agricultural and Veterinary Products (Control of Use) Regulations 2004	Use of chemicals and poisons
Department of Environment, Water and Natural Resources	Regional pest management Biodiversity conservation	Natural Resources Management Act 2004 Natural Resources Management (General) Regulations 2005 Natural Resource Management NRM regulations specific to each NRM region in SA (various)	Pest movements and sale Regional NRM Boards Regional pest management plans
		National Parks and Wildlife Act 1972 National Parks and Wildlife (Wildlife) Regulations 2001 National Parks and Wildlife (Hunting) Regulations 2011 National Parks and Wildlife (Kangaroo Harvesting) Regulations 2003 Regulations for individual parks (various)	Impacts of pests on national parks and wildlife
		Animal Welfare Act 1985 Animal Welfare Regulations 2012	Humane trapping and destruction of animals
Dog Fence Board	Dog fence	Dog Fence Act 1946	Management of dog fence Destruction of dogs
Department of Health	Public health	Controlled Substances Act 1984 Controlled Substances (Poisons) Regulations 2011	Use of poisons
SA Police	Police services	Firearms Act 1977 Firearms Regulations 2008	Use of firearms
Attorney- General's Department	Workplace health and safety	Work Health and Safety Act 2012 Work Health and Safety Regulations 2012	Workplace health ad safety, including pesticide use



Key policies, strategies and frameworks

South Australia Biosecurity Policy 2013-2016 Our Place Our Future: State Natural Resources Management Plan 2012-2017 Regional Natural Resources Management Plans SA Pest Animal Risk Management Guide No Species Loss Nature Conservation Strategy 2007-2017 Deer Policy 2010 Deer Determination Dingo Policy 2011 Goat Policy 2015 Goats Determination Mice Policy 2015

Rabbit Policy 2005

References

Australasian Legal Information Institute. <u>http://www.austlii.edu.au/</u>

Department of Primary Industries and Regions SA. 2015. *Pest Animal Policies and Regulations*. <u>http://pir.sa.gov.au/biosecurity/weeds_and_pest_animals/animal_pests_in_south_australia/pest_animal_policies</u>

Department of Environment, Water and Natural Resources. 2016. *Legislation*. <u>http://www.environment.sa.gov.au/about-us/Legislation</u>

Invasive Animals CRC. 2015. *Legislation and Management of Pest Animals*. <u>http://www.pestsmart.org.au/legislation-management-of-pest-animals/</u>

Contacts

For state policy advice: NRM Biosecurity: Phone: (08) 8303 9620 Email: <u>nrmbiosecurity@sa.gov.au</u>

For regional control advice: Natural Resources: Department for Environment, Water and Natural Resources Web: <u>www.nrm.sa.gov.au</u>

National Pest Alert Hotline: Freecall: 1800 084 881 FREE



Tasmania

Tasmanian laws and regulations

Department	Relevant Mandate	Legislation	Area Regulated
Department of PrimaryBiosecurityIndustries, Parke, WaterAgricultural chemicals	Animal Health Act 1995 Animal Health Regulations 2006	Animal diseases	
and Environment (Biosecurity	Animal welfare Environmental policy Nature conservation	Agricultural and Veterinary Chemicals (Control of Use) Act 1995	Use of agricultural and veterinary chemicals
<u>Tasmania)</u>		Agricultural and Veterinary Chemicals (Control of Use) Regulations 2012	
		Animal Welfare Act 1993	Humane treatment of
		Animal Welfare (general)	pest animals
			Destruction of animals
		Cat Management Act 2009	Cat health and welfare
		Cat Management Regulations 2012	Humane management of feral cats on rural land
		Vermin Control Act 2000	Rabbits and foxes Hunting on Crown Land, State Forest and private land (with landowners permission)
		National Parks and Reserves Management Act 2002	Impacts of pests on national parks and
		National Parks and Reserved Land Regulations 2009	wildlife
		Nature Conservation Act 2002	
Department of Premier and	Local government	Dog Control Act 2000	Wild dogs
<u>Cabinet</u>		Dog Control Regulations 2010	
Health and	Health	Poisons Act 1971	Use of poisons
<u>Human</u> <u>Services</u>		Poison Regulations 2008	
Department of	Police services	Firearms Act 1996	Use of firearms
Police and Emergency Management	Emergency management	Firearms Regulations 2006	
Department of Justice	Workplace health and safety	Work Health and Safety Act 2012 Work Health and Safety	Workplace health and safety, including pesticide use
		Regulations 2012	



Key policies, strategies and frameworks

Tasmanian Biosecurity Strategy 2013-2017 Guideline - Managing Wild Dogs 2013 Threat Abatement Plan: Goats (CTH)(2008) Threat Abatement Plan: Feral Pigs (CTH)(2005)(under review) Feral Pig Management Plan Flinders Island (2002) Threat Abatement Plan: Feral Cats (CTH)(2015)

Recent or pending changes

The Tasmanian biosecurity legislative framework is currently under review. The review will cover legislation administered by the Biosecurity Tasmania, part of the Department of Industries, Parks, Water and Environment. The review aims to identify ways to streamline the current framework and reduce duplication. The Tasmanian Government released a <u>Position</u> <u>Paper</u> on 23 March 2016. The consultation period will close on 29 April 2016. A Cat Management Strategy is also being developed in consultation with key industry, community and research partners to better understand and mitigate these impacts.

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Australasian Legal Information Institute. http://www.austlii.edu.au/

Department of Primary Industries, Parks, Water and Environment. 2016. *Invasive Species*. <u>http://dpipwe.tas.gov.au/invasive-species</u>

Department of Primary Industries, Parks, Water and Environment. 2016. *Biosecurity Tasmania*. <u>http://dpipwe.tas.gov.au/biosecurity</u>

Department of Primary Industries, Parks, Water and Environment, 2016. *Biosecurity Legislation Review: Position Paper for Public Consultation*. <u>http://dpipwe.tas.gov.au/biosecurity/about-biosecurity-tasmania/biosecurity-legislation-review/biosecurity-legislation-review-position-paper</u>

Contacts

Michael Askey Manager, Invasive Species Michael.askey-doran@dpipwe.tas.gov.au

Craig Elliott Director, Biosecurity Operations <u>craig.elliott@dpipwe.tas.gov.au</u>



Victoria

Victorian laws and regulations

Department	Relevant Mandate	Legislation	Area Regulated
Department of EconomicJointly responsible for pest managementJobs, Transport and Resources (Agriculture Victoria)Jointly responsible for pest managementDepartment of Environment, Land, Water and PlanningJointly responsible for pest responsible for primary production, invasive species policy pest management on private land Department of Environment responsible for	Jointly responsible for pest management Agriculture Victoria responsible for primany	Livestock Disease Control Act 1994 Livestock Disease Control Regulations 2006 Livestock Management Act 2010 Livestock Management Regulations 2011	Livestock diseases Compensation for livestock loss Livestock biosecurity and pest management
	Catchment and Land Protection Act 1994 Catchment and Land Protection Regulations 2012	Pests, pest threats and pest declarations Importation, keeping, movement, trade and release of pests Catchment Management Authority obligation to tackle local pests	
	biodiversity and pest management on public land	Flora and Fauna Guarantee Act 1988 Flora and Fauna Guarantee Regulations 2011	Threats to native flora and fauna caused by horses, cats, fox, deer, rabbits and goats
		Wildlife Act 1975 Wildlife (Game) Regulations 2012	Control of wild dogs and dingoes that threaten livestock
			Game hunting
		Game Management Authority Act 2014	Game Management Authority hunting permits and policy advice on humane pest management
		National Parks Act 1975 National Parks Regulations 2013 Parks Victoria Act 1998	Pest animals in national parks
		Agriculture and Veterinary Chemicals (Control of Use) Act 1992	Use of chemicals and poisons
	Agricultural and Veterinary Chemicals (Control of Use) Regulations 2007		
		Drugs, Poisons and Controlled Substances Act 1981	Transportation of baits
		Drugs, Poisons and Controlled Substances (Commonwealth Standard) Regulations 2011	



Department	Relevant Mandate	Legislation	Area Regulated
		Prevention of Cruelty to Animals Act 1986	Use of traps and poisons to kill pests
		Prevention of Cruelty to Animals Regulations 2008	
<u>Victoria</u> <u>Police</u>	Police services	Firearms Act 1996 Firearms Regulations 2008	Use of firearms
Department of Treasury and Finance	Workplace health and safety	Occupational Health and Safety Act 2004	Workplace health and safety, including pesticide use

Key policies, strategies and frameworks

Invasive Plants and Animals Policy Framework

Non-indigenous Bird Management Policy

Order in Council: Declaration of Dingo to be Unprotected Wildlife

Action Plan for Managing Wild Dogs in Victoria 2014-2019

Guidelines for the Import, Movement and Keeping of Exotic Vertebrates in Australia 2014

Recent or pending changes

The Victorian Government is developing a new Biodiversity Strategy alongside a review of the *Flora and Fauna Guarantee Act 1988*. The strategy aims to establish a 20-year vision for biodiversity in Victoria. A stakeholder reference group has been established to gather the views of groups involved in biodiversity management and conservation.

Agriculture Victoria released a <u>discussion paper for stand-alone Invasive Species Management</u> <u>legislation in 2012</u>. The intent is for this legislation to replace the pest animal provisions of the *Catchment and Land Protection Act 1994* (Vic). The new framework is not yet approved.

References

Agriculture Victoria. 2015. New Invasive Species Management Legislation. http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/protecting-victoria-frompest-animals-and-weeds/legislation-policy-and-permits/new-invasive-species-managementlegislation

Department of Environment, Land, Water and Planning. 2016. *Environment and Wildlife*. <u>http://delwp.vic.gov.au/environment-and-wildlife</u>

Victorian Auditor-General. 2010. *Control of Invasive Plants and Animals in Victoria's Parks*. http://www.audit.vic.gov.au/publications/2009-10/20100526-Invasive-Plants-Full-Report.pdf

Contacts

Customer Service Centre: 136 186



Western Australia

Western Australian laws and associated regulations

Department	Relevant Mandate	Legislation	Area Regulated
Department of Agriculture and Food	Biosecurity and quarantine Pests and diseases Primary production	Exotic Diseases of Animals Act 1993 Exotic Diseases of Animals Regulations 2011	Exotic diseases
(DAFWA)		Animal Welfare Act 2002 Animal Welfare (General) Regulations 2003	Humane killing of animals Penalties for use of poisons Prescription of pests and inhumane devices
		Biosecurity and Agriculture Management Act 2007 Biosecurity and Agriculture Management regulations (various) ⁴	Pests and diseases Pest declarations Biosecurity Council Regional Biosecurity Groups Western Australian Organism List Industry funding schemes Imports and exports Quarantine Use of agricultural and veterinary chemicals
		Agricultural and Veterinary Chemicals (Western Australia) Act 1995	Pesticide manufacture, registration, labelling and supply
Department of Parks and Wildlife	Management of parks and reserves Wildlife management	Conservation and Land Management Act 1984 Wildlife Conservation Act 1950 Wildlife Conservation Regulations 1970	Impacts of pests on wildlife, parks and reserves
Department of Health	Public health	Poisons Act 1964 Poisons Regulations 1965	Use of poisons
		Health Act 1911	Pesticides Advisory Committee
		Health (Pesticides) Regulations 2011	Use of pesticides

⁴ See Australasian Legal Information Institute. 2016. *Western Australian Current Regulations*. Available at: <u>http://www.austlii.edu.au/au/legis/wa/consol_reg/toc-B.html.</u>



Department	Relevant Mandate	Legislation	Area Regulated
Department of Commerce	Workplace health and safety	Occupational Safety and Health Act 1984 OSH Regulations 1996	Workplace health and safety, including pesticide use
Police Service	Police	Firearms Act 1973 Firearms Regulations 1974	Use of firearms

Key policies, strategies and frameworks

Invasive Species Plan 2015-2019

Boosting Biosecurity Defences project (funded by Royalties for Regions)

Good Neighbour Policy

State Natural Resource Management Program

<u>A 100-year Biodiversity Conservation Strategy for Western Australia: Phase One: Blueprint to</u> the Bicentenary in 2029 (Draft)

Pest and Disease Information Service (PaDIS)

Western Australian Organism List (WAOL)

Industry Funding Schemes

Bait and Poison Directory for Vertebrate Pests in Western Australia

Code of Practice for the Safe Use and Management of 1080 in Western Australia

Code of Practice on the Safe Use and Management of Strychnine

State Barrier Fence

Recent or pending changes

A <u>draft Biosecurity Strategy 2016-2025</u> was released for public comment in December 2014. The revised Strategy is currently with the Biosecurity Council and the Biosecurity Senior Officers Group for endorsement. The Strategy covers animal and plant pests and diseases, including animal diseases.

The Department of Food and Agriculture is preparing a <u>Post-Border Surveillance and Detection</u> <u>Plan for Invasive Species in Western Australia</u>. Stakeholders will be contacted to have input onto the plan.

The Biodiversity Conservation Bill 2015 (Western Australia) was read in Parliament for a second time on 25 November 2015. If passed, it will replace the *Wildlife Conservation Act 1950* (WA), and amend the *Animal Welfare Act 2002* (WA), *Biosecurity and Agricultural Management Act 2007* (WA), *Conservation and Land Management Act 1986* (WA) and *Firearms Act 1973* (WA).⁵

⁵ See Parliament WA. 2016. *Biodiversity Conservation Bill* 2015. Available at: http://www.parliament.wa.gov.au/parliament/bills.nsf/BillProgressPopup?openForm&ParentUNID=05B04B49751B582 448257F07002E7566; Parliament WA. 2015. *Biosecurity Conservation Bill* 2015: *Explanatory Memorandum*. Available



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Department of Agriculture and Food. 2015. *Development of the State Biosecurity Strategy*. <u>https://www.agric.wa.gov.au/development-state-biosecurity-strategy</u>

Invasive Animals CRC. 2015. *Legislation and Management of Pest Animals*. <u>http://www.pestsmart.org.au/legislation-management-of-pest-animals/</u>

Contacts

Viv Read Director Invasive Species Department of Agriculture and Food Western Australia 08 9368 3561 0467 730 066 <u>Viv.read@agric.wa.gov.au</u>

Pest and Disease Information Service (PaDIS) Department of Agriculture and Food 1800 084 881 info@agric.wa.gov.au

at: http://www.parliament.wa.gov.au/Parliament/Bills.nsf/05B04B49751B582448257F07002E7566/\$File/EM%2B166-1.pdf.



6.5 Resource E: Stakeholders

This resource provides a summary of the 'political' platforms and endorsed policies of different organisations relevant to invasive species management. For policies and strategies adopted by Commonwealth, state, territory and local public authorities, we advise you to refer directly to Resource D: Australian Laws, Regulations, Policies and Programs.

The identification of invasive animal stakeholders in this resource builds on Appendix C of the <u>National Wild Dog Action Plan</u>. The Invasive Species Council is also creating a database of groups working on invasive species issues that will further inform stakeholder identification work. Given the complexity of the institutional environment surrounding invasive species management, it is highly likely that there are stakeholders that we have not been able to identify and that should have been mentioned in this resource. We encourage people to advise us as to what group(s) should be added in this resource. We also apologise to those groups who have not been mentioned in the present version of this resource.

Body	Description	Related bodies	Policies and plans
<u>Australian Pesticides</u> <u>and Veterinary</u> <u>Medicines Authority</u>	Federal body responsible for the national registration system for agricultural and veterinary chemical products.	Australian Pesticides and Veterinary Medicines Advisory Board	<u>Compliance and</u> Enforcement Policy
Agriculture Ministers' Forum and Agriculture Senior Officials Committee	Federal government bodies focused on biosecurity collaborations with New Zealand.	Advised by the <u>National</u> <u>Biosecurity Committee</u> (NBC)	None identified
National Biosecurity Committee (NBC)	Intergovernmental Committee that provides advice on biosecurity matters of national significance.	Biosecurity Roundtable Invasive Plants and Animals Committee Plant Health Committee Marine Pest Sectoral Committee National Biosecurity Emergency Preparedness Expert Group National Biosecurity Information Governance Expert Group	<u>NBC Objectives</u> <u>Modernising Australia's</u> <u>approach to managing</u> <u>established pests and</u> <u>diseases of national</u> <u>significance</u> (Discussion Paper 2015)
Interim Inspector- General of Biosecurity (IIGB)	Provides advice on biosecurity systems to the federal Minister for Agriculture.	None identified	Charter for the role of Interim Inspector- General of Biosecurity

Commonwealth statutory authorities and committees



Other government representative bodies

Description **Related bodies** Body Policies and plans Indigenous Land Commonwealth National Indigenous National Indigenous Land Strategy 2013-17 Corporation company established in **Pastoral Enterprises** 1995 to assist Pty Ltd Submission to the NBC Indigenous people to Discussion Paper on acquire and manage managing established land. pests and diseases Australian Local Represents over 565 Local Governments Western Australian Government councils on local Local Government issues, including Association Biosecurity Association Discussion Paper invasive species issues. Local Government NSW Submission to the NRC Review of Weed Management Game and Pest Represents interests of None identified Submission to the hunters and advises the Natural Resources Management Advisory Board (NSW) Minister for Primary Commission: State-Industries on pest wide Review of NSW management. Pest Animal Management 2015 NRM Regions Australia National representative **Regional Natural** See Landcare for link of Australia's 56 **Resource Management** to each NRM plan regional NRM boards Submission to the NBC organisations. Discussion Paper on managing established pests and diseases Animal Health Australia Not-for-profit company Farm Biosecurity AHA Strategicthat facilitates Plan_2015-2020 partnerships between Submission to the NBC governments, livestock Discussion Paper on industries and other managing established stakeholders to protect pests and diseases animal health. **Emergency Animal** Disease Response Plan **Biosecurity Program** Disease Surveillance Farm Biosecurity PHA Strategic Plan Plant Health Australia Not-for-profit national coordinator of the 2011-2016

For an overview of state and territory government policies, please see Resource D.

government-industry

partnership for plant

biosecurity in

Australia.

Plant Health Strategies

Disease Response Plan

National programs

Emergency Plant



Research and development organisations

Body	Role	Policies and programs
Invasive Animals Cooperative Research Centre	Government-funded research centre focused on testing and developing control measures and developing capacity-building mechanisms for community engagement in invasive species management in Australia.	Strategic Plan 2012-2017 PestSmart Connect Wild Dog Facilitator Natural Resource Management Facilitator Incursions Response Facilitator Rabbit Facilitator
Rural Industries Research Development Corporation	Statutory authority responsible for working with industry and carrying out research to benefit the rural sector.	<u>Corporate Plan 2012-2017</u>
<u>Australian Wool</u> <u>Innovation</u>	Not-for-profit company owned by wool levy payers that invests in research and development (R&D), marketing and promotion to support the Australian wool industry.	Strategic Plan 2013 to 2016
Meat and Livestock Australia	Not-for-profit organisation owned by cattle, sheep and goat producers that co-funds industry R&D with the Government.	MLA Corporate Plan 2010-2015
Australian Centre for Agriculture and Law	University-based research centre focused on reforms to improve the sustainable use of natural resources and quality of rural life.	Martin, P. and Le Gal E. 2013. Submission to the Natural Resource Commission on the Issues Paper for the Review of Weed Management in New South Wales. Australian Centre for Agriculture and Law: Armidale. Martin, P. and Le Gal E. 2014. Submission to Senate enquiry on Environmental Biosecurity Institutional Issues: The Adequacy of Arrangements to Prevent the Entry and Establishment of Invasive Species to Harm Australia's Natural Environment. Australian Centre for Agriculture and Law: Armidale.



Body	Policy statements and submissions
National Farmers Federation	Blue Print for Australian Agriculture 2013-2020 Policies and Issues Statements Submission to Government Inquiries
Australian Pork Limited	Submission to the NBC Discussion Paper 2015 on Managing Established Pests and Diseases
Cattle Council of Australia	Beef Industry Strategic Plan 2020
Goat Industry Council of Australia	Projects and Policies
Sheep-meat Council of Australia	<u>Sheep-meat Industry Strategic Plan</u> <u>Submission to the NBC Discussion Paper 2015 on Managing</u> <u>Established Pests and Diseases</u>
Wool Producers Australia	National Wild Dog Action Plan

Peak industry bodies

Key political parties

Body	Policy statements
Australian Labour Party	Labour Party Policies
Liberal Party of Australia	Policies and Discussion papers
The Nationals	National Federal Council 2014 Decisions
Australian Greens	Policies
Shooters and Fishers Party	Federal policies; NSW State policies

Environmental organisations and welfare groups

Body	Policies and programs
Invasive Species Council	Strategy for Dealing with Invasive Species in Australia 2015
	ISC's Proposal for Environment Health Australia
	Submission to the NBC Discussion Paper on Managing Established Pests and Diseases
	Submission to the Inquiry into Environmental Biosecurity
Wildlife Disease Association (Australasian Section)	Submission to Inquiry into Environmental Biosecurity
Wet Tropics Management Authority	Submission to the NBC Discussion Paper on Managing Established Pests and Diseases
Australian Wildlife Conservancy	Feral Fox and Cat Control
<u>RSPCA</u>	Policies
Environmental Farmers Network	Policies
	Submission to the NBC Discussion Paper on Managing



Body	Policies and programs
	Established Pests and Diseases
Foundation for Rabbit-Free Australia	How to Rapidly Assess a Rabbit Problem and Take Action
Animals Australia	Campaigns
Australian Wildlife Health Network	Programs and Projects

Professional organisations and other networks

Body	Policies and programs
Game Management Council of NSW	Submission to the Natural Resources Commission: State-wide Review of NSW Pest Animal Management 2015
Australian Deer Association	Mission and Objectives (policies under review) Submission to the Natural Resources Commission: State-wide review of NSW Pest Animal Management 2015
Field and Game Federation of Australia	Hunting Code of Conduct and Ethics
Australian Pig Doggers and Hunters Association	Submission to the Natural Resources Commission: State-wide Review of NSW Pest Animal Management 2015
Federation of Hunting Clubs Inc.	Submission to the Natural Resources Commission: State-wide Review of NSW Pest Animal Management 2015
Game Hunters Association of Australia	Game Hunters Association of Australia Objectives
Sporting Shooters' Association of Australia	<u>Code of Ethics</u> <u>Submission to the NBC Discussion Paper on Managing</u> <u>Established Pests and Diseases</u> <u>Submission to the Natural Resources Commission: State-wide</u> <u>Review of NSW Pest Animal Management 2015</u>
Victoria Blackberry Taskforce	Submission to the NBC Discussion Paper on Managing Established Pests and Diseases
Australian Veterinary Association	Policies


6.6 Resource F: Media Reports on Political and Social Dimensions

Pests and invasive species issues generate strong debates among citizens with different values and understanding of the issues. In this appendix, we illustrate this diversity of views with 'pest stories' from the media. These demonstrate some of the conflicts around pest and invasive species issues, which can impact upon community action.

The resources are organised in chronological order under the following headings:

- Ethical issues:
 - $\circ~$ Ethical issues around the use of waste products from the killing of pest animals
 - Ethical issues around control methods
- Disagreement on policy options:
 - Bounties
 - o Shooting
 - Kangaroo control methods
 - Poisoning
 - Invasive management versus iconic species conservation
- Pests with economic value
- Invasive animals and pest control methods
- Scientific uncertainty and the presence (or not) of pests
- Pest animals as a threat to humans
- Carp

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- Illegal imports
- Resourcing capacity and resources

Ethical issues

Ethical issues around the use of waste products from the killing of pest animals

Emily, O. 2011. *The PETA Vermin Rabbit Fur Debate*. The Independent. <u>http://www.independentaustralia.net/australia/australia-display/the-peta-vermin-rabbit-fur-debate,3802</u>

This article highlights some political and ethical issues about the use of waste products from the culling of pest animals.

Vowles, E. 2011. The Ethics of Killing and Wearing Rabbits (audio). ABC Western Australia. <u>http://www.abc.net.au/site-archive/rural/telegraph/content/2011/s3319459.htm</u> This article discusses ethical issues around the use of waste products from the killing of pest animals during the Melbourne Fashion Week.

Thistleton, J. 2015. *NSW Government Declares Fox a Pest*. SMH. <u>http://www.smh.com.au/nsw/nsw-government-declares-fox-a-pest-20141210-124pgv.html</u>



This article reports on calls by fur traders to introduce the fox bounty and encourage and stimulate the fur trade once more.

Ethical issues around control methods

Everingham, S. 2009. Camel Cull to Proceed in Central Australia. ABC News. <u>http://www.abc.net.au/news/2009-12-07/camel-cull-to-proceed-in-central-australia/1171988</u> *Opposition to camel culls hinder community action for effective pest animal control in Central Australia*.

Wool Producers Australia. 2011. WPA Continues Support for 1080. Wool Producers Australia. http://www.woolproducers.com.au/media-releases/?news=179

This media release reports the opposition of Wool Producers of Australia, an industry group, to the ban of 1080 as a control method for pest animals.

Meldrum-Hann, C. 2012. Pig Dogging Faces Question of Barbarity or Hobby? (Video). ABC. <u>http://www.abc.net.au/7.30/content/2012/s3547927.htm</u> This video explores whether the hunting of wild pigs with trained dogs is an unnaturally cruel practice.

Meldrum-Hanna, C. 2012. *Uproar over Pig-dogging "Blood Sport"*. ABC Capricornia. <u>http://www.abc.net.au/news/2012-07-17/uproar-over-pigdoging-</u> 27bloodsport27/4136650/?site=capricornia

Pig-dogging, as a control technique raises ethical issues, pointed out by animal rights activists.

Thistleton, J. and Anderson, S. 2013. *Annual Kangaroo Cull Draws Fire*. The Canberra Times. <u>http://www.canberratimes.com.au/act-news/annual-kangaroo-cull-draws-fire-20130605-2nqyg.html</u>

This article illustrates political conflicts around the culling of kangaroos in the ACT.

Bailey, M. and Webb, E. 2015. Animal Welfare Group Calls for Ban on Fox and Hound Hunt Clubs. Herald Sun.

http://www.heraldsun.com.au/leader/south-east/animal-welfare-group-calls-for-ban-on-foxand-hound-hunt-clubs/news-story/6b45fe300e4b4f4176f1473a0fc8926c

Report on call by welfare group to end Melbourne's fox and hound hunt clubs and restrict fox control to humane methods carried out by authorised personnel as part of a government program.

Edwards, A. 2015. RSPCA Urges Queensland Government to End 'Gruesome' Illegal Pig Hunting. ABC News.

http://www.abc.net.au/news/2015-10-25/rspca-calls-for-end-to-illegal-pig-hunting-centralgueensland/6858646

Report on call by RSPSA to end inhumane and illegal killing of feral pigs.

Lyon, W. 2015. Australia's War on Feral Cats: Shaky Science, Missing Ethics. The Conversation.

https://theconversation.com/australias-war-on-feral-cats-shaky-science-missing-ethics-47444 Reports on mixed reactions to Australia's "war on feral" cats and ethics of killing over nonlethal methods of control.



Rogers, E. 2015. *Queensland Pig Hunting Championships Attract Criticism*. ABC Rural. <u>http://www.abc.net.au/news/2014-10-29/pig-hunting-championships/5850862</u> *Report on criticism of pig hunting as sport on the basis it is inhumane*.

Skoufatoglou, N. 2015. Activists' Answer to Cat Eradication Plan. Neos Kosmos. http://neoskosmos.com/news/en/Activists-answer-to-cat-eradication-plan-australia Report on recent animal rights opposition to "war on feral cats", calling instead for desexing.

Wilson, C. 2015. The Ethics of Trapping, Shooting and Baiting Feral Animals. Bush Telegraph. <u>http://www.abc.net.au/radionational/programs/bushtelegraph/pests-and-pain/5438680</u> Ethics and effectiveness of baits to kill wild dogs and cats.

Disagreement on policy options

Bounties

Dowler, K. 2012. Fox Bounty a "Waste of Money". Weekly Times Now. https://www.facebook.com/permalink.php?id=109736009057839&story_fbid=49655960702446 3

This article argues that Victoria's fox bounty is set to fail, waste money and may worsen feral animal problems.

ABC. 2012. Fox Eradication Scheme Proves Bountiful. ABC Western Australia. <u>http://www.abc.net.au/news/2012-05-14/fox-eradication-scheme-proves-</u> <u>bountiful/4009084/?site=westernvic</u> This article reports the view that the use of bounties can be effective to control foxes.

Pierce, J. 2012. *Wild Dogs Move Closer to Brisbane City*. Herald Sun. <u>http://www.heraldsun.com.au/news/national/wild-dogs-move-closer-to-the-city/story-fndo45r1-1226475162407</u>

This article reports Queensland local farmers' views that bounties should be used to control wild dogs.

McMaugh, Z. 2013. Carp Bounty an Option. Deniliquin Pastoral Times. <u>http://www.mmg.com.au/local-news/deniliquin/carp-bounty-an-option-1.55616</u> Federal Minister for Environment Greg Hunt intends to investigate new policies for controlling infestations from carp.

Pilcher, R. 2015. Greens Should Pay a Bounty to Feral Pig Hunters. Gympie Times. <u>http://www.gympietimes.com.au/news/pig-shooting-ron-is-an-unlikely-greenie/2603664/</u> This article highlights the local call for conservationists to pay feral pig hunters for each pig shot.

Shooting

ABC. 2012. *Pastoralists and Traditional Owners Clash Over Camels* (Lateline Video). ABC. <u>http://www.abc.net.au/lateline/content/2012/s3552805.htm</u>



This article highlights political conflicts between pastoralists and traditional owners around camel management.

Aston, H. and Hasham, N. 2012. *Hunting in National Parks May Increase Feral Animals*. SMH. <u>http://www.smh.com.au/nsw/hunting-in-national-parks-may-increase-feral-animals-</u>20121223-2btkv.html

This article reports that hunting in national parks may increase the population of feral animals in certain areas.

Cooke, B. 2012. Political Dreaming: Shooters Solving Pest Problems? The Conversation. http://theconversation.com/political-dreaming-shooters-solving-pest-problems-8258 In this post, the author explains that the best way to achieve a sustained reduction in fox and wild dog numbers is 'through simultaneous and coordinated community baiting programs implemented at a landscape scale and supported by other control techniques'.

Glanznig, A. 2012. *How Effective is Shooting Feral Animals* (Audio). ABC Sydney. <u>http://blogs.abc.net.au/nsw/2012/06/how-effective-is-shooting-feral-animals-.html</u> *In this interview, Andreas Glanznig, CEO of the Invasive Animals CRC discusses the effectiveness of shooting as a control method for feral animal management.*

Townsend, I. 2012. Guns Are Back (audio). ABC Radio National.

<u>http://www.abc.net.au/radionational/programs/backgroundbriefing/guns-are-back/3725866</u> The article suggests that the use of guns for invasive species control may raise issues related to the national system for monitoring gun ownership.

McCutcheon, P. 2014. Farmers and Shooters Join Forces in Farmer Assist Program to Rid Australia of Pest Animals. ABC News.

http://www.abc.net.au/news/2014-09-06/farmers-and-shooters-join-forces-to-targetpests/5724640

This article reports that farmers and a shooting association have joined forces in an innovative program designed to reduce the number of pest animals in Australia.

Holland, S. 2015. RSPCA Bloodied Rabbit Photo 'Disgraceful': WA Shooters Association. WA Today.

http://www.watoday.com.au/wa-news/rspca-bloodied-rabbit-photo-disgraceful-wa-shootersassociation-20150506-ggvn7j.html

This article reports on the false use of advertising by RSPCA to stop rabbit hunting in Western Australia.

Mazza, R. 2015. Feral Pigs are a Big Problem, Not Hunters. West Australian. <u>https://au.news.yahoo.com/thewest/a/26535517/feral-pigs-are-a-big-problem-not-hunters/</u> This opinion piece disputes the evidence basis for RSPCA claims of illegal shootings of feral animals.

McAloon, C. 2015. Farmers Fighting Feral Pigs Welcome Move To Lift Ban OOn Controversial Shotgun. ABC Rural.

http://www.abc.net.au/news/2015-08-14/debate-over-controversial-rapid-fireshotgun/6697804

This article discusses the lifting of a government ban on lever-action shotguns to aid fight against feral pigs.



Preiss, B. 2015. Hunters' Party Wants Pest Cull. The Age. <u>http://www.bendigoadvertiser.com.au/story/3129670/hunters-party-wants-pest-cull/</u> This article reports on the calls made in Victoria by the Shooters and Fishers Party to shoot pest animals.

Tomlin, S. 2015. Sporting Solution Floated for Goldfields Wild Dog Plague. ABC News. http://www.abc.net.au/news/2015-11-30/sporting-solution-floated-for-goldfields-wild-dogplague/6987386

This article reports on the position of the shooters association in Western Australia suggesting that recreational hunters could help Goldfields pastoralists with their ongoing battle against wild dogs in Western Australia.

Kangaroo control methods

Arthur, P. 2013. *Qld Roos Out Of Control*. The Land. <u>http://www.theland.com.au/news/agriculture/general/news/qld-roos-out-of-</u> <u>control/2658814.aspx</u> *This article identifies political issues that regulations around kangaroo control methods raise in Queensland*.

Francis, A. 2015. ACT Kangaroo Cull Contractor Condemns 'Radical Opposition' of Protesters. ABC News.

http://www.abc.net.au/news/2015-07-05/act-kangaroo-cull-contractor-condemns-radicalopposition/6592832

This article highlights political opposition issues to kangaroo culling.

McIlroy, T. and Kelly, E. 2015. *Kangaroo Cull Photo Sparks Renewed War of Words*. Canberra Times.

http://www.canberratimes.com.au/act-news/kangaroo-cull-photo-sparks-renewed-war-ofwords-20150616-ghozxn.html

This article discusses the political tensions generated by the death of a kangaroo.

Poisoning

Smith, D. and Stockwell, S. 2012. WA Government Eases Restrictions on Poison Use to Tackle Wild Dogs. ABC Rural.

<u>http://www.abc.net.au/site-archive/rural/news/content/201207/s3543699.htm</u> The easing of regulatory restrictions for the use of 1080 could potentially facilitate community action for pest animal control.

Williams, B. 2012. *Culling Dingoes May Take a Toll on Bilbies*. Courier Mail. <u>http://www.couriermail.com.au/news/queensland/culling-dingoes-may-take-a-toll-on-bilbies/story-e6freoof-1226513267320</u> *Dingo-poisoning programs can have adverse environmental effects on native bilby populations*

O'Brien, K. and Dunlevie, J. 2014. *Poison Permit Delay Blamed for Wild Dog 'Plague'*. ABC News.

<u>http://www.abc.net.au/news/2014-08-31/paperwork-to-blame-for-dog-attacks/5708704</u> Northern Territory pastoralists say wild dog numbers are out of control and wreaking havoc on their stock because of a delay in poison permits.



Rogers, E. 2015. Conservationists and Producers Share Common Goal to Control Wild Dogs to Save Dingoes and Livestock. ABC Rural. <u>http://www.abc.net.au/news/2015-08-06/push-to-control-wild-dogs-but-save-</u> <u>dingoes/6676940</u> This article discusses the alliance developing between farmers and conservationists.

Invasive management versus iconic species conservation

Humpage, A. 2013. *Toolern, Vale Dingo Pups Head to Australia Zoo*. Herald Sun. <u>http://www.heraldsun.com.au/leader/west/toolern-vale-dingo-pups-head-to-australia-zoo/story-fngnvmj7-1226693581765</u>

There is a tension between the need for controlling invasive species (e.g. wild dogs) and conserving iconic species (e.g. dingoes).

Marks, K. 2013. *To Cull or Not? 'Brumby' Wild Horses Divide Australians*. The Independent. <u>http://www.independent.co.uk/news/world/australasia/to-cull-or-not-brumby-wild-horses-divide-australians-9029552.html</u>

This article highlights the tension between those who see brumby as iconic species of the Australian bush, and those who see them as pests.

Mercer, D. 2015. Feral Cats a Killer of WA Icons. West Australian. <u>https://au.news.yahoo.com/thewest/wa/a/29948725/feral-cats-a-killer-of-wa-icons/</u> This article discusses the devastating impacts of feral cats on endangered species in Western Australia.

O'Connor, K. 2015. Numbats Listed as Endangered Due to Feral Cat Impact on Wild Population. ABC News. <u>http://www.abc.net.au/news/2015-12-05/numbats-listed-as-endangered-due-to-feral-catimpact/7003714</u> This article highlights the need for a multi-pronged approach to feral cat problems.

Pests with economic value

Mc Donald, C. 2012. *Feral Goats Easy Side Income for Graziers* (ABC Rural Report for Broken Hill). ABC.

http://www.abc.net.au/site-archive/rural/regions/content/201204/3480854.htm This article discusses the economic benefits from goats.

Brown, C. 2015. *Wild Boar Exports Suffer as Accredited Hunter Numbers Drop*. ABC Rural. http://www.abc.net.au/news/2015-04-14/wild-boar-market-hit-by-dropping-hunternumbers/6383368

This article points out the decreasing number of accredited hunters of wild pigs for human consumption and export.



Perry, N. and Boronyak, L. 2015. Kanganomics: It's Not Worth Killing Kangaroos. The Conservation. <u>https://theconversation.com/kanganomics-its-not-worth-killing-kangaroos-43550</u> This article discusses the economic dimensions associated with the culling or the protection of kangaroos.

Invasive animals and pest control methods¹

Central, B. 2012. Dingoes No Solution to Feral Cat and Fox Problem. Beef Central. http://www.beefcentral.com/p/news/article/1867 This article discusses scientific studies, which support the view that dingoes should not be considered as a biological method to control feral cats and foxes.

Cooper, D. 2012. Feral Cats Work Around Dingo's Lifestyle. ABC. <u>http://www.abc.net.au/science/articles/2012/11/05/3611900.htm</u> This article discusses a scientific study that explores the relationship between feral cats and dingoes to determine whether dingoes are an effective biological control method.

Sydney Morning Herald. 2012. Scientists Use Cane Toads' Own Toxin Against Them. SMH. http://www.smh.com.au/environment/conservation/scientists-use-cane-toads-own-toxinagainst-them-20120613-209pf.html

This article highlights aspects of biological control for controlling cane toad population.

Australian Academy of Science. 2013. *Media Release: Australian Rabbit Experiment is an Evolution Classic*. Canberra: AAS.

http://www.science.org.au/node/35246#.U4GcUdB4Ijs

This media release stresses the importance of the myxoma virus for the biological control of pest rabbit populations.

Contraceptive Vaccine for Wild Horses, Burros Gains EPA Registration. 2013. The Horse. http://www.thehorse.com/articles/31361/contraceptive-vaccine-for-wild-horses-burrosgains-epa-registration

The EPA has granted regulatory approval for the use of an equine immunocontraceptive vaccine (GonaCon-Equine) in adult female wild or feral horses and burros.

McLennan, C. 2014. NSW Government Finally Moves to Ban People Keeping Foxes as Pets. Weekly Times.

http://www.weeklytimesnow.com.au/news/national/nsw-govt-finally-moves-to-ban-peoplekeeping-foxes-as-pets/story-fnkfnspy-1227082111067

This article discusses the calls made by a NSW animal rights group for government to support an adopt-a-fox program as an alternative to foxes being declared a feral species.

¹ Pest control methods include a range of techniques such as poison baits, 1080 poison, fumigants, trapping, shooting, introduced disease, Rabbit calicivirus disease (RCD), and fertility control.



ABC News. 2015. Calicivirus Outbreak Sparks Vaccination Warning for Pet Rabbits in South Australia. ANC News.

http://www.abc.net.au/news/2015-08-25/calicivirus-outbreak-sparks-vaccinationwarning/6722472

This article highlights the effects of biocontrol measures on domestic rabbits in South Australia.

Becker, J. 2015. *Calicivirus Wipes Out Half of Rabbit Farmer's Stock in Southern NSW*. ABC Rural.

http://www.abc.net.au/news/2015-10-30/calicivirus-wipes-out-rabbit-farm-in-southernnsw/6900080

This article highlights the devastating economic impacts of biocontrol measures on rabbit farming in New South Wales.

Brown, C. 2015. *Rabbit Bait Research Sparks Wildlife Poisoning Concerns*. ABC Rural. <u>http://www.abc.net.au/news/2015-08-26/nz-scientists-calls-for-more-research-into-rabbit-bait-toxicity/6725172</u>

Wildlife scientists are calling for more research into a popular rabbit bait, after finding it may present a high risk of secondary poisoning.

Doherty, T., Dickman, C., Nimmo, D. and Ritchie, E. 2015. *Killing Cats, Rats and Foxes is no Silver Bullet for Saving Wildlife*. The Conversation.

https://theconversation.com/killing-cats-rats-and-foxes-is-no-silver-bullet-for-savingwildlife-42754

This article discusses a research study pointing out the significant non-targeted impacts of invasive species control on native wildlife.

Kerin, L. 2015. Wild Dogs Decimating Queensland's Sheep Flocks Finally Kept at Bay by Massive Cluster Fences. ABC News.

http://www.abc.net.au/news/2015-10-28/cluster-fences-working-to-keep-queenslands-wilddogs-at-bay/6891262

This article reports on the effectiveness of cluster fencing to keep wild dogs away from production animals.

Orr, A. 2015. Illegal Pig Hunters Getting Feral in WA. WA Today. http://www.watoday.com.au/wa-news/illegal-pig-hunters-getting-feral-in-wa-20141217-129an5.html

This article reports on some pig hunters catching and releasing pigs in other areas in Western Australia.

Vidot, A. 2015. Rabbit Control Plan Plays the Long Game to Contain Devastating Pest, Protect Threatened Native Species. ABC Rural.

http://www.abc.net.au/news/2015-11-26/draft-rabbit-plan-to-protect-threatened-nativespecies/6976474

This article reports on call for long-term approach to rabbit control.



Scientific uncertainty and the presence (or not) of pests

Bailey, C. 2011. Fox: The Questions. Tasmanian Times. http://tasmaniantimes.com/index.php?/weblog/article/foxy1/show_comments This article suggests that the uncertainty around the presence or not of foxes in Tasmania could generate political issues.

Grant, R. 2012. DNA Testing Tells a Tale of Foxes. ABC News. <u>http://www.abc.net.au/site-archive/rural/tas/content/2012/09/s3592649.htm</u> DNA testing is used to identify fox-positive scats and establishes the presence of foxes in Tasmania.

Blucher, A. 2015. MLC Ivan Dean Questions Fox Eradication Funding for Biosecurity Tasmania. ABC News.

http://www.abc.net.au/news/2015-11-12/mlc-questions-fox-eradication-funding-forbiosecurity-tasmania/6934690

Federal fox eradiction money is being questioned as for some there is a lack of evidence of foxes in the state for years.

Felton-Taylor, A. and Claughton, D. 2015. Drones Trialled to Help Reduce Billion-Dollar Invasive Pest Animal Problem. ABC News.

http://www.abc.net.au/news/2015-07-22/drones-to-help-manage-invasive-pest-animal-species-in-australia/6639204

This article discusses the use of drones to tackle a billion-dollar invasive pest animal problem.

Field, E. 2015. *Rabbits Australia's Top Pest*. The Weekly Times. <u>http://www.weeklytimesnow.com.au/news/national/rabbits-australias-top-pest-federal-department-of-environment-report/story-fnkfnspy-1227632123754</u> *This article reports on rabbits considered as the new top pest in Australia*.

Pest animals as a threat to humans

Berg, N. 2012. Feral Dogs Invade Australia's Cities. Atlantic Cities. <u>http://www.theatlanticcities.com/neighborhoods/2012/09/feral-dogs-invade-australias-</u> <u>cities/3296/</u> This article reports wild dog invasions in urban environments.

Broome, H. 2013. Wild Dogs Closing in on Urban Areas. Northern Rivers Echo News.

http://www.echonews.com.au/news/dogs-closing-in/2100359/ Wild dogs are reportedly an increasing threat in urban areas.

Broome, H. 2013. Wild Dogs on the Prowl After Prolific Breeding Season. Northern Star. http://www.northernstar.com.au/news/wild-dogs-on-the-prowl-after-prolific-breedingsea/2091995/

An increasing number of wild dogs have been localised on the North Coast of NSW.

Lush, K. 2013. *Dingoes Head South*. ABC Riverland. <u>http://www.abc.net.au/local/stories/2013/11/22/3897145.htm</u> *The number of dingoes is reportedly increasing in South Australia*.



Osborne, T. 2015. Canberra Woman Requires 10 Stitches After Feral Pig Attack at Mount Jerrabomberra. ABC News. <u>http://www.abc.net.au/news/2015-07-27/feral-pig-traumatises-walker-and-dog-at-mount-jerrabomberra/6650016</u>

This article reports on the health risks associated with feral pig attacks.

O'Reilly, B. 2015. Australia Has Excessive Protections for its Kangaroos. Online Opinion. <u>http://www.onlineopinion.com.au/view.asp?article=17690</u> This article argues that the biggest killer in Australia among wild animals are kangaroos due to road accidents.

Carp

Chesson, T. 2012. Just Add Water' Isn't Enough to Fix Our Rivers. ABC News. <u>http://www.abc.net.au/unleashed/4135704.html</u> The article highlights the need to eradicate carp to achieve a healthy river system in the Murray Darling Basin.

Illegal imports

Ryan, C. 2012. Illegal Turtle Found in Taylors Lakes. <u>http://www.reptilescanada.com/archive/index.php/t-62984.html</u> Illegal keeping and trading of exotic animals is reportedly an increasing threat to agricultural and biodiversity conservation values.

Resourcing capacity and resources

Long, W. 2014. Not Enough Funds to Eradicate Green Snails. ABC. http://www.abc.net.au/news/2014-03-17/nrn-green-snails/5325320 This article highlights funding issues around invasive species programs.

McCarthy, M. and Zonca, C. 2015. *Queensland Environment and Farm Groups Demand Biosecurity Reform be a Top Priority for New State Agriculture Minister*. ABC Rural. <u>http://www.abc.net.au/news/2015-12-09/biosecurity-on-the-agenda-for-new-agricultire-minister/7013466</u>

This article reports on calls made by environmental and farming groups to adequately resource biosecurity.

Prendergast, J. 2015. West Australian Pastoralists Say Government Error Has Resulted in Less Biosecurity Funding. ABC Rural.

<u>http://www.abc.net.au/news/2015-12-03/wa-pastoral-rates-error/6998988</u> This article reports on government funding cuts on measures used to control biosecurity threats on properties in Western Australia.



6.7 Resource G: Addressing Human Dimensions

This document discusses the use of human science in the Australian approach to invasive species management. The support of the Invasive Animals Cooperative Research Centre (IACRC), Rural Industries Research & Development Corporation (RIRDC) and federal Department of Sustainability, Environment, Water, Population and Communities (now the Department of Environment) is gratefully acknowledged.¹

The control of invasive species is largely about managing human behaviour. For effective management, many decisions must be shaped, not just those of landholders or others who spread or fail to control invasive species. Five examples illustrate the diverse human dimensions of invasive species management:

- 1. The lack of resources for management reflects community preferences, expressed through politics. Politics is also involved in under-enforcement or the failure to implement landscape-scale control.
- 2. Consumer choices of what they cultivate or what animals they protect produce many invasive species problems. The importance of emotional and cultural concerns is demonstrated by the furore over animal culls and the cultivation of much-loved well-known weeds.
- 3. Invasive species control depends on 'voluntarism': reporting outbreaks, investing labour and resources, cooperating in coordinated programs and even legal compliance are all voluntary. Significantly, to be useful, desirable voluntary behaviour must be sustained even in the face of difficulty.
- 4. The behaviour of government and industry bodies also needs to be managed and accountable to make it more likely that they will be diligent and effective in their roles and meet the challenges of coordination.
- 5. Key actions involve significant cost and effort; weed or pest animal control can require unrelenting work and a lot of investment. Spending your weekend controlling other people's problems rather than having time with family or friends is a 'big ask'. It is not only necessary to encourage the desire to do the right thing, people also need skills and resources to be effective these too are human dimensions.

Application of the scientific method of theorising, implementing and experimenting, measurement and analysis, and synthesis under the scrutiny of peers have resulted in major improvements in biophysical and technical knowledge and methods. The approach is institutionalised in technical research, widespread scientific qualifications and the peer review processes associated with invasive species technology and techniques. The results have been technologically impressive and economically productive, but behavioural issues limit the benefits. Unfortunately, we do not have an equivalent scientific approach to the human dimensions of invasive species management. The following discussion draws upon two recent studies (and a number of other pieces of evidence) to support this view.

¹ This resource is a copy of a Martin, P. 2014. *Scientific Improvement in the Human Dimension of Invasive Species*. Keynote address delivered at the Weed Society of Victoria's 5th Biennial Conference: Melbourne.



Study 1: Weeds institutions

The study, "Innovations in Institutions to Improve Weed Funding, Strategy and Outcomes", was commissioned by the RIRDC and delivered in 2012.² The researchers reviewed reports and studies and used interviews to identify institutional questions where research could contribute. Issues included the operation and effectiveness of weeds management, regulation and land management.

The report proposed "[a] vision of a radically different future" with a higher level of institutional effectiveness. The study documented regulatory and administrative arrangements, from the Constitution down to local administration. It considered strategies to alter human behaviour with respect to weeds, regulatory compliance, court cases and some aspects of weed funding.

The report identified five opportunities for significant institutional improvement:

- 1. "Institutional innovations to enable integrated 'front line' action"
- 2. "Strategies to increase available front-line human and financial resources"
- 3. "Streamlining weed governance rules and organisations"
- 4. "Embed scientific, continuous improvement in the management of people"
- 5. "Benchmarking and evaluating weeds institutions"

This paper focuses on Opportunity 4. Part of the evidence was the content patterns of papers presented at Australian National Weeds Conferences from the 1960s through to 2011. Up until the 1990s, human issues were largely absent. In the 1990s, the topics shifted slightly towards human aspects, with Landcare emerging as a relevant consideration. By 2002, weed professional and researcher interests had shifted to consider working 'on' community to improve their effectiveness, mainly through diffusing expert knowledge and harnessing volunteers to deliver frontline control using science-led methods. This adjustment of focus towards people strengthened over the following decade:

By the 2011 conference, although a majority of papers still discussed control techniques (such as biocontrols, herbicides, mapping and mechanical controls), many papers dealt with the behavioural aspect of weed management. Two sessions were specifically set aside for such issues: 'Innovative Practices and Approaches: Community Processes' (12 papers); and 'Innovative practices and approaches: Policy and Strategy' (11 papers).

The years have thus seen a gradual progression from ignoring the human dimensions of the management challenge to identifying technical solutions involving human aspects and moving towards an approach that tries to understand how to harness volunteers and landholders. Whilst in recent years there is some concern shown for working 'with' the community, the dominant stance of the papers is working 'on' the community, through extension and promotion coupled with volunteer engagement. Many individual case studies are reported, but there is little evidence of the development of theory or best practices or disciplined collective 'learning from shared experience'.

The following is the main conclusion reached about institutional arrangements for improving theory and practice for human dimensions aspects of weed control:

² Martin, P., Verbeek, M., Riley, S., Bartel, R. and Le Gal, E. 2012. *Innovations in Institutions to Improve Weed Funding, Strategy and Outcomes: Proposals for a National Weed Institutions Research Agenda*. RIRDC: Canberra.



A key consideration is what is missing from the weed governance discourse. Three things stand out. The first is that the focus on people issues is very limited overall, and certainly is not proportionate to the impacts that these issues have on weed governance effectiveness. An analysis of the themes for the 16th Australian Weeds Conference shows that there were 57 themes in papers that related to people, 67 related to weeds and production, 98 concerned with characteristics of plants, 176 concerned with planning issues, and 267 concerned with programmes.³ Of the 57 papers that touched on human themes, one considered economics and another mentioned markets, five concerned communications, and one considered landholder engagement. Weed epidemiology and integrated weed management were the most considered issues. What is striking in this, as with other weeds conferences, is the absence of the scientific method being applied to the human dimensions of weeds.

The second gap is that the community engagement focus is still largely an extension, rather than engagement or partnership. Across the world there has been a shift from extension paradigm (emphasising transfer of knowledge from science to science-user) towards community engagement and partnership⁴. Implicit in this shift are quite fundamental changes in the power relationships between the end-user and the science provider, and in the mechanisms that are used to give effect to this relationship. With this comes cultural change, including de-emphasis upon the scope and exercise of control by government agencies and by scientists. Whilst there is an enormous amount of on-the-ground engagement taking place in the weeds sector, this aspect of weeds governance seems not to have become a focus for continuous scientific improvement.

Study 2: Human dimensions of pest animal control

In 2013, the federal government commissioned an in-depth study of recipients of Caring for Our Country funding for the control of rabbits, foxes, feral pigs and wild dogs between 2008 and 2012.⁵ That research included consideration of the human behaviour methods used 'on the frontline'. The federal government agreed for the data to be further used for the purposes of research on community action on invasive species.⁶ This provided the opportunity to test some hypotheses from the weeds institutions study.

The investigation involved a stratified random sample of approximately one third of the relevant *Caring for our Country* projects from around Australia. The investigation reviewed project documentation, conducted 97 in-field interviews, and evaluated best management practices, community engagement and communications. Twelve interviewers working in teams of two administered a standard set of questions in face-to-face sessions with project applicants and stakeholders. Both quantitative and qualitative analyses were used. Further analysis is being conducted on the data. Later publications will provide a more comprehensive analysis of the issues. We discuss here only the preliminary findings on human dimensions issues.

 ³ Martin, P. 2008. Cross Pollination or Cross-contamination? Directions for Informing the Management of Invasives with Market-Economy Concepts. Keynote address delivered at the16th Australian Weeds Conference: Brisbane.
⁴ See e.g. Oliver, P. and Whelan, J. 2003. Literature review: Regional Natural Resource Governance, Collaboration

 ⁴ See e.g. Oliver, P. and Whelan, J. 2003. Literature review: Regional Natural Resource Governance, Collaboration and Partnerships. Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management: Indooroopilly; Thompson, L., et al. 2009. Engaging in Biosecurity: Literature review of Community Engagement Approaches. Australian Government Bureau of Rural Sciences: Canberra.
⁵ Martin, P. et al. 2013. Measuring the Impact of Managing Invasive Species. Australian Government Department of

⁵ Martin, P. et al. 2013. *Measuring the Impact of Managing Invasive Species*. Australian Government Department of Agriculture Forestry and Fisheries: Canberra (unpublished).

⁶ Each interviewee also consented to this further use. UNE Ethics Approval No. HE12-103



Twenty-three per cent of project managers reported that their projects increased participation in invasive animal control by landholders, 15 to 20 per cent reported increased participation by NRM organisations, the Indigenous community and volunteers. The literature on engagement⁷ highlights that achieving lasting engagement requires that participants feel that they can trust those they work with, that their actions can make a difference, that they are able to influence decisions, and that their efforts will be recognised. Such 'ownership' was evaluated as evident in 49 per cent of projects, possible in another 37 per cent and not evident in 14 per cent.

Absentee landholders and uninterested or resource-poor neighbours were highlighted as significant impediments to coordinated invasive animal control programs. Approximately two-thirds of project managers believed that they had engaged a sufficient number of relevant and motivated stakeholders in the projects.

Evaluators assessed whether the engagement strategies involved the right number and mix of stakeholders with sufficient motivation and competence. Evaluators believed this was true in approximately 50 per cent of projects and 20 per cent were assessed as having failed to achieve effective engagement.



Figure 1: Whether stakeholders directly involved in the project were sufficiently engaged and competent (Note: The fifth label should read, "Did what they were expected to")

⁷ Thompson, L., et al. 2009. *Engaging in Biosecurity: Literature review of Community Engagement Approaches*. Australian Government Bureau of Rural Sciences: Canberra.



Evaluators asked applicants whether they developed an 'outreach' program to communicate information about invasive animal control to the broader community. Only six projects (17%) did not use an outreach program. Workshops and field days were the most common method followed by website, social media and newsletters. Also popular were press releases (nine projects) and websites, social media and newsletter (six projects each). Ten projects used a combination of outreach methods. Nine of these also used workshops and field days. Six projects that utilised websites also used social media and two of these used blogs.

As hypothesised from the weeds institutions study above, engagement and communications strategies were generally not based on specific theories, research data or formal training. There was little evaluation of the effectiveness of these strategies, with only four using formal evaluation.⁸ This is different to the technical aspects of invasive species control where practices are influenced by 'best management practices' (BMPs), and disciplined evaluation is understood to be necessary. The Monitoring, Evaluation, Reporting and Improvement (MERI) requirement for Caring for Our Country projects added to the pressures for biophysical evaluation, but did not translate into human effectiveness evaluation. It should be noted that some individuals and organisations have developed sophisticated approaches, without the benefit of a scientific or institutional support structure, and without mechanisms to refine and spread best practices. That 'human dimensions' matters are neither prioritised by the institutional structures and project requirements, nor in the training of those who carry out the work, supports our earlier conclusion of an institutional deficiency.

A significant policy and practice development is an apparent shift in resources from the employment of frontline extension officers towards digital communications. Whilst the numbers in our sample are small, none of the users of social media rated their use of digital methods as effective. The absence of objective data about the effectiveness of digital mechanisms prevents any firm conclusions being reached about whether these opinions are justified. A strategic shift towards digital engagement should be based upon a well-informed view that digital interaction is more cost-effective than interpersonal interaction. The literature neither supports such a conclusion, nor is there an indication that carefully considered strategic cost-effectiveness has been the basis for this shift. We do not suggest that properly designed digital interactions are ineffective, but these issues lend support to the view that the lack of a scientific approach to human interaction strategies is a serious deficiency.

The study supports the weeds institution study in showing a significant difference in the approaches taken to the technical aspects and the human dimensions of NRM. Technical invasive control has benefited from substantial scientific research investment over many years involving theorising, hypotheses development and empirical testing. This has resulted in well-developed and communicated technical practices (BMPs or equivalent) that should deliver reliable results. These form a foundation for further scientific continuous improvement. Practitioners have access to detailed guidance on how to develop and implement pest control strategies, and reasonably well developed (albeit far from perfect or universally used) methods for empirical evaluation as part of continuous improvement.

The human dimensions are not subjected to an equivalent disciplined process of improvement. This is demonstrated in the practices of communications used in invasive

⁸ The formal monitoring was predominantly based on feedback rather than a design that would enable objective rating. Formal monitoring would also require project managers to define what they meant by the term 'effectiveness', an issue that was not raised by interviewees when asked to rate effectiveness.



animals' management. Eighty-three per cent of projects evaluated invested in outreach, such as websites and blogs, factsheets and newsletters, opportunities for social media interactions, and training sessions. However, very few projects (11 per cent) conducted a formal assessment of the lasting benefits of these efforts, although comments from stakeholders indicated that outreach programs were seen to be important. There was negligible evidence of the use of explicit theory to inform 'human dimensions of NRM' practice. Few practitioners had specific training or referred to particular research-based materials to inform the design or implementation of these activities. There was negligible use of market research or any of the many other 'tools' of social science or modern management. This is quite different to the approach to technical aspects of control.

Observing that elements of a scientific method are lacking is not the same as saying that the work is poorly done or ineffective. We saw many examples of impressive 'human dimensions' work, but history (even within the narrow confines of invasive animals control) demonstrates that the most reliable outcomes and the most rapid improvements arise when individual expertise and creativity is harnessed within a disciplined process of scientific continuous improvement.

The scientific approach to collective improvement depends upon dialogues between experts (including informed practitioners) about specific theories that can be used to predict likely results from interventions or experiments (hypotheses), the use of transparent methods and data, and presentation of explicit findings that feed back into the further development of theory. If this dialogue is not present, then arguably a field is not 'scientific'. The lack of cited studies as foundations for designing human interventions aligns with the patterns of the weeds institutions study. We have not yet done a content analysis of vertebrate pest conferences, but we expect that a similar pattern of dealing with human issues will be present, as we have observed for the weeds sector.

Conclusions

The conclusions are obvious. Despite a clear commitment to scientific continuous improvement in other aspects of invasive species management, and notwithstanding the strategic centrality of the human dimensions of natural resource management, to date we have not given sufficient attention to well-disciplined improvement in these key areas of performance. If we believe that the march of Science is the key to progress, then that view ought to apply to all the important aspects of invasive species management.



6.8 Resource H: Selected International Comparisons

An overview of the legal and institutional arrangements in Canada, New Zealand, United States and Great Britain.

Canada

The Canadian Biodiversity Strategy 1994 calls for the development and implementation of measures to prevent alien organisms from adversely affecting biodiversity. The Biodiversity Strategy 1994 works with the Canadian Invasive Alien Species Strategy 2004 and Canadian Sustainable Development Strategy 2013-2016 to advance this goal.

The Invasive Alien Species Strategy aims to ensure coordination among federal, provincial and territorial departments to deliver the national strategies necessary to tackle the invasive alien risk.¹ Although linked by a common obligation to the three national strategies mentioned above, different agencies focus on different aspects. The environment ministry takes a lead role in invasive species management and focuses on terrestrial animals; the food inspection agency administers invasive species funding and focuses on plant pests; the natural resources department focuses on forest pests; the agriculture department focuses on pests affecting agriculture; and the fisheries and oceans department focuses on aquatic pests.² Similar to Australia, the separation of responsibilities across a range of agencies has the potential to make coordinated action difficult and ineffective. For example, uncertainty exists about where institutional responsibility lies for compiling a complete list of invasive alien species.

There is some overlap in legislative responsibilities (see Table 1 below), and many provincial agencies have enacted their own laws, strategies, plans and programs.³ The *Plant Protection Act*, SC 1990 is the only legislation that contains specific obligations for invasive species management. The legislation exists to protect Canadian agricultural and forestry sectors from pest species by preventing their import and spread, and providing for their control and eradication. Other statutory provisions seek to manage invasive species indirectly, for example, by restricting the disposal of ballast water and import of animal products that could carry disease.

Agency	Policy	Statutes	Regulations	Implementation
Environment and Climate Change Canada	Biodiversity Strategy 1994 Sustainable Development Strategy for Canada 2013-2016 Invasive Alien	Canada Wildlife Act RSC 1985 Federal Sustainable Development Act SC 2008 Species at Risk Act SC	<u>Wild Animal and</u> <u>Plant Trade</u> <u>Regulations SOR</u> <u>1996/96-263</u> <u>List of Pests</u> <u>Regulated under</u> <u>the Plant</u>	Biodiversity Outcomes Framework Sustainable Development Strategy Management Framework 2013-2016 Action Plan for Invasive

Table 1: Sna	pshot of lega	l and institutiona	l arrangements f	or invasive s	pecies in (Canada
Tuble II billa	ponoe or lega	and motivitationa	t an angementer i		peeres in v	canada

¹ Government of Canada. 2004. *An Invasive Alien Species Strategy for Canada*. Government of Canada: Ottowa. ² Treasury Board of Canada Secretariat. 2015. Invasive Alien Species: Plans, Spending and Results. Available at: <u>https://www.tbs-sct.gc.ca/hidb-bdih/initiative-eng.aspx?Hi=119</u>.

³ See e.g Ontario Ministry of Natural Resources. 2012. *Ontario invasive Species Strategic Plan*. Ontario Ministry of Natural Resources: Peterborough.



Agency	Policy	Statutes	Regulations	Implementation
	Species Strategy for Canada 2004 National Accord for the Protection of Species at Risk 1996	2002 Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act SC 1992 Various provincial statutes ⁴	Protection Act 1990 Various provincial regulations ⁵	Alien Terrestrial Plants and Plant Pests 2008 National Framework for Species at Risk Conservation Invasive Alien Species (IAS) funding streams Species at Risk funding programs Provincial invasive species centres, councils, plans, strategies and programs ⁶
Natural Resources Canada	Biodiversity Strategy 1994 Sustainable Development Strategy for Canada 2013-2016 Invasive Alien Species Strategy for Canada 2004 National Accord for the Protection of Species at Risk 1996	Department of Natural Resources Act SC 1994 Forestry Act SC 1985 Pest Control Products Act SC 2002 Species at Risk Act SC 2002 Various provincial laws ⁷	List of Pests Regulated under the Plant Protection Act 1990 Various provincial regulations ⁸	Biodiversity Outcomes Framework Action Plan for Invasive Alien Terrestrial Plants and Plant Pests 2008 Sustainable Development Strategy Management Framework 2013-2016 National Framework for Species at Risk Conservation Invasive Alien Species (IAS) funding streams Species at Risk funding programs
Canadian Food Inspection Agency	Invasive Alien Species Strategy for Canada 2004	Pest Control Products Act SC 2002 Plant Protection Act SC 1990	Plant Protection Regulations SOR 1995 List of Pests Regulated under the Plant Protection Act 1990	Action Plan for Invasive Alien Terrestrial Plants and Plant Pests 2008 Invasive Alien Species (IAS) Funding

⁴ See e.g. Invasive Species Act SO 2015.

 ⁵ See e.g. Natural Resources Canada. Law and Regulations. Available at: <u>https://www.exoticpests.gc.ca/regulations.</u>
⁶ See e.g. Invasive Species Centre. 2015. What we do. Available at: <u>http://www.invasivespeciescentre.ca/SitePages/WhatWeDo.aspx;</u> Alberta Invasive Species Council. Resources. Available at: https://www.abinvasives.ca/resources; Ontario Federation of Anglers and Hunters and Ontario Ministry of Natural Resources. Invading Species Awareness Program. Available at: http://www.invadingspecies.com/; Ontario Ministry of Natural Resources. 2012. Ontario invasive Species Strategic Plan. Ontario Ministry of Natural Resources: Peterborough.

⁷ See Natural Resources Canada. Law and Regulations. Available at: <u>https://www.exoticpests.gc.ca/regulations.</u> ⁸ Ibid.



Agency	Policy	Statutes	Regulations	Implementation
Fisheries and Oceans Canada	Biodiversity Strategy 1994 Invasive Alien Species Strategy for Canada 2004	Canada Shipping Act SC 2001 Fisheries Act SC 1985 Oceans Act SC 1996 Pest Control Products Act SC 2002 Species at Risk Act SC 2002	Fishery Regulations, SOR 1993 Ballast Water Control and Management Regulations SOR 2011 Aquatic Invasive Species Regulations SOR 2015 List of Pests Regulated under the Plant Protection Act 1990	Biodiversity Outcomes Framework Sustainable Development Strategy Management Framework 2013-2016 National Framework for Species at Risk Conservation Invasive Alien Species (IAS) funding streams Species at Risk funding programs National Code on Introductions and Transfers of Aquatic Organisms 2013
Agriculture and Agri- Food Canada	Sustainable Development Strategy for Canada 2013-2016 Invasive Alien Species Strategy for Canada 2004 Growing Forward 2 2013-2018	Federal Sustainable Development Act SC 2008 Health of Animals Act SC 1990 Plant Protection Act SC 1990	Plant Protection Regulations, SOR 1995 List of Pests Regulated under the Plant Protection Act 1990	Action Plan for Invasive Alien Terrestrial Plants and Plant Pests 2008 Sustainable Development Strategy Management Framework 2013-2016 AgriRisk funding initiatives Invasive Alien Species (IAS) funding
Parks Canada	Invasive Alien Species Strategy for Canada 2004	Canada National Parks Act SC 2000	National Parks and Wildlife Regulations SOR 1982	Integrated Pest Management Plan ⁹
Health Canada	Invasive Alien Species Strategy for Canada 2004	Pest Control Products Act SC 2002	Pest Control Products Regulation SOR 2006	Pest Management Regulatory Agency Pest Management Advisory Council Pesticide Product Information Database
Canada Border Services Agency	Invasive Alien Species Strategy for Canada 2004	Canada Shipping Act SC 2001 Canadian Environment Protection Act SC	New Substances Notification Regulations (Organisms) SOR 2005	Animal Health Import Requirements for Rendered and Inedible Products Directive Export requirements

⁹ Parks Canada has adopted a non-native plant control program called integrated pest management. The goal of this program is to prevent the introduction of non-native plants, and to eliminate or control them, and where practical, to maintain native plant and animal diversity.



Agency	Policy	Statutes	Regulations	Implementation
		1999 Department of Agriculture and Agri- Food Act RSC 1985	Health of Animals Regulations CRC 2015	applicable to all commodities Import requirements applicable to all
		Fisheries Act RSC 1985		<u>commodities</u> <u>Risk management</u>
		Health of Animals Act SC 1990		<u>documents</u>
		Pest Control Products Act SC 2002		
		Plant Protection Act SC 1990		
		Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act SC 1992		



New Zealand

Amendments to the Biosecurity Act 1993 in 2012 aimed to introduce an integrated system of management to ensure protection capabilities across government, local council, industry and community.¹⁰ The amendments created strategic interventions to address risks before entry to New Zealand, and positioned border protection as a key element of invasive species management.¹¹ They also identified a framework for agencies, industries and individuals to collectively manage risks and responsibilities.¹² The Ministry for Primary Industries is the lead agency for biosecurity in New Zealand, administering legislation that covers agriculture, forestry, biosecurity, fisheries and food. Other departments become involved in responses that affect their responsibilities.¹³

In 2015, the Minister for Primary Industries announced the Biosecurity 2025 project "to review and future-proof New Zealand's biosecurity system" and "ensure New Zealand's world-class biosecurity system remains resilient and can adapt to increasing" biosecurity risks, pressures and opportunities. The Ministry for Primary Industries is now leading a collaborative process to develop the Biosecurity 2025 Direction Statement. The Statement will cover system expectations and priority actions, and replace the 2003 Biosecurity Strategy.¹⁴

Agency	Policy	Statutes	Regulations	Implementation
Ministry for Primary Industries	Biosecurity Strategy 2003 National Policy Direction For Pest Management 2015 Policy for MPIs Response to Risk Organisms 2008	Animal Products Act 1999 Animal Welfare Act 1999 Biosecurity (Border Processing - Trade Single Window) Amendment Act 2014 Biosecurity Act 1993 Fisheries Acts 1996 Hazardous Substances and New Organisms Act 1996 Maritime Transport Act 1994 National Animal Identification and Tracing Act 2012	Various biosecurity regulations Biosecurity (Notifiable Organisms) Order 2010 National Animal Identification and Tracing (Infringement Offences) Regulations 2012 National Animal Identification and Tracing	Pest Management National Plan of Action 2011 Guidelines for Meeting the Requirements of the National Policy Direction for Pest Management 2015 National Pest Plant Accord Government Industry Agreement for Biosecurity Readiness and Response (GIA) National Biosecurity Response System Marine Biosecurity

Table 2: Snapshot of legal and institutional arrangements for invasive species New
Zealand

¹⁰ Ministry for Primary Industries. 2016. *Biosecurity*. Available at: <u>http://mpi.govt.nz/law-and-policy/legal-</u> overviews/biosecurity/

Biosecurity Council. 2003. Protect New Zealand: The Biosecurity Strategy for New Zealand. Government of New Zealand: Wellington. ¹² Ibid p. 7.

¹³ Ministry for Primary Industries. 2016. *Biosecurity*. Available at: <u>http://mpi.govt.nz/law-and-policy/legal-</u> overviews/biosecurity/. ¹⁴ Ministry for Primary Industry. 2016. *Biosecurity* 2025. Available at: <u>http://mpi.govt.nz/law-and-policy/legal-</u>

overviews/biosecurity/biosecurity-2025/.



Agency	Policy	Statutes	Regulations	Implementation
		Plants Act 1970	(Obligations and Exemptions) Regulations 2012	PartnershipsPest ManagementGroupNational InterestPests Responses(NIPR)Pest DetectiveNational AnimalIdentification andTracing
Environmental Protection Authority	Biosecurity Strategy 2003	Hazardous Substances and New Organisms Act 1996	Various hazardous substances regulations	Implements environmental laws, including hazardous substance laws
Department of Conservation	Biosecurity Strategy 2003 National Policy Direction For Pest Management 2015 Conservation General Policy 2005	Animal Welfare Act 1999 Biosecurity Act 1993 Conservation Act 1987 Fisheries Act 1996 Hazardous Substances and New Organisms Act 1996 Noxious Fish (Freshwater Fish Regulations 1983) Unwanted Organisms (Biosecurity Act 1993) Wild Animal Control Act 1977	<u>Various</u> <u>biosecurity</u> <u>regulations</u>	Conservation management plans and strategiesWild animal control plansNew Zealand Invasive Fish Management Handbook 2015Pest Detective reporting systemGame Animal CouncilFish and game councils
Regional and local councils	Biosecurity Strategy 2003 National Policy Direction For Pest Management 2015	Biosecurity Act 1993 Resource Management Act 1991	None identified	Pest Management National Plan of Action 2011 Various pest management plans and strategies ¹⁵

¹⁵ See e.g. Waikato Regional Council. 2014. *Regional Pest Management Plan (RPMP) 2014-2024*. Waikato Regional Council: Waikato; Auckland Council. 2016. *Regional Pest Management Strategy*. Available at: http://www.aucklandcouncil.govt.nz/EN/environmentwaste/biosecurity/Pages/regionalpestmanagementstrategy.as



United States

Executive Order 13112 (Feb 1999) defines invasive species as, "An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health". It directs all federal agencies to address invasive species concerns and refrain from actions likely to increase invasive species problems. It requires a National Invasive Species Council and National Invasive Species Management Plan, to better coordinate federal efforts.

Executive Order 13112 mandates a risk-based approach; it requires consideration of the likelihood that an invasive species will establish and spread and the degree of harm it could cause. The National Invasive Species Council is a group of federal agency representatives charged with coordinating invasive species action at the federal level, developing the National Invasive Species Management Plan and encouraging state-level action towards national goals. The most recent National Plan concluded in 2012. It is possible that an up-to-date plan has been held up by budget constraints and disputes.

A 2005 review of the operation of Executive Order 13112 found that the task of coordinating an effective government-wide response in the United States was complex. There were over 40 agencies and 25 federal laws governing invasive species, and hundreds of non-federal programs and groups involved in invasive species management.¹⁶

Agency	Policy	Statutes	Regulations	Implementation
<u>National</u> <u>Invasive Species</u> <u>Council</u>	Executive Order 13112 (1999)	None identified	None identified	National Invasive SpeciesManagement Plan 2008-1012General Guidelines forthe Establishment &Evaluation of InvasiveSpecies Early Detection& Rapid ResponseSystems 2003Guidelines for RankingInvasive Species ControlProjects 2005National Invasive SpeciesInformation CenterInvasive Species AdvisoryCommitteeState boards, agenciesand programs ¹⁷

Table 3: Snapshot of legal and institutional arrangements for invasive species in theUnited States

¹⁶ National Invasive Species Council. 2005. *Five-Year Review of Executive Order 13112 on Invasive Species*. Department of the Interior: Washington DC. p 21.

Species NYIS.INFO. 2016. ŃYS Invasive Committee. See e.g. Advisory Available at: http://nyis.info/?action=state_advisory; Minnesota Department of Agriculture. 2014. Welcome to the Minnesota Invasive Species Advisory Council. Available at: http://www.mda.state.mn.us/misac/; http://www.iscc.ca.gov/cisac.html; Invasive Species Council of California. 2014. California Invasive Species Advisory Committee. Available at: http://www.iscc.ca.gov/index.html.



Agency	Policy	Statutes	Regulations	Implementation
Department of Agriculture (including Border Protection, Forest Services and the Animal and Plant Health Inspection Service)	Executive Order 13112 (1999) Forest Service National Strategic Framework for Invasive Species Management 2013	Animal Damage Control Act 1931 Farm Security and Rural Investment Act 2002 Federal Noxious Weed Act 1974 Federal Seed Act 1940 Hawaii Tropical Forest Recovery Act 1992 National Environmental Policy Act 1970 National Plan for Control and Management of Sudden Oak Death 2004 Noxious Weed Control and Eradication Act 2004 Organic Act 1944 Plant Protection Act 2000 Public Health Security and Bioterrorism Preparedness and Response Act 2002 Public Lands Corps Healthy Forests Restoration Act 2005	42 CFR Part 73 7 CFR Part 331 9 CFR Part 121	Forest Service: A Dynamic Invasive Species Research Vision: Opportunities and Priorities 2009-2029National Plan for Control and Management of Sudden Oak Death 2004Final Environmental Impact Statement evaluating Alternatives for Reducing damage and Risks to Agriculture from Feral SwineAnimal and Plant Health Inspection Service manuals and guidesAnimal and Plant Health Inspection ServiceWestern Wildland Environmental Threat Assessment CenterEastern Forest Environmental Threat Assessment CenterInvasive Species ProgramFunding for Invasive Species programs and research
Department of the Interior, Fish and Wildlife Service	Executive Order 13112 (1999)	Alien Species Prevention and Enforcement Act 1992 Asian Carp Prevention and Control Act 2010 Brown Tree Snake Control and Eradication Act 2004 Endangered Species Act 1973 Great Lakes Fish and Wildlife Restoration Act of 2006	<u>Various</u> <u>federal and</u> <u>state</u> <u>regulations</u>	Aquatic Nuisance Species(ANS) Task ForceFederal InteragencyCommittee for theManagement of Noxiousand Exotic WeedsFederal InteragencyCommittee on InvasiveTerrestrial Animals andPathogensNonindigenous AquaticSpecies (NAS) Databaseand its associated AlertSystemANS Task Force Strategic



Agency	Policy	Statutes	Regulations	Implementation
		Lacey Act, 18 USC 42, 1900 National Environmental Policy Act 1970		Plan 2013-2017 State ANS Management Plans Funds invasive species programs and research
		Aquatic Nuisance Prevention and Control Act 1990		Various state departments, agencies and programs
		Non-indigenous Aquatic Nuisance Prevention and Control Act 1990		
		Salt Cedar and Russian Olive Control Demonstration Act 2006		
		Water Resources Development Act 1999		
		Wild Bird Conservation Act 1992		
Environmental Protection Agency	Executive Order 13112 (1999)	Clean Boating Act of 2008 Federal Insecticide, Fungicide, and	None identified	Pesticide Registration system Pesticide Registration manual
		Nonindigenous Aquatic Nuisance Prevention and Control Act 1990		
Department of Defence ¹⁸	Executive Order 13112 (1999)	National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2008	<u>Various</u> <u>related</u> <u>regulations</u>	Commanders Guide on Invasive Species Armed Forces Pest Management Board
		Non-indigenous Aquatic Nuisance Prevention and Control Act 1990		Funds invasive species programs and research
		Water Resources Development Act of 2007		

¹⁸ Responsible for protecting the natural resources on military lands.



Great Britain

The Invasive Non-Native Species Strategy 2015 promotes a coordinated approach to invasive species management in Great Britain, and a parallel exercise is underway in Ireland. Implementation of the Strategy is through the Non-native Species Coordinating Mechanism, which consists of a Programme Board, Secretariat, Risk Analysis Panel, Stakeholder Forum and Working Groups. The Programme Board and key stakeholders interact via working groups and an annual stakeholder forum.¹⁹

Responsibilities are spread across government agencies and stakeholders (such as landholders and farmers). In England and Wales, responsibility for dealing with invasive weeds rests with individual landowners. Strategic, widespread control is currently not the sole responsibility of any statutory organisation.

In 2015, the European Union adopted a coordinated approach to invasive species legislation through the Invasive Alien Species Regulation (EC 1143/2014). The Great Britain approach follows this Directive. It appears integrated, with flexible provisions for each country linked through a centralised institutional structure (the Secretariat).²⁰

Agency	Policy	Statutes	Regulations	Implementation
<u>GB Non-native</u> <u>Species</u> <u>Secretariat</u> Various departments in England, Wales and Scotland	Invasive Alien Species Regulation (EC 1143/2014) Marine Strategy Framework Directive (2008/56/EC) <u>Great Britain</u> <u>Invasive Non- native Species</u> <u>Strategy 2015</u>	Anti-social Behaviour, Crime and Policing Act 2014 (UK) ²¹ Bees Act 1980 (UK) Countryside and Rights of Way Act 2000 (UK) Dangerous Wild Animals Act 1976 (UK) Destructive Imported Animals Act 1932 (England and Wales) Environmental Protection Act 1990 (UK)	Environmental Protection (Duty of Care) Regulations 1991 Plant Health (England) Order 2005 Plant Health (Forestry) Order (2005) Plant Health (Scotland) Order (2005) Plant Health (Wales) Order 2006	Flatworm Code of Practice Horticultural Code of Practice Species on Schedule 9, Wildlife and Countryside Act Guidance on section 14 of the Wildlife and Countryside Act Knotweed Code of Practice Non-native Species Information Portal Campaigns to raise awareness of freshwater issues ²²

Table 4: Snapshot of legal and institutional arrangements for invasive species in GreatBritain

¹⁹ Great Britain Non-native Species Secretariat. 2016. *GB Co-ordination*. Available at: http://www.nonnativespecies.org/index.cfm?sectionid=22

²⁰ See Great Britain Non-native Species Secretariat. 2015. *Great Britain Invasive Non-native Species Strategy*. UK Government: London.

²¹ This enables community protection notices to be served by local authorities or the police against individuals who are acting unreasonably or who persistently act in a way that has a detrimental effect on the quality of life of those in the locality. These powers are designed to be flexible and could be used to address specific problems caused by widespread species, such as Japanese knotweed.

²² See e.g. Great Britain Non-native Species Secretariat. 2016. *Be Plant Wise*. Available at: <u>http://www.nonnativespecies.org//beplantwise/index.cfm?</u>; GB Non-native Species Secretariat. 2016. *Help Stop the*



	Natural Environment and Rural Communities Act 2006 (England and Wales) Nature Conservation Act 2004 (Scotland)	Prohibition of Keeping of Live Fish (Crayfish) Order 1996 Prohibition of Keeping or Release of Live Fish (Specified Species) Order 1998	Local Action Groups tackling invasive species ²³ RAFTS (Rivers and Fisheries Trusts of Scotland) biosecurity project ²⁴
Plant He 1967 (Uk	Plant Health Act 1967 (UK)		
	Water Resources Act 1991 (UK) Weeds Act 1959 (UK) Wildlife and Countryside Act 1981 (UK)		
	Wildlife and Natural Environment (Scotland) Act 2011		

Discussion

Dwindling public investment in invasive species management is a theme evident in Australia and the above regions. There are, however, sharp differences in the handling of resourcing difficulties and uncertain responsibilities. A review of the arrangements noted above reveals a link between centralised, well-coordinated approaches and clearly defined implementation responsibilities.

The Canadian approach emphasises education and individual responsibility, as government moves away from funding a national approach. There is a degree of uncertainty about who coordinates what amongst the many different agencies involved in invasive species action, for example, there is uncertainty about which agency has responsibility to compile and maintain a register of invasive species.

The United States faces similar issues, where a central council presides over a National Plan that expired in 2012. Political wrangling creates uncertainty about the drafting of a new Plan. Other agencies at federal and state levels also have responsibilities, and there are many relevant laws at both levels. A possible consequence of the multiplicity of laws and agencies is the fragmentation of invasive species management. This may lead to ineffectiveness.

New Zealand and Great Britain have integrated systems coordinated by a central body with government and stakeholder involvement. In New Zealand, there are clear roles for different levels of government, risk management pathways for individual species, and strong statutory supports in the form of strict liability offences, duties, and good neighbour rules. In Great Britain, implementation of the National Non-native Species Strategy is overseen by a national

Spread of Invasive Plants and Animals in British Waters. Available at: http://www.nonnativespecies.org//checkcleandry/index.cfm?

²³ See Great Britain Non-native Species Secretariat. 2015. *Great Britain Invasive Non-native Species Strategy*. UK Government: London. p 18.



board and supported by a national secretariat, technical panel and stakeholder forums. This body provides for the coordinated implementation of resources, including species identification information, risk analyses, action plans and alerts.





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