Department of
Primary Industries and
Regional Development

GOVERNMENT OF
WESTERN AUSTRALIA

Western Australian Feral Pig Strategy 2020–2025

Important disclaimer

Copies of this document may be available in alternative formats upon request.

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- Community volunteers
- Department of Biodiversity Conservation and Attractions
- Department of Planning Lands and Heritage
- Department of Water and Environment Regulation
- Licensed Pest Management Technicians
- Landholders
- Local Government Authorities
- Not-for-profit conservation and animal welfare organisations
- Recognised Biosecurity Groups
- Regional Natural Resource Management organisations, Land Conservation District Committees, and catchment groups
- Recreational hunting groups
- Southern Feral Pig Advisory Group
- Vertebrate pest management groups
- Water Corporation

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The Department notes that the Strategy document does not necessarily reflect the views or policies of the organisations or individuals who participated in the consultation process.

Glossary

Animal Welfare Act	*Animal Welfare Act 2002*
Australian Government	In the context of the strategy, refers only to those National or central government departments responsible for invasive species and biosecurity.
BAM Act	*Biosecurity and Agriculture Management Act 2007*.
BC Act	*Biodiversity Conservation Act 2016*.
Biosecurity	Has the meaning assigned under the BAM Act, namely '*protection from the adverse effect an organism has or may have on:* • another organism • a human being • the environment, or part of the environment • agricultural activities, fishing or pearling activities, or related commercial activities carried on, or intended to be carried on, in the State or part of the State'.
C3 management	A control category that declared pests may be assigned under regulation 8 of the Biosecurity and Agriculture Management Regulations 2013. Landholders are responsible for managing C3 organisms in order to alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism.
CALM Act	*Conservation and Land Management Act 1984*
Containment	The application of measures in and around an infested area to stop or prevent the spread of invasive species, which may include reduction of the density in the area of infestation, or eradication of satellite infestations.
Control	In relation to a declared pest or other organism, 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.
Declared pest	A species declared by the relevant Minister to be prohibited under section 12 of the BAM Act, or a pest under section 22(2) of the BAM Act.
Eradication	Removal of an entire population of an invasive species from an area, including reproductive propagules.
Feral pig	Un-owned pigs that live in the wild but are descended from domesticated animals. As defined for this Strategy they are feral pigs (*Sus scrofa*).
Feral pig management	As used in this strategy, feral pig management encompasses prevention, eradication, containment and control of feral pigs and asset-based protection.

Impact	The (usually) negative economic, environmental and/or social effects of invasive species.
Incursion	A newly established population of a non-native organism detected in an area (e.g. country, jurisdiction, region or site). Re-invasion of a previously eradicated species is considered a new incursion.
Invasive species	Terrestrial and aquatic plants, vertebrates and invertebrates that have actual or potential undesirable impacts on economic, environmental or social values in a new environment where they are not native.
Landholder	Individuals, companies, organisations and governments that own, lease or manage private, commercial or government land.
Large feral herbivores	Un-owned donkeys (*Equus asinus*), horses (*Equus caballus*), their hybrids, and Arabian (dromedary) camels (*Camelus dromedarius*) that live in the wild but are descended from domesticated animals.
Management	For pests declared under the BAM Act, control category 3 (C3), management aims to reduce the distribution or prevent or contain spread of the declared pest in an area to alleviate harmful impacts of the pest.
Pest animal	A species that has the potential to cause either direct or indirect, harm to human, animal or plant health; or the environment (amended from the *Biosecurity Act 2015*).
Prevention	Management strategies including regulatory and physical measures to ensure that incursions of invasive species are prevented or their impacts mitigated.
Rangelands	Land where livestock graze extensively on native vegetation and where rainfall is considered to be too low or erratic for agricultural cropping or for improved pastures. Rangelands cover about 2.2M km^2 of WA and consist of pastoral stations (~860,000km^2)[1], land vested for conservation, Indigenous purposes, and Unallocated Crown Land.
Removal	Activity that causes the removal of the feral animal through humane means.
Recognised Biosecurity Group	An organisation formally recognised by the Minister for Agriculture and Food for the purpose of declared pest control in their area of operation.
Reporting mechanism	Any tool, application or communication channel through which invasive species reports can be made (for example, functions and resources for mapping species distribution).
Southwest agricultural zone	Area of land south of a line approximately extending from Geraldton to Esperance (aka Clearing Line), encompassing land managed for intensive agricultural activities in Western Australia.

[1] Based on active pastoral leases as at June 2016

List of acronyms

APAS	Australian Pest Animal Strategy
AWC	Australian Wildlife Conservancy
BAM Act	*Biosecurity and Agriculture Management Act 2007*
COP	Code of Practice
DBCA	Department of Biodiversity, Conservation and Attractions
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DPR	Declared Pest Rate
DWER	Department of Water and Environment Regulation
IGAB	Intergovernmental Agreement on Biosecurity
LMPT	Licensed Pest Management Technician
NRM	Natural Resource Management
RBG	Recognised Biosecurity Group
RSPCA	Royal Society for the Prevention of Cruelty to Animals
SOP	Standard Operating Procedure
UCL	Unallocated Crown Land
UMR	Unmanaged reserve(s)
WA	Western Australia

Executive summary

Management of invasive species is an important component of biosecurity. For species already established in Western Australia (WA), including feral pigs, effective management aims to reduce the impacts of those populations and detect occurrences of new populations, thereby preventing further harm to the State's agriculture and biodiversity. Effective management also includes monitoring the density and distribution of established populations to define their boundaries and determine the effectiveness of control programs.

The foundations for a national biosecurity framework were established in 2007, with the development of the inaugural Australian Pest Animal Strategy (APAS). The Feral Pig Strategy (this Strategy) outlines the principles of APAS that underpin a high-level approach to the management of feral pigs throughout Western Australia from 2020–2025.

This strategy builds upon the '*Feral Pig Control Strategy: South-west Western Australia 2015-2020*' (Bain and Kinnear, 2015) which provides a comprehensive overview of existing knowledge regarding feral pig biology, impacts and distribution, as well as an '*Industry Code of Practice for Feral Pig Control (Trapping and Eradication)*', developed by the Southern Feral Pig Advisory Group (SFPAG) for southwest WA.

Purpose of the Strategy

The Strategy has been developed by the Department of Primary Industries and Regional Development (DPIRD), in conjunction with stakeholders, to provide guidance to stakeholders on a strategic approach to the management of feral pigs in WA. It describes the principles of effective feral pig management, and sets the goals and priorities that will help improve WA's ability to deliver economic, environmental and social benefits through improved feral pig management.

The Strategy recognises that effective feral pig management requires a long-term, well-resourced, tenure-blind, coordinated approach and active involvement of all key stakeholders including State Government agencies, Local Governments, Recognised Biosecurity Groups (RBGs), regional Natural Resource Management (NRM) bodies, pastoralists, landholders, Traditional Owners, non-government organisations, mining companies, and research institutions. The ongoing support of the public is also essential to ensure funding continues to be applied to feral pig management.

The Strategy recognises that in some instances, particularly for Traditional Owners, feral pigs may have food harvesting, hunting or commercial values and these must be balanced with the obligation to manage these declared species.

The Strategy has been informed by the recommendations of experts and an extensive stakeholder consultation process. This has identified where feral pig management is working effectively and where, with increased collaboration, cooperation and resourcing, improvements in feral pig management would be achieved. The Strategy identifies a range of key management opportunities and challenges. Some of the identified opportunities can be achieved through increased cooperation and collaboration and can be readily implemented at little or no cost. Others will require significant additional research, planning, time or funding to implement.

The Strategy outlines goals which are required for coordinated, effective, safe, humane and ongoing feral pig management, and ways to achieve these at a State level. As such, the Strategy informs but does not prescribe specific, local, or on-ground actions. These must be planned and undertaken by those with appropriate expertise and knowledge of the local issues.

Western Australian Feral Pig Strategy 2020-2025

Management of feral pigs should be strategic and include defined management objectives, in terms of determining where management should occur, timing of management, being proactive and using appropriate techniques. Prevention and early intervention are the most cost-effective techniques. Management should aim to address actual rather than perceived problems, and to reduce impacts rather than simply animal numbers.

Vision

The Vision for the Strategy is:

Feral pig management is an integral part of the sustainable management of natural resources of Western Australia for the benefit of the economy, environment, human health and social and cultural wellbeing of the community.

Guiding principles for this Strategy

The following principles of best practice feral pig management underpin this Strategy.

Feral pigs are managed effectively

Primary production and ecosystems need protection from the significant impacts of feral pigs. Such impacts include competition with native fauna and livestock for resources, habitat degradation, damage to human-made infrastructure and disease transmission. As such, coordinated and effective feral pig management is integral to the sustainability of WA's agricultural industry and natural environment.

Decision-making and prioritisation need to be risk-based and informed by evidence

The development, monitoring and review of integrated feral pig management should be based on robust evidence, intelligence and analysis. This information can assist in evaluating the effectiveness of ongoing management and whether it has been successful. Decisions on how to allocate resources for feral pig management should be evidence-based and informed by a risk management approach. The benefits of feral pig management should exceed the costs of implementing control; however, determining and applying accurate and widely accepted economic values to the natural environment and native species impacted by feral pigs is extremely difficult. As such, care should be taken not to under-value the benefits of feral pig management in protecting natural environments.

Management is more effective with the participation of all stakeholders

Feral pig management benefits from a coordinated approach among all levels of Government, industry, natural resource managers, community groups and individuals. All stakeholders should be involved in decision-making, according to their roles and responsibilities. Combating declared pest animal problems is a shared responsibility that requires all parties to have a clear understanding of their roles and responsibilities.

Capacity building is essential to ensure effective feral pig management

Effective feral pig management requires the collective will and capacity of all stakeholders to be adequate for the task. Management activities should be adequately resourced and capacity building should be prioritised. Stakeholders require appropriate skills, tools and resources to

undertake effective and humane feral pig control. Cooperation and collaboration at the landscape-scale should be promoted and actively facilitated. Effective leadership, commensurate with the local, regional or State-wide scale of the management activity or role, should be identified, fostered and resourced to ensure continuity of ongoing management.

Feral pig management embraces new technologies and innovation

Research and development can identify and evaluate new technologies to be used in feral pig control. This can introduce new, more efficient ways or improve existing methods of applying limited resources to feral pig management.

Background and context

Feral pigs

In the context of this Strategy, feral pigs (*Sus scrofa*) are defined as pigs which are free-living and unowned. They are widespread and abundant throughout the southwest and Kimberley regions of WA and occur in more localised populations elsewhere in WA.

Feral pigs are declared pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and have been assigned to the C3 control category under the Biosecurity and Agriculture Management Regulations 2013. The legislation requires that they be managed to alleviate their harmful impact, reduce their numbers or distribution and contain their spread.

Pigs were introduced to Australia at the time of European exploration and colonisation in the late 18th and early 19th centuries, with the main founder breeds most likely being the European Berkshire and Tamworth. Shortly after introduction, populations of pigs became feral and subsequently spread via natural dispersal and escapes as well as through intentional releases (Long 1988). Self-sustaining populations of feral pigs persist in every mainland State and Territory of Australia.

Feral pigs are habitat generalists, meaning that they can utilise a range of habitats including both the wet and dry tropics, arid and semi-arid woodlands, both wet and dry eucalypt forests, and sub-alpine environments. Feral pigs are highly fecund and capable of having two litters per year with an average of 4-6 piglets per litter when sufficient resources are available. The impacts of feral pigs on agriculture and biodiversity in Australia are significant, and estimated to exceed $100 million damage annually (McLeod 2004). Feral pigs facilitate the spread of weeds and plant pathogens, damage crops, and cause habitat degradation due to their rooting behaviour and trampling of native vegetation. They also impact and degrade culturally significant sites, particularly those associated with riparian or wetland areas. Feral pigs also predate upon and compete with both livestock and native fauna, and are capable of harbouring a range of exotic and zoonotic diseases as well as transmitting numerous endemic diseases of agricultural and public health importance (Commonwealth of Australia 2017).

Responsibility for feral pig management

The Department of Primary Industries and Regional Development (DPIRD) is the lead agency for the Western Australian Feral Pig Strategy 2020-2025. DPIRD provides strategic leadership in biosecurity matters across WA, is responsible for the administration of the BAM Act, and the declaration of pest species within the Act. DPIRD provides post-border surveillance and coordinates surveillance and reporting from industry and community, including biosecurity groups.

All landholders including Commonwealth, State and Local Governments, Traditional Owners, pastoralists and private landholders are required under the BAM Act to control feral pigs on land under their management. Roles and responsibilities of each group are outlined in Appendix 1.

Effective control of this highly mobile species is best conducted at a strategic level with strong partnership arrangements that support individual landholders.

Management techniques used to control declared pest animals including feral pigs must be of the highest welfare standards, and must comply with the *Animal Welfare Act 2002* and the Codes of Practice (COPs) and Standard Operating Procedures (SOPs) that support the Act.

Vertebrate pest management groups and Recognised Biosecurity Groups

Vertebrate pest management groups are voluntary organisations made up of local landholders, and supported by Local Governments, State Government agencies and other community volunteers. Located predominantly in the southwest agricultural zone, these voluntary groups have been the traditional approach to effective feral pig management on private property, and provide a supplementary role for feral pig management on Government land.

These groups traditionally provide a highly specialised and targeted feral pig management service to landholders within their region. Collectively, they are responsible for removing significant numbers of animals and in some areas have had good success in reducing feral pig abundance and impacts, both on private and Government lands. However, the availability of funds for these groups to undertake feral pig control is typically intermittent and limited, and they are highly reliant on Local, State and Federal Government grants to operate.

Recognised Biosecurity Groups (RBGs), which are made up of landholders, are a partnership arrangement under the BAM Act aimed at the control of widespread and established declared pests, such as feral pigs (Figure 1). RBGs provide a mechanism to enable landholders to develop a coordinated approach to managing declared pests in their area.

RBGs may support and complement activities that individual landholders are required to do to meet their legal obligations to control declared pests on their land, and they provide a framework to foster efficiency through arrangements which make the best use of skills, funds, capacities, incentives and regulations.

RBG activities are funded through a Declared Pest Rate (DPR) paid annually by landholders, which is matched dollar-for-dollar by the State Government. Funding is allocated yearly to each RBG to manage declared animal and plant pests in their area. RBGs may also receive funds from multiple other sources including Commonwealth, State and Local Government grants and grants from private conservation organisations. Governed by the intended purpose of this funding, RBGs may also undertake feral pig control programs on Government lands such as State forest, National parks and reserves, where there is collaboration with and approval from the landholder.

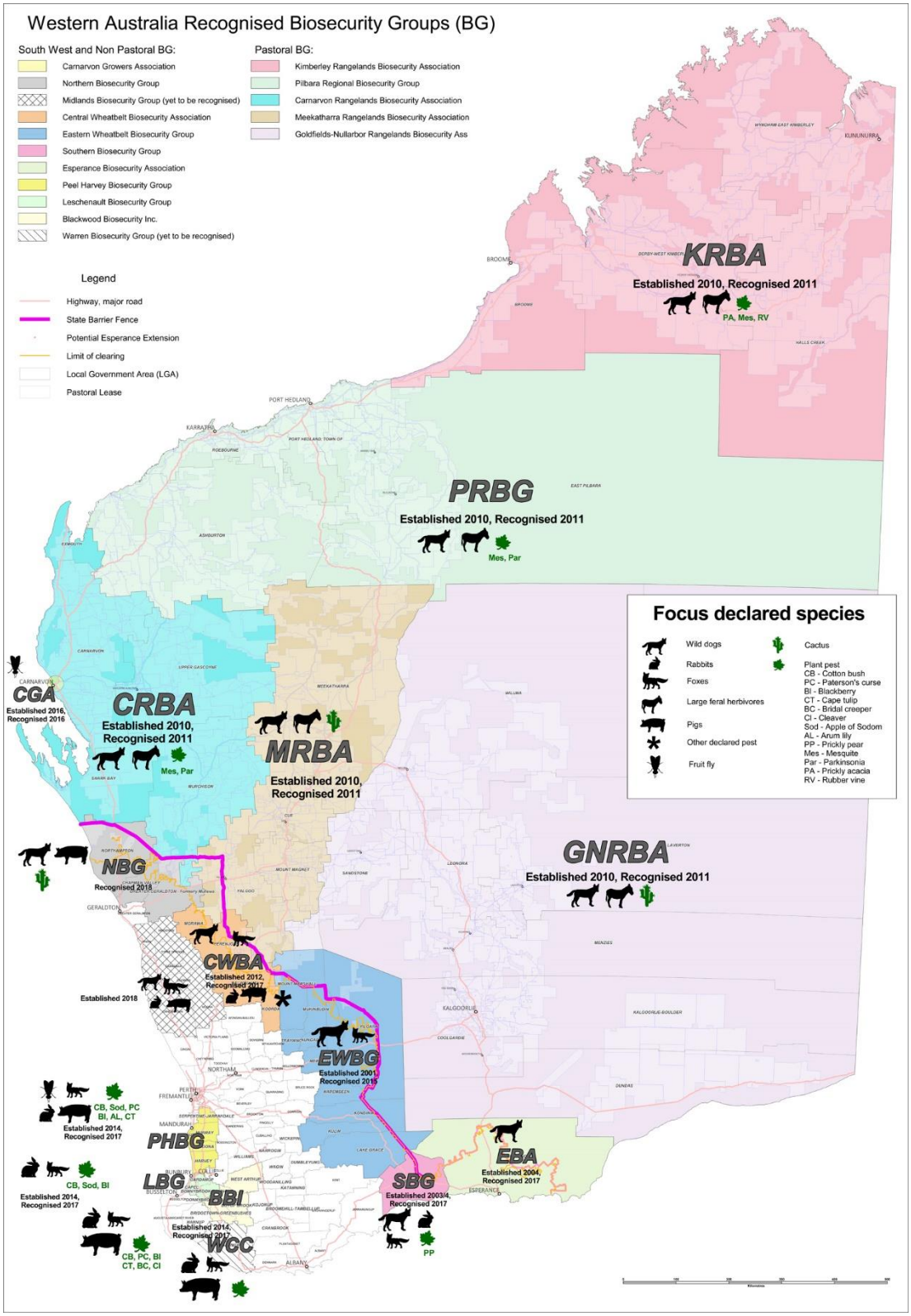

Figure 1: Recognised Biosecurity Groups and their respective prioritised declared pests in Western Australia.

In 2019, five RBGs are recognised across the rangelands of WA, and an additional RBG, the Carnarvon Growers Association (CGA), has been established in the horticultural precinct in Carnarvon (Figure 1). The majority of feral pig management undertaken within the rangelands is

currently *ad hoc* and opportunistically associated with established large feral herbivore management programs.

In contrast, feral pigs are listed as a priority declared species for many of the established RBGs in the agricultural region and are the target of concerted management efforts (see Figure 1). Eight RBGs are currently recognised in the southwest agricultural zone, and the geographic area represented by RBGs in this region is steadily increasing. Feral pig management programs undertaken in the southwest are predominantly implemented by RBGs, vertebrate pest management groups, catchment groups, State and Local Government Authorities, and private landholders.

It is recognised that Natural Resource Management (NRM) organisations are key collaborators with all landholders, Commonwealth, State and Local Governments, and RBGs, and can foster and support valuable partnerships that increase the capacity of collective responses to the landscape-scale issue of feral pig infestation and management.

Feral pig abundance and distribution

Feral pig populations in WA range from small localised populations to extensive and highly abundant infestations (Figure 2).

Feral pig abundance is dependent upon environmental conditions and the availability of essential resources (food, shelter, water). In WA, feral pigs occur in four regions (Long 1988):

- Kimberley – localised high densities typically in association with major river systems and agricultural activities
- Pilbara – localised densities closely associated with major river systems or large year-round water bodies
- Mid-west/northern agriculture region – widespread and abundant within farming landscapes with seasonal variations
- Southwest – widespread and generally abundant throughout much of the jarrah forest and southern forests, including adjacent and associated farmland. Densities of approximately 1 pig/km^2 have been estimated for the northern jarrah forest.

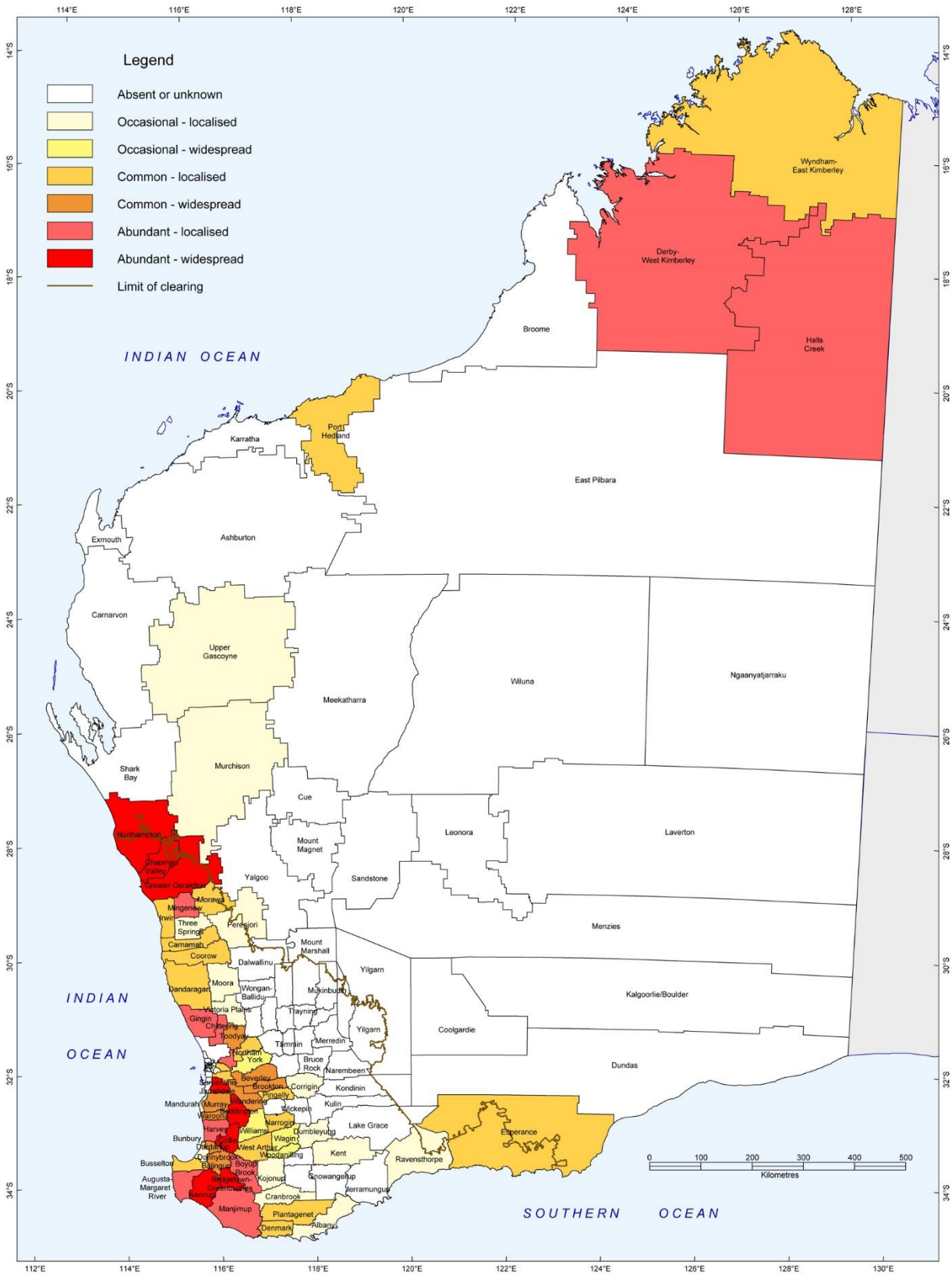

Figure 2: Abundance and distribution of feral pigs throughout Western Australia, mapped to Local Government Area (LGA), determined from research, expert opinion and WA stakeholder interviews.

Illegal translocation

Genetic evidence definitively shows the occurrence of illegal translocation of feral pigs within southwest WA. There are six genetically distinct sub-populations of feral pigs in the southwest (Spencer and Woolnough 2004) (Figure 3). A study by Spencer and Hampton (2005) identified the translocation of multiple feral pigs within southwest WA on three separate instances, including one group of pigs translocated from Northampton to the Perth Hills; a distance of more than 400km. Satellite populations of feral pigs also occur on the Swan Coastal Plain and in western Wheatbelt regions. Illegal translocation or seeding of new populations for hunting purposes is likely to be the source of satellite populations of feral pigs (Commonwealth of Australia 2017).

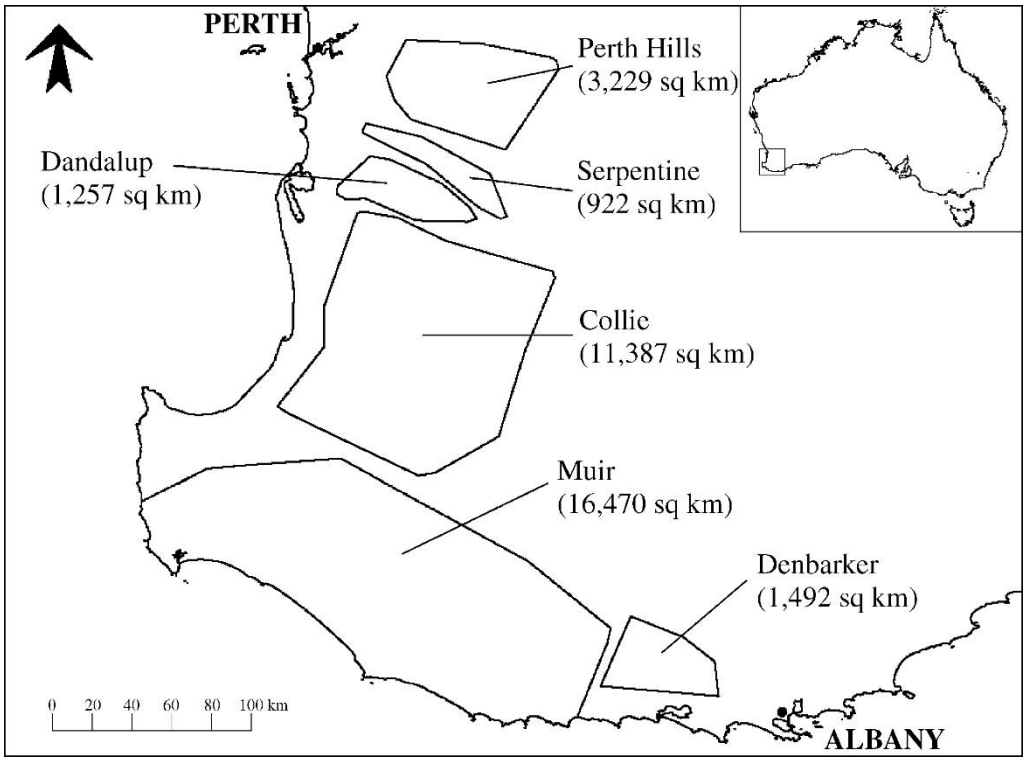

Figure 3: Geographic locations of six genetically defined feral pig populations in southwest WA (Spencer and Woolnough 2004).

Feral pig impacts

Feral pigs are responsible for significant economic/agricultural, environmental and social impacts.

Agricultural impact

Feral pigs impact directly on agriculture through reduced crop yields (due to consumption and trampling), reduced animal productivity (due to predation, competition and disease transmission), and damage to agricultural infrastructure (i.e. fences, irrigation equipment) (Choquenot *et al.* 1996). In agricultural landscapes feral pigs are largely herbivorous (>99% of biomass consumed) and have been reported to consume crop species more frequently than non-crop species (greater than 60% of dietary biomass) (Gentle *et al.* 2015). Feral pigs consume or dig up pasture which could otherwise be utilised by grazing stock, and may

indirectly influence livestock productivity through selective feeding by influencing pasture species composition which may ultimately degrade pasture quality (Choquenot *et al.* 1996).

Feral pig impacts on agricultural infrastructure, such as fences and irrigation systems, can have significant knock-on effects that can potentially manifest in significant costs to the grower. Ground rooting and wallowing activities of feral pigs in drains and at water points lead to damage of earth banks and fouling of farm dams and waterholes. Feral pig activities at these locations can also prevent access by livestock to essential water sources at crucial times (i.e. during high ambient temperatures).

Environmental impact

Feral pigs predate on a range of native fauna including; earthworms, centipedes, beetles, crustaceans and other arthropods, snails, frogs, lizards, snakes, small ground nesting birds and their eggs, small mammals, turtles and crayfish, as well as consuming marine turtle eggs and hatchlings in coastal areas (Choquenot *et al.* 1996; Mitchell 2010). Due to insufficient data, the true impact of feral pig predation on invertebrates and small vertebrates is largely unknown.

Feral pigs consume a wide variety of native plant species, and are recognised as a major risk to threatened flora in southwest WA, particularly those species with underground food storage organs (Hearn *et al.* 2006). They can also spread the devastating plant pathogen *Phytophthora cinnamomi* through transporting infected soil and in their faeces (Kliejunas and Ko 1976; Li *et al.* 2014). Feral pigs are estimated to disturb more than 12 million tonnes of soil in the northern jarrah forest each year (Adams *et al.* 2019), and these digging activities can disturb the composition of soil microbes and nutrient cycling (Singer *et al.* 1984). Feral pigs have a marked negative impact on wetlands and river systems, digging up and consuming riparian and aquatic vegetation, increasing erosion, downstream silting, lowering water quality, and posing a threat to the health of public drinking water supplies (Commonwealth of Australia 2017).

Disease transmission

Feral pigs can act as hosts or vectors of both endemic and exotic diseases which can cause significant impacts to livestock production, biodiversity conservation, and public health.

Feral pigs are capable of spreading diseases that are infectious to humans (zoonotic disease). In Australia, two common zoonotic diseases isolated from feral pigs are *Leptospira* spp. and *Brucella* spp., both of which can have serious health implications for livestock, wildlife and humans if infected (Choquenot *et al.* 1996; Hampton *et al.* 2006). Feral pigs are also responsible for transmission of *Cryptosporidium* spp. and *Giardia* spp. via contaminated drinking water sources due to feral pig wallowing activities and faecal contamination of water catchments. Disease transmission is also associated with direct contact with feral pigs and/or their bodily fluids coupled with poor hygiene or hand washing practices, or the consumption of undercooked meat harvested from feral pigs.

Feral pigs also commonly harbour large numbers of ticks (*Amblyomma* spp. and *Ixodes* spp.) which harbour *Rickettsia gravesii* (Li *et al.* 2010), and may potentially carry other zoonotic diseases such as Q fever (*Coxiella burnetii*), or lyme-like disease organisms (*Borrelia* spp.). Additionally, feral pigs are susceptible to numerous exotic diseases including; African swine fever (ASF), foot and mouth disease (FMD), swine vesicular disease, Aujeszky's disease, trichinosis (*Trichinella* spp.), and classical swine fever. Feral pigs can contribute to the persistence and transmission of diseases such as ASF and FMD as they are highly susceptible and efficient transmitters of disease to other pigs and susceptible livestock (Doran and Laffan 2005; Pech and McIlroy 1990; Ward *et al.* 2007). It has been estimated that a large, multi-State FMD outbreak in Australia would result in a financial cost of between $49.3 - 51.8 billion over 10 years (Buetre *et al.* 2013).

Social and cultural impacts

Social and cultural impacts of feral pigs are often overlooked.

Feral pigs impact on religious, burial or ceremonial sites of cultural significance. Damage to ceremonial stone arrangements or the loss of totem plant or animal species from the landscape due to feral pig behaviour or disturbance can cause significant concern for Traditional Owners.

Negative effects of feral pigs on water points and local swimming areas (billabongs, soaks, and springs) include the degradation of riparian vegetation and erosion of banks or pollution by wallowing and associated defecation and urination in and around water bodies. These impacts may be significantly worsened in times of low rainfall or drought, when feral pigs concentrate around remnant water sources.

Feral pigs are hunted for meat, sport, and trophies in WA. Feral pigs represent a valued resource by some indigenous communities as an alternative source of inexpensive meat/protein. They are highly prized by the hunting community leading some feral pig hunters to illegally translocate feral pigs for the purposes of growing or seeding new populations to support their hunting activities (Spencer and Hampton 2005).

Commercial harvesting or hunting practices are viewed by the majority of landholders as detrimental to effective feral pig management as they provide an incentive to maintain feral pig populations on the basis of a perceived current or potential future value. These populations may then act as reservoirs for re-infestation.

Case studies – effective feral pig management in WA

These case studies are intended to outline the benefits of a well administered and coordinated feral pig management group. They provide two examples of how community-led groups can provide and deliver coordinated and effective feral pig management within their region.

Lake Muir Denbarker Community Feral Pig Eradication Group

The Lake Muir Denbarker Community Feral Pig Eradication Group (LMDCFPEG) was founded in 2000 by a group of local farmers concerned about feral pig damage on their properties. The Group established collaborative links between landowners, community groups, industry, Local and State Government, and funding bodies to address this issue. The Group adopted a tenure-blind approach to feral pig management, carrying out control on approx. 420,000ha of both private and Government lands.

Group structure/operation

Initially, DPIRD (formerly DAFWA) undertook the lead role in brokering agreements in support of the Group; however, as they matured, all operational activities were devolved to a committee. The Group has an open and inclusive membership and participation policy and has representation from a broad cross section of interested groups. Funds are administered by the Shire of Plantagenet, and committee meetings are held before trapping commences and then every two months until annual field activities are completed.

Accreditation and appropriate training for trappers is essential. The LMDCFPEG employs skilled contractors to maintain control over where activities are conducted, adherence to highest animal welfare standards, compliance with conditions of access to properties, and data collection and reporting. Employment of a part time secretary provides administrative support and coordination for the Group, and the chairman and secretary are directly responsible for supervising operational staff. The Shire of Plantagenet hosts the employment of the Group's staff, which ensures personal accident and public liability insurance is covered by their corporate policy, a critical aspect of the group's operation.

Key elements to success

Success of the LMDCFPEG has largely been due to the high level of community support and ability of the group to work well with a broad range of stakeholders, leading to well coordinated, tenure-blind feral pig management. The ability for the group to act autonomously and to ensure that financial resources are prioritised to on-ground activities has been important to success. Additional success factors include:

- All operational matters are based on best practice feral pig management;
- Flexibility is maintained and continual improvement is actively sought;
- Local people are employed and their expertise is retained in the region;
- Succession planning, ensures continuance of the program and avoids individual burnout;
- Support is sought from multiple sources, and funds prioritised for operational activities;
- Effective partnerships are formed and nurtured to ensure that governance and operational requirements are adequately met, and results are widely communicated to maintain support.

Can this approach be used for other groups?

If the key principles of partnerships, common interest, communication, collaboration and governance could be replicated, it is likely that other groups seeking to effectively manage feral animals would enjoy similar success to that of the LMDCFPEG. However, the path this group has taken is unique in the sense that they have engineered their success by strategically seeking and taking advantage of opportunities, and working in partnership with those who were able to contribute expertise and resources. Success has come due to the commitment and hard work of committee members and partners over many years.

Northern Biosecurity Group Inc.

The Northern Biosecurity Group (NBG) was established in 2017 with an interim committee of six representatives from the Northern Agri Group, Yuna Farm Improvement Group, Mullewa Dryland Farming Initiative, and Northampton Feral Eradication Group. The NBG received funding from the Commonwealth and DPIRD to help with establishment and begin delivering on-ground outcomes for landholders within the NBG region prior to raising a Declared Pest Rate (DPR). Formal recognition of the NBG by the Minister for Agriculture occurred in 2018. The NBG covers the Shires of Chapman Valley, Northampton, and the Mullewa area in the City of Greater Geraldton, an area of approximately 25,000 km^2.

Group structure/operation

The NBG employs a part time Executive Officer responsible for managing the day to day operations of the group, and is led by a management committee which meet every three months. Being a formally recognised RBG, the NBG is responsible for directly managing funds raised from the DPR.

The NBG takes a proactive approach toward declared pest management across the region and promotes coordinated actions between landholders, Local and State Government, industry groups and neighbouring biosecurity groups. The group facilitates this approach through the delivery of community activities such as biosecurity training workshops and communal bait mixing days.

The group employs Licenced Pest Management Technicians (LPMTs) to address the impacts of wild dogs and feral pigs within the NBG area. The LPMTs support landholders with on-ground advice on how to protect their properties and assist with making dog and pig baits during community bait days. The NBG has funded and coordinated two aerial shooting programs to reduce feral pig numbers in the Northampton area in 2018 and 2019, which, in conjunction with ongoing landholder baiting and trapping activities, has resulted in a significant reduction in feral pig abundance within the treated area.

Key elements to success

The success of the NBG is largely due to the extensive support it receives from the local community, Government, and industry partners. Many of the NBG Board are active members of local farming groups, which significantly improves the sharing of information between the NBG and landholders. The NBG ensures the community is accurately informed regarding the DPR and its strategic plan to implement effective pest management in line with common goals and objectives set by the NBG committee.

Additional success factors of the NBG include:

- Initiation, promotion, and fostering of effective and strategic biosecurity in the region;
- Attracting additional funds from external sources to reduce pressure on the local community and declared pest ratepayers;
- Identifying opportunities and actively collaborating to build partnerships for pest management which combine local on-ground stakeholder knowledge and commitment.

Can this approach be used for other groups?

The RBG partnership model is promoted across WA as the fundamental approach to community-led management of declared pests. However, whilst the key principles of establishing a RBG are clearly defined, the collective drive and ongoing commitment from all stakeholders within the community is crucial to delivering success.

Feral pig management techniques

Methods commonly employed for feral pig management in WA and some related considerations to these techniques are outlined in Appendix 2. The '*Feral Pig Control Strategy: South-West Western Australia 2015-2020'* (Bain and Kinnear 2015) and the Centre for Invasive Species Solutions PESTSMART website (pestsmart.org.au/pest-animal-species/feral-pig/) provide comprehensive descriptions of these techniques.

There are also a number of State Government agency policy documents that stakeholders need to be aware of relating to feral pig management in WA, and for ease of reference these have been listed below and include:

- 'Industry Code of Practice for Feral Pig Control (Trapping and Eradication)' – developed by the Southern Feral Pig Advisory Group (SFPAG) in consultation with local stakeholders as a guiding document for the implementation of best practice feral pig management in southwest WA.
- 'Water Quality Protection Note 96, June 2009, Pest animal management in public drinking water source areas' – developed by the Department of Water as a guiding document relating to the control of pest animals within public drinking water source areas.
- 'Guidelines for Approving the Use of Dogs for Feral Pig Control Activities' – developed by DBCA specifically for pest animal contractors and organisations, and specifies the conditions where detection dogs can be used.

The applicability of any given control method or approach is ultimately dependent upon prevailing factors such as the habitat, location, feral pig abundance, and level of community involvement.

Like any management approach for controlling a pest species, an integrated approach to managing feral pigs utilising multiple control methods in conjunction with a tenure-blind approach will be more effective and achieve better outcomes. Strategically applied, well planned and adequately resourced management programs have shown to be very effective in reducing feral pig impacts.

Animal Welfare

Animal welfare is a key consideration in effective feral pig management. Humane, safe, and effective control practices are very important. The Australian Animal Welfare Strategy was developed to guide the development of new, nationally consistent policies for the humane treatment of animals and enhance existing animal welfare arrangements.

Consistent with the Australian Animal Welfare Strategy, National Model and State Codes of Practice (COPs), and Standard Operating Procedures (SOPs) have been developed for the humane control of a range of pest animal species, including feral pigs, to provide guidance on best practice.

Key success factors for effective feral pig management

- The key to effective feral pig management lies in the long-term, sustained use of multiple, complementary humane control techniques applied using a tenure-blind approach. Management must continue in perpetuity, even when population densities are low, in order to prevent rapid population growth when control activities are suspended.
- Strong ownership and commitment from all stakeholders and a willingness to actively share knowledge and resources, to collaborate, and to coordinate management activities are critical to effectively manage feral pigs at a landscape scale.
- Partnerships between landholders (both private and Government), industries, and not-for-profit organisations encourage identification and ownership of the problem, adoption of long-term planning, and facilitation of effective communication.
- Successful management requires all landholders to adopt approved control techniques and apply them using the highest animal welfare standards.
- A better understanding of the economic, environmental and social impacts of feral pigs is required to enable informed decision making and prioritisation of control activities on a cost-benefit basis. Improved understanding of feral pig population size, density and distribution would enable evaluation of control programs.
- The destructive and disruptive actions of illegal pig hunters, and the deliberate translocation of feral pigs in order to establish new populations to hunt, represent a significant impediment to effective feral pig management. A unified and sustained approach to detect and prosecute offenders is required.
- A secure, ongoing funding stream is essential for effective feral pig management in the long-term. Declared Pest Rates, together with the dollar-for-dollar matching funding contributed by the State Government, support feral pig control activities on the lands on which the DPRs are raised. However, these funds are also required to support the control of other declared pest species (both animals and weeds) and are therefore subject to local prioritisation.
- The ongoing support of the Western Australian public is essential to maintain the contribution of public funding to feral pig management, and to maintain the social license to control these pest species.

The role of the Strategy within the National and State framework

This Strategy meets the State's responsibilities under the Australian Pest Animal Strategy and supports the Western Australian Biosecurity Strategy 2016-2025 and the Invasive Species Plan for Western Australia 2015-2019 (Figure 4).

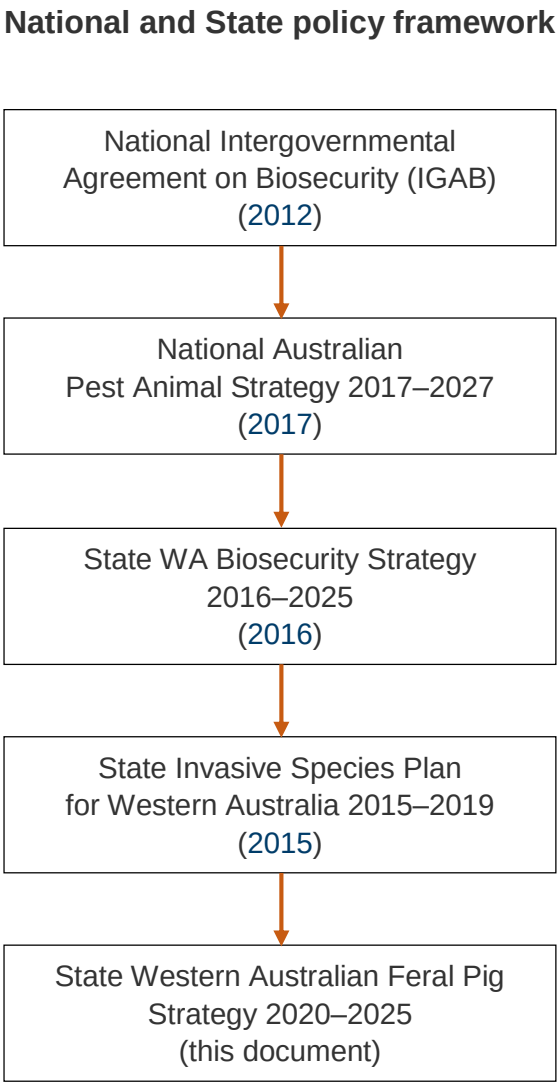

Figure 4: Policy framework for the management of feral pigs in Western Australia.

Intergovernmental Agreement on Biosecurity (IGAB)

WA is signatory to the IGAB, which came into effect in January 2012. The IGAB was established to enhance Australia's biosecurity system and strengthen the collaborative approach between the Commonwealth of Australia and State and Territory Governments to address Australia's broad range of biosecurity issues. The IGAB is primarily for animal and plant pests and diseases in aquatic and terrestrial environments. The agreement recognises that biosecurity is a shared responsibility and sets out the principles that underpin the national biosecurity system.

Australian Pest Animal Strategy

The Australian Pest Animal Strategy (2017) is a vital part of Australia's integrated approach to national biosecurity under the IGAB. The strategy sets the direction for 2017 – 2027 for national pest animal management and encourages collaboration. The strategy includes priorities to improve early detection, diagnostics and response for priority pest animals.

WA Biosecurity Strategy

The WA Biosecurity Strategy 2016 – 2025, sets the strategic direction for partnership arrangements to manage biosecurity issues affecting agriculture, fisheries, forestry and biodiversity in terrestrial and aquatic environments. The strategy covers pest animals and plants, and diseases. It acknowledges that an effective biosecurity system needs to manage risks across the entire biosecurity continuum and emphasises the importance of preventing incursions as well as detecting them early.

Invasive Species Plan for Western Australia

The Invasive Species Plan for Western Australia 2015 – 2019, identifies actions for a coordinated approach to manage existing and potential invasive species. The plan defines invasive species as vertebrate animals and plants that can cause undesirable impacts on economic, environmental and social assets and values.

The plan provides for greater involvement in pest surveillance by all stakeholders, and the use of improved ways of identifying and reporting pests. Developing a post-border surveillance strategy relevant to industry, community and Government will help achieve this coordinated approach.

Goals and strategies

Table 1: Summary of goals and supporting strategies[2]

Goal 1: Feral pig management is collaborative, coordinated and integrated	
Strategy 1.1	Facilitate collaboration between all stakeholders and enable sharing of knowledge, resources and skills.
Strategy 1.2	Review and address, wherever possible, legislative, policy, social or cultural barriers that prevent a tenure-blind approach for feral pig management.
Strategy 1.3	Build the knowledge, capacity and commitment of all stakeholders to deliver a coordinated, regional scale and tenure-blind approach to feral pig management.
Strategy 1.4	Facilitate cooperative and coordinated partnerships between new and existing feral pig management groups and all landholders.
Strategy 1.5	Utilise appropriately trained and authorised members of the community, where they can safely, ethically, and productively contribute to feral pig management.
Strategy 1.6	Establish and support an advisory group with broad representation from key stakeholder groups to guide feral pig management in WA.

Goal 2: Feral pig management is innovative, effective and cost-efficient	
Strategy 2.1	Quantify the environmental, economic and social impacts of feral pigs in all regions to ensure transparent investment in feral pig management that is prioritised by asset value and region.
Strategy 2.2	Set location-specific targets for feral pig control that are evidence-based and recognise the practical limitations of current management techniques and available resources.
Strategy 2.3	Establish and support monitoring programs of sufficient scale and intensity to improve evaluation of the effectiveness of feral pig management activities.
Strategy 2.4	Collaboratively develop, apply and evaluate innovative new management techniques.
Strategy 2.5	Explore options to address State Government policies and processes that restrict the ability of landholders and community groups to undertake timely and cost-effective management activities.

[2] Goals and Strategies have not been prioritised, the order in which they appear does not imply priority.

Table 2: Summary of goals and supporting strategies (continued)

Goal 3: Feral pig management is adequately resourced and ongoing	
Strategy 3.1	Investigate ongoing and stable funding streams to support the administration and delivery of effective feral pig management on both government and privately owned land.
Strategy 3.2	Ensure that public funding directed towards feral pig management remains accountably linked to strategic forward plans, whilst retaining capacity for adaptive management.
Goal 4: Reporting mechanisms support effective feral pig management and facilitate stakeholder engagement	
Strategy 4.1	Implement and support an easy-to-use, centralised reporting system that enables consistent processes for reporting and sharing information.
Goal 5: Feral pig management is undertaken to the highest animal welfare standards and complies with all relevant legislation	
Strategy 5.1	Ensure all stakeholders utilise best practice feral pig management techniques that comply with state and national animal welfare standards and legislation.
Strategy 5.2	Investigate options for regulatory authorities to improve compliance with animal welfare legislation and the management of feral pigs.
Goal 6: Effectively manage illegal activities impeding feral pig management	
Strategy 6.1	Identify options to improve capacity for regulatory authorities to prosecute those who engage in illegal hunting, deliberate translocation of feral pigs or wilful disruption of lawful feral pig management activities.
Goal 7: The Western Australian public is supportive of feral pig management	
Strategy 7.1	Raise public awareness of current and projected environmental, economic and social impacts of feral pigs in WA, and the benefits of sustained, effective, and humane management.

Goal 1: Feral pig management is collaborative, coordinated and integrated

Strategy 1.1: Facilitate collaboration between all stakeholders and enable sharing of knowledge, resources and skills.

Effective management of feral pigs requires strong ownership and commitment from all stakeholders with a combined willingness to collaborate. This is due to the frequent movement of feral pigs across multiple land tenures, requiring significant commitment from all landholders. A long-term, coordinated, and integrated management approach by all stakeholders, which is supported by adequate funding, is critically important for success.

Feral pig management needs to be carefully planned and coordinated at a district or regional level to have a lasting effect. Feral pigs are very mobile and have a high reproductive capacity, which allows populations to recover quickly following management activities. All stakeholders should seek to maximise the effect of control operations to prevent a build-up in population size and thereby reduce the frequency at which large numbers of animals are required to be culled. An integrated approach to feral pig management requires stakeholders to develop management plans that clearly define objectives, select options, choose appropriate strategies, and monitor the success of the management program against the stated objectives.

There are a large number of stakeholders engaged in feral pig management throughout WA including; pastoralists, Local, State and Federal Government organisations, Traditional Owners, LPMTs, mining companies, RBGs, not-for-profit organisations, and recreational hunting groups. In addition to these stakeholders are organisations and individuals which have an interest in feral pig management or are indirectly affected by feral pigs, such as animal welfare organisations, tourism operators and the general public.

Mechanisms facilitating collaboration between these stakeholders and enabling open communication and the sharing of knowledge, resources and skills need to be supported where they exist and established where they do not currently exist. These mechanisms need to recognise and accommodate cultural differences, sensitivities and dissimilarities in the capacity and capability of stakeholders to manage feral pigs.

Strategy 1.2: Review and address, wherever possible, legislative, policy, social or cultural barriers that prevent a tenure-blind approach for feral pig management.

Complex land tenure and management arrangements currently complicate the effective management of feral pigs. Under existing arrangements, it can be a complex and time consuming process to obtain permission to enter lands of different tenure to undertake feral pig control activities. The adoption of a tenure-blind approach is widely acknowledged as being essential to deliver improved feral pig management; however, there are many legislative, jurisdictional and stakeholder relationship issues to overcome before this can be achieved.

State Government agencies including the Department of Biodiversity, Conservation and Attractions (DBCA), Department of Water and Environmental Regulation (DWER), and Water Corporation are responsible for large areas of land where feral pigs are present. Each agency operates under different legislation and policy frameworks and these, or the way they are applied, may vary between regions. Aligning policies and protocols within and across agencies would be beneficial in working towards a tenure-blind approach for the management of feral pigs.

Tenure and jurisdictional issues are not the only barriers to effective feral pig management in WA. Throughout much of the State where feral pigs occur, they are valued as a recreational hunting resource. In many instances, the associated hunting practices are in direct conflict with effective management, and this will be covered further under Goal 6 Strategy 1. Alternatively, Traditional Owners may view feral pigs as a valuable food resource, so an understanding of these and other culturally sensitive issues is required when engaging with Traditional Owners and landholders.

Effective, tenure-blind feral pig management can reduce the impact of feral pigs on both private property and government lands, and may assist in addressing some of the issues associated with illegal hunting of feral pigs.

The combined effort of all stakeholders is required to identify and resolve issues that prevent or hinder a tenure-blind approach to feral pig management. Elements that require addressing through cooperative arrangements, formal policies, or MOUs to achieve an effective tenure-blind approach include:

- Uniform standards and practices across State Government agencies;
- Improved access to land by approved feral pig managers, particularly State forest, National parks and reserves;
- Greater capacity for approved feral pig managers to respond quickly to feral pig impacts or the reported presence of feral pigs.

Strategy 1.3: Build the knowledge, capacity and commitment of all stakeholders to deliver a coordinated, regional scale and tenure-blind approach to feral pig management.

Feral pig management is a shared responsibility. The wide range of stakeholders involved necessitates that information and support be provided in different and tailored ways in order to increase stakeholder capacity and motivation to undertake effective management activities.

To enable this, the following are of particular importance:

- Increasing awareness and understanding of feral pig impacts;
- Building and sharing knowledge about available management options and tactics;
- Providing training in data acquisition, analysis and reporting, and mechanisms to share data;
- Providing information and training in best practice management techniques;
- Enabling ready and timely access to appropriately skilled personnel and resources to undertake effective feral pig management;
- Identifying and supporting neutral, region-specific leadership structures that facilitate stakeholder collaboration and cooperation.

To maximise effectiveness, commitment and coordination of management activities across a region by individual stakeholders is required. Integrated planning is a necessity in feral pig management and therefore it is important that resources are allocated and work is undertaken at the appropriate State, regional and local level.

Strategy 1.4: Facilitate cooperative and coordinated partnerships between new and existing feral pig management groups and all landholders

Best practice control of established pests requires coordinated, humane, landscape scale action shared between landholders, industry and government. RBGs are DPIRDs mechanism under the BAM Act to support landholders and managers to develop a coordinated approach to control and management of declared pests in their area. However, the responsibility for the management of declared pests, including feral pigs, ultimately rests with landholders.

RBGs are established throughout the Rangelands and parts of the agricultural area of the south west of Western Australia. However, a significant proportion of the south west of WA, where feral pigs are currently well established, does not have local RBGs. Instead, vertebrate pest management groups with the support of State Government agencies, Local Government, landholders and various community based organisations in the south west of WA, have been actively managing feral pigs for many years.

Over time, it is expected that RBGs will establish in those areas of the State not yet represented by them (i.e. the agricultural zone). Their formation and gazettal is being encouraged and facilitated by DPIRD; however, it is important that both newly formed RBGs and existing vertebrate pest management groups complement each other and work in partnership to share expertise in feral pig management.

Strategy 1.5: Utilise appropriately trained and authorised members of the community, where they can safely, ethically, and productively contribute to feral pig management.

Baiting and trapping are the two most effective techniques to control feral pigs on a broad scale. Ground-based shooting as a control method for feral pigs is typically only useful for dealing with small numbers of pigs but can be an essential tool, particularly when needing to remove recalcitrant individuals that have previously avoided baiting or trapping programs. Use of hunting dogs by recreational hunters to hunt feral pigs poses animal welfare concerns relating to mutilation and inhumane killing of feral pigs.

Recreational hunting groups such as the Sporting Shooter's Association of Australia, Western Australia (SSAAWA), WA Field and Game Association Inc. (WAFGA), Conservation Australia Inc., West Australian Hunters-Shooters Union Australia, South West Hunting and Conservation Inc., and Australian Deer Association (ADA), have previously assisted DBCA to cull declared pests on their lands. When operating on DBCA lands, these groups are required to adhere to an established MOU that includes appropriate insurance requirements, Codes of Practice, training and safety procedures and legislation (including the *Conservation and Land Management Act 1984*, the *Firearms Act 1973* and the *Animal Welfare Act 2002*). Recreational hunters, when invited to by private landholders, also contribute by removing feral pigs from private property.

Utilising recreational hunting groups to remove feral pigs with firearms on Government land contains inherent risks to shooters (i.e. injury or death from firearm discharge, aggressive and/or wounded pigs, becoming lost) and the public (i.e. injury or death if present in the area when shooting is undertaken). These risks must be effectively mitigated before recreational hunting groups are engaged. It is also essential to ensure that the goal of every recreational hunter engaged is to cull all feral pigs encountered. Selectively leaving some feral pigs in order to maintain a base population to hunt in the future must not be permitted.

Strategy 1.6: Establish and support an advisory group with broad representation from key stakeholder groups to guide feral pig management in WA.

During the stakeholder consultation phase undertaken to develop this Western Australian Feral Pig Strategy (2020 – 2025), a wide range of stakeholders expressed a strong desire to have an active role in improving the way feral pig management is undertaken in WA.

An advisory group with broad representation from key stakeholder groups should be established to help guide feral pig management in WA. The advisory group should operate at a State level to provide guidance to community-led feral pig management groups and to facilitate the implementation of the Strategy. It is envisaged that the role of the advisory group would be to act as a conduit for information sharing between operative groups (i.e. RBGs, community groups) as well as liaising with government agencies (Local, State and Commonwealth) and industry bodies regarding feral pig management throughout WA. Participation in the advisory group would be on a purely voluntary basis.

Goal 2: Feral pig management is innovative, effective and cost-efficient

Strategy 2.1: Quantify the environmental, economic and social impacts of feral pigs in all regions to ensure transparent investment in feral pig management that is prioritised by asset value and region.

Feral pigs are a triple threat pest due to their ability to cause agricultural damage, impact on environmental biodiversity, as well as threaten biosecurity and public health via the spread of disease. However, robust data relating to their impacts on public health, livestock productivity, and cropping and horticultural enterprises in both agricultural and pastoral areas in WA is relatively poor. Quantifying these impacts in WA is required so that feral pig management activities can in turn be evaluated on a cost/benefit basis. This will enable appropriate structuring of operational budgets to ensure effective management of feral pigs across different landscapes.

Management goals and priorities for feral pigs need to be determined, communicated to stakeholders, and reflected in operational plans. The ultimate goals of those managing feral pigs are likely to differ between stakeholders depending on their region, values and activities. Contributing factors such as feral pig population size, distribution, and movement patterns will also influence management goals. Nonetheless, the processes adopted by all stakeholders to determine management goals must be underpinned by science, based on risk assessment, and consider cost-effectiveness.

Strategy 2.2: Set location-specific targets for feral pig control that are evidence-based and recognise the practical limitations of current management techniques and available resources.

Region or location-specific targets for feral pig impacts are required so that investment in management activities is focused on priority areas. Identifying realistic thresholds for feral pigs and their impacts (i.e. abundance, density, extent of damage caused) is also required to enable the effectiveness of control measures to be evaluated.

Determining specific impact thresholds for a region or location will need to take into account the following key factors:

- Environmental, economic and social value of assets that occur in the area.
- Current and projected feral pig population size and density.
- Current and projected environmental, economic and social impacts of feral pigs on those assets.
- Currently available management techniques and the feasibility and cost of applying them.
- Capacity of the responsible landholders to undertake the required management.

Targeted feral pig impact levels will also be influenced by whether the population is to be controlled to manage the impact on assets at that location, or as a precaution to stop animals from relocating to other areas with vulnerable assets.

Clear identification of management goals (prevention of spread, eradication, sustained control, or do nothing) allows managers to justify and defend operational actions against feral pigs. Targeted control in focus areas will generally provide better management outcomes than attempting to manage the impacts across large areas. Feral pigs are rarely spread uniformly across the landscape, and densities and impacts can vary markedly between different regions and ecosystems. For this reason, control of widespread populations should focus on areas where impacts are greatest or where the return for effort is greatest. Management programs should predominantly focus on locations where site characteristics (e.g. natural barriers to reinvasion, site accessibility and presence of cooperative landholders) provide a greater chance of success.

Permanent removal of entire feral pig populations across the State is unlikely to be achievable; however, in areas where feral pigs have not yet fully established, or where populations are intensively managed, local eradication within a defined area may be possible. Preventing the spread or establishment of new populations of feral pigs throughout the State represents a significant cost/benefit approach to managing feral pigs.

Strategy 2.3: Establish and support monitoring programs of sufficient scale and intensity to improve evaluation of the effectiveness of feral pig management activities.

Feral pig management in WA is predominantly evaluated on the number of animals culled. The absence of sufficient data to determine variation in feral pig population size and densities in response to management activities restricts the ability to evaluate the success, or lack thereof, of ongoing programs. Monitoring programs of sufficient scale and intensity are required to evaluate the effectiveness of feral pig management activities and to measure improvements in environmental, economic and social parameters in response to these activities.

Monitoring programs should be structured to ensure sufficient data is gathered to enable the effectiveness of feral pig management activities to be evaluated with a high degree of confidence, while at the same time enabling and supporting the gathering of less-rigorous but valuable information, such as landholders' observations or photographic evidence. Opportunities for capturing relevant observations from the public and landholders should be actively pursued (for example, through appropriate citizen science programs such as FeralScan).

Strategy 2.4: Collaboratively develop, apply and evaluate innovative new management techniques.

Control activities for feral pig management should be undertaken with appropriate accuracy, resolution and frequency. Management methods should be appropriate for the distribution, density, landscape, and capacity of the landholder. Evaluation of both traditional and innovative management activities is required to ensure groups are achieving their objectives.

DPIRD is involved in ongoing research into the development of broad-scale monitoring techniques for feral pigs using thermal sensors, as well as remote sensing cameras. These techniques are being evaluated to quantify the efficacy of control programs on feral pig populations in the agricultural and rangelands regions. This research will help stakeholder groups to improve their understanding and knowledge of well-designed feral pig management programs, determine priorities and allocate resources appropriately.

Government and industry bodies should collaboratively undertake further research and field testing of new approaches to manage feral pigs, continue the development of innovative management tools and communication techniques, and facilitate the adoption of these by landholders.

Strategy 2.5: Address State Government policies and processes that restrict the ability of landholders and community groups to undertake timely and cost-effective management activities.

State Government agencies, particularly DPIRD and DBCA, play an important role in feral pig management through their regulatory roles, the management of feral pigs on lands they manage (e.g. DBCA's management of feral pigs in parks and reserves and Unallocated Crown Land) and the services and resources they provide to feral pig management groups. However, there is scope for improving the alignment between State agencies' policies and procedures associated with feral pig stakeholder groups, particularly RBGs and community groups, gaining access to Government lands. Under current arrangements, it can be complicated and time consuming for stakeholders to obtain permission to enter lands of different tenure to undertake legitimate management activities. Alignment of State agency policies and procedures and reduction of red-tape wherever possible, would assist approved groups to more effectively control feral pigs.

Goal 3: Feral pig management is adequately resourced and ongoing

Strategy 3.1: Investigate ongoing and stable funding streams to support the administration and delivery of effective feral pig management on both government and privately owned land.

The lack of stable, ongoing funding streams severely limits the capacity to deliver effective feral pig management on both Government and privately owned land. Feral pigs are capable of rapid population growth and recovery in the absence of ongoing management pressure, so with the exception of very isolated areas where local eradication may be possible, ongoing management activities must be maintained in perpetuity, especially when population densities are low.

Feral pig management is seen by most stakeholders to be significantly under resourced, with no secure funding stream other than through Declared Pest Rates available to RBGs. These rates are intended to be applied to the management of prioritised declared pests (weeds and pest animals) on privately owned land and/or pastoral leases within the RBG area, not just feral pigs.

Additionally, a significant proportion of the feral pig distribution in WA occurs outside the borders of currently established RBGs. Consequently, the extent of management activities undertaken by groups is strongly influenced by spasmodic, short-term grant funding.

Undertaking effective feral pig management in a coordinated tenure-blind manner requires sufficient funding be available on an annual basis. As such, there is a need to identify sources of stable funding which can be accessed or applied to the effective management of feral pigs across the State. Of particular importance is the allocation or availability of sufficient funding to adequately manage feral pigs in areas where existing funding streams are neither stable nor sufficient.

Industry Funding Schemes (IFS) may represent a source of potential funding support, given that feral pigs are capable of impacting on both the livestock and cropping/horticulture industry in WA. Additionally, the risk posed by the feral pig population to Australia's agricultural export industry in the event of an exotic disease incursion is significant. Should an exotic disease such as foot and mouth disease (FMD) or African swine fever (ASF) become established within the feral pig population, it would be extremely difficult and potentially impossible to eradicate, and cost the Australian export industry billions of dollars in lost revenue.

Similarly, opportunities to increase funding for feral pig management on privately owned land or pastoral leases, and to ensure it is maintained on an ongoing, stable basis should be actively pursued. This may include increasing the DPR where necessary (thereby also raising additional revenue through the dollar-for-dollar funding contributed by the State Government) in the case of RBGs, and/or lobbying Federal, State and Local Governments to increase grant funding for feral pig management purposes.

Strategy 3.2: Ensure that public funding directed towards feral pig management remains accountably linked to strategic forward plans, whilst retaining capacity for adaptive management.

Many stakeholders, including RBGs, rely heavily on opportunistic grant funding to boost their capacity to undertake feral pig management activities; however, grant funds are almost always very target driven and reflect the goals of the grantor. For example, grants are often directed at achieving specific conservation or biodiversity outcomes, which do not always align with operational activities. Landholders wishing to access these funds may have to adjust their planning or deviate from their strategic feral pig management operations to qualify for a particular grant, and as a consequence, may not achieve optimum control outcomes.

The development of this State-wide Feral Pig Strategy will provide a widely recognised and accepted list of management objectives that are both relevant and supported by all stakeholders. This will assist groups applying for funding support to identify how their proposed activities are aligned with the Strategy and will contribute to effective feral pig management within the State. Additionally, this structured approach will also support funding requests for operational expenses such as wages and/or administration costs, which are essential for the operation of RBGs and not-for-profit organisations, but which are seldom supported by grant programs. Similarly, monitoring and evaluation activities are seldom supported by grants.

Public funding directed to RBGs and/or community groups for feral pig management should remain accountably linked to strategic forward plans and clearly articulated control outcomes, preferably in line with those of this strategy.

Goal 4: Reporting mechanisms support effective feral pig management and facilitate stakeholder engagement

Strategy 4.1: Implement and support an easy to use, centralised reporting system that enables consistent processes for reporting and sharing information.

A significant amount of feral pig management data is currently collected in different ways by a range of stakeholder groups including State Government agencies, academic and not-for-profit conservation organisations, RBGs, Traditional Owners, and others. The data ranges from scientifically rigorous to observational, anecdotal, and/or photographic records.

To ensure this data is collected in a consistent manner and can be accessed by relevant stakeholders, an easy-to-use and uniform reporting system that ensures consistent processes for data collection, reporting and sharing information is needed. The system would achieve greater consistency and efficiency in data collection, analysis and interpretation, and would allow for more effective coordination of management activities and decision making, enable rapid response, inform policy and facilitate information sharing.

Convenient and easy to use reporting tools, mechanisms, and processes need to be readily available to stakeholders to ensure timely and effective response. Current reporting channels include phone, email, web applications, mobile phone apps (e.g. FeralScan; Centre for Invasive Species Solutions) and informal reports through established networks. As technology and user preferences change, continual review and evaluation is needed to ensure reporting mechanisms remain effective and appropriate, without duplication of existing systems.

Reporting mechanisms should provide reliable and consistent feedback to the user about actions taken in response to their report. Feedback builds confidence and improves understanding, which in turn, increases the likelihood of stakeholders utilising reporting mechanisms.

Goal 5: Feral pig management is undertaken to the highest animal welfare standards and complies with all relevant legislation

Strategy 5.1: Ensure all stakeholders utilise best practice feral pig management techniques that comply with State and National animal welfare standards and legislation.

Feral pig control programs must comply with the *Animal Welfare Act (2002)* and use the most humane, target specific, cost-effective and efficacious techniques available to minimise animal suffering associated with management. Consideration of animal suffering must occur regardless of the status given to a particular pest species and the extent of the damage or impact caused by the pest.

Management of feral pigs needs to comply with the '*Code of Practice for the Capture and Marketing of Feral Animals in WA (2003)*' and it should adhere to the National Model COP and SOPs. While SOPs describe procedures involved with each control technique and address animal welfare issues applicable to each technique, the COP specifies aspects of best practice principles and provides guidance on choosing the most humane and appropriate control technique. Relative humaneness is essential to take into account when selecting a control technique and is highly dependent on whether that technique is correctly employed. In selecting

techniques, it is important to consider whether sufficient resources are available to fully implement a chosen technique.

To maintain continued public and political support for feral pig management into the future, it is critical that all stakeholders adhere to animal welfare regulations and standards. Best practice feral pig management techniques must be demonstrated to stakeholders by trusted sources in their local environment. Any innovations or improvements to control methods must be made available through these same channels.

Strategy 5.2: Investigate options for regulatory authorities to improve compliance with animal welfare legislation and the management of feral pigs.

A coordinated approach between government, industry and community groups towards feral pig management places significant expectations on these groups to determine the status of these pests within their jurisdictions and to work with all landholders to collaboratively manage them. This includes influencing those landholders who are seen to be non-compliant. However, community groups typically have limited budgets and no capacity to enforce compliance. This is the role of State Government agencies pursuant to their relevant legislation. However, the downsizing of State Government agencies over many years has reduced the capacity of some agencies to allocate staff to monitoring and compliance roles, with fewer officers now responsible for larger geographic areas. Limited by resources and the burden of evidence required to prosecute cases of non-compliance, State Government agencies often fall back on an educative rather than an enforcement approach.

It would be valuable to review the role of compliance in feral pig programs in relation to animal welfare legislation, the BAM Act, and COP to ensure that landholders are meeting their responsibilities to humanely manage declared pests on their land. One option could be to focus on awareness raising of landholder responsibilities and voluntary compliance coupled with a risk assessment to determine the role of compliance in feral pig management programs compared to other priority declared pests within WA. This would align the role and level of compliance with the risk and outcomes desired and help to ensure that compliance can be adequately resourced.

Goal 6: Effectively manage illegal activities impeding feral pig management.

Strategy 6.1: Identify options to improve capacity for regulatory authorities to prosecute those who engage in illegal hunting, deliberate translocation of feral pigs or wilful disruption of lawful feral pig management activities.

Illegal hunting of pigs on both private and Government land occurs throughout the State where feral pigs occur. Restricting illegal hunting and the deliberate translocation of feral pigs is recognised by all stakeholder groups as an important issue for the effective management of feral pigs in WA. In addition, reports by stakeholders indicate that illegal hunters typically use techniques for hunting and catching feral pigs that contravene the *Animal Welfare Act (2002)*, and deliberately damage fences, gates, and equipment on both private and Government lands in order to gain access to feral pigs, or as an act of retribution when denied access.

State Government agencies that manage lands on which feral pigs are present typically operate under differing legislation, and the regulatory frameworks pertaining to these can vary. As such, a unified approach to detecting and prosecuting offenders is often difficult to achieve. To effectively manage feral pigs in WA, the regulatory basis and capacity of authorities to detect and prosecute those who engage in illegal hunting, the deliberate translocation of feral pigs or the willful disruption of lawful feral pig management activities will need to be aligned. Similarly, if State agencies managing land on which feral pigs are present work collaboratively to apply a single unified approach that all parties can work to, it could produce beneficial outcomes for feral pig management.

Goal 7: The Western Australian public is supportive of feral pig management.

Strategy 7.1: Raise public awareness of current and projected environmental, economic and social impacts of feral pigs in WA, and the benefits of sustained, effective, and humane management.

Public awareness of the detrimental impacts of and the consequent need to manage feral pigs is currently limited; however, public support of feral pig management is required to maintain the social license to manage feral pigs and ensure ongoing funding for feral pig management.

It is important for the general public to be made more aware of the environmental, economic and social impacts of feral pigs and the need for humane management. However, culling animals is inherently unpleasant for many in the community, so the raising of public awareness should be undertaken carefully, in a coordinated manner, using simple but sensitive messaging. Public communications and messages need to be targeted, consistent, regionally specific, and relevant to the local issues. Dissemination of research outcomes to community groups is typically limited, and greater effort is required to ensure effective translation of scientific findings into accessible and engaging communication messages.

The internet and the increasingly widespread use of social media platforms has resulted in the ability to rapidly and widely disseminate information. It has also provided a ready platform for those wishing to spread misinformation, express extreme opinions or to sensationalise. As community vertebrate pest management groups, RBGs, DPIRD and DBCA are the lead organisations for feral pig management throughout WA, they should act together as the public face of feral pig management. Moreover, they should actively collaborate with all stakeholders to ensure that a consistent approach and information sharing is taken by all when communicating feral pig impacts and management. This has the potential to strengthen public support for feral pig management.

Implementation

Implementation of the WA Feral Pig Strategy will be coordinated by DPIRD in consultation with the proposed WA Feral Pig Advisory Group.

No single group of stakeholders can meet the goals set out in this Strategy for managing feral pigs in WA. Stakeholders from multiple sectors with different roles and responsibilities should consider how they might best adopt the principles and goals, and work with others to maximise outcomes. Government agencies may need to work with non-government organisations to make the vision of this Strategy a reality, and to ensure the gaps that have been identified are addressed. Action plans for each region and priority areas should be developed by the key stakeholders who are best placed to play an active role in feral pig management.

Implementation of the Strategy will require a set of milestones to be used to track the progress of adoption including:

- Commitment from all stakeholders identified in this Strategy to achieve collaborative and effective implementation, evaluation and review of the Strategy;
- Establishment of the WA Feral Pig Advisory Group. Building on the success of the feral pig stakeholder committee established voluntarily to help develop this Strategy, an advisory group will be set up to oversee and coordinate the implementation of the Strategy across the State and at regional levels;
- Prioritising and costing the goals articulated in the Strategy.

This Strategy guides feral pig management over the next five years. The implementation of the Strategy will be reviewed periodically, with a comprehensive review within five years to ensure that it is working effectively. The Strategy will be reviewed after five years to assess adoption of the Strategy by all stakeholders and to identify and incorporate changes in feral pig priorities in WA. Any necessary modifications to approaches will be made in consultation with the WA Feral Pig Advisory Group.

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Appendix 1: Stakeholder roles and responsibilities in feral pig management

Stakeholder	Role in feral pig management
Federal Government	
Department of Agriculture and Water Resources	• Administers the *Biosecurity Act 2015*. • Undertakes biosecurity risk analysis, import approvals, diagnostics, standards, policy, education and awareness.
Department of Environment and Energy	• Administers the *Environment Protection and Biodiversity Conservation Act 1999*.
State and Local Government	
Minister for Agriculture and Food	• Under the BAM Act, may declare an organism as a declared pest for the whole or part of WA. • Recognises groups that are managing declared pests. • Determines Declared Pest Rates.
Minister for the Environment	• If proclaimed, under the BC Act, may proclaim a species as an environmental pest for the whole or part of WA. • Allocates funds for environmental conservation.

Stakeholder	Role in feral pig management
State and Local Government	
Department of Primary Industries and Regional Development (DPIRD)	• Lead agency in developing the Western Australian Feral Pig Strategy 2020-2025. • Provides strategic leadership in biosecurity matters across WA, and administers the BAM Act and the declaration process. • Leads the response to incursions and eradication of priority invasive species within the State, where it is feasible and cost-effective to do so. • Provides inspection and certification services for interstate border and post-border movements, and at international borders (in collaboration with the Federal Government). • Coordinates surveillance and reporting from industry and community, including biosecurity groups. • Responsible for policies and systems that relate to specific pests. • Undertakes research into the distribution, identification, surveillance, management and control of invasive species. • Raises awareness, actively engages stakeholders and empowers them to share responsibility. • Administers the *Animal Welfare Act 2002*. • Administers the BAM Act, including compliance with the BAM Act. • Through the Director General, disburses funds from the declared pest account to RBGs for the implementation of operational plans.
Department of Biodiversity, Conservation and Attractions (DBCA)	• Undertakes surveillance and management of priority invasive species that affect environmental values on the State land that it manages. • Administers the BC Act and CALM Act. • Participates in tenure-blind control of invasive species with community groups. • Implements Good Neighbour Policy.

Stakeholder	Role in feral pig management
State and Local Government	
Department of Water and Environmental Regulation	• Administers the Metropolitan Water Supply, Sewerage and Drainage Act 1909, Country Areas Water Supply Act 1947, the Water Services Act 2012, and associated By-laws and Regulations. • Responsible for protection of raw water in proclaimed Public Drinking Water Source Areas to protect water quality and public health. • Responsible for Policy and the strategic management and protection of proclaimed Public Drinking Water Source Areas across Western Australia.
Water Corporation	• Undertakes surveillance, on ground management and By-law enforcement of Public Drinking Water Source Areas under delegated authority from DWER, to protect the raw water quality in catchments. • Participates in tenure-blind control of invasive species with State Government agencies and community groups as appropriate. • Raises awareness of the issues feral animals cause in the Public Drinking Water Source Areas. • Provide observations and feedback as appropriate on feral pig activity within Public Drinking Water Source Areas to DPIRD, DBCA, DWER, and the Department of Health.
WA Police Force	• Administers the *Firearms Act 1973*. • Provides enforcement of the *Criminal Code Act 1913*.
Biosecurity Council of Western Australia	• Provides strategic advice to the Minister for Agriculture and Food, the Director General of DPIRD and other WA State Government Ministers on matters related to biosecurity. • Comprises members with an interest and expertise in managing the biosecurity of WA. • Actively engages with industry, community and Government to ensure informed and robust advice is given.

Stakeholder	Role in feral pig management
State and Local Government	
Biosecurity Senior Officers Group	• Comprised primarily of senior executives from each of the WA State Government agencies with statutory responsibility for the leadership and management of biosecurity in WA. • Provides strategic overview and interagency coordination of biosecurity issues of interest to the State and the activities of member agencies. • Raises awareness and provides advice on biosecurity issues to the Minister for Agriculture and Food and other ministers as required.
Local Government	• Raises awareness and undertakes surveillance activities within the community. • Biosecurity responsibilities as landholders.
Industry	
Industry and landholders	• Undertakes targeted surveys and passive surveillance. • Biosecurity responsibilities as landholders. • Relevant primary producers contribute to management of priority pests through Industry Funding Schemes and Declared Pest Rates.
Community	
Recognised Biosecurity Groups	• Established under the BAM Act for purposes including controlling declared pests that are important in local and regional areas relevant to the group. • Develop operational plans to manage declared pests. • Work in partnership with landholders, other RBGs, and Government agencies to develop and undertake strategic, landscape-wide management programs for declared species.

Stakeholder	Role in feral pig management
Community	
Landholders, managers and occupiers of land and freshwater bodies	• Primary responsibility for controlling invasive species on the lands they manage (legally obligated to control declared species).
Regional NRM bodies	• Overarching regional support and facilitation of both State and Australian Government NRM objectives, including landcare, regenerative agriculture and biodiversity conservation. • Supportive of community-led, locally driven solutions to regional agricultural and landscape function issues.
Not-for-profit and community organisations	• Deliver on-ground programs, fundraising, communications and awareness-raising activities. • Be aware and informed of invasive species and the importance of surveillance and maintain vigilance.
Research organisations such as CSIRO and universities	• Undertake research and partner with other organisations to deliver on-ground programs.
General public	• Report vertebrate pests. • Be aware and informed of invasive species and the importance of their management.

Appendix 2: Feral pig control methods and considerations

Method	Considerations
Baiting	• Baiting is the most economical and effective method for controlling feral pigs on a broad scale. • Grain and pellets are the only approved baits for use with 1080 concentrate. As per the Code of Practice for the Safe Use and Management of Registered Pesticides containing 1080, PAPP and STRYCHNINE in Western Australia, mixing of 1080 liquid concentrates can only be performed by authorised persons or Licensed Pest Management Technicians (LPMTs). • Commercially manufactured PIGOUT® 1080 baits are registered for use in WA (Landholder 1080 poison permit required for use).
Trapping	• Trapping can be an effective method for reducing feral pig abundance provided it targets the entire mob. • Numerous effective trap designs are available. Similarly there are many different types of food attractant used including; fruit (apples most commonly), grain (wheat, barley, maize, lupins), and vegetables. • Use of animal carcasses or swill feeding is not permitted. • Trapping must conform to animal welfare standards, and requires resources to maintain and check traps accordingly. Traps should be built where possible in locations that will provide natural shade or shade must be provided, using designs approved by the National Model Code of Practice. • Water should be provided and traps should be checked a minimum of every 24 hrs (more regularly in hot conditions).
Fencing	• Feral pig exclusion fencing may or may not incorporate electrified wire(s). • Fencing is expensive and is typically used to protect high value resources or crops. In southwest WA fencing is used by DBCA to protect some threatened flora populations. Exclusion fencing has also been erected around high value crops such as truffle and avocado farms in the southwest. • For best results and to minimise maintenance requirements, exclusion fencing needs to be installed prior to feral pigs ‘finding’ the high value food resource.

Method	Considerations
Shooting	• Shooting as a control method for feral pigs is typically only useful for dealing with small numbers of pigs or recalcitrant individuals which have avoided baiting or trapping programs. • Ground shooting operations occur in the Walpole Wilderness area through recreational hunting groups under an MOU with, and following liaison and approval by, DBCA. • Aerial shooting is a logistically intense activity that requires many levels of approvals and can be expensive. Aerial shoot programs may be more effective when used in conjunction with a Judas program. • In recent years, coordinated aerial shooting programs for feral pigs have been undertaken in the southwest agriculture zone across adjoining private property and Government land. • Aerial shooting of feral pigs in the rangelands is generally opportunistic, and associated with large feral herbivore culling programs.
Detection dogs	• Detection dogs are trained to only track and locate (NOT hold) feral pigs to enable operators to destroy the pig by shooting only. • The use of dogs to attack and bring down feral pigs is an unacceptable practice under the *Code of Practice for the Capture and Marketing of Feral Animals in Western Australia 2003,* and it is in contravention to the *Animal Welfare Act 2002*. • Some community-led feral pig control groups utilise detection dogs to identify feral pig presence or locations of recent feral pig activity for trap placement or feral pig removal. • Bait aversion training is strongly recommended for detection dogs used in feral pig control, particularly if dogs are going to be used in areas where 1080 baiting occurs. Pest control operators can choose to muzzle or have non-muzzled dogs and will be required to adhere to the conditions of the DBCA *Guidelines for Approving the Use of Dogs for Feral Pig Control Activities*. • DBCA will permit access to CALM Act land, UCL and unmanaged reserves for feral pig control groups where the activity compliments regional priorities.