Feral pigs *Sus scrofa*

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Foreword

Feral pigs have major economic, environmental and social impacts in Queensland. They are designated as a 'threatening process' under the *Environmental Protection Biodiversity Conservation Act 1999* and as a Class 2 pest under the *Land Protection (Pest and Stock Route Management) Act 2002.*

The agricultural impacts of feral pigs in Queensland exceed $50 million per year through predation, competition and destruction of crops and pastures. While harvesting of feral pigs contributes some $10 million to the Queensland economy and contributes to reducing their impacts, harvesting may also, paradoxically, contribute to the sustainability of some feral pig populations.

The environmental impacts of feral pigs in riparian zones, wetlands and rainforests include destruction of plants, animals and habitat; disturbing soil with secondary erosion; siltation; and water quality effects. These impacts are of major concern.

This Feral Pig Management Strategy provides stakeholders with a framework to coordinate control measures and reduce impacts.

The final value of any strategy, however, is in its application. A sustained and coordinated effort in controlling feral pigs is required to ensure that value to the community and individual landholders.

Murray Jones
Chair
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Acronyms

AFRS	Alan Fletcher Research Station
AHA	Animal Health Australia
AUSVETPLAN	Australian Veterinary Emergency Plan
CRC	Cooperative Research Centre
CWTA	Centre for Wet Tropics Agriculture
DEH	Department of Environment and Heritage
DPI	Department of Primary Industries (Qld)
EPA	Environmental Protection Agency (Qld)
EPBC	Environment Protection Biodiversity Conservation Act (Comm.)
FMD	foot and mouth disease
JCU	James Cook University
LG	local government
LGAQ	Local Government Association of Queensland
LPO	Land Protection Officer (NRM&E)
NHT	National Heritage Trust
NRM	natural resource management
NRM&E	Department of Natural Resources, Mines and Energy (Qld)
QA	quality assurance
QHealth	Queensland Health
QMWGH	Queensland Macropod and Wild Game Harvesters Association Inc.
RIRDC	Rural Industries Research and Development Corporation
RWPARC	Robert Wicks Pest Animal Research Centre
RWRC	Tropical Weeds Research Centre
1080	sodium fluoroacetate

Definitions

Feral pig. A pig that has all of the following morphological features:
(a) an elongated snout
(b) long coarse hair
(c) sloping hindquarters.

Best practice. A superior method or an innovative practice that contributes to improved performance of a process. Best practice may incorporate several factors to include but not be limited to the following:

(a) expert review
(b) clearly superior results
(c) results that are a breakthrough in efficiency/ effectiveness
(d) agreement from multiple sources that the practice is superior
(e) the use of latest technology
(f) a high number of satisfied repeat users.

The best practice must demonstrate through data that it is 'more, better, faster, cheaper'. Data must exist to validate that the best practice increases productivity (i.e. more), improves quality and service (i.e. better), reduces cycle time (i.e. quicker) and reduces cost (i.e. cheaper) (Harbour, Jerry L., 1996).

Executive summary

The overall vision of the feral pig management strategy is to use best practice management to minimise the impact of feral pigs on the environment, economy and health of Queensland.

The strategy is intended to achieve five outcomes:

(1) The community accepts that feral pigs are an issue for the community as a whole.

This will involve:

- developing and implementing an awareness program to encourage adoption of effective feral pig management.

(2) Feral pigs are managed effectively.

This will involve:

- eradicating feral pigs from areas where feasible and where eradication will have a long-term effect
- training and accrediting feral pig control operators in best practice management techniques
- managing feral pigs having regard to local circumstances and conditions
- investigating the role of game harvesting in feral pig management
- incorporating feral pig management into broader natural resource management, being mindful of implications of feral pig management for the management of natural resources.

(3) Resources are used effectively and strategically through collaborative and coordinated pest management planning.

This will involve:

- ensuring that agencies with legislated responsibilities are empowered and adequately resourced
- encouraging, preparing and implementing feral pig planning at local levels (local government area, catchment and property) that aligns with state and national plans.

(4) Strategic research is directed toward more accurately defining the feral pig problem and finding effective management solutions.

This will involve:

- continuous improvement of feral pig management practices through regular review and adjustment of activities
- obtaining and using information to holistically manage the impacts of feral pigs
- understanding the ecology and biology of feral pigs in all habitats in Queensland
- improving existing and, where necessary, developing additional control techniques
- promoting continuous improvement in feral pig management by provision of new information.

(5) Effective feral pig management in Queensland is supported by adequate resourcing.

This will involve:

- obtaining cooperation and support from all stakeholders in resourcing their components of this strategy
- coordinating education, awareness and research resources
- using community knowledge and support for feral pig control
- ensuring all stakeholders are committed and contributing to feral pig control in Queensland
- gaining public and political support for the effective and humane management of feral pigs.

1 Feral pigs in Queensland: background

1.1 Overview

Feral pigs have been part of the Queensland landscape since about 1865. The theory that feral pigs, sometimes known as 'Captain Cookers', were derived from deliberate releases or escapes from Cook's time at Cooktown in north Queensland has been discounted. The only pigs landed by Cook were killed by a fire deliberately lit by Aborigines (Pullar 1953). There has also been speculation that pigs were introduced from New Guinea by travellers to Cape York. This has been shown to be the case for the later part of last century only (Pullar 1953), as there were no words in the local Aboriginal language for 'pig' before this time (Pullar 1950; Pavlov, Hone & Moore 1992).

Feral pigs were derived from stock that were let loose or wandered away from where they were being kept, often under semi-feral conditions, as settlement progressed across the state. To this day, pigs are still being introduced to areas of the state that do not have significant feral pig numbers—both accidentally (escapes from piggeries or truck accidents) and deliberately (usually by recreational hunters).

Feral pigs are probably descendants of Berkshire and Tamworth pigs that were introduced to Australia, including pigs transported as part of the First Fleet (Choquenot, McIlroy & Korn 1996). These pigs probably then crossed with various breeds from Europe and Asia that were brought into Australia by early settlers from these regions.

Feral pigs are one of the most widespread and damaging pest animals in Queensland. They are widely distributed and often difficult to control; they inflict damage on the environment, lower agricultural production and degrade amenity values. Feral pigs also pose a disease risk to humans and native and domestic animals through harbouring many exotic and endemic diseases.

Feral pigs do provide benefits as income to many professional and amateur hunters, through the export of 'wild boar' products. Both activities inject money into the economies of many small rural communities. However, it is unlikely that these benefits offset the damage caused by feral pigs.

1.2 Legislative status

The feral pig is a 'declared' animal under the Regulations of *Land Protection (Pest and Stock Route Management) Act 2002*. It is categorised as a Class 2 pest.

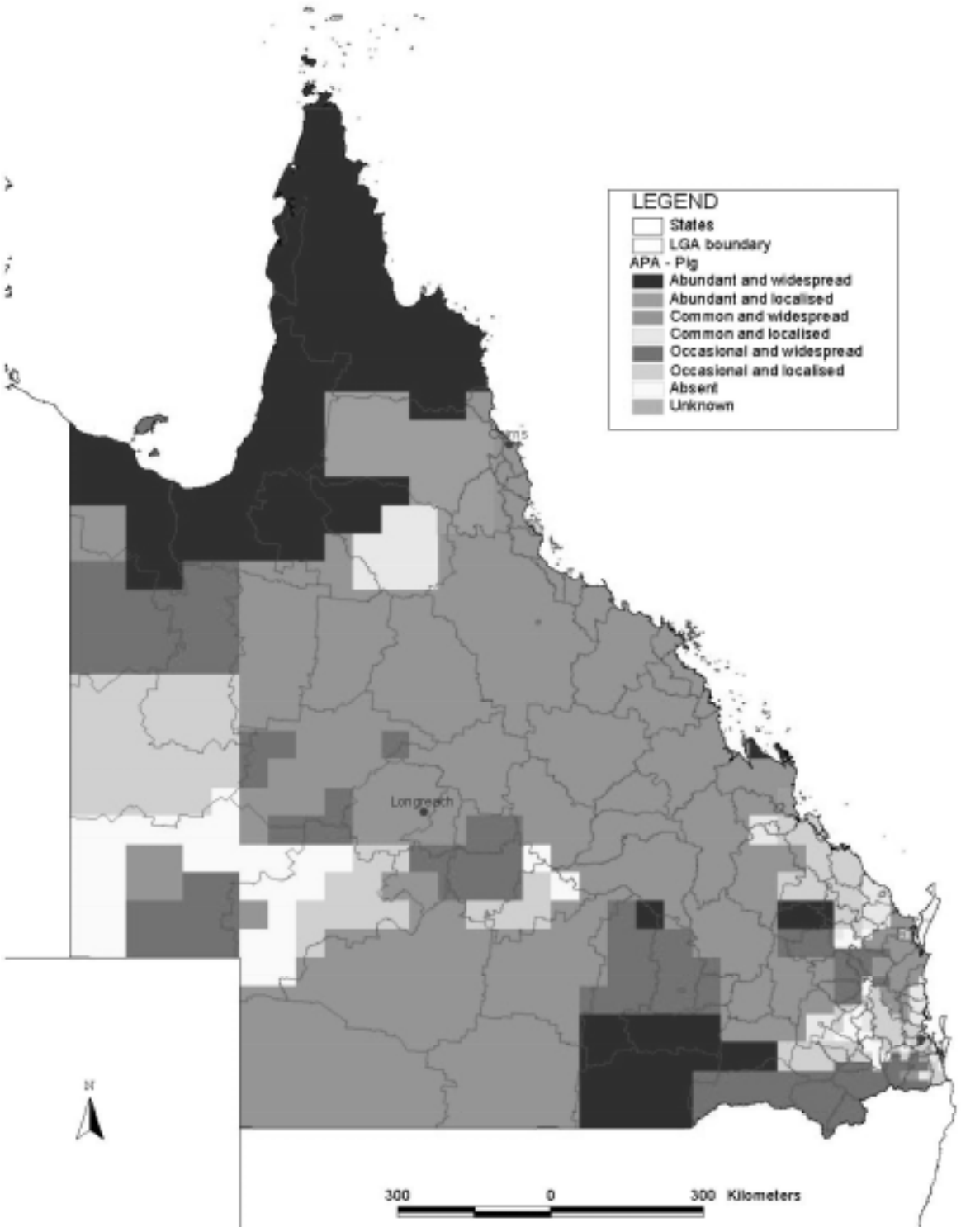
Section 77 of the *Land Protection Act* places the responsibility on the owner of land to take reasonable steps to keep the land free from feral pigs. Local governments are empowered under Section 78 to issue a non-complying landholder with a notice to control feral pigs, and a maximum penalty of $60 000 is applicable if they do not comply with this notice. The Act also provides for penalties for the feeding, release or illegal keeping of feral pigs.

The 'predation, habitat degradation, competition and disease transmission by feral pigs' has been listed as a key threatening process under the *Environment Protection Biodiversity Conservation Act 1999.*

1.3 Distribution

Map 1 shows the most recent distribution data for feral pigs in Queensland. This information is drawn from biannual reports submitted by regional Land Protection Officers about the numbers and distribution of various species of pest animals.

Map: Feral pig distribution, Queensland, 2003



Source: NRM&E 2003, Annual Pest Assessment

1.4 Impacts

Table 1 provides a summary of the major impacts of feral pigs.

Table 1. Environmental, production and social impacts of feral pigs

Environmental impacts
Negative • Predation on native animal species • Consumption of native flora • Disruption of soils and soil organisms • Damage to watercourses and wetlands and their ecology • Vector for weed spread • Encouragement of *Phytophthora* and other fungal infestations
Production impacts
Negative • Predation on lambs • Disruption of lambings • Consumption of, and associated damage to, crops and pasture • Damage to fences and water points • Animal disease spread • Competition for fodder **Positive** • Income generation from game meat industry and flow-on benefits to regional communities
Social impacts
Negative • Human disease spread • Damage to visual amenity **Positive** • Contribution to hunting-based tourism • Contribution to hunting as a recreational activity

Impact on primary production

The financial impact of feral pigs on agriculture takes three forms (Choquenot et al. 1996):

- value of the direct losses to agricultural production
- value of the continuing expenditure on pig control
- value of lost opportunities to take profit from alternative investment of this expenditure.

It is difficult to provide an accurate dollar figure of the economic damage caused by pigs; some localities will suffer less damage because of naturally low pig numbers or the practice of control methods that reduce their impacts. Nevertheless, some attempts have been made to estimate the costs of feral pigs.

Pigs are responsible for damage to a range of industries. They reduce the yields of grain crops (Benson 1980, Caley 1993), damage and consume pastures (Hone 1980), reduce yields of sugar cane and some tropical fruits such as bananas, mangoes, pawpaw and lychees (McIlroy 1993), damage netting fences, damage and pollute water sources (Tisdell 1982; O'Brien 1987), and prey upon newborn lambs (Plant et al. 1978; Pavlov, Kilgour & Pederson 1981; Hone 1983; Choquenot 1993).

A study of the damage caused to banana and sugarcane farms in Queensland's Wet Tropics has shown that impacts can vary from nil to quite significant (Mitchell & Dorney 2002). The impact on total banana production was estimated to be about 0.08 per cent, with 3.5 per cent for sugar cane farms. However, these are average figures and some farms suffered greater or lesser impacts.

Lamb predation by feral pigs is estimated to range from 1.6 to 37.9 per cent for the semi-arid rangelands (Pavlov et al. 1981; Plant et al. 1978), and is thus highly variable. Estimates for losses to grain crops in Queensland are shown in Table 2.

Taking an Australia-wide approach, Choquenot et al. (1996) conservatively estimated the national loss to agriculture caused by feral pigs to be in the order of $100 million.

Table 2. Estimated value of lost crop production for Queensland 2001–02

Crop	% Reduction in yield*	Value# (millions)
Wheat	3	$6.03
Sorghum	5	$9.74
Barley	1	$0.4
Other	3	$1.39
Total		**$17.56**

* Based on Tisdell (1982)

Based on DPI (2002)

The costs resulting from damage to pasture and competition with domestic stock are difficult to estimate, as there is considerable variation across pasture types and their respective biomasses. It has been shown that pig activity reduces pasture availability and can lead to the establishment of less desirable pasture species, including weeds (Hone 1980). Most work to date on the impacts of pigs on grazing industries has been concentrated on the predation of lambs and the effects on the sheep grazing lands of semi-arid New South Wales, which is similar in some respects to the southern sheep grazing areas of Queensland.

It has been estimated that in 1984 Queensland spent approximately $1.1 million on feral pig control, which equates to about $2.2 million in today's dollar values (Choquenot et al. 1996). This amount includes both government and private expenditure on control by varying means. It does not include amounts spent by recreational hunters, who also contribute to control. This estimate of expenditure is based upon government and landholder estimates of expenditure on control, and so should be used as a guide only to current control costs.

Impact on the environment

The impact of feral pigs on the environment takes one of two forms:

- damage to habitats
- direct damage to animal species.

Degradation of habitats is probably the most obvious form of environmental damage caused by pigs. This damage can be through rooting, trampling, tusking or rubbing trees and consumption of plants and soil organisms.

Research (Hone 1988, 1995; Mitchell 1993) has found that the rooting behaviour of pigs is more prevalent in areas of high soil moisture such as drainage lines and swampy areas. Such behaviour can severely disrupt the composition of the soil's micro-organisms and, subsequently, the process of nutrient cycling. Rooting can also disrupt the regeneration of plants, change the composition of the plant community, facilitate

weed invasion and initiate soil erosion in drainage areas where the soil has been severely disturbed. Secondary siltation and water quality impacts also occur.

In addition to rooting, pigs can physically destroy vegetation by trampling it along their paths or in the areas where they wallow. Pigs will often have a favourite rubbing tree, though this has not been linked to territory marking. The purpose of this behaviour is to remove parasites and relieve irritations. They also tusk trees as part of their normal behaviour. Undermining (in which pigs create deep holes) and rooting during feeding can lead to trees being knocked over.

Although pigs are known to feed on most parts of a wide variety of native and exotic plants, they usually prefer the softer, higher energy parts, especially tubers and fruits. Their negative impact on plant communities is partially balanced by the positive impact of their assistance in the spread of some plants by passing their seeds in dung. However, this pig-assisted spread of plants also includes weed species such as the weeds of national significance (WONS) = mesquite (*Prosopis spp.*) and pond apple (*Annona glabra*).

The feral pig has also been implicated in the transmission of plant diseases such as root rot fungus (*Phytophthora cinnamomi*) and other plant pathogens. Introduction is usually via contaminated mud and soil carried by pigs and by the physical damage to plants that allows diseases to enter through the wounds.

Feral pigs are known to consume numerous native animals including earthworms, amphipods, centipedes, beetles and other arthropods, snails, frogs, lizards, snakes, the eggs of freshwater crocodiles (C*rocodylus johnstoni*), turtles and their eggs, and small ground-nesting birds and their eggs (Pullar 1950; Tisdell 1984; McIlroy 1990; Mitchell 1993; Roberts et al. 1996).

Without definitive information on the prey eaten, rates of predation, density and status of prey, and whether predation is density dependent (Choquenot et al. 1996), it is impossible to determine accurately what effect pigs have on native fauna, apart from the observable damage to individual animals.

Competition with other animal species has not been proven, but there is some evidence that pigs may compete directly with some specialist feeders such as the cassowary (C*asuarius casuarius*) (Choquenot et al. 1996) and other species such as the brolga (*Grus rubicundus*) and magpie geese (*Anseranas semipalmata*) (Tisdell 1984).

A Threat Abatement Plan is currently being drafted to address these threats at a national level. This plan is being prepared to meet the Commonwealth Government's obligations under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) following the listing of feral pigs in July 2001 as a key threatening process. Section 271 of the EPBC Act requires the preparation and implementation of a threat abatement plan for nationally coordinated action to manage the damage to Australian wildlife—particularly endangered plants, animals and communities—caused by feral pigs (Environment Australia 2002).

Disease risk

The feral pig poses a serious threat to Queensland's livestock industries and human health through being a carrier, or amplifier, of many endemic and exotic diseases. The diseases that pose the greatest threat are listed in Table 3.

Table 3. List of endemic and exotic diseases carried by feral pigs

Endemic	Exotic
Brucellosis (*Brucella suis*)[#] Murray Valley encephalitis [#] porcine parvovirus leptospirosis (*Leptospira* spp.)[#] melioidosis (*Burkholderia pseudomallei*)[#] sparganosis (*Spirometra erinacei*)[#]	foot and mouth disease (FMD) classical swine fever Aujeszky's disease Japanese encephalitis[#] swine vesicular disease African swine fever trichinosis[#] rabies[#] screw-worm fly infestations[#]

Zoonoses (diseases that affect both humans and feral pigs)

Of the exotic diseases, foot and mouth disease (FMD) poses the greatest threat to Queensland's economy. In its June 2002 research report, 'Impact of a foot and mouth disease outbreak in Australia', the Productivity Commission examined in detail the potential social, economic and environmental consequences of an FMD outbreak. The Commission's worst-case scenario involved key beef and lamb export markets being closed for 15 months. The cost of a FMD disease incursion under this scenario would be between $8 and $13 billion of gross domestic product, and its consequences would be felt for nearly 10 years after the event. Even an isolated outbreak that was brought rapidly under control was estimated to potentially cost $2 to $3 billion of gross domestic product.

However, a recent review sponsored by the Council of Australian Governments (COAG) of the role of feral animals in the introduction, maintenance and spread of FMD has revealed that the risk posed by feral pigs may not be as great as perceived by the general community and that other species (e.g. feral goats) may be a greater threat. Whilst pigs are essentially 'virus factories' for FMD during infection, once they recover from the disease they do not become carriers, whereas goats and other animals remain carriers for some time. The COAG review also highlighted that Australia may not necessarily have to demonstrate that feral animals are free from FMD in order to display overall freedom from FMD.

FMD could have devastating effects on the livestock industries of Queensland although these impacts have not been costed. The Department of Primary Industries (DPI) and the Commonwealth have formulated a national approach to exotic disease management, the Australian Veterinary Emergency Plan (AUSVETPLAN) which can be viewed at <http://www.aahc.com.au/ausvetplan/>.

1.5 Control issues

Responsibilities

Under the *Land Protection Act* all landholders, including the state, are responsible for the control of feral pigs on lands that they manage. Because of the mobile nature of feral pigs, control efforts are most successful when they are conducted cooperatively over large areas; this assists in preventing reinvasion and subsequent waste of resources if re-treatment is required.

Methods

Table 4 gives an overview of the available control methods for feral pigs, along with their relative strengths and weaknesses.

Table 4. Techniques for controlling feral pigs in Queensland

Control option	Features
Trapping	Can be made target specific Allows commercial utilisation Is labour- and skill-intensive Requires access for trap and bait materials
Shooting	Is target specific Allows commercial utilisation Requires adherence to firearms legislation Is costly for large numbers Is not suitable for thick vegetation Is labour- and skill-intensive
Fencing	Is low in impact on non-targets Requires constant maintenance Is costly and largely ineffective Shifts problem May impede movement of non-target species
Dogging	Involves animal welfare concerns May displace pigs rather than capture them Allows commercial utilisation Controls only part of population
Baiting	Can control large numbers over large areas quickly and economically Can be tailored to be target specific Involves possible non-target issues if not conducted correctly Raises public concern over humaneness and safety Non-registered chemicals are used on occasions (illegal)
Aversion (i.e. making the animal wary, cautious or afraid)	Currently not commonly used Longevity of this approach may be limited by pig intelligence Raises potential animal welfare issues
Biocontrol	Not available Potentially high cost and low chance of success Public wariness of genetically modified organisms (GMOs) Potential problems with domestic pig industry and native pigs in South-East Asia

Bounties or bonuses have been used in Australia and overseas as a component of pest management. It should be noted, however, that bounties are not control methods; they are a motivational tool that is used to encourage people to use various control methods. After several reviews, bounties have been shown not to result in significant reductions in populations or impacts and have often resulted in fraud and wasted resources.

Controlling pigs or managing them as a resource?

Some people believe that the feral pig should be managed as a resource rather than eradicated as a pest. In general, control programs are conducted because of the economic and environmental damage caused by feral pigs and the legislative requirement for their management in all mainland states except the ACT and South Australia. However, control programs usually do not lead to the utilisation of the feral pig as a resource.

The feral pig, marketed as ‘wild boar’, has been harvested for export. The main markets for Australian wild boar meat are European Union (EU) countries (particularly Germany, France, Italy and, to a lesser extent, Sweden) and Japan. The EU countries have traditionally consumed wild boar meat, and with high human populations and varying local production they periodically become dependent on imports for much of their wild boar meats.

In the early 1990s Australia supplied some 20–30 percent of the wild boar consumed worldwide (Ramsay 1994). This market is very volatile, with sales and prices fluctuating from year to year. The market seems to be dependent on the length and

severity of the northern winter, which affects the supply of local wild boar. Over recent years, the sustained dry conditions in central and northern Queensland have reduced the numbers harvested in those parts of the state. The 2002–03 drought conditions over much of Queensland severely depleted feral pig numbers (C Dee, 2002, pers. comm., November).

All field harvesters processing wild boar for human consumption or pet food must have an accreditation with Safe Food Queensland and operate to an approved quality assurance (QA) program. This QA program provides guidelines to shooters and pig harvesters on how to harvest and handle the product so that it is suitable for the export market.

There are 2100 field harvesters with an accreditation with Safe Food Queensland (R Schultz, 2002, pers. comm., November). There are also numerous other shooters and hunters who do not sell carcases. Across some parts of Australia, recreational feral pig hunters sometimes make a significant impact on pig numbers, as well as injecting funds into local economies where they hunt. However, this does not occur to the same extent in Queensland (C Dee, 2002, pers. comm., November).

The value of wild boar exports has varied between $10 and $40 million annually over the last few years because of Australia's drought conditions, and the variability of European supply and demand (Ramsay 1994). The number of carcases processed in Australia is shown in Table 5.

Table 5. Number of wild boar carcases processed in Australia 1989–92 and Queensland 2001

Year	Carcases
1989	203 837
1990	96 962
1991	101 006
1992	271 133
2001	240 000 (Qld only)

In Queensland in 2001 there were 220 seasonal chiller boxes operating that received approximately 240 000 carcases. These boxes were in diverse locations across Queensland including Texas in southern Queensland, 'Three Ways' near Burektown in the north, Mt Isa and Townsville. However, the grain-growing areas provided the greatest and most constant supplies of 'wild boar'.

The average price paid to 'hunters' in 1996 was 90 cents/kg but by mid 1997 it averaged about 70–5 cents/kg. Preferred carcases are between 30 and 60 kg, with pigs below 21 kg often being rejected and carcases over 90 kg being difficult to chill and process. In more recent years, however, markets have been developed for smaller animals, with these animals being slaughtered in domestic or export-accredited abattoirs. In 2002 export-licensed processing works were located in Longreach, Roma, Nerang and Mt Isa with two at Eagle Farm in Brisbane. The game meat processing industry in Queensland employs up to 80 people during times of peak production/harvest (C Dee, 2002, pers. comm., November).

Cost–benefit relationship

While the game meat industry and recreational hunters play an important role in controlling feral pigs in some localities, there is, nevertheless, an overall net cost to the broader community from feral pigs. The damage done to crops, pastures, fences, water facilities and livestock can be approximated ($100 million), which is well in excess of the estimated value of the 'wild boar' market ($20 million)—even without including the

costs to the environment and the potential costs from an emergency disease outbreak to Australia.

Through only taking 'commercial' size feral pigs, the game meat industry has an investment in sustainable harvest rather than control and eradication. However, there is potential for the game management industry to provide additional impacts on feral pig numbers.

2 About the strategy

2.1 Purpose

The strategy aims to provide a integrated set of strategic directions, agreed to by stakeholders, for the future management of feral pigs in Queensland. Without such direction and coordination of effort, stakeholders may not necessarily achieve their goals and many will have wasted significant resources and effort in the interim.

This strategy is one of a group of strategies which aim to establish statewide planning frameworks to provide clear direction to government, community, industry and individuals for the management of pest animals and weeds across Queensland.

2.2 Process of development

This strategy has been developed from the results of a multi-stakeholder strategy development workshop held on feral pig management in Townsville on 18–19 June 2002, involving government officers, environmental groups, primary industry groups and academics, and from further consultation with stakeholders. It has been expanded through additional input from Department of Natural Resources, Mines and Energy research, extension and operational staff; peak stakeholder groups; and interstate experts.

2.3 Scope

This strategy has been established to address all feral pig impacts within Queensland. It is linked to other planning frameworks as shown in the strategy matrix (Table 6), is consistent with the Queensland Pest Animal Strategy, and draws on activities at the property level.

Stakeholders include individual farmers and graziers and their peak bodies such as Agforce and Cane Growers; managers of state lands such as national parks; local government authorities; state and federal government departments; feral pig hunters and harvesters; and community and conservation groups.

Table 6. Context and relationship of the Queensland Feral Pig Strategy to planning initiatives at other levels

Scope / Scale	Natural resource management	Pest management	Pest species management
National	National Strategy for the Conservation of Australia's Biological Diversity (1996); National Guidelines National Guidelines and Principles for Rangeland Management (1999); National Action Plan for Salinity and Water Quality (2003)	Managing Vertebrate Pests: Principles and Strategies	Threat Abatement Plan—Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs; Managing Vertebrate Pests—Feral Pigs
State	Queensland Biodiversity and NRM Strategy (proposed)	Queensland Pest Animal Strategy; QPWS park plans	**Queensland Feral Pig Management Strategy**
Regional or catchment	Lake Eyre Basin Catchment Management; Condamine Catchment Integrated Management Strategy; Murray Darling Natural Resource Management Plan (draft)	Central Highlands Pest Management Plan; Qld Murray–Darling Pest Management Plan (proposed)	
District or local govt	Local government planning schemes	Local government area pest management plans	Cooloola Cat Management Plan
Property	Property management plans	Property pest management plans	

2.4 Implementing the strategy—potential outcomes

Benefits and opportunities

Implementation can potentially provide a basis for:

- improved communication mechanisms
- improved general awareness
- wider community support for feral pig control
- coordination of management efforts
- documented action plan
- optimum use of resources
- improved participation in and acceptance of control
- improved data collection and research.

Risks and challenges

Significant challenges may constrain stakeholders from managing feral pigs, including:

- unpredictable behaviour and mobility of feral pigs
- availability of funding and other resources
- competing stakeholder expectations, priorities and resources
- lack of commitment or cooperation with respect to control programs
- differences in management priorities based on conflict between the benefits arising from feral pigs (e.g. game harvesting) and their negative impacts
- opposition to the use of 1080 and pesticides generally
- the development of cost-effective and efficient alternatives to the use of 1080

- difficulty in enforcing feral pig control
- concerns over non-target impacts of baiting, particularly aerial baiting
- limitation or prevention of the use of some control methods due to animal welfare obligations
- lack of pest management on lands controlled by absentee landholders
- need for coordinated action and management in order to address the mobility of feral pigs.

2.5 Principles of pest management

The development and implementation of this strategic plan is based on the pest management principles contained within the *Land Protection (Pest and Stock Route Management) Act 2002* and listed below. These principles provide the over-arching basis for pest (animal and weed) management in Queensland.

Integration
Pest management is an integral part of managing natural resources and agricultural systems.

Public awareness
Public awareness and knowledge of pests must be raised to increase the capacity and willingness of individuals to control pests.

Commitment
Effective pest management requires a long-term commitment to pest management by the community, industry groups and government entities.

Consultation and partnership
Consultation and partnership arrangements between local communities, industry groups, State government agencies and local governments must be established to achieve a collaborative approach to pest management.

Planning
Pest management planning must be consistent at local, regional, State and national levels to ensure that resources target the priorities for pest management identified at each level.

Prevention
Preventative pest management is achieved by:

- preventing the spread of pests, and viable parts of pests, especially by human activity, and
- early detection and intervention to control the pests.

Best practice
Pest management must be based on ecologically and socially responsible pest management practices that protect the environment and the productive capacity of natural resources.

Improvement
Research about pests, and regular monitoring and evaluation of pest control activities, is necessary to improve pest management practices.

3 Strategic plan

The strategy developed through the stakeholder consultation process is structured around an overall vision of feral pig management in Queensland and five inter-related desired outcomes that were identified to realise the vision. Strategies and actions to achieve each of the desired outcomes, and who will undertake them, have also been developed. The main elements of the strategy are summarised as follows.

Vision

To minimise the impact of feral pigs on the environment, economy and health of Queensland

Desired outcomes

1. The community accepts that feral pigs are an issue for the community as a whole.
2. Feral pigs are managed effectively.
3. Resources are used effectively and strategically through collaborative and coordinated pest management planning.
4. Strategic research is directed toward more accurately defining the feral pig problem and finding effective management solutions.
5. Feral pig management is supported by appropriate resourcing.

3.1 Community awareness

Desired outcome: The community accepts that feral pigs are an issue for the community as a whole.

Background

To improve awareness of feral pig impacts, management and control techniques, there is a need to segment the audience and develop communication strategies regarding feral pig management appropriate to the specific needs of each segment.

Without this community knowledge and understanding, feral pig management may not attain the vision outlined in this strategic plan. It is also important that those undertaking management programs appreciate the attitudes of various community groups towards feral pigs and methods for their control, so as to take such concerns into consideration in their programs.

Some landholders may not be undertaking control because they believe that non-target species may be poisoned. Other landholders may be unaware of the damage that feral pigs can cause, and hence of the possible costs to them personally of ‘providing free agistment’ for these animals.

Pest management principle

Public awareness: Public awareness and knowledge of pests must be raised to increase the capacity and willingness of individuals to control pests.

Strategy 1: Develop and implement awareness programs to encourage adoption of effective feral pig management

No.	Action	By whom	By when
1.1	Develop landholder, industry and local government awareness programs containing information on costs and impacts—environmental, disease, productivity loss/gain—and control options	NRM&E, all stakeholders including industry and community groups	Dec 2004
1.2	Establish partnerships between government and supportive community and industry groups in order to harness their collective communication channels and support for feral pig control	NRM&E, industry and community groups	Dec 2004 and ongoing
1.3	Develop community awareness programs containing information on feral pigs and convey that they are a 'whole of community' issue	NRM&E, all stakeholders including industry and community groups	Dec 2004
1.4	Develop an awareness program relating to the disease risk of feral pigs	DPI, QHealth, AHA	June 2005

3.2 Effective management

Desired outcome: Effective management of feral pigs

For management to be effective it needs to be focused on locations that are high-value areas for both agriculture and the environment.

In order to address management across the range of habitats and conditions found in Queensland, feral pig control techniques must be tailored to suit the particular needs and requirements of each region. Critical control points should be identified so that control activities have the greatest impacts on feral pig populations, for example, during drought.

Whilst eradication is not considered feasible for the whole state, successful localised elimination and generalised impact management may be possible. In high impact areas, periodic knockdowns of pig populations may be the best approach.

Local free-feeding sites are a valuable tool in the long-term management of local feral pig populations, as they can serve as both monitoring locations and possible control (trapping or baiting) locations.

Community support for feral pig control is a critical component of a successful strategy. It is therefore essential that any strategic plan give due recognition to competing interests and exotic animal disease preparedness within the community. Accordingly, this strategic plan seeks to engage the community in feral pig control activities by the dissemination of information.

Training and accreditation of feral pig control operators is an important aspect of effective feral pig management. Such training and accreditation would also involve the development and promulgation of best practice procedures.

Pest management principles

Prevention: Preventative pest management is achieved by (a) preventing the spread of pests, and viable parts of pests, especially by human activity, and (b) early detection and intervention to control the pests.

Best practice: Pest management must be based on ecologically and socially responsible pest management practices that protect the environment and the productive capacity of natural resources.

Integration: *Pest management is an integral part of managing natural resources and agricultural systems.*

Strategy 2: Eradicate feral pigs from areas where feasible and where eradication will have a long-term effect

No.	Action	By whom	By when
2.1	Identify areas for local-area eradication programs	NRM&E, LG	Dec 2004
2.2	Conduct sustained eradication programs	All stakeholders	June 2006
2.3	Fence areas of high production and conservation value and maintain fencing	All landholders including government agencies	Ongoing

Strategy 3: Train and accredit feral pig control operators in best practice management techniques

No.	Action	By whom	By when
3.1	Develop best practice procedures and related template	NRM&E	Dec 2005
3.2	Promulgate NRM&E best practice template	NRM&E	Dec 2005
3.3	Encourage registered training organisations to provide accredited training on feral pig management	NRM&E	Dec 2005

Strategy 4: Manage feral pigs having regard to local circumstances and conditions

No.	Action	By whom	By when
4.1	Apply effective control techniques suitable for each bioregion	All stakeholders	June 2005
4.2	Coordinate control programs across and adjoining areas of high production and conservation value	All relevant landholders including government agencies	Ongoing
4.3	Conduct coordinated broad-scale population knockdowns across all tenures	All stakeholders	Ongoing years
4.4	Establish local free-feeding sites to identify areas most suitable for control programs	Landholders/managers	Ongoing
4.5	Ensure local governments have the competency and capacity to utilise compliance provisions	NRM&E, LG	Ongoing
4.6	Utilise compliance provisions where necessary on stakeholders with legal responsibilities for feral pig control	LG	Ongoing
4.7	Review feral pig management processes at all levels	All stakeholders	Annually

Strategy 5: Investigate the role of game harvesting and recreational hunting in feral pig management

No.	Action	By whom	By when
5.1	Quantify economic and social benefits from feral pigs as a resource (commercial and recreational)	CRCs, JCU, UQ, game harvesters	December 2005
5.2	Conduct a cost–benefit analysis of game harvesting contribution to feral pig control	NRM&E, game harvesters	June 2005
5.3	Investigate improving techniques for harvesting, processing and market development	CRCs, game harvesters, RIRDC, DPI	December 2006

Strategy 6: Incorporate feral pig management into broader natural resource management, being mindful of natural resource management implications of such management

No.	Action	By whom	By when
6.1	Provide feral pig management information to catchment and regional NRM groups	NRM&E	June 2004
6.2	Include feral pig components (either specifically or as 'pest animals') within regional and catchment NRM planning	LG, regional and catchment groups	Ongoing
6.3	Conduct feral pig management activities so as not to adversely impact upon natural resources	All stakeholders	Ongoing

3.3 Effective collaboration and coordination

Desired outcome: Effective and strategic use of resources through collaborative and coordinated pest management planning

Background

Collaboration and involvement by all agencies and stakeholders in addressing feral pig impacts will maximise the benefits from their contribution. The game harvesting industry can provide a contribution to the management and disease surveillance of feral pigs, but its exact role needs to be fully understood and communicated.

Management and harvesting activities must be undertaken in compliance with the requirements of the *Animal Care and Protection Act 2001*. While s. 42 of this act provides exemptions for feral and pest animal control, such activities should be carried so as to cause the animal as little pain as is practicable.

Planning will play a crucial role in any successful management of feral pig impacts. Planning is needed for various tenures of land and at various scales. It must also be supported by a commitment to appropriate implementation (including resourcing) and review.

Pest management principle

Planning: Pest management planning must be consistent at local, regional, state and national levels to ensure that resources target the priorities for pest management are identified at each level.

Strategy 7: Ensure that agencies with legislated responsibilities are empowered and resourced

No.	Action	By whom	By when
7.1	Include feral pig management in all planning and budgeting activities for all tenures	All stakeholders	June 2004
7.2	Implement this strategy on all tenures	All stakeholders	June 2005

Strategy 8: Encourage, prepare and implement feral pig planning at local levels (local government area, catchment and property) that is compatible with state and national plans

No.	Action	By whom	By when
8.1	Develop guidelines for local government pest management plans to aid in consistency	NRM&E	Dec 2003
8.2	Develop guidelines for catchment and property pest management plans to aid in consistency	NRM&E	Dec 2004
8.3	Develop assistance options for local feral pig management planning (all levels)	NRM&E, LG	Dec 2005
8.4	Develop incentive options to produce feral pig management planning	NRM&E, LG	Dec 2004
8.5	Develop local management plans	LG, regional and catchment groups and landholders	Dec 2005
8.6	Implement local management plans	All stakeholders	Ongoing

3.4 Informed management

Desired outcome: *Strategic research is directed toward more accurately defining the feral pig problem and finding effective management solutions*

Background

Currently, there is insufficient research information available on the economic, environmental and social impact of feral pigs and this lack of information may be hampering efforts to manage them. An increased knowledge of the biology and ecology of feral pigs, their populations and impacts will provide an improved basis for management programs and planning. Innovation will reduce the cost and increase the effectiveness of control techniques.

As well as researching the impacts and populations of feral pigs, there is a need to quantify the resource potential of feral pigs. Once this basis of knowledge is attained, it will be necessary to develop (or modify) and adopt best practice techniques.

Pest management principle

Improvement: Research about pests, and regular monitoring and evaluation of pest control activities, is necessary to improve pest management practices.

Strategy 9: Continuously improve feral pig management practices through regular review and adjustment of activities

No.	Action	By whom	By when
9.1	Amend management plans/strategies in light of review outcomes	All stakeholders	Annually
9.2	Evaluate and document best practice procedures using an adaptive management approach	All stakeholders	Every two years

Strategy 10: Obtain and use information to manage the impacts of feral pigs holistically

No.	Action	By whom	By when
10.1	Quantify economic, environmental and social impacts on a regional and industry basis	NRM&E, industry, CRCs, JCU, UQ	Dec 2006
10.2	Continue to refine tools used in measuring impacts	NRM&E, industry, CRCs, JCU, UQ	Ongoing
10.3	Use this impact information in planning management activities, including justifying expenditure	All stakeholders	Ongoing

Strategy 11: Understand the ecology and biology of feral pigs in all habitats in Queensland

No.	Action	By whom	By when
11.1	Identify knowledge gaps in feral pig ecology and biology in various Queensland habitats where research outcomes will result in improved control	NRM&E, CRCs, JCU, UQ	June 2005
11.2	Prepare project plans to fill these knowledge gaps and identify possible sources of funding	NRM&E, CRCs, JCU, UQ	December 2005
11.3	Provide or obtain identified resources to conduct projects identified above	NRM&E, CRCs, JCU, UQ	December 2005
11.4	Conduct targeted research into the ecology and biology of feral pigs in all habitats	NRM&E, CRCs, JCU, UQ	December 2005

Strategy 12: Improve existing control techniques and, where necessary, develop additional techniques

No.	Action	By whom	By when
12.1	Review existing control technologies and identify gaps in control technology and areas for improvement in existing technology	NRM&E, CRCs, JCU, UQ	June 2005
12.2	Investigate means of modifying existing technologies to improve effectiveness, efficiency and humaneness	NRM&E, CRCs, JCU, UQ	December 2007
12.3	Where identified and feasible, develop new control techniques, e.g. toxins and traps	NRM&E, CRCs, JCU, UQ	December 2007

Strategy 13: Promote continuous improvement in feral pig management by providing new information

No.	Action	By whom	By when
13.1	Support development, encourage adoption, and cooperate in implementing latest technologies in controlling feral pigs	All stakeholders	Ongoing
13.2	Search periodically for latest management information	All stakeholders	Ongoing
13.3	Encourage partnership with private companies and research agencies to improve existing technologies and investigate new ones, and provide information on existing technologies	All stakeholders	Ongoing
13.4	Develop accurate and consistent monitoring techniques for population and impact monitoring	NRM&E, CRCs, game harvesters	December 2005
13.5	Conduct regular population assessments of feral pig numbers and impacts across Queensland and report annually	All stakeholders	Ongoing (post Dec. 2005)

3.5 Adequate resourcing

Desired outcome: Feral pig management in Queensland is supported by adequate resourcing

Background

In order for this strategic plan to be fully implemented and the potential benefits achieved, it is important that adequate resources, both financial and human, be allocated to the management of feral pigs. All parties who would benefit both directly and indirectly from feral pig management should make this resource allocation.

Pest management principles

Consultation and partnership: Consultation and partnership arrangements between local communities, industry groups, state government agencies and local governments must be established to achieve a collaborative approach to pest management.

Commitment: Effective pest management requires a long-term commitment to pest management by the community, industry groups and government entities.

Strategy 14: Obtain cooperation and support from all stakeholders in resourcing their components of this strategy

No.	Action	By whom	By when
14.1	Promote this strategy	NRM&E	June 2004
14.2	Seek high-level endorsement of this strategy	NRM&E	June 2004
14.3	Review this strategy	All stakeholders	Annually
14.4	Establish inter-agency linkages via State Land Pest Management Committee	EPA, DPI and NRM&E	June 2004

Strategy 15: Coordinate education, awareness and research resources

No.	Action	By whom	By when
15.1	Establish network of stakeholders and inventory of resources	NRM&E	June 2006
15.2	Establish a process to facilitate the coordination of state, local and interstate feral pig management programs	NRM&E	Ongoing

Strategy 16: Use community knowledge and support for feral pig control

No.	Action	By whom	By when
16.1	Establish stakeholder meetings	NRM&E, LG and industry groups	six monthly
16.2	Use peer respect as a vehicle for increasing community knowledge and support ('landholders teaching landholders')	Landholders, NRM&E, LG and game harvesters	Annually
16.3	Demonstrate control techniques to all relevant stakeholders	NRM&E, LG and game harvesters	Ongoing
16.4	Build capacity of community to manage their own feral pig problems	NRM&E, LG and game harvesters	June 2005

Strategy 17: Ensure all stakeholders are committed and contributing to feral pig control in Queensland

No.	Action	By whom	By when
17.1	Identify all stakeholders in feral pig management	NRM&E	June 2006
17.2	Inform all stakeholders of the impacts of feral pigs upon them and their industries	NRM&E, industry, tourism, financial sector, QMWGH	Ongoing
17.3	Request stakeholders to contribute to feral pig management either directly or indirectly	NRM&E	Ongoing

Strategy 18: Gain public and political support for the effective and humane management of feral pigs

No.	Action	By whom	By when
18.1	Liaise with ministers, directors general, Land Protection Council, catchment groups, LGAQ and conservation groups	All	Dec 2004
18.2	Develop and agree on a consistent message for feral pig management	Feral Pig Management Committee	Dec 2004
18.3	Link actions within this strategy to Threat Abatement Plan (*EPBC Act*)	DEH, EPA	Dec 2004

4 Implementation

Planning at property, local government and regional levels is the first step in implementation. Experience has shown that coordinated control programs over a wide area enjoy a better long-term success rate.

The primary responsibility for pest animal management rests with the land manager but sometimes the problem is far greater than the capacity of the individual and requires collective action. If necessary, enforcement measures may be used to ensure all land managers fulfil their duty of care in controlling declared animals on their land. Normally, enforcement is undertaken only after other avenues have failed.

5 Monitoring and evaluation

5.1 Review

This strategy will be reviewed through:

1. Reviews of individual Local Government Area Pest Management Planning processes and State Land Pest Management Committee activities
2. Provision of this review information to the review process of the Queensland Pest Animal Strategy.

5.2 Key performance indicators

The factors to be reviewed include**:**

General

- Reduced economic, environmental and social impacts of feral pigs
- Greater awareness of, and commitment to, feral pig issues
- Timely response to sudden changes in pig numbers, distribution and disease outbreaks

Individual rural enterprises

- Incorporation of feral pig management into general property management
- Reduced losses from feral pigs
- Increased awareness of disease symptoms in feral pigs, especially exotic diseases
- Use of best practice procedures

Rural industry organisations

- Commitment to agreed direction for feral pig management
- Provision of information on feral pig impacts and issues of concern to government

Conservation

- Reduced impacts on native species and habitats
- Increased control of feral pigs in areas of high conservation value
- Completion and implementation of the national Threat Abatement Plan
- Increased acceptance of control techniques

Community/interest groups

- Increased knowledge of feral pigs and their impacts
- Increased understanding and acceptance of feral pig control techniques

6 Stakeholder responsibilities

All stakeholders will need to assist with the development of site-specific management plans. The general responsibilities of each of the major stakeholders in feral pig management are listed below.

6.1 All land managers (private and public, including Commonwealth and state lands)

- Participate in organised groups for coordinated control
- Adhere to all direct and indirect legislative requirements for feral pig management and use of techniques
- Conduct population and damage assessments for their lands
- Conduct control programs using the most appropriate and effective methods available for their particular situation
- Notify neighbours and erect warning signs around baited areas
- Monitor effectiveness of control techniques

6.2 Industry groups

- Promote availability and 'conditions of use' of control techniques
- Promote the need for, and assist with, formation or operation of landholder groups for coordinated control
- Raise awareness of control issues with the media
- Contribute to coordination of feral pig management

6.3 Community and conservation groups (including natural resource management regional groups)

- Review and participate in education, information, conservation and planning processes
- Contribute to coordination of feral pig management

6.4 Local government

- Incorporate feral pig issues in Local Government Area Pest Management plans
- Enforce feral pig control where required
- Contribute to coordination of feral pig management
- Ensure feral pig control is undertaken
- Assist with the formation of landholder groups; organise coordinated baiting campaigns; and provide 1080 impregnation of baits in association with NRM&E Land Protection Officers
- Provide advice on various feral pig control techniques
- Coordinate and monitor control campaigns

6.5 Authorised Officer*

- Assist in the implementation of feral pig control programs
- Assist with the formation of landholder groups; organise coordinated baiting campaigns; and provide 1080 impregnation of baits in association with NRM&E Land Protection Officers
- Provide advice on various feral pig control techniques
- Coordinate and monitor control campaigns

6.6 Department of Natural Resources, Mines and Energy (Land Protection)

Director

- Undertake policy development and planning
- Seek greater cooperation from departments managing public lands

Project Manager, Pest Animals

- Manage 1080 administration in Queensland
- Ensure capacity to respond to feral pig control needs in the event of an emergency disease incursion

Regional Service Directors

- Ensure appropriate links and communication between internal and external stakeholders within their area of responsibility
- Identify and address operational issues associated with control operations within their area of responsibility including resourcing and training
- Support implementation of this strategic plan

Land Protection Officers (LPO)

- Undertake feral pig extension activities, including provision of advice on various possible control techniques
- Encourage the formation of landholder groups to control feral pigs
- Coordinate and monitor control campaigns
- Organise or provide 1080 impregnation of baits in association with the authorised local government officers
- Undertake population and damage assessments and collect impact data
- Investigate complaints
- Seek greater local and regional cooperation from departments managing public lands

Research officers (RWPARC, TWRC, CWTA, AFRS)

- Investigate development of a treatment/antidote for 1080
- Monitor effectiveness of control techniques
- Investigate additional control techniques (including toxins)
- Assess feral pig impacts to assist in cost–benefit analyses
- Quality control of 1080 use in Queensland

* Under *Land Protection (Pest and Stock Route Management) Act 2002*

- Toxicological analysis of 1080 and other toxins
- Assist in training of NRM&E staff

Extension/communication officers

- Develop and implement a Feral Pig Extension Plan, including media and Internet liaison
- Prepare advisory publications on feral pig management for grazing enterprises and the general community

6.7 Other state government agencies

Environmental Protection Agency

- Control feral pigs on protected areas
- Assess and, where appropriate, provide approval for feral pig control on State forest estate
- Undertake population and damage assessments and collect impact data

Queensland Health

- Authorise operators for use of 1080

Land Protection Council

- Provide strategic advice and direction to the Minister of the Department of Natural Resources, Mines and Energy on feral pig management and 1080 use

6.8 Commonwealth

- Completion, implementation and review of threat abatement plan

7 Management arrangements

The membership, structure, resourcing and reporting arrangements for a management group/committee and its relationship to the minister, department, Land Protection Council and local governments have not yet been determined but may be modelled on the rodent and rabbit research and control groups.

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Appendix 1: Summary of the biology and ecology of the feral pig

Scientific name: *Sus scrofa*
Common name: feral pig
Length: 105–55cm (male) and 100–30cm (female)
Weight: up to 115 kg (male) and 75 kg (female); habitat and conditions may increase or decrease these averages

Reproductive characteristics

Breeding season: limited by food availability (requires ~15% protein)
Oestrus cycle: 21 days
Mean litter size: average 4.9–6.3 (up to 10)
Gestation: 112–14 days
Juvenile mortality: 10–15% (good conditions) and 90–100% (drought)
Age at first breeding: weight dependent (25–30kg)

Diet

The feral pig is considered to be an opportunistic omnivore (Choquenot et al. 1996), and it has been known to consume the following groups of foods:

- fruits and seeds: grains, fruits, rainforest fruits
- foliage and stems: grasses, sugar cane, banana trees
- rhizomes, bulbs and tubers: including tuberous crops such as potatoes
- fungi
- animal material: carrion, earthworms, lambs, arthropods.

The foods consumed vary from region to region and through the year, and the potential food sources are limited by availability rather than preference for any single food type.

Pigs have a relatively high-energy requirement, particularly during lactation and the growth of young pigs (Choquenot et al. 1996). Sows require about 15% of their diet to be crude protein in order to successfully suckle their young. This protein requirement can be met from plant material but more commonly is met from animal matter such as earthworms, carrion, arthropods, frogs and reptiles. Animal matter rarely exceeds 5–18% of a pigs diet (Giles 1980; Pavlov 1980).

Feral pigs will relocate in response to food availability and, in particular, seasonal requirements for higher protein and energy associated with reproduction and growth.

Social structure and behaviour

The most common grouping of feral pigs are either a few sows and their young, bachelor groups (individuals less than 18 months of age) or individual boars (usually older than 18 months). After weaning, pigs will remain with their mother until the next litter or, in the case of sows, until they mate (Masters 1979; Giles 1980; Pavlov 1980).

Group size varies with age, sex, food and water availability and disturbances (such as hunting or other control measures). Group size can range from solitary boars to groups of 100 or more sharing a locally scarce resource such as a single waterhole during droughts.

Feral pigs habitually make use of trails, shelter areas, feeding and watering areas (subject to availability), rubbing and tusking trees and wallows. There is no evidence that feral pigs, of either sex, actively defend territories.

The size of a feral pig's home range depends on a number of variables including gender (males have larger home ranges than females) and resources. Food availability and quality are thought to be the main determining factors influencing home range size. Home range size varies from as little as 0.16 sq km for furrowing sows to greater than 40 sq km for individual boars in the semi-arid rangelands (Saunders 1988; Giles 1980).

Feral pigs are most active at night or during times of cooler temperatures (late afternoon, early morning, cooler weather, rainy or overcast conditions). They may become active during periods of disturbance from hunting or other human activities such as stock mustering (Pullar 1950; Giles 1980; Saunders & Kay 1991).

Appendix 2: Statutory framework for feral pig management

State legislation

Health (Drugs and Poisons) Regulations 1996

Authorises operators to use 1080.

Animal Care and Protection Act 2001

Provides for the welfare of animals and regulates activities for the humane control of pest and feral animals.

Forestry Act 1959

Provides for the management and protection of forest resources.

Definitions

s. 33—Cardinal principle of management of State forests.
s. 39—A person shall not interfere with any forest products on State forest, timber reserve or forest entitlement area except under the authority of a lease or permit.

Health (Drugs and Poisons) Regulation 1996

Regulates the manufacture, sale and use of drugs and poisons.

s. 272**—**Fluoroacetic acid in baits: an Authorised Person or Inspector under the *Rural Land Protection Act* can only supply baits; baits must not contain more than 0.03% fluoroacetic acid, and must be used in accordance with written conditions.

Schedule 7 poison—fluoroacetic acid (1080).

Nature Conservation Act 1992

Provides for the conservation of nature.

s. 7 —'Take': means to hunt, shoot, wound, kill, poison, snare, harm, etc. or to attempt to do so.

s. 7—'Wildlife': means any taxon or species of an animal, plant, protista, procaryote or virus.

s. 14—'Protected area': National Parks (Scientific); National Parks; National Parks (Aboriginal land); National Parks (Torres Strait Islander land); Conservation Parks; Resources Reserves; Nature Refuges; Coordinated Conservation Areas; Wilderness Areas; World Heritage Management Areas; and International Agreement Areas.

ss. 16–26—Management principles of protected areas.

ss. 22 and 23—Interests of landholders (Refuge areas and Coordinated Conservation areas) to be taken into account.

s. 62—A person cannot take use or keep or interfere with a natural resource of a protected area other than under a licence, permit, etc.

s. 137—Licences, etc. to be consistent with management principles, and management intent or plan.

Nature Conservation Regulation 1994

s. 81—A person must not bury or leave a noxious, etc., substance or use a pesticide (without the chief executive's written approval) in a protected area.

s. 235—Schedule 7 Poisons (e.g. 1080) are not to be used to take protected wildlife.

Land Protection (Pest and Stock Route Management) Act 2002

s. 6(2)—Where a person does something that is required or permitted under this Act, but would have committed an offence under the *Nature Conservation Act 1992 and the Forestry Act 1959*, then they have not committed that offence.

s. 9—Outlines the principles of pest management.

ss. 10–16—Provides a legislative head of power for the development of strategies and guidelines for the management of pests in Queensland.

ss. 17–24—Pest management on state lands.

ss. 25–35—Local government area pest management planning.

ss. 77–82—Private landholders to control pests on their lands. Penalties for non-compliance, notices may be issued, costs recovered.

s. 183—Local governments are to ensure declared pests are managed within their areas in accordance with the Act and the principles of pest management.

ss. 39–42, 44—Offences for the introduction, feeding, keeping, release and supply (sale) of declared pests without permit.

s. 213–236—Provides for pest operational boards.

Wet Tropics Management Plan 1998 (*Wet Tropics World Heritage Protection and Management Act 1993*)

s. 26(1)(b)—Prohibits the keeping of an undesirable animal, bringing in an undesirable animal, or allowing an undesirable animal to stray or escape onto, or remain at, any place in the area. Schedule 2 (Undesirable Animals) lists pigs (*Sus scrofa*). Note: does not separate domestic and feral pigs.

Federal legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

This Act applies when the activity is likely to have a significant impact on a matter of national environmental significance. It aims to promote the conservation of biodiversity and it includes provisions to deal with invasive species. The invasive species provisions provide for the listing of the impacts of species as 'threatening processes' and if listed as such there is an obligation on the Commonwealth Government to prepare a Threat Abatement Plan to address these threat/s. The predation, habitat degradation, competition and disease transmission by feral pigs was listed as a threatening process in 2001 and a Threat Abatement Plan is in preparation.

Land listed on the Commonwealth Register of the National Estate is managed under provisions in the *Australian Heritage Commission Act 1975* (AHC Act). Listing under Criteria A and B of the AHC Act requires that any activities that may impact on the biodiversity of the area have to be formally considered under section 30 of the Act; however, baiting of nuisance and feral animals is not precluded. Baiting can be viewed as a routine maintenance operation aimed at enhancing biodiversity by reducing non-native predator pressure on indigenous wildlife populations.

Civil Aviation Regulations 1988

Govern the aerial application of 1080 baits.