

NATIONAL FERAL PIG

ACTION PLAN:

2021 - 2031

ACKNOWLEDGEMENTS



Image by Nic Perkins, supplied by the Centre for Invasive Species Solutions

National Feral Pig Action Plan: 2021-2031

The National Feral Pig Action Plan was written in consultation with the National Feral Pig Action Plan Steering Group members, independently chaired by John Maher. Thanks are extended to each of the Steering Group members for their time, energy, expertise and enthusiasm to participate in meetings and provide comments on the drafts of the National Feral Pig Action Plan. Particular thanks are extended to those members of the Steering Group who were involved in the writing sub-group for their direction, guidance and advice provided.

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The Traditional Owners of the land, sea and waters that we live and work on across Australia are acknowledged. We recognise their input into this Plan, continuing connection to their culture, and we pay our respects to their Elders past, present and emerging.

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ABOUT THE PLAN

The National Feral Pig Action Plan (the Plan) has been developed in response to the significant threat that feral pig populations impose on Australia's environmental, agricultural, cultural and social assets.

Driven by the increasing damage to the Australian landscape from feral pigs, and the extensive risks they pose in disease transmission, the Plan provides the national framework to reduce their many impacts.

The overarching aim of the Plan is to lead and support all land managers (public and private) to work to more effectively manage feral pigs and reduce their impacts.

The Plan seeks to do this through the delivery of effective, coordinated, sustained and humane best practice management to suppress, or eradicate (where feasible), feral pig populations to protect assets. The Plan and its actions are designed to increase the effectiveness of current and new management activities, use of resources, tools and systems, and provide the platform to transform investment models for the long term.

VISION

Actively suppress, or eradicate, Australian feral pig populations to reduce their impacts on environmental, agricultural, cultural and social assets.

MISSION

Guide and support all land managers to deliver effective, coordinated, sustained and humane best practice management of feral pigs.



Image by: Brian Boyle, supplied by the Centre for Invasive Species Solutions

EXECUTIVE SUMMARY

Feral pigs (*Sus scrofa*) are a major pest and significant threat to Australia's environment, cultural sites, and its \$65 billion agricultural industry¹. This is due to their destruction of crops, infrastructure, habitat, land and water sources, ability to spread weeds and diseases, predation of livestock and impacts on biodiversity.

Approximately 45 per cent of Australia's land mass is inhabited by feral pigs². Damage (including infrastructure costs) caused by feral pigs to Australia's agricultural industry is at least \$100 million per annum³. Additionally, feral pigs cause serious environmental damage to ecosystems, biodiversity, habitats, culturally important sites and social assets, although these have not been quantified. The total yearly expenditure on feral pig management by private landholders (agricultural establishments) has been estimated at \$47.7 million (uncertainty in the estimate means that the actual value is likely to be between 39.4 to \$64.3 million)⁴. These estimates exclude costs from production losses due to feral pig impacts.

Feral pigs pose biosecurity and disease risks to Australia. An incursion of foot and mouth disease would cost in excess of \$50 billion to Australian agriculture⁵ as well as greatly impact on Australia's clean and healthy image. The introduction of African swine fever into Australia could cost more than \$2 billion to the Australian pork industry alone⁶. Feral pigs are also implicated in the soil-borne fungal transmission of Panama disease tropical race 4 in Queensland, which could decimate the Australian banana industry if it became widespread.

Feral pigs are difficult, time-consuming and costly to manage because of their intelligence, adaptiveness, reproductive capacity and mobility in the landscape. Coordinated actions by private and public land managers through well-managed programs are needed to protect assets and maintain suppression of feral pig populations.

Currently, very few feral pig management programs are conducted at a landscape scale that are supported by best practice management tools and science-based information. Because of this, feral pigs continue to cause widespread impacts in many regions across Australia, populations are increasing (depending on seasonal conditions) and/or are spreading into new areas.

For land managers, the Plan builds on the many control programs underway. It aims to improve the effectiveness of feral pig best practice management, and better coordinate private and public investment and resources by supporting land managers to work together in local groups at a landscape scale. Issues including long term investment and resourcing, and trust between all land managers to share intelligence and data for planning, monitoring, and reporting purposes are also addressed.

¹ ABARES (2020). *Agricultural overview: December quarter 2020*.

<https://www.agriculture.gov.au/abares/research-topics/agricultural-outlook/agriculture-over-view>. Accessed on 18 December 2020

² West, P. (2008). *Assessing Invasive Animals in Australia 2008*. National Land & Water Resources Audit and Invasive Animals CRC, Canberra.

³ Bomford M. and Hart, Q. (2002). *Non-indigenous vertebrates in Australia Chapter 3*. In *Biological Invasions: Economic and Environmental Costs of Alien Plant, Animal and Microbe* pp. 25–44

⁴ ABARES (in review). *Preliminary estimates. Private agricultural landholder expenditure on feral pig management. 2019 National Pest Animal and Weed Landholder Management Survey*.

⁵ Buetre, B., Wicks, S., Kruger, H., Millist, N., Yainshet, A., Garner, G., Duncan, A., Abdalla, A., Trestrail, C., Hatt, M., Thompson, L.J. and Symes, M. (2013). *Potential socio economic impacts of an outbreak of foot and mouth disease in Australia*, ABARES research report, Canberra, September CC BY 3.0.

⁶ ACLL Allen Consulting (2019). *Analysis of African swine fever incursion in Australia*. Prepared for Australian Pork Limited. August 2019.

Available at: <http://australianpork.com.au/wp-content/uploads/2019/11/African-Swine-Fever-Final-Report-140819.pdf>

The Plan will deliver on its vision by:

- Delivering long-term suppression (or eradication, where deemed feasible) of feral pig populations and their impacts;
- Establishing a network of regional coordinators to work with community groups and land managers to deliver best practice management actions;
- Building capacity and capability of community-led groups to deliver best practice feral pig management programs;
- Developing and implementing communication strategies to support the execution of the Plan;
- Identifying, improving and promoting existing and new strategies and technologies to improve the effectiveness of control programs;
- Enabling the collection and use of data to inform management decisions and measure program success;
- Supporting the development of standard reporting templates for funded programs; and
- Supporting the use of local management plans by land managers to monitor, measure and report progress, adapt programs and inform ongoing actions.



Image by Nic Perkins, supplied by the Centre for Invasive Species Solutions

Framework of the Plan



1. **Effective leadership, coordinated partnerships and strong governance**

National coordination and promotion of humane, integrated best practice management and monitoring techniques for feral pigs and their impacts.



2. **Community engagement and education**

Building community awareness of impacts from feral pigs and increasing the capacity and capability of land managers to apply humane, best practice management through education and training.



3. **Effective methods and systems**

Supporting land managers to effectively plan and apply best practice feral pig management through the adoption of existing and new methods, resources, technologies and systems. New sustainable investment models to support and incentivise long term actions will be explored.

Expected outcomes:

- National coordination of strategic feral pig management approaches applied by land managers at a local and regional level that will lead to long term suppression, or eradication (where feasible), of feral pig populations, and protection of threatened assets;
- Cohesive, collaborative, and coordinated partnerships between stakeholders;
- Increased land manager capacity and capability to apply adaptive management principles using best practice management techniques, in accordance with the Model code of practice for the humane control of feral pigs and endorsed standard operating procedures;
- Effective delivery of new approaches, resources, data management and science- based knowledge to stakeholders; and
- Sustained action and investment over the long term.

The execution of the Plan will be overseen by an Implementation Committee comprised of key stakeholder representatives.

SUMMARY OF GOALS, OBJECTIVES & ACTIONS

GOAL	Provide leadership and strategic coordination for sustained feral pig management
OBJECTIVE	Provide national leadership, governance and co-ordination
ACTIONS	<p>Ensure the Plan's Implementation Committee provides leadership and strategic coordination, with clear governance structures and responsibilities in place</p> <p>Ensure national consistency in humane, best practice feral pig management</p> <p>Ensure linkages with the national Threat Abatement Plan</p>
OBJECTIVE	Drive collaborative, co-ordinated and informed approaches to feral pig management
ACTIONS	<p>Ensure strategic, adaptive and humane feral pest management at a local, regional and national level</p> <p>Collaborate with partners to improve co-ordination, decision making, and reporting of adaptive approaches, actions and outcomes</p> <p>Develop trusted systems, structures and networks to enable and support co-ordinated regional-scale planning and land manager engagement</p> <p>Establish a coordinator network to support management groups</p>
OBJECTIVE	Implement processes and measures to objectively monitor, evaluate and improve the Plan to ensure longevity beyond 2031
ACTIONS	<p>Monitor and evaluate the implementation of the Plan</p> <p>Provide an annual performance report to NFPAP stakeholders</p> <p>Conduct a half-term (5th year) and full-term (10th year) review of the Plan</p>
GOAL	Build community awareness of impacts caused by feral pigs and enhance capacity and capability of all land managers to apply humane, best practice management
OBJECTIVE	Build community and land manager awareness of feral pig impacts and humane best practice feral pig management
ACTIONS	Implement a communication and engagement strategy on feral pig impacts and best practice management
OBJECTIVE	Strengthen land manager capacity and capability to effectively apply humane feral pig best practice management
ACTIONS	<p>Implement nationally recognised and accredited training programs for feral pig best practice management</p> <p>Review current training, and develop training and extension materials in best practice feral pig management</p>
GOAL	Increase the adoption of best practice methods and systems
OBJECTIVE	Improve best practice feral pig management methodologies, tools and systems
ACTIONS	<p>Ensure feral pig management resources are consistent, updated and incorporate new approaches and technologies</p> <p>Improve measures and systems to inform feral pig management activities and outcomes by land managers</p> <p>Develop strategic RD&E opportunities to inform actions</p> <p>Ensure long term investment through new innovative approaches</p>
OBJECTIVE	Drive collaborative, strategic and scientific approaches to humane best practice feral pig management to suppress, or eradicate, feral pig populations and minimise threats
ACTIONS	<p>Support existing and implement new collaborative and coordinated feral pig management activities</p> <p>Ensure adoption of existing and new feral pig management and monitoring technologies by land managers</p> <p>Develop strategic approaches to deliver active suppression, or eradication, of feral pig populations</p>
OBJECTIVE	Ensure adoption of best practice in management plans
ACTIONS	Develop national minimum guidelines for feral pig management plans and templates to promote consistency at local, regional and state/territory levels



GPS-collared feral pig; Image supplied by NSW Department of Primary Industries

Innovative approaches identified

Active investigation of innovative approaches that support long term investment into feral pig management, and incentivise actions by land managers, to protect assets from feral pigs is a key action within Goal 3 of this Plan. The strategic, innovative approaches identified by stakeholders, and as part of the gap analysis, to support delivery of the Plan's bold vision are presented below.

The costs, benefits and feasibility of these ideas, and others as they are identified, should be thoroughly examined as the Plan is implemented.

- Develop and implement a biodiversity stewardship fund that enables sustained action and investment in vertebrate pest management (comparable to those in place for savanna fire management) using a phased approach (i.e. northern Australia; ii. agricultural systems).
- Develop and implement a tripartite, long term investment program for vertebrate pest management between the private sector/ industry, state and territory governments and Commonwealth government.
- Investigate feasibility of regional coordinated zoning plans to eradicate feral pigs (and other vertebrate pests) at a landscape scale.
- Create new economic and employment opportunities for local communities through co-development of solutions to manage feral pigs.
- Modelling of potential impacts of climate change on habitat suitability, geographical locations, population dynamics of feral pigs and impacts on assets to be protected.
- Actively deter trespass and unauthorised hunting in conjunction with jurisdictions and law enforcement agencies.

The Plan is in line with:

- The National Threat Abatement Plan (TAP) for predation, habitat degradation, competition and disease transmission by feral pigs (2017)⁷ – created in response to feral pigs being recognised as a key threat under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) (EPBC Act). The TAP identified 148 species of threatened flora and fauna and eight threatened ecological communities at the national level as being adversely affected by feral pigs.
- The EPBC Act provides a national legal framework to ‘protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places’.
- State and territory legislation and strategies (Appendix 2).
- The Australian Pest Animal Strategy (2017- 2027)⁸ – a key national strategy that provides overarching guidance on effective best practice management of introduced vertebrate pests by using a coordinated approach by land managers across a range of land tenures to protect priority assets.
- The Model code of practice for humane control of feral pigs⁹ and Standard Operating Procedures (available via the PestSmart website) are points of reference for all feral pig management activities. The Plan acknowledges that animal welfare and the safe, efficient and consistent application of humane best practice control methods are fundamental in all management actions undertaken, regardless of the nature or scale of the land tenancy.



Wetland damage in the Hinchinbrook Shire from feral pig activity. Image supplied by Lawrence di Bella, Herbert Cane Productivity Services

⁷ Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (2017), Commonwealth of Australia, 2017.

⁸ Australian Pest Animal Strategy 2017 to 2027, Invasive Plants and Animals Committee 2016, Australian Government Department of Agriculture and Water Resources, Canberra.

⁹ Sharp, T., and Saunders, G. (2012). Model code of practice for the humane control of feral pigs. Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT, Australia. Available at: <https://pestsmart.org.au/toolkit-resource/code-of-practice-feral-pigs/>

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I. INTRODUCTION

I.1 Definition of feral pig

Feral pigs are un-owned pigs that live in the wild and are descended from domesticated pigs of the species *Sus scrofa*, family Suidae.

Feral pigs are a declared pest in all states and territories of Australia. It is the responsibility of all managers of land (encompassing Commonwealth, state and territory governments, local government, Indigenous communities and private landholders) to comply with legislative requirements to control feral pigs and minimise the biosecurity risks that they present¹⁰.

I.2 Defining the issue

First introduced into Australia in the late 1700s, feral pigs are now widespread in areas where there is dense vegetative cover, food and permanent water sources. Typically, they are found in mountainous forests, swamps and reed bed marshes, open floodplains, semi-arid floodplains, dry woodlands, open shrubby heathlands and grasslands¹¹, using rivers and floodplains as major migration routes¹².

Australia's sheepmeat, wool, beef, pork, horticulture, sugar, banana, cotton, cereal and pulse industries, as well as the infrastructure associated with these enterprises, are impacted by feral pigs. They destroy land, crops, pastures and water sources, threaten biosecurity through the spread of weeds and transmission of diseases to livestock, plants and humans; and prey on livestock. They also threaten the natural environment, biodiversity, culturally important Indigenous sites and social assets through the loss of native flora and fauna, damage to and contamination of water sources, competition for feed with native animals, native fauna habitat destruction, disease transmission, and land degradation¹³.

Feral pigs do have some positive values, including being a food and cultural resource for Indigenous communities¹⁴, supplying market demand for wild boar products, primarily in Europe¹⁵, and as game for recreational shooters¹⁶. These positive aspects are confounded by declining export demand for Australian wild boar¹⁷, logistical challenges impacting on its viability, and that recreational hunting pursuits are generally not related to population control¹⁸.

The distribution of feral pigs can be extended by illegal movement/translocation of pigs which can disrupt local pig control efforts by land managers¹⁹. Threats and impacts to regions where feral pigs are an emerging issue or where incursions occur in response to seasonal conditions also need to be considered. It is imperative that incursion prevention strategies are developed for these areas to support land managers, jurisdictions and other stakeholders.

¹⁰ Bengsen, A.J., Gentle, M.N., Mitchell, J.L., Pearson, H.E., and Saunders, G.R. (2014). Impacts and management of wild pigs *Sus scrofa* in Australia. *Mammal Review*, 44, 135-147.

¹¹ Choquenot, D., Malloy, J. and Korn, T. (1995) *Managing vertebrate pests: feral pigs*. Bureau of Resource Sciences, Canberra ACT, Australia. Available online at: <http://www.pestsmart.org.au/wp-content/uploads/2010/03/Managing-vertebrate-pests-feral-pigs.pdf>.

¹² Cowled, B. D., Aldenhoven, J. A., Odeh, I. O. A., Garrett, T., Moran, C., and Lapidge, S. (2008). Feral pig population structuring in the rangelands of eastern Australia: applications for designing adaptive management units. *Conservation Genetics* 9, 211–224

¹³ Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (2017) – Background Document. Commonwealth of Australia.

¹⁴ Koichi, K., Sangha, K. K., Cottrell, A., and Gordon, I. J. (2013). Aboriginal rangers' perspectives on feral pigs: are they a pest or a resource? A case study in the Wet Tropics World Heritage Area of northern Queensland. *Journal of Australian Indigenous Issues* 15:1-19.

¹⁵ Gentle, M., and Pople, A. 2013. Effectiveness of commercial harvesting in controlling feral-pig populations. *Wildlife Research* 40:459-469.

¹⁶ Meurk, C. S. (2011). *Loving nature, killing nature, and the crises of caring: An anthropological investigation of conflicts affecting feral pig management in Queensland, Australia*. Ph.D. Thesis, The University of Queensland, Brisbane, Queensland, Australia. pp. 229

¹⁷ Anon (2020). Feral pigs in Australia. Reported prepared for the National Feral Pig Action Plan by Australian Pork Limited, July 2020. Available at: <https://feralpigs.com.au/resources/>

¹⁸ Bell, J. (2016). *Shared problem, shared solutions - Statewide review of pest animal management*. Natural Resources Commission, NSW Government, Sydney NSW 2001.

¹⁹ Spencer, P. B. S., and Hampton, J. O. (2005). Illegal translocation and genetic structure of feral pigs in Western Australia. *The Journal of Wildlife Management* 69:377-384.

CASE STUDY A

The **Western Cape Turtle Threat Abatement Alliance** (WCTTAA) is a partnership of Indigenous land and sea owners and managers on the western coast of Cape York who work together to protect marine turtle populations, including the endangered olive ridley turtle (*Lepidochelys olivacea*) and vulnerable flatback turtle (*Natator depressus*). Over the past 40 years, feral pigs have been responsible for the predation of 70-90 per cent of nesting marine turtle nests in rookeries along western Cape York. The maximum allowable clutch loss required for population sustainability is 30%. Through funding from the Nest to Ocean Turtle Protection Program from 2013-2021, Indigenous rangers controlled predators preying on nesting sites on target beaches during peak turtle nesting season by using a range of best practice management methods. A 12 per cent predation rate of marine turtle nests was achieved on beaches managed by WCTTAA groups during the 2019 nesting season.

KEY OUTCOMES

- Monitoring systems are routinely used by Indigenous rangers to capture data on asset protection
- Protection of regional biodiversity, biosecurity threats, ecosystem function, Indigenous cultural values and agricultural productivity through activities of Indigenous rangers



Pompuuraaw Land and Sea Management Rangers placing a nest protection cage on a marine turtle nest to prevent predation. Photo supplied by Cape York NRM

1.2.1 Management of feral pigs

Feral pigs are highly mobile within their home ranges. A landscape-scale, nil tenure approach for their management is needed. In all states and territories, it is illegal to feed, transport, release or facilitate establishment or persistence of feral pig populations. Considering their high reproductive capacity, an annual knockdown rate of at least 70 per cent is needed to suppress population growth and prevent rapid population recovery¹⁵. This is difficult to achieve, particularly when the population densities in different regions are not well known.

Managing feral pigs is mentally and financially demanding on land managers due to the time, effort and money spent⁴ on their control – with these issues exacerbated by seasonal conditions. Increasingly, a diverse range of skills and information are needed by land managers to make evidence-based decisions. These include best practice management methods, technical monitoring skills, use of GPS equipment; data collection, analysis, management and communication; and, safe and effective use of firearms and toxins. Coordinated management groups can assist land managers to develop skills through training, mentoring and social support networks.

1.2.2 Distribution and abundance

Feral pig populations are widely distributed throughout northern and eastern Australia, with smaller feral pig populations present in Western Australia¹¹. In 1990, it was estimated that the average national population of feral pigs was 13.5 million, ranging from 3.5 to 23.5 million pigs, with a high proportion of these located in northern Australia²⁰. It should be noted that abundance and population density estimates have been recently updated, with these estimates needing to be interpreted cautiously²¹. This is because the majority of published studies available were from Queensland, New South Wales and the Northern Territory (with no data available for Victoria and South Australia where pigs have been reported¹).

Seasonal habitat suitability models for northern Australia at the regional scale are based on species ecology data and expert knowledge, informing programs to better manage impacts from feral pigs²². Feral pig distribution maps for Australia¹, New South Wales (2020)²³ and Queensland (2013-14)²⁴ (Figure 1) reflect the abundant and widespread distribution of feral pigs, particularly in far north Queensland.

The scope and extent of the problem needs to be defined and based on quantitative data, before any response to feral pig management can be considered¹¹. Management efforts need to use a risk-based approach focusing on areas with the highest likelihood of threats from feral pigs e.g. risk of disease entry into northern Australia.

²⁰ Hone, J. (1990). How many feral pigs in Australia? *Australian Wildlife Research*, 17, 571-572.

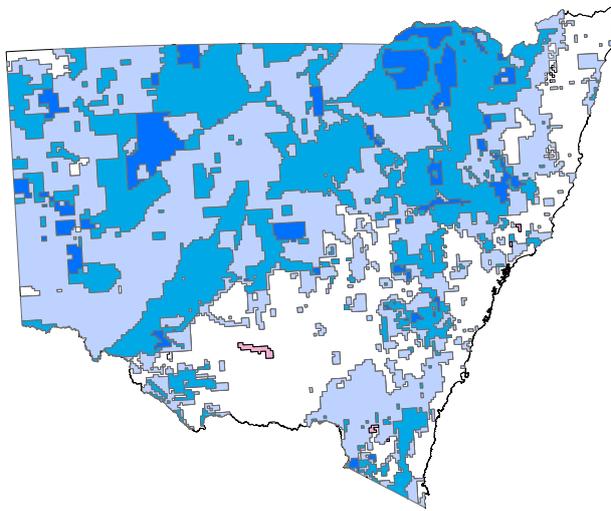
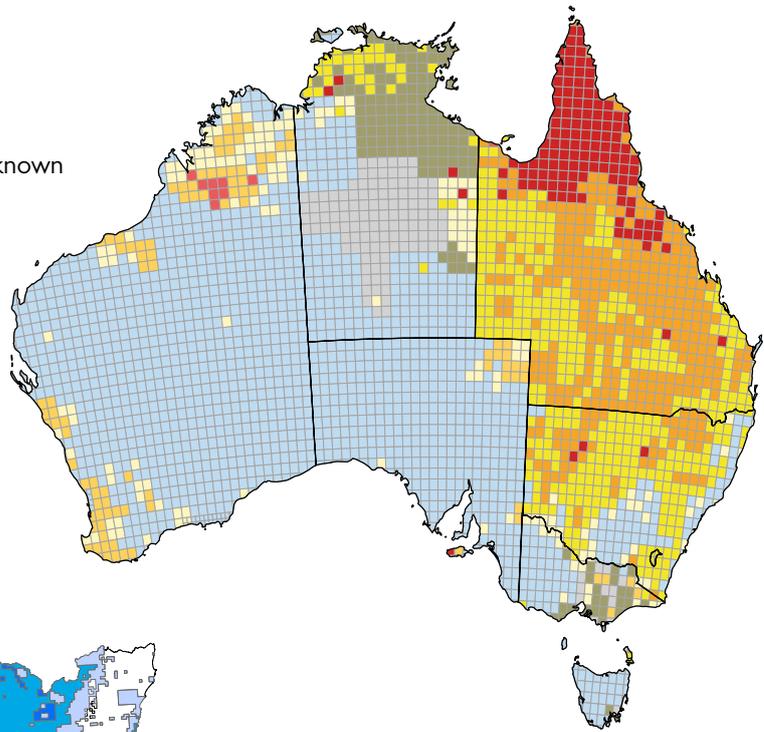
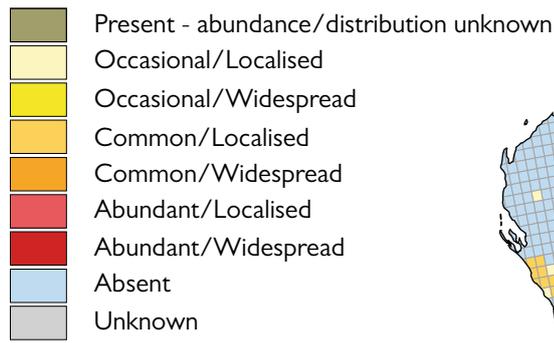
²¹ Hone, J. (2020). How many feral pigs in Australia? An update. *Australian Journal of Zoology*, <https://doi.org/10.1071/ZO20077>.

²² Froese, J. G., Smith, C. S., Durr, P. A., McAlpine, C. A., and van Klinken, R. D. (2017). Modelling seasonal habitat suitability for wide-ranging species: Invasive wild pigs in northern Australia. *PLOS ONE* 12(5):e0177018.

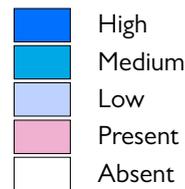
²³ NSW Department of Primary Industries (2020). Feral pig distribution and relative abundance map. Available online at: https://www.dpi.nsw.gov.au/file/0008/1266884/feral-pig-distribution-and-abundance-2020.pdf/data/assets/pdf_

²⁴ Queensland Department of Agriculture and Fisheries (2013-14). Pig Feral (*Sus scrofa*) Queensland distribution 2013-14. Available online at: https://www.daf.qld.gov.au/assets/pdf_file/0010/790354/Feral-pig_2013.pdf

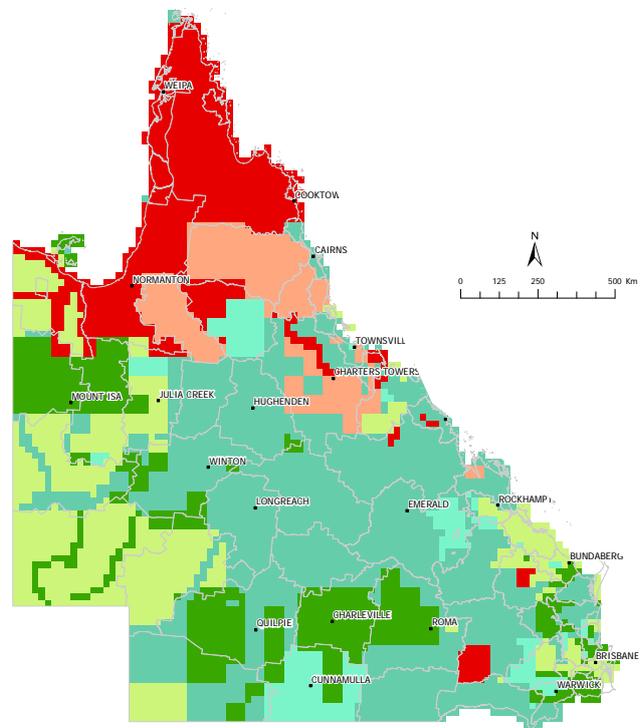
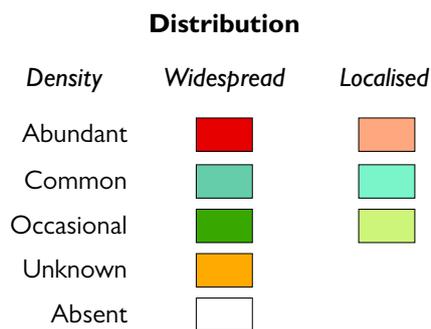
A. AUSTRALIA



B. NSW



C. QLD



Digital data supplied by the Queensland Departments of Agriculture and Fisheries; Natural Resources and Mines; Geoscience Australia. This map is for reference purposes only and the features depicted on it are approximate. Neither the Department, its officers or employees warrant or make any representations about the accuracy, completeness or reliability of this map. The Department, its officers and employees will not be held liable for any loss or damage suffered as a result of any use of, or reliance on, the map. This map must not be copied or reproduced in any form without the written consent of the Department.

Figure 1: Feral pig occurrence, distribution and abundance in A) Australia¹, B) New South Wales²³ (2020) and C) Queensland²⁴ (2013-14)

CASE STUDY B

Western Riverina Pig Project 2016-2019

This coordinated, multi-organisational and large-scale program managed by NSW Local Land Services was initiated in response to NSW Farmers' concerns of feral pig impacts. It covered 1.3 million hectares across 147 holdings (113 landholders) on private land, national parks and government- owned floodplains across a range of habitats. The baseline feral pig population was determined in 2016 via aerial infra-red thermal survey and repeated annually. This data was used to develop the strategy, identify target areas and evaluate the effectiveness of control activities on pig populations.

In 2017, satellite tracking was used to estimate populations ($n=21,535$) and their growth rates. Using an average population growth rate of 2.5, it was determined if an annual control program of $>16,000$ pigs (70 per cent of the population) was not put in place, the population would exceed two million feral pigs in five years. Aerial shoots in November 2018 and May/June 2019 reduced population density from 11 pigs/km² in 2017 to 0.6 pigs/km² in 2019. A total of 34,519 feral pigs were dispatched, with operating costs of \$1.37 million.

KEY OUTCOMES

- Collection of data informed control strategies and influenced behavioural change of land managers
- Recognised need for capacity building of land managers to carry out integrated and regular on-ground best management, using a combination of baiting, trapping and ground shooting in coordinated programs with neighbouring properties

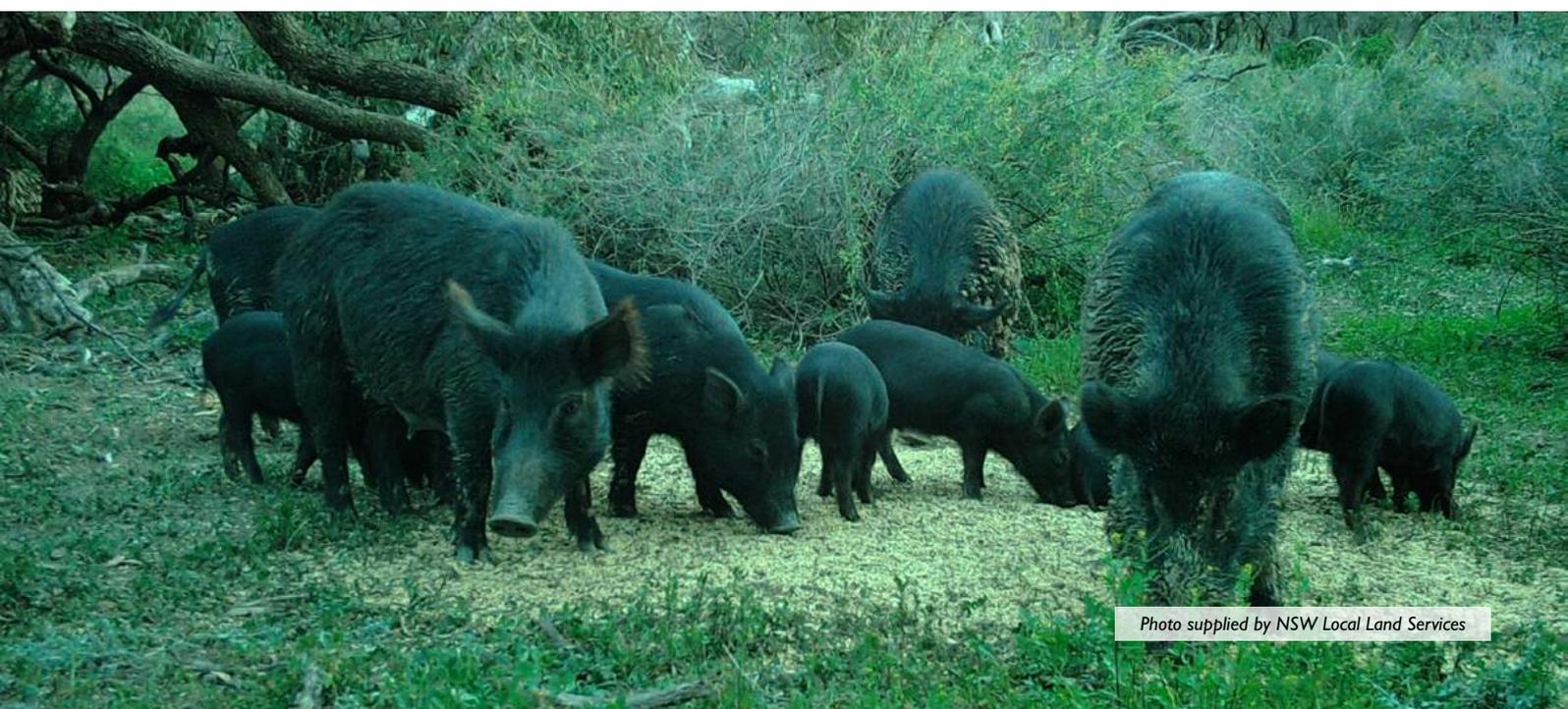


Photo supplied by NSW Local Land Services

1.2.3 Management strategies and decisions informed by data

Stakeholders reported that little effort is typically put into monitoring the impacts of their management activities on the assets they are trying to protect from feral pigs. It was also identified that land managers who do record data predominately record operational-based information, such as numbers of pigs killed, rather than outcome-based data (e.g. impact level, population density). For many externally funded management programs, the reporting of operational data has typically been requested by investors.

The usefulness of operational data to inform local control programs and strategies is limited if monitoring (before, during and after the management activity) has not been consistently conducted and knowledge of feral pig populations is limited. Capacity and capability building efforts on key aspects of effective monitoring is required. This is needed so that the information collected during management programs can be used to measure program success of applying adaptive management principles. For example, the management of established populations, as well as new incursions, can be informed by population modelling and the application of technologies such as camera traps and aerial surveillance.



Image by E McCrudden, supplied by the Centre for Invasive Species Solutions

CASE STUDY C

The Whitsunday Regional Council (WRC) is implementing funding models to enable pest management programs to be conducted without external funding support. In 2018-19, WRC introduced an aerial shooting program co-funding model with contributions from WRC, NQ Dry Tropics NRM, Reef Catchments NRM and land managers, with a fee of \$200 per property to participate in each aerial shooting program charged. In 2019-20, this program was expanded into the Isaac, Burdekin and Charters Towers Regional Council areas.

Landholders within each of the sixteen feral animal management areas in these council areas have been formed into syndicates, and managed by a local "champion" land manager. For the 2019-2020 year to 3 December 2019, 3,229 feral pigs were dispatched across 9,878km through 28 helicopter flights across 102 properties. A range of integrated strategies are used to manage pigs in different areas (e.g. under vegetative cover, gullies and creeks) and different agricultural enterprises.

WRC has also determined the impact of their feral pig control activities^{25,26}. Damage to agricultural production and the environment was estimated at \$590 and \$903 per feral pig per year, respectively. This indicates that aerial shooting is a feasible option as part of a feral pig management strategy until the cost per destroyed animal is greater than the cost of impacts.

KEY OUTCOMES

- A self-sustaining, community-led model is enabling stakeholders to work together to support land managers to cost-effectively fulfil their legislative obligations to control feral animal populations
- Local landholder support and involvement can be achieved through identifying, supporting and working with champion landholders



Image supplied by Whitsunday Regional Council

²⁵Hardy, S. and Fuller, B. (2017). Project report: A review of the feral animal control program in the Whitsunday Regional Council area from 2012-13 to 2016-17. Whitsunday Regional Council.

²⁶Synergies Economic Consulting (2020). Estimating the economic impact of feral pigs in the Whitsunday Regional Council. Synergies Economic Consulting Pty. Ltd.

2. CURRENT SITUATION AND GAP ANALYSIS

Effective feral pig management is achieved when key stakeholders accept and understand the damage caused by feral pigs, and they work together in a coordinated and collaborative fashion to rectify it. A wide range of cost-effective strategies and techniques are available to manage feral pigs, and it is essential that these continue to be refined through research and development initiatives. These outcomes will be provided and demonstrated to land managers to continuously improve their management actions.

Extensive consultation was undertaken to identify the strengths, weaknesses, opportunities and threats facing land managers in relation to feral pig best practice management. A gap analysis was conducted and outcomes were used to inform the development of the goals, objectives and actions of the Plan.

Strengths

- National Threat Abatement Plan for feral pigs provides overarching direction to NFPAP
- NFPAP shares underlying principles with the NWDAP (2020-2030) including cooperation, collaboration, and community-led partnerships between all land managers, applied on a landscape- scale, nil tenure basis to support the adoption of best practice pest management
- Biosecurity legislation in place driving shared responsibility of all land managers in the control of feral pigs
- Strong suite of humane, best practice management methods available for use by land managers
- Successful impact reduction programs demonstrated from coordinated and collaborative programs e.g. turtle abatement programs managed by Indigenous ranger groups
- Dedicated, motivated, skilled and experienced practical management RD&E personnel and organisations
- Surveillance and monitoring technologies being developed to provide tools/solutions to land managers to better manage feral pig populations, cost-effectively and efficiently
- Linkages established with other pest management programs to work together to support development of joint resources and materials

Weaknesses

- Reactive, ad hoc and fragmented approach to feral pig management
- Lack of standardised measures and methodologies to consistently measure outcomes or demonstrate management effectiveness
- Inconsistent implementation of adaptive management programs
- Low local/regional knowledge of feral pig population density and spatial and temporal movement ecology in different habitats and geographical areas
- Intermittent, short term and/or minimal funds available to support feral pig control by land managers
- Regeneration of feral pig populations occurs in response to reduced pressure from control activities
- Difficulties for regulatory agencies to enforce biosecurity responsibilities to control feral pigs on non-compliant landholders
- Under-reporting of feral pig control activities by land managers
- Skills, training, experience, support and/or resources not available in some regions
- Focus of investors on short-term population reduction rather than long-term impact reduction
- Varied levels of participation in coordinated feral pig management programs by land managers
- Variations with legislation and regulations between jurisdictions

Opportunities

- Sustained investment models and resources to support landholder groups with implementing local management activities
- New information available from commissioned studies by June 2022, updating population dynamics and economic, environmental and social impact information to inform the size of the problem, costs and impacts
- New technologies being developed to obtain real time knowledge of feral pig population densities, locations and spatial and temporal movements at the local level
- Need for consistent/standardised methodologies for estimating populations adopted and applied by all states and territories
- Development of appropriate performance measures for different asset types to support and inform monitoring and evaluation
- Develop and launch a centralised, trusted data management and feedback system operated under agreed business rules to capture outcomes of control programs in collaboration with allied vertebrate pest management programs
- Develop and implement a biodiversity stewardship fund to incentivise sustained action and investment for vertebrate pests (comparable to those in place for savanna fire management): Phased approach: a. northern Australia; b. agricultural systems
- Investigate feasibility of regional coordinated zoning plans to eradicate feral pigs at a landscape scale (that also incorporate other vertebrate pest species, where appropriate)
- Develop and implement a tripartite, long-term investment program between a) private sector/ industry, b) state and territory governments and c) Commonwealth government for vertebrate pest management
- Collate programs being undertaken by community led groups into a dynamic online information Hub
- Investigate potential impacts of climate change on feral pig population dynamics and threats, habitat suitability and geographical type
- Sustainable employment opportunities in local communities associated with feral pig control programs
- Maintained social license through best practice management techniques to meet the SOPs

Threats

- Inability to engage/attract/motivate some land managers to participate in community led groups
- Uncontrolled ground shooting activities – illegal trespass, sabotage of control activities, biosecurity, safety and rural crime
- Regional land manager champions withdraw from local voluntary coordination/leadership roles
- Lack of communication infrastructure on ability of land managers to collaborate and access shared knowledge and skills
- No high-level transparency of expenditure, details of feral pig management activities supported by governments and industry
- Government/public land generally viewed as the source of local feral pig populations by private land managers
- Low allocations of funds to feral pig management by local councils, NRM agencies and/or state governments
- Inconsistent application of best practice management techniques by land managers

CASE STUDY D

Learning on Country program – Maningrida, Northern Territory

In Arnhem Land, feral pigs significantly impact flood plains, wetlands, billabongs and water quality, and adversely affect native magpie geese populations.

The community-driven, school-based Indigenous ranger-facilitated Maningrida Learning on Country (LOC) program targets remote Indigenous students and disengaged young people, and links Australian curriculum subjects with field-based Indigenous learning and data collection. The Maningrida LOC program has been in place for 10 years and is federally funded through the National Indigenous Australians Agency.

A pig research project, that commenced in April 2019 and due to be completed by December 2021, is an example of training of Indigenous students in best practice management of feral pigs. It aims to apply knowledge to reduce biodiversity, environmental and biosecurity threats associated with feral pigs through engagement to influence community behaviours. Junior rangers set up camera traps, use GPS collars to understand feral pig movements, trial different trapping methods and investigate the use of various bush food baits in different areas to attract feral pigs into traps. The plan is to use traps annually to catch pigs as an additional method to ground and aerial culling to keep pressure on the population. This project is being managed by a local steering committee in Maningrida.

Traditional owners and elders are involved in this program to demonstrate to students what country should look like once pressures from feral animals have been removed. Understanding of local values, balance between biodiversity and healthy country, and the importance of feral pigs to local communities are being worked through with traditional owners and elders. A community awareness campaign in Maningrida about impacts of feral buffalo and pigs is to be run by the students, with posters to be erected through the community in language.



Image supplied by Alex Ernst, NT Schools

3. GOALS, OBJECTIVES & ACTIONS

The goals of the Plan:

Goal 1:

- Provide leadership and strategic coordination for sustained feral pig management

The Plan will deliver national coordination across jurisdictional borders and between all land managers, to promote humane, integrated best practice management and monitoring of feral pig populations and their impacts.

Goal 2:

- Build community awareness of impacts caused by feral pigs and enhance capacity and capability of land managers to apply humane, best practice management

The Plan will raise awareness among the general community to maintain social licence and support land managers to apply humane, best practice management through skills development, training and education.

Goal 3:

- Increase the adoption of best practice methods and systems

The Plan will support land managers to effectively implement best practice management and planning approaches over the long term to suppress (or eradicate, where feasible) feral pig populations and minimise threats.



Image supplied by NSW Local Land Services

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIME FRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Goal 1: Provide leadership and strategic coordination for sustained feral pig management						
Objective 1.1: Provide national leadership, governance and coordination						
Action 1.1.1 Ensure the Plan's Implementation Committee provides leadership and strategic coordination, with clear governance structures and responsibilities in place	<ul style="list-style-type: none"> a. Clear governance purpose and structure established b. Committee members understand the Plan's purpose and objectives and their roles and responsibilities c. Annual operational plan (AOP) with agreed KPIs and yearly milestones in place to support the NFPAP's implementation, with monitoring by NFPAP IC d. Transparent, consistent management processes and performance evaluation in place 	Lead: NFPAP Implementation Committee (IC) Support: National Feral Pig Management Coordinator (NFPMC) and National Feral Pig Project Support Officer (NFPSO)	NFPAP IC Chair and Committee members, NFPMC, NFPSO	HIGH PRIORITY Draft plan to be endorsed by EIC in June 2021 and NBC by October 2021. NFPAP IC to be established by 31 March 2021.	<ul style="list-style-type: none"> a. Governance structure implemented b. Independent chair and committee members appointed c. Terms of reference endorsed d. Induction of committee members completed, responsibilities being met e. AOP developed and endorsed by NFPAP IC by July each year f. Key performance indicators in AOP achieved and reported by August each year 	NFPMC contracted until June 2023 Implementation Committee and governance processes in place to oversee progress of NFPAP's implementations
Action 1.1.2 Ensure national consistency in humane, best practice feral pig management	<ul style="list-style-type: none"> a. State, regional and local feral pig management is consistent with the NFPAP b. Improved coordination across jurisdictional borders and between land managers c. Purpose of NFPAP is clear to all stakeholders d. Purpose of NFPAP is communicated to target audiences 	Lead: NFPAP IC Support: NFPMC and NFPSO	NFPAP IC Chair and Committee members, NFPMC, NFPSO	MEDIUM PRIORITY Commence 1 April 2021; execution ongoing with annual KPI reporting by NFPMC	<ul style="list-style-type: none"> a. State, regional and local plans reflect the goals and objectives of NFPAP b. Number of programs that are running across jurisdictional borders 	Performance measures are consistent with the guidelines presented in the NFPAP Each IC member can clearly communicate the role of the NFPAP to our wide stakeholder base Organisations of each IC member promotes best practice management of feral pigs Communication of need for, and value of, the NFPAP to stakeholders
Action 1.1.3 Ensure linkages with the National Threat Abatement Plan	<ul style="list-style-type: none"> a. Effective coordination of action on feral pigs between the NFPAP and the Threat Abatement Plan b. All stakeholders are aware of the Threat Abatement Plan 	Lead: NFPAP IC Support: NFPMC and NFPSO	NFPMC, NFPSO & NFPAP IC, DAWE, jurisdictions	MEDIUM PRIORITY: Commence 1 March 2021; execution ongoing (for the life of the TAP) with yearly KPI reporting by NFPMC to NFPAP IC	<ul style="list-style-type: none"> a. State, regional and local feral pig management plans include linkages to the Threat Abatement Plan (on renewal or as developed) b. Yearly audit conducted on TAP actions completed, including those delivered through NFPAP 	Alignment between NFPAP and TAP; NFPAP to support and inform delivery of TAP outcomes

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 1.2: Drive collaborative, coordinated and informed approaches to feral pig management						
Action 1.2.1 Ensure strategic, adaptive and humane feral pest management at a community, regional and national level	<ul style="list-style-type: none"> a. Greater awareness by land managers of benefits of working together to manage feral pigs in conjunction with other vertebrate pest plans b. Increased consistency in application of best practice management by land managers c. Increased access to best practice feral pig management information d. Demonstration sites established and outcomes reported e. Methods to report on performance measures established 	Lead: NFPAP IC Support: NFPMC and NFPISO	NFPMC, NFPISO & NFPAP IC	HIGH PRIORITY Commence 1 April 2021; execution ongoing with annual KPI reporting by NFPMC	<ul style="list-style-type: none"> a. Number of state, regional and local communication and engagement plans that target community groups b. Number of pest management groups that incorporate feral pigs into their activities c. Listing of known pest management group and activities on NFPAP information hub as identified d. Number of demonstration sites established 	Promotion of best practice management by organisations of each IC member Communication of need for, and value of, land managers working together Land managers have access to information, tools and data to support their activities
Action 1.2.2 Collaborate with partners to improve coordination, decision making, and reporting of adaptive approaches, actions, and outcomes	<ul style="list-style-type: none"> a. Mechanisms adopted for sharing and reporting of feral pig management actions at local, regional and state levels to build knowledge and networks b. Increased use of data by land managers working together to design, control, monitor and report activities c. Feral pig management actions by all stakeholders are coordinated at the local and regional level d. New partnerships developed 	Lead: NFPAP IC Support: NFPMC and NFPISO	NFPMC, NFPISO & NFPAP IC	MEDIUM PRIORITY Commence 1 April 2021; Ongoing activity, with at least annual KPI reporting by NFPMC	<ul style="list-style-type: none"> a. All stakeholders to be on board with NFPAP and data reporting, using agreed performance measures, by December 2021 b. Number of jurisdictions and management groups collecting and sharing data through NFPAP IC according to agreed measures 	Collaboration of stakeholders to support information and data flow and coordination of activities Expansion of partnerships to broaden networks and capacity for feral pig management

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 1.2 Continued: Drive collaborative, coordinated and informed approaches to feral pig management						
Action 1.2.3 Develop trusted systems, structures and networks, in partnership with other vertebrate pest management programs, enable and support coordinated regional-scale planning, land manager engagement and actions	<ul style="list-style-type: none"> a. Agreement obtained from state and territory jurisdictions to establish a centralised data system to capture information on vertebrate pest management activities from data systems being used b. A national centralised system, data standards and agreed metrics developed in collaboration with allied vertebrate pest management programs c. Centralised data system launched d. Business rules developed and supported by stakeholders e. Consistent reporting templates developed in collaboration with allied programs and adopted by management groups f. Information recording and reporting systems meet the needs of land managers 	Lead: NFPAP IC Support: NFPMC and NFPPO	NFPMC, NFPPO & NFPAP IC	HIGH PRIORITY Commence February 2021 and complete by December 2022; annual KPI reporting. Ongoing NFPMC reporting to NFPAP IC	<ul style="list-style-type: none"> a. All states and territory jurisdictions support a centralised data system for reporting and feedback, data standards and metrics commencing in December 2021 b. Number of management groups using systems for data recording and impact monitoring – annual reporting each August c. Number of groups / organisations who have adopted agreed templates for reporting – annual reporting each August 	Demonstrate reliability and governance structures of data recording systems to land managers to build trust and overcome negative stigma Groups of land managers are supported in their best practice management activities by experienced regional coordinators Land managers provide feedback on capability, use and security of data recording systems to refine system functionality to better meet needs
Action 1.2.4. Establish a coordinator network to support management groups with effective adaptive management approaches	<ul style="list-style-type: none"> a. Regional feral pig coordinator network established to support management groups b. Linkages with regional NWDAP (and from other programs, where relevant) coordinators are in place, where practicable and relevant to NFPAP 	Lead: NFPAP IC Support: NFPMC and NFPPO	NFPMC, NFPPO	HIGH PRIORITY Commence March 2021; execution ongoing; annual KPI reporting by NFPMC to NFPAP IC	<ul style="list-style-type: none"> a. Priority areas for regional coordinators determined based on criteria agreed by NFPAP IC b. Regional coordinators funded/co-funded, identified and appointed in prioritised areas 	Localised pest management groups supported in application of adaptive best practice management by regional coordinator network

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 1.3: Implement processes and measures to objectively monitor, evaluate and improve the Plan to ensure longevity beyond 2031						
Action 1.3.1 Monitor and evaluate the implementation of the Plan	<ul style="list-style-type: none"> a. National approach for measuring feral pig management actions, including standard measures of impacts, efficacy and cost effectiveness relevant to all stakeholders implemented b. Agreed key performance measures/indicators c. Baselines established to measure performance d. Effectiveness of the Plan reviewed and evaluated using agreed baselines and performance measures e. Data obtained from stakeholders to inform KPIs 	Lead: NFPAP IC Support: NFPMC and NFPSO	NFPMC, NFPSO & NFPAP IC	HIGH PRIORITY Commence February 2021. Annual reporting to NFPAP stakeholders in August 2021 and ongoing	<ul style="list-style-type: none"> a. Key performance measures, baselines and processes are agreed by the NFPAP IC by December 2021 b. Benchmarks established for number of management programs reporting against agreed performance measures, updated annually c. Number of management programs achieving annual population reduction, updated annually 	Supported by data collected from a range of stakeholders
Action 1.3.2 Provide annual performance report to NFPAP stakeholder groups	<ul style="list-style-type: none"> a. Confidence of stakeholders in the governance structure and outcomes being delivered by the NFPAP 	Lead: NFPAP IC Support: NFPMC and NFPSO	NFPMC, NFPSO, NFPAP IC Chair and Committee members	HIGH PRIORITY Annual reporting to NFPAP stakeholders in August 2021 and ongoing	Annual report published, disseminated to stakeholders and made available via the NFPAP website. Stakeholder forum meetings to be held at least quarterly	Annual report provided to stakeholders
Action 1.3.3 Conduct a half-term (5th year) and full-term (10th year) review to measure performance and identify adaptations and improvements required	<ul style="list-style-type: none"> a. Independent assessment of the delivery and outcomes of the NFPAP b. Impact of NFPAP determined and communicated to stakeholders c. Recommendations from the independent review of coordinated action for feral pig management are adopted by stakeholders, where appropriate 	Lead: NFPAP IC Support: NFPMC and NFPSO	NFPAP IC Chair and Committee members, NFPMC, NFPSO	MEDIUM PRIORITY Operational deliverables June 2026 and June 2031	<ul style="list-style-type: none"> a. Completed independent half term review of NFPAP published in 2026 b. Completed independent full-term review of NFPAP published in 2031 c. Number of recommendations implemented 	Independent review of plan to measure performance of NFPAP

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Goal 2: Build community awareness of impacts of feral pigs and enhance capacity and capability of land managers to apply humane, best practice management						
Objective 2.1: Build community and land manager awareness of feral pig impacts and humane best practice management						
Action 2.1.1 Implement a communication and engagement strategy on feral pig impacts and best practice management	<ul style="list-style-type: none"> a. Target audiences for tailored messaging on feral pig impacts and management identified b. Messaging for target audiences developed c. Communication and engagement strategy implemented on feral pig impacts and best practice management d. Social license maintained for feral pig control strategies and programs e. Impacts caused by feral pigs communicated to all land managers f. Need for impact reduction through feral pig population suppression communicated g. Land managers can communicate best practice management strategies 	Lead: NFPMC, NFPSO and NFPAP IC	NFPMC, NFPSO and external communication support as required	HIGH PRIORITY Commence in April 2021, execution ongoing Annual KPI reporting commencing in June 2021	<ul style="list-style-type: none"> a. Communication and engagement strategy implemented by June 2021; once approved by NFPAP IC b. Messaging communicated to target audiences c. Audience reached through broad media strategies – including Website, Twitter, LinkedIn and Facebook using system analytics. (ongoing; assessed monthly/quarterly) d. Community sentiment assessed and communicated 	Communication & Engagement strategy will create public acceptance through effective social licence strategies and land manager knowledge of impacts and most effective control methods for their local region
Objective 2.2: Strengthen land manager capacity and capability to effectively apply humane feral pig best practice management						
Action 2.2.1 Implement nationally recognised and accredited training programs for feral pig best practice management	<ul style="list-style-type: none"> a. Auditable and certifiable qualifications for feral pig management implemented by training providers b. Capabilities developed by land managers to support the implementation of best practice management c. Consistency in training delivered 	Lead: NFPAP IC Support: NFPMC and NFPSO	NFPMC, NFPSO, regional feral pig coordinators	MEDIUM PRIORITY Commence June 2021. Action a. completed by June 2022, Action b and c ongoing Annual KPI reporting commencing in June 2021	<ul style="list-style-type: none"> a. Number of land managers completing accredited training programs, reported by training providers b. Knowledge and skill base of land managers tested and reported by trained assessors c. Number of appropriately trained people available to support management groups d. Number of training events for recognised qualifications in pest management held 	Promotion of available qualifications or individual units in pest management

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
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Objective 2.2 Continued: Strengthen land manager capacity and capability to effectively apply humane feral pig best practice management

<p>Action 2.2.2</p> <p>Review current training, and develop training and extension materials in best practice feral pig management</p>	<ul style="list-style-type: none"> a. Tailored up-to-date feral pig best practice management resource materials available b. Mentored management groups implementing best practice management at the local and regional level c. Training packages are current, inclusive of new technologies and available 	<p>Lead: NFPMC, NFPSO and NFPAP IC</p>	<p>NFPMC, NFPSO, regional feral pig coordinators</p>	<p>MEDIUM PRIORITY</p> <p>Commence May 2021; ongoing activity</p> <p>Annual KPI reporting commencing in June 2021</p>	<ul style="list-style-type: none"> a. Resource materials are accessed and used by land managers – metrics obtained from websites and regional coordinators b. Number of training courses conducted meet land manager needs, assessed by surveys c. Number of coordinated training days (e.g. field days, demonstrations, meetings) as arranged by local management groups and number of land managers who attended d. Number of mentored groups in operation obtained through regional coordinators 	<p>Training to support sustained involvement of individual land managers in management groups</p>
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Goal 3: Increase the adoption of best practice methods and systems

Objective 3.1: Improve best practice feral pig management methodologies, tools and systems

<p>Action 3.1.1</p> <p>Ensure feral pig management resources are consistent, updated and incorporate new approaches and technologies</p>	<ul style="list-style-type: none"> a. Existing resources (including SOPs and COPs) for managing feral pigs reviewed b. Scope and need for new materials identified, prioritised and developed c. Resources are enhanced/updated 	<p>Lead: NFPMC, NFPSO</p>	<p>NFPMC, NFPSO, regional feral pig coordinators</p>	<p>MEDIUM PRIORITY</p> <p>Commence May 2021; ongoing activity</p> <p>Annual KPI reporting commencing in June 2021</p>	<ul style="list-style-type: none"> a. Records updated at least every 12 months b. New materials and resources developed for stakeholders as needed to support use of new and existing technologies and methodologies c. Number of resources accessed using tracking software 	<p>Land managers are supported through materials, and resources to implement best practice management appropriate to their location</p>
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OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 3.1 Continued: Improve best practice feral pig management methodologies, tools and systems						
Action 3.1.2 Improve measures and systems to inform feral pig management activities and outcomes by land managers	<ul style="list-style-type: none"> a. Decision making informed by the adoption and inclusion of measures into management plans b. Data recording and reporting systems refined/ developed for land managers 	Lead: NFPMC, NFPSO	NFPMC, NFPSO	HIGH PRIORITY Commence April 2021; completed by December 2022 Bi-annual KPI reporting commencing in June 2021	<ul style="list-style-type: none"> a. Number of performance measures implemented into local management plans, obtained through regional coordinators b. Number of management groups regularly using data recording systems 	<p>Provide quantitative data for ongoing monitoring and analysis</p> <p>Use of existing systems to support decision making is important to promote</p>
Action 3.1.3 Develop research, development and extension (RD&E) opportunities to inform action	<ul style="list-style-type: none"> a. Economic, environmental, cultural and social impact studies completed b. Strategic collaboration and co-investment of RD&E applications and investment opportunities identified c. RD&E addresses gaps and priorities consistent with the NFPAP d. RD&E plan completed for adoption by investors e. New cost-effective technologies, systems and strategies developed for land managers to suppress feral pig populations and/or quantify impacts 	Lead: NFPMC, NFPSO	NFPMC, NFPSO	HIGH PRIORITY Commence February 2021; execution ongoing, annual KPI reporting commencing in June 2021	<ul style="list-style-type: none"> a. RD&E gaps addressed by R&D audit as prioritised by NFPAP IC b. Number of new collaborative RD&E projects being funded through new and existing investment streams c. Strategies for use of RD&E outcomes provided to end users d. Existing and new technologies communicated and made available to optimise feral pig management 	This action is focused on supporting applied, collaborative and strategic RD&E to minimise impacts from feral pigs
Action 3.1.4 Ensure long term investment through new innovative approaches	<ul style="list-style-type: none"> a. New partnerships developed to obtain long term investment to support management groups b. New methods developed to support new investment opportunities 	Lead: NFPAP IC, Support: NFPMC, NFPSO	NFPAP IC, NFPMC, NFPSO	HIGH PRIORITY Commence March 1, 2021; execution ongoing Annual KPI reporting commencing in June 2021	<ul style="list-style-type: none"> a. New resourcing mechanisms supported and implemented to support management groups over the long term b. New employment opportunities generated from adoption of new resourcing approaches 	New models and sources of investment are essential to realise the vision of the NFPAP. Novel / aspirational solutions proposed (e.g. zoning, biodiversity stewardship, investment models) and other ideas as identified to be addressed within this action

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 3.2: Drive collaborative, strategic and scientific approaches to best practice feral pig management to suppress, or eradicate, feral pig populations and minimise threats						
Action 3.2.1 Support existing and implement new collaborative and coordinated feral pig management activities	<ul style="list-style-type: none"> a. Land managers and community groups work together, using best practice management b. Best practice information made available to management groups c. Best practice feral pig management adopted in community initiatives 	Lead: NFPMC Support: NFPSO, regional feral pig coordinators	NFPMC, NFPSO, regional feral pig coordinators, all land managers	HIGH PRIORITY Commence March 2021; execution ongoing Bi-annual KPI reporting commencing in June 2021	<ul style="list-style-type: none"> a. Land manager feedback on outcomes from collaborative activities operating at the local and regional scale collected by regional coordinator network using agreed templates b. Area covered by coordinated feral pig control activities c. Number of case studies completed d. Number of co-invested management programs in place 	Successful feral pig coordination supports the community Land managers have the capacity and are supported to implement best practice management and inform decision making Community of practice used by coordinators to support each other
Action 3.2.2 Ensure adoption of new feral pig management and monitoring technologies by land managers	<ul style="list-style-type: none"> a. Existing and new technologies to inform control activities being used b. Existing and new technologies applied to improve cost-effectiveness of control activities 	Lead: NFPMC Support: NFPSO, regional feral pig coordinators	NFPMC, NFPSO, regional feral pig coordinators, all land managers	HIGH PRIORITY Commence April 2021; Execution ongoing bi-annual KPI reporting commencing in June 2021	<ul style="list-style-type: none"> a. Number of management groups utilising existing and new technologies, as reported by regional coordinators b. Effectiveness of technologies on control operations obtained from land managers c. Number of activities (field days, demonstrations, meetings) held to promote adoption of existing and new technologies 	New technologies through RD&E are demonstrated and made available to land managers
Action 3.2.3 Develop strategic approaches to deliver active suppression, or eradication, of feral pig populations	<ul style="list-style-type: none"> a. Identified key threats/risks from feral pigs in Australia are prioritised b. Population suppression actions are prioritised against identified key threats/risks c. Long-term tactical approaches to population suppression activities are developed and implemented d. Communication strategy implemented for population suppression activities e. Ongoing investment to support suppression activities obtained 	Lead: NFPAP IC, Support: NFPMC, NFPSO	NFPMC, NFPSO, regional feral pig coordinators	HIGH PRIORITY Commence April 2021; Delivery of strategy – September 2021. ongoing bi-annual KPI reporting commencing in December 2021	<ul style="list-style-type: none"> a. Agreement obtained from NFPAP IC on prioritised key threats/risks b. Stakeholder agreement obtained on risk-based priorities c. Extensive matrix of objectives that support activity agreed by NFPAP IC d. Reporting of progress of implementation activities 	Brings together all actions to operationalise the Plan's ambitious vision over the long term

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 3.3: Promote adoption of best practice in management plans						
<p>Action 3.3.1</p> <p>Develop nationally minimum guidelines for feral pig management plans and templates to promote consistency at local, regional and state/territory levels</p>	<ul style="list-style-type: none"> a. Nationally agreed minimum guidelines for feral pig management plans made available to land managers b. Plan guidelines are consistent with the NFPAP endorsed by the IC c. Templates and supporting resources used by land managers to prepare feral pig management plans d. Stakeholders at various levels adopt and apply the minimum guidelines 	<p>Lead: NFPMC Support: NFPSO</p>	<p>NFPMC, NFPSO, regional feral pig coordinators</p>	<p>HIGH PRIORITY</p> <p>Actions a & b: Commence May 2021 and achieved by December 2021</p> <p>Action c - development of templates to be completed by December 2021, with promotion ongoing</p> <p>Action d: Commence December 2021, execution ongoing</p> <p>Annual KPI reporting commencing in June 2021</p>	<ul style="list-style-type: none"> a. Incorporation of minimum guidelines into templates of management plans b. Number of community groups who have feral pig management plans in place that incorporate the minimum guidelines 	<p>This supports consistency in planning strategies and agreed measures of success, recognising that there are local differences in how best practice management will be used</p>

4. GOVERNANCE AND IMPLEMENTATION

The Plan will operate over ten years, with a progress review to be independently conducted in year five. Recommendations from the five-year review, in relation to the Plan’s governance and delivery performance, will be incorporated into a revised Plan.

Governance will be managed through the National Feral Pig Action Plan Implementation Committee, whose membership will be drawn from the extensive stakeholder base including key government, conservation/environmental management, agricultural sector, Indigenous communities and research and development representatives, with a proposed number of 10 to manage its execution (Figure 2). An independent chair will be appointed to ensure balanced engagement of all stakeholders and oversee efficient execution of the Plan.

The Committee will be responsible for overseeing the implementation of the Plan. An annual operating plan, with objective key performance indicators detailing year by year actions and milestones to progress the Plan’s implementation, will be prepared by the National Feral Pig Management Coordinator. The Committee will endorse the annual operating plan and monitor the delivery of the Plan’s milestones and achievements. Terms of reference for the Implementation Committee will be established and reviewed annually and expressions of interest for committee membership will be conducted against agreed selection criteria. A Scientific Advisory Panel will be established and will report to the Implementation Committee.

Both the National Feral Pig Management Coordinator and the Program Support Officer, managed by Australian Pork Limited, will report to the Implementation Committee on a regular basis.

Agreement and acceptance of the Plan across jurisdictions and by a wide range of environmental, agricultural and Indigenous land managers is essential. The Committee will establish a stakeholder consultative process to support the Plan’s delivery at the local, state and national level. Reports will update stakeholders on the Plan’s activities, milestones and issues.

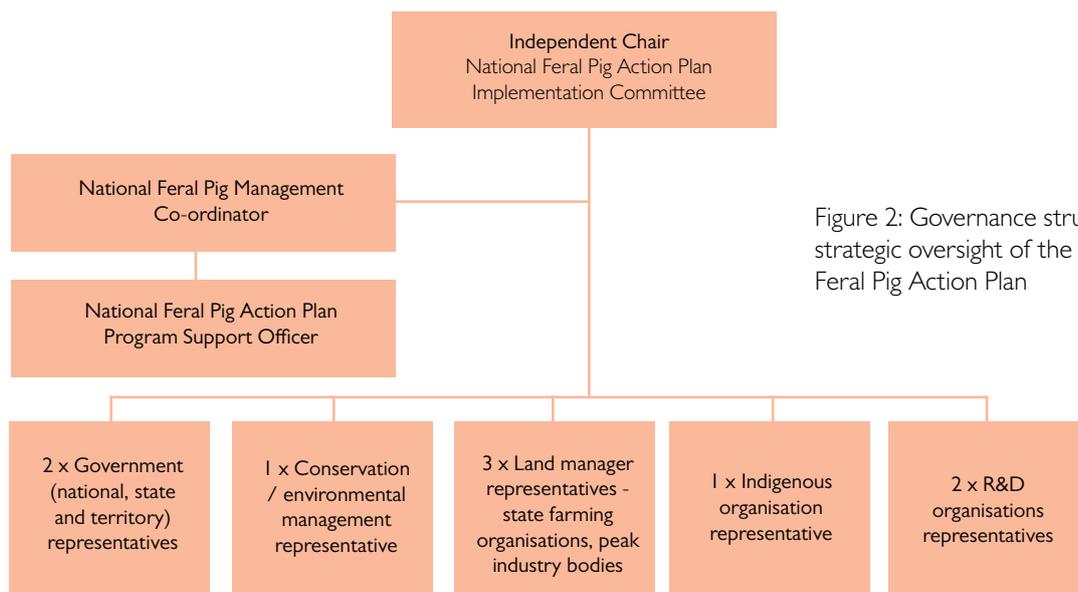


Figure 2: Governance structure for strategic oversight of the National Feral Pig Action Plan

Glossary of terms

ABARES	Australian Bureau of Agricultural Resources, Economics and Sciences
Best practice management	A structured and consistent approach to the management of vertebrate pests in an attempt to achieve enduring and cost-effective outcomes. 'Best practice' is defined as the best practice agreed at a particular time following consideration of scientific information and accumulated experience (Braysher, 1993).
Biodiversity	The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part of; this includes diversity within species, between species and of ecosystems (EPBC Act 1999).
Biosecurity	The management of the risks to the economy, the environment and the community, of pests and diseases entering, emerging, establishing or spreading (Intergovernmental Agreement on Biosecurity 2012)
Control	In relation to a declared pest, includes eradicate, destroy, prevent the presence or spread of, manage, examine or test for, survey for or monitor the presence or spread of, and treat
DAWE	Department of Agriculture, Water and the Environment
Eradication	Removal of an entire population of an invasive species from an area
Feral pig	Un-owned pigs that are descended from domesticated pigs but live in the wild (<i>Sus scrofa</i>).
Feral pig management	Encompasses prevention, eradication, containment and control of feral pigs and asset-based protection.
Humane	The humaneness of a control method refers to the overall welfare impact that the method has on an individual animal (RSPCA 2019). Different techniques may be more or less humane depending on the species being controlled, non-target risks, and the way in which each technique is applied.
Impact	The (usually) negative environmental, agricultural, cultural and/or social effects of invasive species

Land manager	Individuals, companies, organisations and governments that own, lease or manage private, commercial or government land.
Landscape-scale	The landscape-scale approach involves working with stakeholders to develop cooperative and coordinated wild dog management programs which incorporate the delivery of a range of control techniques in a strategic and integrated fashion across all tenures at a scale large enough to reduce pest animal populations to levels where impacts on assets are mitigated
Management group	A group comprised of land managers working together to control feral pigs and their impacts. These can be referred to as local, regional and/or coordinated management groups.
MERI	Monitoring, Evaluation Reporting and Improvement Plan Model
Model code of practice	Model Code of Practice for the humane control of feral pigs ⁹
NFPAP	National Feral Pig Action Plan
Nil tenure	An approach where a range of control methods are applied across all tenures by all stakeholders at a regional or 'landscape' (rather than 'property') level in a cooperative and coordinated manner. This approach focuses on mapping and information gathered from landholders to identify areas of feral pig habitat, movement corridors, damage/impacts and current control. At the regional level, it assists land managers to implement appropriate control measures and join adjacent control programs.
NWDAP	National Wild Dog Action Plan
Pest animal	Native or introduced, wild or feral, non-human species of animal that is currently troublesome locally, or over a wide area, to one or more persons, either by being a health hazard, a general nuisance, or by destroying food, fibre, or natural resources (Koehler, 1964).
RD&E	Research, Development and Extension
Social licence	The ongoing acceptance of a company or industry's standard business practices and operating procedures by its employees, stakeholders, and the general public. It is created and maintained slowly over time as the actions of an entity builds trust with the community it operates in and other stakeholders.
SOP	Standard Operating Procedure
Stakeholder	A stakeholder is any individual, group or party that has an interest in feral pig management and/or is affected by their impacts.

APPENDIX I

List of organisations consulted

ABARES
ACT Government
AgForce Queensland Farmers Ltd
Agriculture Victoria
Animal Control Technologies Australia
Animal Health Australia
Australian Banana Growers Council
Australian Department of Agriculture, Water and the Environment
Australian Pig Doggers and Hunters Association
Australian Pork Limited
Australian Veterinary Association
Australian Wildlife Conservancy
Australian Wool Innovation
Balkanu Aboriginal and Torres Strait Island Corporation
Barron River Catchment, Queensland
Blackwood Biosecurity Inc, WA
Bush Heritage Australia
Cambooya Landcare Queensland
Canegrowers Australia
Cape York NRM, Queensland
Cape York Weeds and Feral Animals Incorporated, Queensland
Carpentaria Land Council Aboriginal Corporation, Queensland
Cassowary Coast Regional Council, Queensland
Cattle Council of Australia
Central Wheatbelt RBG, WA
Centre for Invasive Species Solutions
Charles Darwin University, NT
Charles Sturt University, NSW
Cook Regional Council, Queensland
Craig Mostyn Farms, WA
CRC for Northern Australia
CSIRO
Department of Agriculture and Fisheries, Queensland
Department of Agriculture, Water and the Environment
Department of Biodiversity, Conservation and Attractions, Western Australia
Department of Defence
Department of Environment and Science, Queensland
Department of Environment, Land, Water and Planning, Victoria
Department of Primary Industries, NSW
Department of Primary Industries and Regional Development, WA
Department of Primary Industries, Water and Environment, Tasmania
Far North Queensland Regional Organisation of Councils, Queensland
Feral Fix Services, Queensland
Feral Vertebrate Reduction Contracting, Queensland
Fitzroy Basin Association Queensland
Food Agility CRC
Future Drought Fund
Game Meat Processors Queensland
Grain Growers Limited
Grain Research and Development Corporation
Growcom, Queensland
Hancock Agriculture
Healthy Land and Water
Herbert Cane Productivity Services Limited, Queensland
Hinchinbrook Shire Council, Queensland
Hort Innovation Australia
HQ Plantations Queensland
Hunter Land Management
Indigenous Land and Sea Council

Innisfail Babinda Cane Productivity Services, Queensland
 James Cook University, Queensland
 Kimberley Biosecurity Group, WA
 Kimberley Pilbara Cattlemen's Association
 Lake Muir Denbarton Feral Pig Eradication Group, WA
 Landscapes Board SA
 Leschenault Biosecurity Group Inc, WA
 Livestock SA
 Local Government Association of Queensland
 Local Land Services, NSW
 Lower Blackwood RBG
 Mackay Area Productivity Services, Queensland
 Macquarie University
 MacroMeats, SA
 Meat and Livestock Australia
 Meat Industry Training and Advisory Council Inc.
 Midlands Biosecurity Group, WA
 Mingenew Irwin Group, WA
 National Drought and North Queensland Flood Response and Recovery Agency
 National Farmers Federation
 National Wild Dog Action Plan
 North Kimberley LCDIC, WA
 Northern Australia Indigenous Land and Sea Management Alliance
 Northern Australia Quarantine Strategy
 Northern Biosecurity Group, WA
 Northern Gulf NRM, Queensland
 Northern Land Council, NT
 NQ Dry Tropics, Queensland
 NRM Regions Australia, ACT
 NRM Regions Queensland
 NSW Farmers
 NSW Game and Pest Management Advisory Board
 NT Cattlemen's Association
 NT Department of Environment and Natural Resources
 NT Department of Primary Industries and Resources
 NT Department of Tourism, Sport and Culture
 Parks Victoria
 Peel Harvey Biosecurity Group, WA
 Peel Harvey Catchment Council, WA
 Pilbara Regional Biosecurity Group, WA
 Pork Innovation WA
 Primary Industries and Regions South Australia
 RAPAD Longreach, Queensland
 Reef Catchments NRM, Queensland
 Remote Area Projects and Training, Queensland
 RSPCA Australia
 Sarina Landcare, Queensland
 Sensand Technologies
 SEQ Water, Queensland
 Seymour Out Bush, Queensland
 Sheep Producers Australia
 Somerset Regional Council, Queensland
 Southern Gulf NRM, Queensland
 Sporting Shooters Association of Australia
 SQ Landscapes, Queensland
 Sugar Research Australia
 Terrain NRM, Queensland
 Territory NRM, NT
 University of Southern Queensland
 Victorian Farmers Federation
 WA Farmers
 WA Pork Producers Association
 Westpork, WA
 Whitsunday Regional Council, Queensland
 Wide Bay Burnett Regional Organisation of Councils, Queensland
 Wild Science, NT
 Wildlife Drones, ACT
 Wildlife Health Australia
 WoolProducers Australia

APPENDIX 2

Legislation and applicable strategies

Table 1: Relevant state and territory legislation and strategies related to pest animal management.

State/Territory	Relevant legislation and strategies
Commonwealth	<p>Environmental Protection and Biodiversity Conservation Act 1999 Biosecurity Act 2015 Agricultural and Veterinary Chemicals Code Act 1994 Civil Aviation Regulations 1988 (aerial baiting) Biological Control Act 1984 Intergovernmental Agreement on Biosecurity (IGAB) Australian Pest Animal Strategy 2017-2027 Threat Abatement Plan for feral pigs 2017 AUSVETPLAN (Australian Veterinary Emergency Plan)</p>
Australian Capital Territory	<p>Pest Plants and Animals Act 2005 Nature Conservation Act 2014 Environment Protection Act 1997 Firearms Act 1996 Animal Welfare Act 1992 Prohibited Weapons Act 1996 ACT Pest Animal Management Strategy 2012-2022</p>
New South Wales	<p>Local Land Services Act 2013 National Parks and Wildlife Act 1974 Biosecurity Act 2015 & Biosecurity Regulation 2017 Threatened Species Conservation Act 1995 Game and Feral Animal Control Act 2002 Pesticides Act 1999 Prevention of Cruelty to Animals Act 1979 NSW Biosecurity Strategy 2018-2021 NSW Invasive Species Plan 2018-2021 Regional Strategic Pest Animal Management Plans (Local Land Services) Regional Pest Management Strategies (Office of Environment and Heritage, NSW National Parks and Wildlife Service)</p>
Victoria	<p>Catchment and Land Protection Act 1994 Flora and Fauna Guarantee Act 1988 Prevention of Cruelty to Animals Act 1986 Biosecurity Strategy for Victoria National Parks Act 1975 Wildlife Act 1975 Invasive Plants and Animals Policy Framework (IPAPF) Drugs, Poisons and Controlled Substances Act 1981</p>

Queensland	<p>Biosecurity Act 2014</p> <p>Land Protection (Pest and Stock Route Management Act) 2002</p> <p>Animal Care and Protection Act 2001</p> <p>Rural Lands Protection Act 1985</p> <p>Health (Drugs and Poisons) Regulation 1996</p> <p>Nature Conservation Act 1992</p> <p>Queensland Invasive Plants and Animals Strategy 2019-2024</p> <p>Wet Tropics Management Plan 1998 (Wet Tropics World Heritage Protection and Management Act 1993)</p>
Tasmania	<p>Vermin Control Act 2000</p> <p>Agricultural and Veterinary Chemical (Control of Use) Act 1995</p> <p>Poisons Act 1971</p> <p>Nature Conservation Act 2002</p> <p>Animal Welfare Act 1993</p>
Northern Territory	<p>Territory Parks and Wildlife Conservation Act 2006</p> <p>Animal Welfare Act 1999</p> <p>Northern Territory Biosecurity Strategy 2016-2026</p>
South Australia	<p>Landscape South Australia Act 2019</p> <p>Animal Welfare Act 1985</p> <p>National Parks and Wildlife Act 1972</p> <p>Controlled Substances Act 1984</p>
Western Australia	<p>Biosecurity and Agriculture Management Act 2007</p> <p>Conservation and Land Management Act 1984</p> <p>Agriculture and Related Resources Protection Act 1976</p> <p>Animal Welfare Act 2002</p> <p>Biological Control Act 1986</p> <p>Firearms Act 1973</p> <p>Poisons Act 1964</p> <p>Wildlife Conservation Act 1950</p> <p>Code of Practice for the Capture and Marketing of Feral Animals in Western Australia 2003</p> <p>WA Biosecurity Strategy 2016-2021</p> <p>Invasive Species Plan for Western Australia 2015-2019</p> <p>WA Feral Pig Strategy 2020-2025</p>

Table modified from:

<https://pestsmart.org.au/framework-overview/government-pest-animal-management-strategies/>