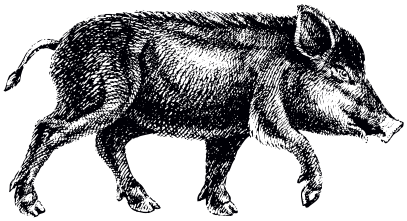

NATIONAL FERAL PIG

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.

The generous input by many stakeholders who provided insights, feedback and suggestions during the drafting of this Plan (many of these are listed in Appendix 1), and those who responded to the National Feral Pig Action Plan's stakeholder survey, is also gratefully acknowledged.

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. By 2031, threats and risks posed by feral pigs to Australia's environment, agricultural businesses, cultural sites, and biosecurity will be discernably minimised.

The Plan seeks to protect assets through the delivery of effective, coordinated, sustained and humane best practice management to suppress, or eradicate (where feasible), feral pig populations. 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 industry[1]. 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.

Up to 45 per cent of Australia's land mass is inhabited by feral pigs[2]. Damage (including infrastructure costs) caused by feral pigs to Australia's agricultural industry is at least $100 million per annum[3]. 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 agriculture[5] 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 alone[6]. 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. Furthermore, feral pigs have been implicated in the spread of *Phytophthora cinnamomi* which presents significant threats to Australian biodiversity, ecosystems, landscapes and agricultural industries due to dieback[7].

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 integrated 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 through natural progressive or human assisted movement.

For land managers, the Plan builds on the many control programs underway. It aims to improve the effectiveness of humane 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.

It is essential that the significant threats that feral pigs pose on Australia's assets, and how these assets are being protected through management programs, are understood by the community to maintain their support for the ongoing public and private investment required for their control.

[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] *ACIL 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*
[7] *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi, Commonwealth of Australia 2018.*

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 and humaneness 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	*Ensure the Plan's Implementation Committee provides leadership and strategic coordination, with clear governance structures and responsibilities in place* *Ensure national consistency in humane, best practice feral pig management* *Ensure linkages with the national Threat Abatement Plan and the Threatened Species Strategy*
OBJECTIVE	Drive collaborative, co-ordinated and informed approaches to feral pig management
ACTIONS	*Ensure collaborative and strategic approaches to adaptive feral pest management at a community, regional and state level* *Collaborate with partners to improve co-ordination, decision making, and reporting of adaptive approaches, actions and outcomes* *Utilise 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* *Establish a coordinator network to support management groups with effective, adaptive management approaches*
OBJECTIVE	Implement processes and measures to objectively monitor, evaluate and improve the Plan to ensure longevity beyond 2031
ACTIONS	*Monitor and evaluate the implementation of the Plan* *Provide annual performance report to NFPAP stakeholder groups* *Conduct a half-term (5th year) and full-term (10th year) review to measure performance and identify adaptations and improvements required*
GOAL	Build community awareness of impacts of feral pigs and enhance capacity and capability of 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	*Review current training, and develop training and extension materials in best practice feral pig management for land managers* *Develop and implement nationally recognised and accredited training programs for feral pig best practice management*
GOAL	Increase the adoption of best practice methods and systems
OBJECTIVE	Improve best practice feral pig management methodologies, tools and systems
ACTIONS	*Ensure feral pig management resources are consistent, updated and incorporate new approaches and technologies* *Improve measures and systems to inform feral pig management activities and outcomes by land managers* *Develop research, development and extension (RD&E) opportunities to underpin the Plan's implementation* *Ensure long term investment through new innovative approaches*
OBJECTIVE	Reducing impacts by driving collaborative, strategic and scientific approaches to humane best practice feral pig management to suppress, or eradicate, feral pig populations
ACTIONS	*Support existing and implement new collaborative and coordinated feral pig management actions* *Drive adoption of new feral pig management and monitoring technologies by land managers* *Develop strategic approaches to protect prioritised assets through active suppression, or eradication, of feral pig populations*
OBJECTIVE	Promote adoption of best practice in management plans
ACTIONS	*Develop nationally 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.
- 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)[8] – 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)[9] – 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 pigs[10] 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.
- National Threatened Species Strategy to protect and recover Australia's threatened species.
- Response deeds and agreements in place to provide for emergency animal disease incidents (EADRA), emergency plant pest responses (EPPRD) and to respond to biosecurity incidents that primarily impact on the environment and/or social amenity and where the response is for the public good (NEBRA).

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

[8] *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017), Commonwealth of Australia, 2017.*
[9] *Australian Pest Animal Strategy 2017 to 2027, Invasive Plants and Animals Committee 2016, Australian Government Department of Agriculture and Water Resources, Canberra.*
[10] *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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1. INTRODUCTION

1.1 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 present[11].

1.2 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 grasslands[12], using rivers and floodplains as major migration routes[13].

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, sediment run-off, erosion, competition for feed with native animals, native fauna habitat destruction, disease transmission, and land degradation[14].

Feral pigs do have some positive values, including being a food and cultural resource for Indigenous communities[15], supplying market demand for wild boar products, primarily in Europe[16], and as game for recreational shooters[17]. These positive aspects are confounded by declining export demand for Australian wild boar[18], logistical challenges impacting on its viability, and that recreational hunting pursuits are generally not related to population control[19].

The distribution of feral pigs can be extended by illegal movement/translocation of pigs which can disrupt local pig control efforts by land managers[20]. Threats and impacts to regions where feral pigs are an emerging issue, how growing populations are suppressed to prevent spread into new areas, or where incursions occur in response to seasonal conditions also need to be considered. It is imperative that incursion prevention strategies are developed to support land managers, jurisdictions and other stakeholders.

[11] *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.*
[12] *Choquenot, D., McIlroy, 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.*
[13] *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*
[14] *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017) – Background Document. Commonwealth of Australia.*
[15] *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.*
[16] *Gentle, M., and Pople, A. 2013. Effectiveness of commercial harvesting in controlling feral-pig populations. Wildlife Research 40:459-469.*
[17] *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*
[18] *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/*
[19] *Bell, J. (2016). Shared problem, shared solutions - Statewide review of pest animal management. Natural Resources Commission, NSW Government, Sydney NSW 2001.*
[20] *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 (NQ NRM Alliance 2020[21]). 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

[21] *NQ NRM Alliance Submission Feral Pigs Senate Enquiry (2020). Available at: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/FeralDeerPigGoat2019/Submissions.*

Pormpuraaw 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 humane 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 recovery[15]. 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 spent[4] 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, compliance with agreed national welfare codes of practice and standard operating procedures, technical monitoring skills, use of GPS equipment; data collection, analysis, management and communication, strategic land management actions; 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 Australia[12]. In 1990, estimates of the national population of feral pigs of 13.5 million, ranging from 3.5 to 23.5 million, was based on very limited data[22]. Using a larger sample size drawn from 30 published studies, the abundance of feral pigs in Australia during the 1980s, 1990s and 2000s has been estimated and varied from 3.0 million to 4.4 million, with an average density of 1.03 pigs/km[23]. Only data from published studies was used; no studies were conducted in Victoria and South Australia.

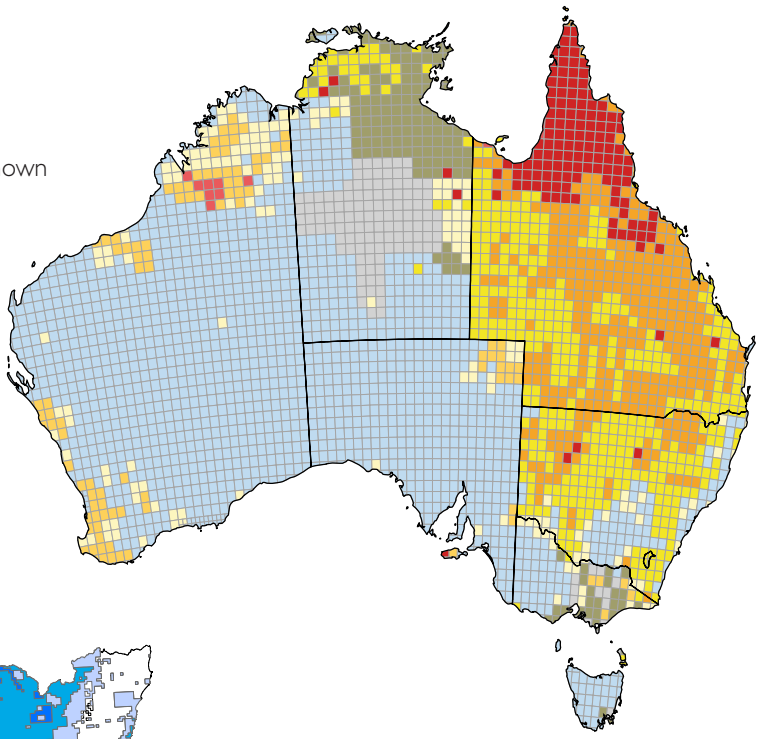
Seasonal habitat suitability models for northern Australia at the regional scale are based on species ecology data and expert knowledge, informing programs to better manage impacts from feral pigs[24]. Feral pig distribution maps for Australia[1], New South Wales (2020)[25] and Queensland (2013-14)[26] (Figure 1) reflect the abundant and widespread distribution of feral pigs, particularly in far north Queensland.

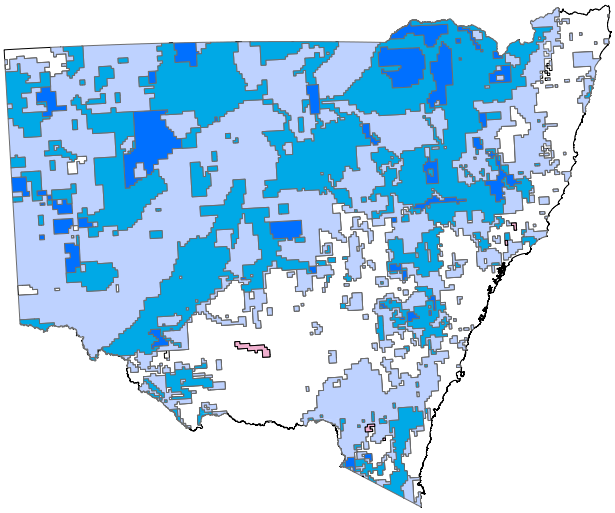
The scope and extent of the problem needs to be defined and based on quantitative data, before any response to feral pig management can be considered[12]. Management efforts need to use a risk-based approach focusing on areas with the highest likelihood of threats from feral pigs e.g. risk of disease entry into northern Australia.

[22] *Hone, J. (1990). How many feral pigs in Australia? Australian Wildlife Research, 17, 571-572.*
[23] *Hone, J. (2020). How many feral pigs in Australia? An update. Australian Journal of Zoology, https:doi.org/10.1071/ZO20077.*
[24] *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.*
[25] *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_*
[26] *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

- Present - abundance/distribution unknown
- Occasional/Localised
- Occasional/Widespread
- Common/Localised
- Common/Widespread
- Abundant/Localised
- Abundant/Widespread
- Absent
- Unknown





B. NSW

- High
- Medium
- Low
- Present
- Absent

C. QLD

Distribution

Density	*Widespread*	*Localised*
Abundant		
Common		
Occasional		
Unknown		
Absent		

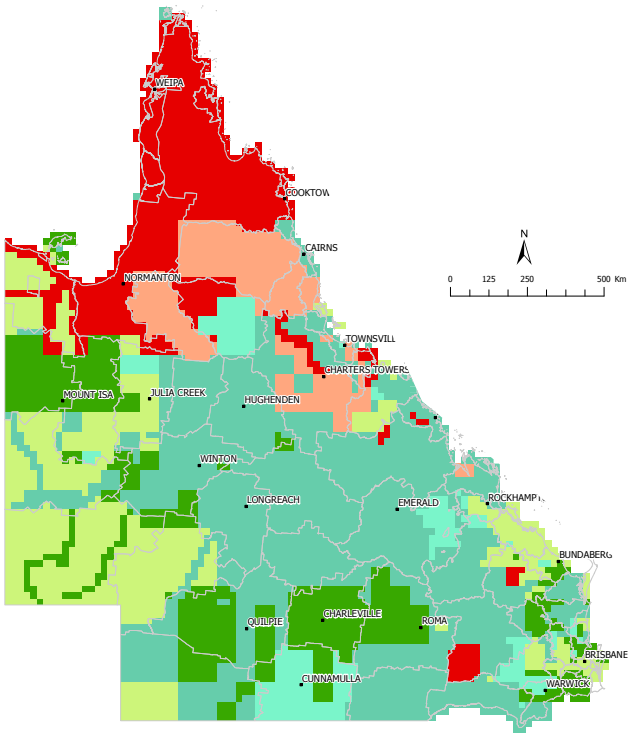


Figure 1: Feral pig occurrence, distribution and abundance in A) Australia[2] (2008) B) New South Wales[24] (2020) and C) Queensland[25] (2013-14)

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 in the high priority zone across 180,000 hectares 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/km^2 in 2017 to 0.6 pigs/km^2 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
- Economic and environmental analyses for this population control program are to be determined

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 activities can be used to measure program success of applying adaptive management principles. For example, strategies implemented to manage established populations, as well as new incursions, can be informed by population modelling and impact assessment, using technologies such as cameras 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. In 2018-19, WRC's aerial shooting program cost $58.75 per pig dispatched, including administration costs. 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[27,28]. 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 land manager support and involvement can be achieved through identifying, supporting and working with champion land managers

Image supplied by Whitsunday Regional Council

[27] *Hardy, 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.*

[28] *Synergies 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 supported by agreed national animal welfare COP and SOPs
- 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 to be available from commissioned ABARES studies that provides updated 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
- No one best practice management method can be applied to control feral pig populations

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, (approved by CSIRO Animal Ethics Committee, number 2017-27), 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 consistently and effectively 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 TIMEFRAME	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	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 KPI's and yearly milestones in place to support the NFPAP's implementation, with monitoring by NFPAP IC d. Transparent, consistent management processes, stakeholder engagement 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.	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	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 e. Improved consistency of state and territory legislation and policies for feral pig management	**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	a. State, regional and local plans reflect the goals and objectives of NFPAP and nationally agreed animal welfare COP and SOPs 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 and the Threatened Species Strategy	a. Effective coordination of action on feral pigs between the NFPAP and the Threat Abatement Plan b. Effective coordination of action on feral pigs between the NFPAP and the Threatened Species Strategy c. Stakeholders are aware of the Threat Abatement Plan and the Threatened Species Strategy	**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	a. State, regional and local feral pig management plans include linkages to the Threat Abatement Plan and the Threatened Species Strategy (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 collaborative and strategic approaches to adaptive feral pest management at a community, regional and state level**	a. Greater awareness by land managers of benefits of working together to manage feral pigs in conjunction with other vertebrate pest plans and knowledge of impact reductions achieved 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. All funded feral pig control activities under the auspices of the NFPAP are compliant with the relevant national welfare COP and SOPs	**Lead:** NFPAP IC **Support:** NFPMC and NFPSO	NFPMC, NFPSO & NFPAP IC	HIGH PRIORITY Commence 1 April 2021; execution ongoing with annual KPI reporting by NFPMC	a. Number of state, regional and local communication and engagement plans that target community groups b. Percentage 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 e. Benefits quantified of integrated control strategies used to protect assets from feral pigs using data collected for agreed performance measures	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**	a. Mechanisms adopted for sharing and reporting of integrated feral pig management actions at local, regional and state levels to build knowledge and networks b. Methods and tools to report on performance measures and evaluate outcomes established c. Increased use of data by land managers working together to design, control, monitor and report activities d. Feral pig management actions by all stakeholders are coordinated at the local and regional level e. New partnerships developed	**Lead:** NFPAP IC **Support:** NFPMC and NFPSO	NFPMC, NFPSO & NFPAP IC	MEDIUM PRIORITY Commence 1 April 2021; Ongoing activity, with at least annual KPI reporting by NFPMC	a. Governments and NRM organisations are on board with NFPAP by December 2021 b. Jurisdictional support for data reporting requirements and performance measures obtained by June 2022 c. 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 **Utilise 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**	a. Agreement obtained from jurisdictions to utilise a centralised data system to capture aggregated information on vertebrate pest management activities from data systems being used b. A national centralised system, data standards and agreed metrics in place 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 are accessible and meet the needs of land managers	**Lead:** NFPAP IC **Support:** NFPMC and NFPSO	NFPMC, NFPSO & NFPAP IC	HIGH PRIORITY Commence February 2021 and complete by December 2022; annual KPI reporting. Ongoing NFPMC reporting to NFPAP IC	a. All jurisdictions support the need for 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**	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 NFPSO	NFPMC, NFPSO	HIGH PRIORITY Commence March 2021; execution ongoing; annual KPI reporting by NFPMC to NFPAP IC	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	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	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	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	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	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	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:** NFPAP IC **Support:** NFPMC, NFPSO	NFPMC, NFPSO and external communication support as required	HIGH PRIORITY Commence in April 2021, execution ongoing Annual KPI reporting commencing in June 2021	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 Review current training, and develop training and extension materials in best practice feral pig management for land managers	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 d. Capacity and capability gaps of land managers identified from training and skills audits	**Lead:** NFPAP IC **Support:** NFPMC, NFPSO	NFPMC, NFPSO, regional feral pig coordinators	MEDIUM PRIORITY Commence May 2021; ongoing activity Annual KPI reporting commencing in June 2021	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	Training to support sustained involvement of individual land managers in management groups

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 2.2 Continued: Strengthen land manager capacity and capability to effectively apply humane feral pig best practice management						
Action 2.2.2 Develop and implement nationally recognised and accredited training programs for feral pig best practice management	a. Nationally recognised, standardised and accredited training programs specific to feral pig best practice management in place b. Capabilities developed by land managers to support the implementation of best practice management c. Consistency in training delivered d. Training programs are underpinned by the nationally agreed animal welfare COP and SOPs e. Network of accredited trainers to deliver training programs or skill sets for land managers, contractors and/or regional coordinators in place	**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	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
Goal 3: Increase the adoption of best practice methods and systems						
Objective 3.1: Improve best practice feral pig management methodologies, tools and systems						
Action 3.1.1 Ensure feral pig management resources are consistent, updated and incorporate new approaches and technologies	a. Existing resources (including SOPs and COPs) for managing feral pigs reviewed b. Scope and need for new materials identified, prioritised, developed and implemented c. Resources are enhanced/updated d. Centralised information portal for feral pig management promoted	**Lead:** NFPMC, NFPSO	NFPMC, NFPSO, regional feral pig coordinators	MEDIUM PRIORITY Commence May 2021; ongoing activity Annual KPI reporting commencing in June 2021	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	Land managers are supported through materials, and resources to implement best practice management appropriate to their location

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	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 c. Increased land managers' understanding of relationships between impacts, populations and landscape positions that can inform management decisions	**Lead:** NFPMC, NFPSO	NFPMC, NFPSO	HIGH PRIORITY Commence April 2021; completed by December 2022 Bi-annual KPI reporting commencing in June 2021	a. Number of performance measures implemented into local management plans, obtained through regional coordinators b. Number of management groups regularly using data recording systems and toolkits for monitoring and evaluating outcomes of management strategies	Provide quantitative data for ongoing monitoring and analysis Use of existing systems to support decision making is important to promote
Action 3.1.3 Develop research, development and extension (RD&E) opportunities to underpin the Plan's implementation	a. Economic, environmental, cultural and social impact studies provide updated estimates of impacts of feral pigs and population dynamics 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 humanely suppress feral pig populations and/or quantify impacts	**Lead:** NFPAP IC, Scientific Advisory Panel **Support:** NFPMC, NFPSO	NFPMC, NFPSO, NFPAP Scientific Advisory Panel	HIGH PRIORITY Commence February 2021; execution ongoing, annual KPI reporting commencing in June 2021	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 Scientific Advisory Panel appointed to support delivery of RD&E gap analysis, RD&E strategy, propose performance measures, identify new investment opportunities and review latest RD&E outcomes
Action 3.1.4 Ensure long term investment through new innovative approaches	a. New partnerships in place to provide long term investment to support management groups b. New methods and/or models developed to support sustained levels of investment and land manager actions	**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	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 Scientific Advisory Panel to support delivery of this action

OBJECTIVES AND ACTIONS	OUTCOMES	RESPONSIBLE PARTIES	RESOURCES	PRIORITY AND TIMEFRAME	PERFORMANCE MEASURES	CONTEXT AND COMMENTS
Objective 3.2: Reducing impacts by driving collaborative, strategic and scientific approaches to best practice feral pig management to suppress, or eradicate, feral pig populations						
Action 3.2.1 Support existing and implement new collaborative and coordinated feral pig management actions	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 d. Strategies evaluated to conserve threatened species and communities impacted from feral pig activities	**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	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 Templates to capture humane methods being used for feral pig control adhere to nationally agreed feral pig COP and SOPs
Action 3.2.2 Drive adoption of new feral pig management and monitoring technologies by land managers	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	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 protect prioritised assets through active suppression, or eradication, of feral pig populations	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 to reduce impacts have been developed, implemented and monitored 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	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						
Action 3.3.1 Develop nationally minimum guidelines for feral pig management plans and templates to promote consistency at local, regional and state/territory levels	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	**Lead:** NFPMC **Support:** NFPSO	NFPMC, NFPSO, regional feral pig coordinators	HIGH PRIORITY Actions a & b: Commence May 2021 and achieved by December 2021 Action c - development of templates to be completed by December 2021, with promotion ongoing Action d: Commence December 2021, execution ongoing Annual KPI reporting commencing in June 2021	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	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

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.

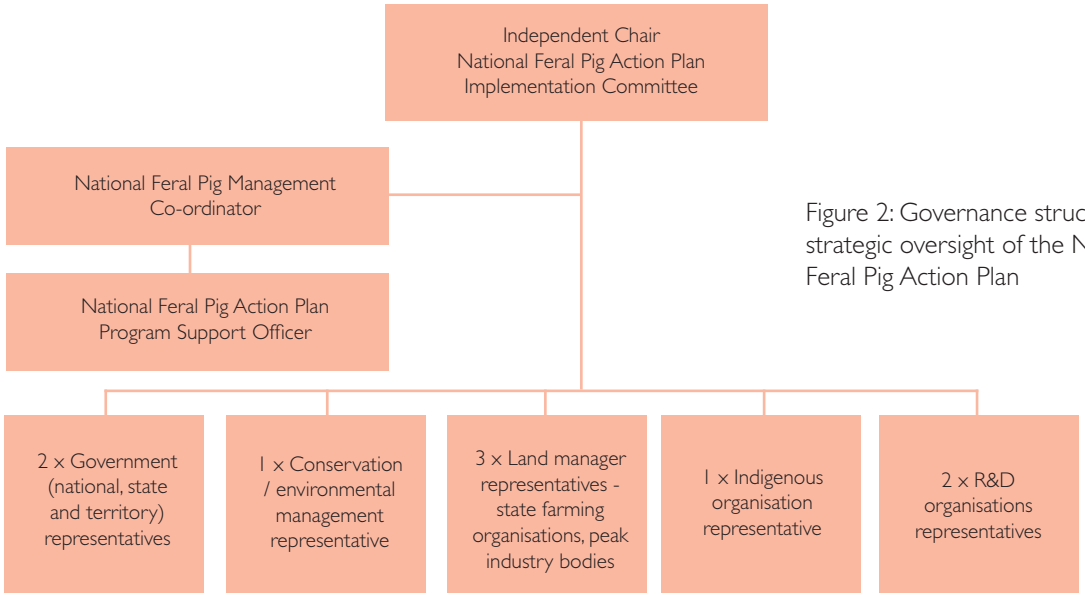


Figure 2: Governance structure for strategic oversight of the National Feral Pig Action Plan

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)[29]
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 2019)[30]
COP	Code of Practice (Sharp 2012)[31]
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
EBPC Act (1999)	Environment Protection and Biodiversity Conservation Act 1999
EADRA	Emergency Animal Disease Response Agreement
Eradication	Eradication may be deemed possible for some isolated, geographically-bound, feral pig populations i.e. those confined to an area due to the presence of artificial and/or natural barriers
EPPRD	Emergency Plant Pest Response Deed
Feral pig	Un-owned pigs (*Sus scrofa*) that are descended from domesticated pigs but live in the wild
Feral pig management	Encompasses prevention, eradication, containment and control of feral pigs and asset-based protection
Humane	When an animal is either killed instantly or rendered insensible until death ensues, without pain, suffering or distress
Humaneness	The humaneness of a control method refers to the overall welfare impact that the method has on an individual animal (RSPCA 2021). Different techniques vary in relative humaness 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
Jurisdictions	Local, state, territory and/or Commonwealth governments

[29] *Braysher, M. (1993). Managing Vertebrate Pests: Principles and Strategies. Bureau of Resource Sciences, Australian Government Publishing Service, Canberra. 58 pp*
[30] *Intergovernmental Agreement on Biosecurity (2019). https://www.coag.gov.au/about-coag/agreements/intergovernmental-agreement-biosecurity-0*
[31] *Sharp, T. (2012). Model code of practice for the humane control of feral pigs. Code of Practice. PestSmart website. https://pestsmart.org.au/toolkit-resource/code-of-practice-feral-pigs*
[32] *RSPCA (2021). RSPCA knowledgebase. Accessible at: https://kb.rspca.org.au/knowledge-base/where-can-i-find-information-on-best-practice-management-of-feral-pigs/*

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 feral pig 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]
NEBRA	National Environmental Biosecurity Response Agreement
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)[33]
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
Threatened Species Strategy	Aiming to protect and recover Australia's threatened plants and animals[34]

[33] *Koehler, J. W. (1964). Opening remarks. Proceedings of the 2nd Vertebrate Pest Control Conference. March 4 and 5, 1964, Anaheim, California.*
[34] *Threatened Species Strategy (2015). Australian Government, Canberra ACT.*

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 Corporation

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 LCDC, WA

North Australian 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

Shooters Union of 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	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)
Australian Capital Territory	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
New South Wales	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)
Victoria	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 Protecting Victoria's Environment - Biodiversity 2037 (Biodiversity 2037) Invasive Plants and Animals Policy Framework (IPAPF) Drugs, Poisons and Controlled Substances Act 1981

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

Table modified from:
https://pestsmart.org.au/framework-overview/government-pest-animal-management-strategies/