



SOUTH AUSTRALIAN WILD DOG STRATEGIC PLAN

2016 – 2020

A plan to protect the livestock industries and public safety from the impact of wild dogs whilst maintaining the ecological and cultural roles of the dingo as a wildlife species.



ACRONYMS

AMRRIC	Animal Management in Rural and Remote Indigenous Communities
APVMA	Australian Pesticides and Veterinary Medicines Authority
APY Lands	Anangu Pitjantjatjara Yankunytjatjara Lands
AW NRMB	Alinytjara Wilurara NRM Board
BFDCCC	Box Flat Dingo Control Coordinating Committee
Coordinator	State Wild Dog Coordinator
CCSA	Conservation Council SA
DEWNR	Department of Environment, Water and Natural Resources
DCMB	Dog and Cat Management Board
DFB	Dog Fence Board
EP NRMB	Eyre Peninsula NRM Board
IACRC	Invasive Animals Cooperative Research Centre
LMS	Land managers
LSA	Livestock SA
LDFB	Local Dog Fence Board
LWDPG	Local wild dog planning group
MLA	Meat and Livestock Australia
NCSSA	Nature Conservation Society of South Australia
NRM	Natural Resources Management
NWDAP	National Wild Dog Action Plan
NY NRMB	Northern and Yorke NRM Board
OCA	Outback Communities Authority
PIRSA	Department of Primary Industries and Regions South Australia
SAAL NRMB	South Australian Arid Lands NRM Board
SAMDB NRMB	South Australian Murray Darling Basin NRM Board
SASAG	South Australian Sheep Advisory Group
SASIF	South Australian Sheep Industry Fund
SAWDAG	South Australian Wild Dog Advisory Group
TWS	The Wilderness Society

South Australian Wild Dog Advisory Group (2016). South Australian Wild Dog Strategic Plan: A plan to protect the livestock industries and public safety whilst maintaining the integrity of the dingo as a wildlife species.

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FOREWORD



Wild dogs, including dingoes, play an important ecological and cultural role in South Australia, but they can also be a serious livestock pest.

With the production value of the South Australian sheep industry at \$1.5 billion, it is important that we provide a framework that enables proper management of our wild dog population.

As a result, we have developed the South Australian Wild Dog Strategic Plan 2016-2020 to provide for the protection of livestock and the sustainable maintenance of wild dog populations. The Plan also aligns with the National Wild Dog Action Plan, which promotes and supports community-driven action to manage wild dogs.

A considerable body of advice has informed the development of this plan, with significant contributions by Primary Industries and Regions SA (PIRSA) through Biosecurity SA and the South Australian Wild Dog Advisory Group who have overseen this task. In addition, the South Australian Arid Lands Natural Resources Management Board facilitated extensive community advice that assisted in shaping the Plan.

Significant contributions were also made by peak stakeholder groups, the other seven regional natural resources management boards, local dog fence boards and other community members and groups. I thank you all for your input into this work.

I commend this Plan for adoption by all who play a part in the management of wild dogs in South Australia.

A handwritten signature in black ink, appearing to read 'I. Hunter', written over a light grey rectangular background.

Hon. Ian Hunter MP
Minister for Sustainability, Environment and Conservation

November 2016

1. EXECUTIVE SUMMARY

The arrival of the dingo in Australia is estimated to have occurred around 4000 years ago. Thereafter they assumed great cultural and spiritual significance to Aboriginal people. At European settlement dingoes were widespread in South Australia but were gradually eradicated from southern areas due to their impacts on the sheep industry.

The dog fence was subsequently erected to protect sheep flocks in the 40 percent of the state inside (south of) the fence. The 2,187 km long fence is maintained in a dog-proof condition by fortnightly inspections and maintenance. Outside (north of) the fence a 35 km wide baited buffer zone is maintained as insurance to reduce the risk of incursions in the event of damage.

Since European settlement interbreeding between dingoes and domestic dogs has resulted in a mix of purebreds and hybrids. In keeping with the *National Wild Dog Action Plan*, this plan refers to the resulting mix of dingoes and their hybrids as 'wild dogs'.

Permanent populations of wild dogs are now essentially confined to the 60 percent of the state lying outside the dog fence. They are most common in cattle production areas due to an increase in livestock waters and to the introduction of rabbits, now their staple prey in many areas.

They are generally uncommon in remaining desert areas where there is little available water. Wild dog numbers fluctuate considerably according to seasonal conditions, prey abundance, and to the level of control exerted.

Inside the dog fence an isolated population persists at Ngarkat Conservation Park in the upper South-East. Increasingly there are also occurrences on many pastoral and sometimes agricultural properties extending hundreds of kilometres inside the dog fence. These incursions result mostly from breeding inside the fence; rarely from breaches of the dog fence.

Wild dogs are regarded as both a serious pest and a keystone wildlife species with legitimate ecological and cultural roles. These dual roles provide challenges for their management.

Management of wild dogs is essential for sustainability of South Australia's extensive livestock industries. The pastoral sheep industry based wholly inside the dog fence is at greatest risk, but the pastoral cattle industry mostly outside the fence can also be seriously impacted.

A strategic approach to the management of wild dogs is proposed by this plan based on three broad management zones:

1. inside (south of) the dog fence
2. the dog fence and 35 km buffer zone immediately outside the fence
3. outside (north of) the dog fence, including the pastoral cattle zone and other non-production areas.

Other management actions are not confined to a single zone but apply across the state.

The plan has the following visions and goals:

Vision: To protect the livestock industries and public safety from the impact of wild dogs whilst maintaining the ecological and cultural roles of the dingo as a wildlife species

- **Goal 1** – Detect and eradicate wild dogs inside the dog fence
- **Goal 2** – Prevent incursions by wild dogs through the dog fence
- **Goal 3** – Protect the cattle industry and human safety while maintaining populations of wild dogs outside the dog fence
- **Goal 4** - Ensure good governance for management of wild dogs across South Australia

Significant partnerships and resourcing will be required to achieve these goals. It is proposed that a State Coordinator be appointed to oversee implementation of this plan consistent with the *National Wild Dog Action Plan*.

2. INTRODUCTION

Dingoes, feral domestic dogs and their hybrids, hereafter referred to generally as wild dogs, are regarded as both a serious pest and a wildlife species with ecological and cultural roles. This provides challenges for their management.

Management of wild dog impacts is essential for sustainability of South Australian extensive livestock industries. The pastoral sheep industry based inside (south of) the dog fence is at greatest risk, but the pastoral cattle industry, mostly outside (north of) the fence, can also be impacted by predation. It is also recognised that wild dogs can assist cattle production through control of overabundant herbivores.

Successful wild dog management requires a coordinated approach involving all levels of government in establishing appropriate legislative, educational and funding frameworks in partnership with industry, land managers and the community.

The primary responsibility for wild dog control rests with land managers, but collective action is necessary where the problem transcends the capacity of the individual land manager to address it adequately. This is especially the case for a highly mobile species.

The status of, and principal management actions that apply to wild dogs in South Australia, are delineated by the dog fence. Inside the fence wild dogs are declared as pests under the *Natural Resources Management Act 2004* (hereafter NRM Act) and subject to eradication. Outside the fence they are not declared and any control undertaken is a decision of individual land holders, working within existing state policy and legislative limits on control measures. The 2011 *NRM Act Policy on the management of dingoes in South Australia* provides an overview of the status of wild dogs in South Australia but does not provide strategic direction for their management.

This plan provides a state framework to describe and improve cooperative participation by government, industry and community stakeholders in wild dog management.

It provides detail on how the *National Wild Dog Action Plan* will be implemented in South Australia.

2.1 Definitions

Existing South Australian legislation and policies variously refer to 'dingoes', 'dingo crosses' and 'wild dogs' to describe the wild canids present in South Australia. Similar anomalies occur between the various states and territories.

In acknowledging this the National Wild Dog Action Plan uses the term 'wild dogs' which it defines as: 'all wild-living dogs which include dingoes, feral dogs and their hybrids'.

Preliminary consultation with key stakeholders indicated a preference for the term 'wild dog' as a catchall description to reduce confusion and simplify management. Accordingly, this plan adopts the above definition although 'dingo' is retained for historical usage and when used in legislation. It is acknowledged that using the term 'wild dog' also causes confusion for some people. In particular some take the term wild dog to mean feral domestic dog, or fail to understand that the term includes pure dingoes. Thus they are comfortable with the control of 'wild dogs' but not with the killing of dingoes.

A recent genetic study scored 79 percent of a sample of South Australian animals as pure or likely pure dingoes suggesting that most 'wild dogs' in this state still are essentially dingoes. The following definitions provide additional descriptions of the various categories of 'dog' and are based on those by Fleming *et al.* (2001). See also Appendix 1: Glossary of terms, for more detailed definitions.

Dingo – Native dog of Australia and Asia introduced into Australia more than 4000 years ago

Domestic dog – dog breeds other than dingoes selectively bred from wolves and usually living in association with humans

Wild dog – all wild-living dogs (including dingoes and hybrids with domestic dogs)

2.2 Strategic plan development

This strategic plan was developed following workshops held in Olary, Blinman, Glendambo and Port Augusta in 2012-15 to initiate and guide the development of a strategic approach to minimising the impacts of wild dogs in South Australia.

The workshops were instigated by Biosecurity SA with support funding from the State NRM Program. They involved a wide range of stakeholder groups representing primary production, conservation, animal welfare, indigenous groups, Local Dog Fence Boards, NRM Boards and others.

Following a wild dog public forum in Port Augusta in October 2013, the Minister for Sustainability, Environment and Conservation convened the *South Australian Wild Dog Advisory Group (SAWDAG)* to advise him on management of wild dogs. Its terms of reference included the development and implementation of the SA Wild Dog Strategic Plan, consistent with the *National Wild Dog Action Plan* (launched on 4 July 2014).

In 2014 SAWDAG undertook a review of potential improvements to the management of wild dogs in SA, which informed further development of this plan.

Public consultation on the draft plan was undertaken in December 2014 – August 2015, including a second public forum in Port Augusta.

The final draft was considered by key stakeholder organisations prior to being adopted by the Minister for Sustainability, Environment and Conservation.

The plan will be reviewed in five years (2021) or as required.

2.3 Scope

Wild dog management is a complex and frequently a conflicting issue. Wild dogs are both a declared pest and a species of ecological and cultural significance in South Australia.

Wild dogs may have positive or negative impacts depending on their location and abundance.

This plan provides a practical framework for implementing wild dog management in South Australia over the five year period 2016-20.

The plan aims to:

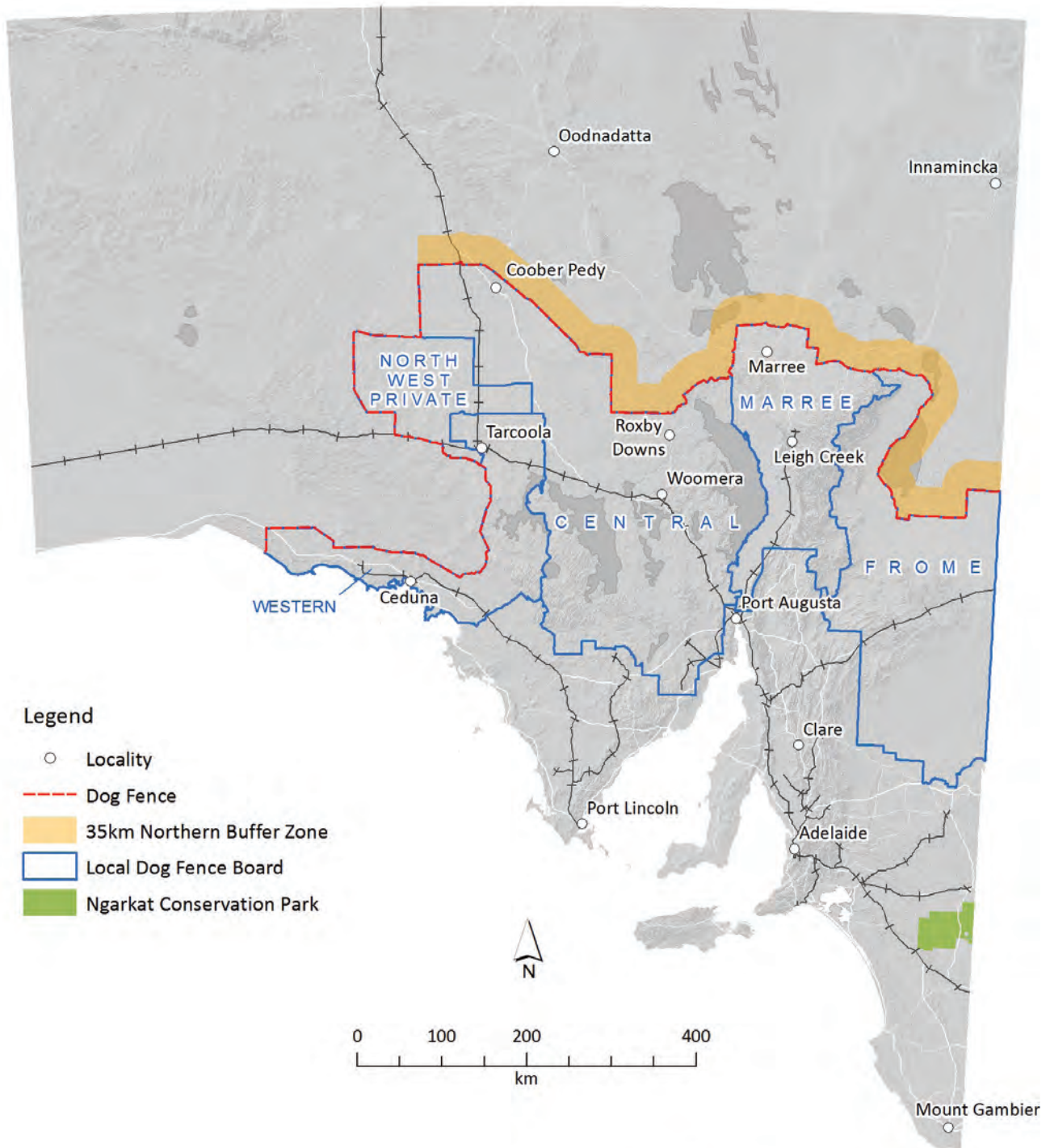
- provide adequate protection from wild dog impacts to ensure sustainable livestock industries
- ensure ecologically functional populations of wild dogs are maintained in the wild, and
- ensure public safety from wild dogs, whether free roaming or captive.

Legislation, policies and plans for wild dog management have been operating for a number of years in South Australia. This plan seeks to collate and connect existing arrangements to produce a single strategic document to guide state-wide management over the next five years.

As part of this, it clarifies the roles and responsibilities of all stakeholders involved in wild dog management. It gives consideration to best practice management strategies and to community expectations inside and outside the South Australian dog fence.

Key community and industry stakeholders in wild dog management include *Livestock SA*, *South Australian Sheep Advisory Group* and land managers representing the livestock industries; the *Dog Fence Board* and *Local Dog Fence Boards*; *Natural Resources Management Boards* and *Local NRM Groups*; indigenous groups, conservation organisations such as the *Conservation Council* and *Wilderness Society* and animal welfare groups such as the *Royal Society for the Prevention of Cruelty to Animals*.

Fig. 1: The Dog Fence, 35 km buffer zone and Local Dog Fence Boards.
 (note that Western LDFB replaces Fowlers Bay, Penong & Pureba LDFBs)



2.4 Linkages to other policies and plans

This plan is consistent with the following national, state and regional documents.

National

National Wild Dog Action Plan - objectives and goals:

- Provide leadership and coordination for the management of wild dogs.
- Increase awareness, understanding and capacity building with regard to wild dog management.
- Mitigate the negative impacts caused by wild dogs.
- Monitor, evaluate and report to inform and continuously improve wild dog management.

Australian Pest Animal Strategy - goals and objectives:

- Provide leadership and coordination for pest management.
- Develop capacity and processes for effective delivery of management solutions.
- Improve public awareness.
- Adopt best practice management methods.
- Coordinate management across all jurisdictions.

Principles under-pinning this Strategic Plan adapted from the Australian Pest Animal Strategy are included in Appendix 3

State

Policy on management of dingo populations in South Australia 2011– objective:

- Protect the livestock industry to the degree necessary to ensure its economic survival while recognising the continued survival of the dingo as a wildlife species.

State NRM Plan – target:

- Limit the establishment of pests and diseases and reduce the impacts of existing pests.

Regional

Wild dogs are recognised in the pest management plans for most NRM Boards, e.g.

SA Arid Lands NRM Board Wild Dog Management Plan – purpose:

- The effects of wild-living dogs (dingoes, hybrids or unmanaged domestic) will be managed to limit the impact to the livestock industry and ensure public safety whilst recognising the ecological role of dingoes as a wildlife species.
- This policy recognises the cultural significance of the dingo to Aboriginal people.

Eyre Peninsula NRM Board – Pest Species Regional Management Plan: Dingo/ wild dog – outcome

- To minimise impact of dingoes, feral dogs and hybrids on primary production.

Box Flat Dingo Control Coordinating Committee Strategic Plan – Mission:

- Assist public and private landowners with the control of dingoes/ wild dogs within the Box Flat area (i.e. the area encompassing the Ngarkat Conservation Park in south-eastern South Australia).

2.5 Legislative requirements

The management of wild dogs, including dingoes and their crosses, is covered in the following legislation:

2.5.1 *Natural Resources Management Act 2004*

The NRM Act is responsible for overseeing the control of declared pest animals in South Australia, including the dingo.

The Act is administered by NRM Boards in partnership with the *Department of Environment, Water and Natural Resources (DEWNR)*. A dingo is interpreted to include an animal that is a cross of a dingo.

Under Section 182 of the *NRM Act* dingoes are Category 3 pests declared for control inside the dog fence where all landowners have a legal responsibility to destroy them.

Under Section 186 a landowner inside the dog fence may lay poison baits and set traps on adjoining land immediately outside the fence.

Under Sections 175, 176, 177 and 179 respectively, the Act restricts the movement, possession, sale and release of dingoes south of the dog fence.

Public zoos, wildlife parks or research institutions keep dingoes under permit. Those with permits to keep dingoes must comply with the instructions of an authorised officer.

2.5.2 *Dog Fence Act 1946*

Under Section 22 of the *Dog Fence Act 1946*, owners of land adjoining the dog fence must keep it properly maintained in a dog-proof condition at all times; must inspect the fence at intervals of not more than 14 days; and must take reasonable steps to destroy all wild dogs in the vicinity of the fence by shooting, trapping or laying poisoned baits. Under the Act a wild dog is interpreted to include a dingo or a dog that is any cross of a dingo, or a feral dog.

2.5.3 *Animal Welfare Act 1985 and Regulations*

The *Animal Welfare Regulations 2012* specify conditions on the setting of jawed traps to ensure the humane treatment of wild dogs.

Under Section 9 the jaws of the trap must not be serrated; must be padded with rubber pads; the metal part must be offset by at least 6 mm when closed; and traps must be treated with a toxin (currently strychnine) sufficient to ensure a rapid death for any animal caught in the trap.

Traps for wild dogs must not be set inside a municipal council, nor more than 100 metres outside the dog fence.

2.5.4 *Dog and Cat Management Act 1995*

Under the Dog and Cat Management Act a dog is interpreted as an animal of the species *Canis familiaris* but does not include a dingo or cross of a dingo. This means a dingo is unable to be registered, even outside the dog fence where they may be legally kept under the *NRM Act*.

2.5.5 *Policy on the management of dingo populations in South Australia*

The current policy, adopted by the Minister for Sustainability, Environment and Conservation in a 2011 revision, provides a mechanism to guide and implement the relevant legislation. It seeks to adequately protect the livestock industries whilst ensuring the survival of the dingo as a wildlife species. NRM Boards supporting wild dog populations have developed regional management plans and policies for wild dogs, all of which support the State policy and legislation.

2.5.6 Directions for Use of 1080 wild dog baits in South Australia

The *Directions for Use of 1080 bait* products provide mandatory and non-mandatory instructions on the safe use of baits for the control of wild dogs in South Australia. They include instructions regarding supply, placement, storage, transport and disposal of baits as well as requirements for distance restrictions, neighbour notification and signage. Only Government officers and contractors authorised by the *Department of Health* are able to supply 1080 baits to landholders for the control of wild dogs.

2.6 Regional context

All eight NRM Boards operate under the *NRM Act* for the purposes of wild dog management. NRM regions in northern and western parts of the state are impacted most by wild dogs due to their proximity to wild dog populations outside the dog fence. Only the *Adelaide and Mt Lofty Ranges* and the *Kangaroo Island NRM* regions remain largely unaffected by wild dogs.

Alinytjara Wilurara NRM region

The *Alinytjara Wilurara NRM* region comprises most of the western third of the state. It lies outside the dog fence except for a couple of tiny sections on the west coast. Livestock grazing is limited to a few cattle herds in the *Anangu Pitjantjatjara Yankunytjatjara (APY) Lands* in the far north of the region although cattle numbers are increasing.

Wild dogs are widespread and common in the APY Lands in the north and on the Nullarbor in the south, but are rare in the intervening spinifex sandplains of the Great Victoria Desert.

Hybrids between camp dogs and dingoes are plentiful in the vicinity of the main communities in the APY Lands (Copley *et al.* 2003). The dingo plays an important role in cultural and spiritual practices in aboriginal communities (Tunbridge 1991).

Trapping and baiting are conducted along the dog fence on the region's south-eastern boundary to reduce the risk of incursions.

Trapping is conducted by the fence contractor and baiting by the contractor and local land managers. Baits are currently produced by authorised officers of the *Eyre Peninsula NRM Board* and the *Dog Fence Board*.

Prior to 2003, baiting was periodically undertaken in the APY Lands to protect calves on the handful of cattle properties, mostly on the eastern margin.

Subsequently, *APY Land Management* in consultation with traditional owners adopted a policy to discontinue baiting due to the risk to owned dogs on homelands and for conservation reasons. The future status of baiting in the AW region is currently under review.

Eyre Peninsula NRM region

The *Eyre Peninsula NRM* region covers all of Eyre Peninsula and agricultural areas of the west coast. It lies largely inside the dog fence except for a couple of small sections on the west coast. Sheep grazing is an important enterprise but has declined in some areas in favour of broad-acre cropping.

The greatest risk occurs on the west coast where wild dogs dispersing from the Nullarbor result in a seasonal build-up on the dog fence in March-April of each year.

Control of incursions is hampered by large property sizes and substantial areas of native vegetation inside the fence. Occasional reports of wild dogs also occur in northern parts of the region associated with increased numbers in the *SA Arid Lands* region to the north.

A vertebrate pest risk assessment for the *EP NRM Board* identified wild dogs as a high priority for control. Trapping is conducted year round along the dog fence to minimise incursions. This is supplemented by annual baiting in autumn when wild dogs are most common near the fence. Reactive baiting is also done as necessary.

Northern and Yorke NRM region

The *Northern and Yorke NRM* region lies wholly inside the dog fence. It includes mixed agricultural and grazing land in the south, tending to pastoral sheep grazing in the north.

Historically the region experienced occasional problems with wild dogs but these have become more frequent, especially in the southern Flinders Ranges areas around Hawker and Carrieton. These individuals are controlled as a matter of priority by land managers, with the assistance of the *NY NRM Board* when required.

SAAL NRM region

The *South Australian Arid Lands NRM* region is bisected by the dog fence. The northern half outside the dog fence is occupied mostly by pastoral beef cattle stations and conservation areas. Wild dogs there are widespread and generally common.

The southern half inside the fence is dominated by pastoral sheep production, although significant areas are used for cattle production, nature conservation, mining and aboriginal ownership. Wild dogs were historically all but eradicated but have increased dramatically in the last decade, with at least 280 shot or trapped on 100 properties in 2014-15 (SAALNRM 2015). Few properties in the region have not experienced wild dog problems at some stage in the past few years.

A wild dog management plan encouraging a collaborative approach between land managers was developed in 2010 and revised in 2015.

The SAAL NRM Board facilitates coordinated autumn and spring ground baiting over a 200,000 km² area inside the dog fence as part of its Biteback program. Twenty-two Wild Dog Planning Groups were created inside the dog fence to assist and encourage coordinated control activities (Fig. 2).

Outside the dog fence, wild dogs are managed according to the risk they pose to cattle production. The extent and intensity of baiting control is limited to maintain populations of wild dogs for their ecological and cultural significance. Nine Wild Dog Planning Groups exist outside the dog fence to assist management (Fig. 3).

Since 2015, an annual baiting service is provided upon request by a Wild Dog Planning Group. The annual maximum numbers of baits supplied is limited to one bait /2 km² of property. The bait injection service is conducted within four weeks of a request being received. Nine Wild Dog Planning Groups have been established outside the dog fence to assist in this process (Fig. 3).

On rare occasions, where annual baiting is insufficient to satisfactorily reduce livestock impacts, landholders may apply for an additional baiting by submitting a 'Bait Request for Exceptional Circumstances' form. Landholders need to submit evidence to support their request. Requests are assessed within seven days.

South Australian Murray Darling Basin NRM region

The entire *South Australian Murray Darling Basin NRM* region lies more than 200 km inside the dog fence. Consequently, the region generally experiences few incursions by wild dogs. These are increasing however with recent confirmed cases from areas such as Taylorville, Swan Reach, Nackara and Burra.

These incursions tend to be controlled as a matter of urgency by land managers, with the assistance of NRM board officers as required.

South East NRM region

The *South East NRM* region shares an isolated population of wild dogs in the Ngarkat Conservation Park with the *SAMDB NRM* region and with the Big Desert region of adjacent north-west Victoria.

Management of the South Australian wild dog population is overseen by the *Box Flat Dingo Control Coordinating Committee*. Membership of the committee includes representatives from the two NRM Boards and from three participating District Councils (Coorong, Southern Mallee and Tatiara). The committee develops and implements control programs aimed to protect livestock in the surrounding district and outlined in a strategic plan last reviewed in 2015 (BFDCCC 2015).

The *Box Flat Dingo Control Coordinating Committee* oversees a quarterly baiting program and monitoring of predator tracks along all roads through the Ngarkat area.

Baiting began in 1999 (DEWNR 2012). Sheep losses to wild dogs were common prior to the start of baiting, but since then few wild dog tracks have been recorded and losses have been minimal. This is in contrast to adjacent areas of Victoria where wild dogs continue to cause significant problems.

Adelaide and Mt Lofty Ranges NRM region

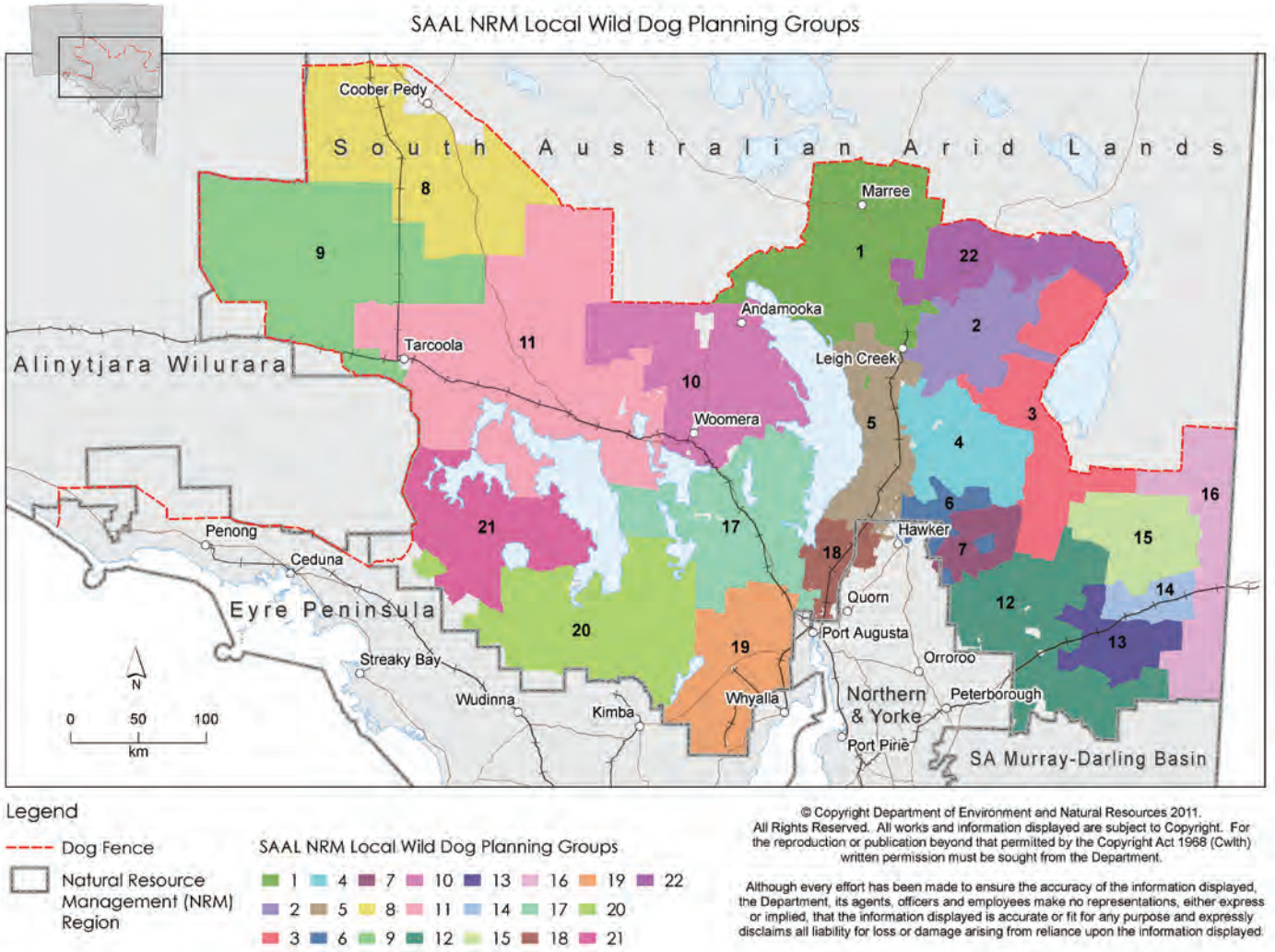
Reports of wild dogs are very rare in the *Adelaide and Mt Lofty Ranges NRM* region. Attacks on livestock by owned domestic dogs in peri-urban areas have been common in the past (VPCA 1983), and likely still so.

Illegally-owned 'pet' dingoes and dingo crosses are the main focus for the NRM board.

Kangaroo Island NRM region

There are no wild dogs present on Kangaroo Island.

Fig. 2: SA Arid Lands NRM Wild Dog Planning Groups inside the dog fence, 2015

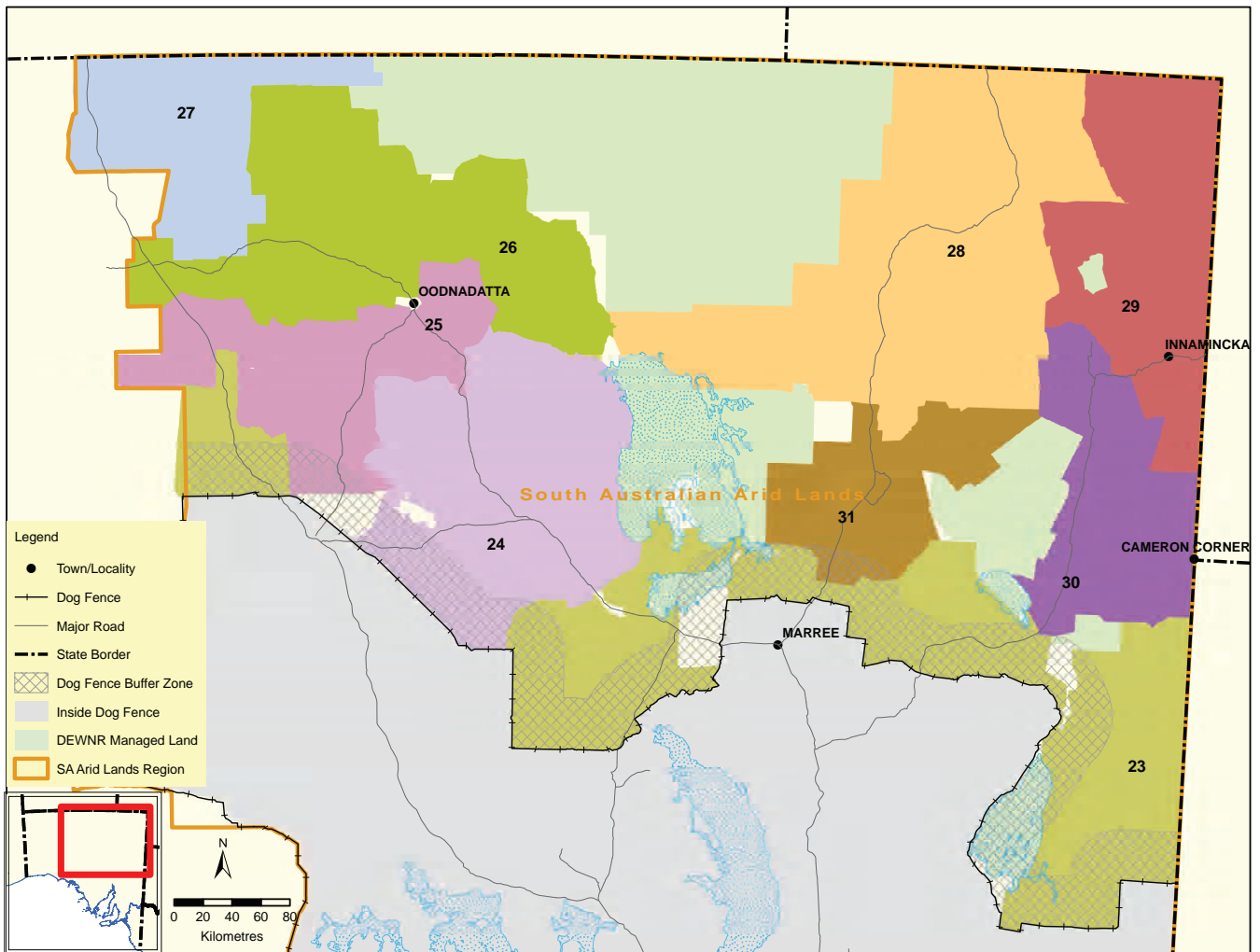


Map produced by Rural Solutions SA
8/04/2013



Government of South Australia
South Australian Arid Lands Natural Resources Management Board

Fig. 3: South Australian Arid Lands NRM Wild Dog Planning Groups outside the dog fence, 2015



3. STRATEGIC GOALS AND ACTIONS

3.1 Vision

To protect the livestock industries and public safety from the impact of wild dogs whilst maintaining the ecological and cultural roles of the dingo as a wildlife species.

3.2 Management zones

A key part of reducing the impacts of wild dogs in South Australia is a strategy based on management zones. The use of zones recognises that while management of wild dogs depends on local actions, these will be more effective when part of a consistent strategic approach applied on a broad scale.

The three zones outlined in the plan are largely delineated by the dog fence, its location prescribing the northern extent of sheep production in South Australia.

Zone 1: Inside the dog fence

Region: all boards inside the dog fence.

Status: wild dogs occur transiently throughout the rangelands, especially near the dog fence; an isolated population exists in the Ngarkat Conservation Park in the South-East of the State, adjacent to Victoria; potential for isolated occurrences in the agricultural zone.

Management Aim: To eradicate all wild dogs inside the dog fence.

Zone 2: The dog fence and baited buffer zone extending 35 km outside the fence

Region: SA Arid Lands, Eyre Peninsula, Alinytjara Wilurara.

Status: variable numbers dependent upon seasonal conditions, prey abundance, history of control and dispersal. Typically higher numbers occur in late summer-autumn coinciding with the post-breeding dispersal period.

Management Aim: To maintain the dog fence in dog-proof condition, and maintain low numbers of wild dogs in the buffer zone (a statutory requirement of the Dog Fence Board).

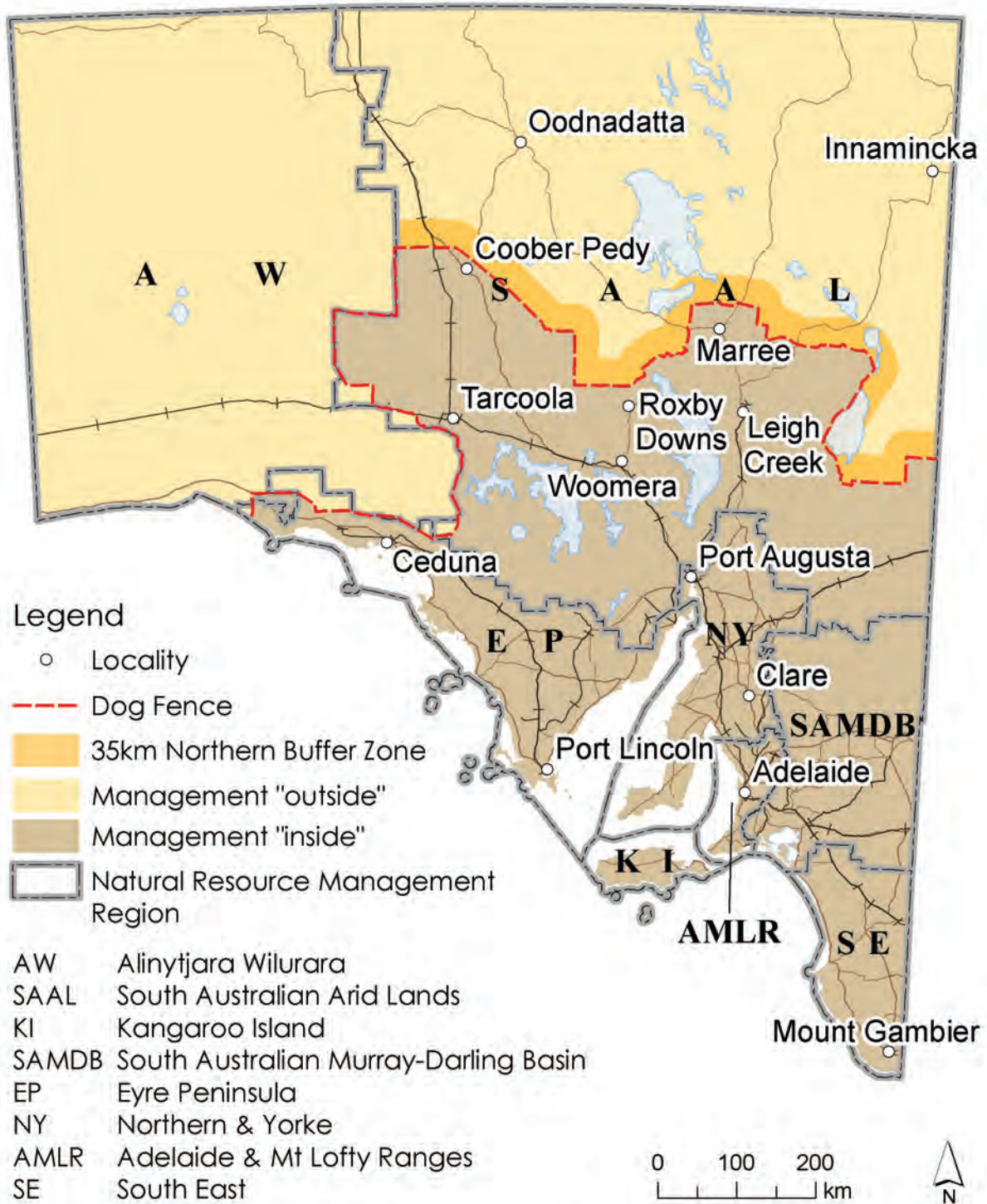
Zone 3: Outside the dog fence incorporating cattle production and non-production areas

Region: SA Arid Lands, Alinytjara Wilurara.

Status: variable numbers dependent upon seasonal conditions, prey (native animals, feral animals and livestock) abundance, access to water and history of control.

Management Aim: To strategically manage wild dog populations to minimise damage to the cattle industry and risk to public safety when risk is high; maintain ecological and cultural roles of wild dog populations in non-production areas.

Fig. 4: Wild Dog Management Zones and Natural Resources Management Regions



Map produced by Rural Solutions SA
8/04/2013



GOAL 1 Detect and eradicate wild dogs inside the dog fence

Background

From earliest European settlement the sheep industry was one of South Australia's most important enterprises. It remains so today with the wool and sheep meat commodities an important part of domestic and export markets. Total annual farm gate value of sheep in South Australia is \$680 million and the whole value chain is \$1.48 billion (*SA Sheep Industry Blueprint 2015-2020*).

Damage from wild dogs was, and remains, such a threat to sheep production that it ultimately shaped the historical distribution and extent of the sheep industry in South Australia. As a result of generations of sheep producers investing in wild dog control, wild dogs were effectively eradicated from the south of the state.

In the last two decades however the domination of sheep production has diminished in pastoral areas inside the dog fence. More than 20 former sheep properties have switched enterprise to cattle production, mining, nature conservation or tourism.

These enterprises do not demand the same zero tolerance of wild dogs as sheep production. While managers of these enterprises usually undertake some wild dog control they lack incentive for eradication. This has also coincided with a downturn in profitability in the pastoral industries and reduced labour availability.

These factors have contributed to an increase in wild dogs, with breeding populations now present well inside the dog fence. Resultant stock losses and increased control costs place additional pressure on those sheep producers remaining, sparking risks of further contraction in the sheep industry.

The South Australian dingo policy, when first drafted in 1977, recognised that wild dog presence is incompatible with sheep production. Recent developments clearly indicate that this is still the case. Consequently, under the *NRM Act*, wild dogs are a declared pest inside the dog fence and all property owners have a responsibility to destroy them. Although recent research suggests that wild dogs may confer production and biodiversity benefits in semi-arid grazing systems, their impacts on sheep production are considered too severe to allow populations to persist inside the dog fence.

There is no distinction for captive wild dogs; it is illegal under the *NRM Act* to keep dingoes or their crosses inside the dog fence unless under permit (generally in public zoos or wildlife parks).

The *Biteback* program was introduced in 2009 by Arid Lands NRM to target wild dogs inside the dog fence. *Biteback* is a coordinated, community-based program which encourages landholders to work together to control wild dogs. At its heart are 22 Local Wild Dog Planning Groups set up to encourage local control activities (Fig. 2).

Current control measures include spring and autumn ground baiting, aerial baiting, shooting and trapping. These techniques have not always been perfectly applied and have been insufficient to safeguard sheep against damage from relatively low level wild dog populations.

A high level of landholder participation in effective wild dog control activities is the key factor for success in achieving Goal 1. Participation rate is influenced by land use, organic status, cost, incentives and compliance.

Given a declining sheep industry inside the dog fence, coupled with the potential for increased damage to the fence from more frequent and severe flood and fire events, predicted with climate change, it may increase resilience among sheep producers to develop and promote alternative non-lethal techniques to protect sheep, such as the use of livestock guardian animals.

Key issues for Goal 1 are maintaining the right mix of incentives and compliance to ensure land managers are able to conduct effective eradication of wild dogs.

GOAL 1 - DETECT AND ERADICATE WILD DOGS INSIDE THE DOG FENCE		
ACTION	ACTIVITY	RESPONSIBILITY*
1.1 Improve awareness, surveillance, reporting and monitoring of wild dog activity	<ul style="list-style-type: none"> Conduct community extension activities to increase capacity of land managers to detect wild dog presence and damage Establish a notification system for wild dog detections to alert surrounding land managers Encourage land managers to undertake ongoing surveillance and reporting of wild dog presence Undertake quarterly monitoring of wild dog activity in Ngarkat area 	NRMBs, BFDCCC, LMs
1.2 Undertake regional planning across wild dog affected areas	<ul style="list-style-type: none"> Establish Local Wild Dog Planning Groups of appropriate scale across all NRM regions wherever wild dogs are present Provide best practice management information in a range of formats Establish local area plans for LWDPGs that include minimum standards for expected property-level control 	NRMBs, Coordinator, LWDPGs, SASAG
1.3 Manage records of wild dog activity to assist strategic planning	<ul style="list-style-type: none"> Collect and maintain property records of wild dog reports, stock losses, control activity and wild dogs killed Annually collate, map, analyse and report above wild dog activity to advisory group, stakeholders and land managers Maintain records of 1080 bait use 	NRMBs, Coordinator, LMs, LWDPGs, Biosecurity SA
1.4 Develop and promote integrated wild dog control	<ul style="list-style-type: none"> Conduct training in best practice management of wild dog populations Integrate wild dog control with other predator control programs as required 	NRMBs, Coordinator, Biosecurity SA
1.5 Increase land manager participation in wild dog control by education, motivation and compliance	<ul style="list-style-type: none"> Encourage all land managers to participate in local wild dog planning groups including through incentives Develop compliance process to ensure adequate levels of control by all land managers 	NRMBs, Coordinator, Biosecurity SA
1.6 Conduct ground baiting of wild dogs	<ul style="list-style-type: none"> Conduct regular autumn and spring baiting campaigns in areas where wild dogs are likely to be present, in compliance with NRM Regional Plans Conduct targeted baiting programs elsewhere when the need is determined through consultation with affected land managers Conduct regular quarterly baiting in the Ngarkat area Ensure opportunities for flexible bait injection services at other times Facilitate supply of commercially manufactured baits and canid pest ejector capsules Help facilitate bait production and storage for land managers Help facilitate meat supply for bait production Investigate licensing for appropriately trained and audited local land managers to manufacture 1080 baits Investigate licensing of 1080 oat grains for land manager manufacture of baits 	NRMBs, BFDCCC, LMs, DFB, Biosecurity SA, SASAG
1.7 Conduct aerial baiting of wild dogs	<ul style="list-style-type: none"> Identify and map key sites for targeted aerial baiting in inaccessible areas, ensuring aerial baiting is integrated with, and complements ground baiting Investigate opportunities for legally compliant land manager pilots to undertake aerial baiting 	Biosecurity SA, AWI, NRMBs
1.8 Conduct trapping of wild dogs	<ul style="list-style-type: none"> Conduct trapping workshops to increase capacity and skills of land managers as needed Employ professional dog trappers to trap wild dogs and to train land managers Employ dog trapper to respond within two working days to assist land managers reporting wild dog activity in the Ngarkat area Provide traps and equipment for short-term loan to land managers Maintain supplies of an agricultural chemical product approved by the Minister sufficient to ensure a rapid death for humane trapping Adopt lethal trap device technology when developed 	NRMBs, BFDCCC, Biosecurity SA
1.9 Conduct ground shooting of wild dogs	<ul style="list-style-type: none"> Encourage skills-based training for ground shooting of wild dogs Encourage land managers to provide incentives to actively remove wild dogs by capitalising on professional roo shooters and by recreational hunting groups and individuals 	LMs, NRMBs
1.10 Develop and promote new tools to control wild dogs and to protect livestock	<ul style="list-style-type: none"> Research, promote and ensure regulatory and training needs are met for new control tools, e.g. canid pest ejectors, lethal trap devices, para- aminopropiophenone (PAPP) baits, guardian animals, and 1080 oats Investigate, promote and train land managers in use of livestock guardian animals and other techniques to mitigate livestock damage 	Biosecurity SA, IACRC, Coordinator, NRMBs

* Bold = Lead responsibility (may be more than one organisation/ group). For NRMBs relates to regions inside dog fence where wild dogs present



GOAL 2

Prevent incursions by wild dogs through the dog fence

Background

As dingoes were gradually eradicated from southern sheep growing properties, graziers built dog-proof netting fences to exclude them. These fences were gradually consolidated into Vermin-Fenced Districts. When dingoes were eventually eradicated from within these districts the northern-most extension of the fence was adopted as the official dog fence under the *Dog Fence Act 1946*.

Today the South Australian dog fence extends from the Great Australian Bight near Fowlers Bay eastward across South Australia to the NSW border north of Broken Hill, a distance of 2178 km (Fig. 1) It forms part of the 5600 km tri-state fence shared with NSW and Queensland, which protects the south-eastern Australian sheep industry from wild dogs to the north and west.

The fence consists mainly of 1.7 m wire netting but with sections of solar-powered electric fence. Supplementary electric wires are used in western sections as added protection against damage by wombats and camels.

Overall management of the dog fence is overseen by the state-level Dog Fence Board. The Board, through four Local Dog Fence Boards employs contractors to inspect the fence at intervals of 14 days and to undertake necessary repairs to maintain the fence in dog-proof condition.

It should be noted that most of the actions listed under Goal 2 are enshrined in the *Dog Fence Act 1946* as a statutory requirement and as such are already achieved on an ongoing basis by the Dog Fence Board.

Funding for the fence is collected from landholders via the dog fence rate and a sheep transaction contribution matched 1:1 by the State Government. In 2015 this amounted to \$1,045,000. This pays for ongoing maintenance, upgrades, and replacement of old sections of fence.

Regardless of the type or general condition of the dog fence, some wild dogs inevitably breach the fence, especially as a result of flood damage.

To reduce this risk, a baited buffer zone extending 35 km outside the northern dog fence was established in 1993 (Fig. 1). The buffer zone is designed to create a 'sink' into which dispersing wild dogs from further north can settle. Regular baiting removes most of these animals before they contact the fence.

Buffer zone baiting is conducted in accordance with management plans developed for each Local Dog Fence Board area. These plans detail when, where and how baits will be laid on target properties.

Typically baits are ground-laid around stock waters once or twice a year in autumn and spring. The costs are fully subsidised by the Dog Fence Board.

The baited buffer zone is applied only along the northern part of the dog fence between Coober Pedy and the NSW border, where there are pastoral properties outside the fence. This encompasses about 40,000 km² along a 1,000 km front. The area includes parts of 15 cattle properties and about 240 target waters.

West of Coober Pedy there is no pastoral industry outside the fence, and consequently few waters, few access tracks and relatively few wild dogs except on the far west coast. Baiting is mainly restricted to the area immediately along the actual fence. It is supplemented by trapping on far western sections adjacent to the Nullarbor, where wild dogs are typically more abundant.

Key issues for maintaining the integrity of the dog fence is the capacity to respond to broad scale damage events (e.g. floods), and adequately maintaining the buffer zone which is challenged by an inability to bait on properties with organic status.

GOAL 2 - PREVENT INCURSIONS BY WILD DOGS THROUGH THE DOG FENCE		
ACTION	ACTIVITY	RESPONSIBILITY*
2.1 Maintain the dog fence in a dog-proof condition	<ul style="list-style-type: none"> • Conduct fortnightly fence inspections and undertake repairs as required • *Identify, prioritise and conduct upgrades and renewal of fence as needed • *Inspect condition of the fence quarterly (DFB supervisor) and half of the fence annually (DFB) • Encourage land managers to report fence damage to the Chair of the LDFB 	DFB, LDFBs, LMs
2.2 Oversee dog fence planning and governance	<ul style="list-style-type: none"> • *Set the Dog Fence Rate and collect from rateable land and from the South Australian Sheep Industry Fund • *Develop and implement management plans for each Local Dog Fence Board area • *Source, experiment with and maintain adequate supplies of fencing materials for fence upgrades and renewal • *Ensure fence maintenance track is in a safe and accessible condition • *Monitor high risk invasion pathways, e.g. poor fence condition, and undertake surveys of high risk areas following significant rainfall events • *Monitor wild dog activity at grids through fence and install deterrent devices as necessary to prevent breaches • *Replace electric fence with netting fence as resources allow • *Establish state-level procedures for receiving and responding to reports of fence damage • *Investigate establishment of contract work crews for emergency repairs to the fence 	DFB, LDFBs
2.3 Ensure wild dogs are controlled in a 35 km buffer zone outside the dog fence	<ul style="list-style-type: none"> • Conduct baiting programs at an appropriate scale and frequency to prevent a build-up of wild dogs on the northern dog fence in accordance with buffer zone management plans • Identify resources required to increase the frequency of buffer baiting programs • Review responsibility for buffer zone baiting • Conduct additional control measures (ground/ aerial baiting, trapping) when the fence sustains serious damage, e.g. by flooding • *Maintain traps along fence in areas where a baited buffer zone is impractical • Review buffer zone management plans regularly to ensure control regimes are appropriate, including for the far west coast • Investigate opportunities for non-baiting control on organically-accredited properties in the buffer zone 	DFB, SAAL NRMB, EP NRMB, Coordinator
2.4 Investigate aerial baiting opportunities	<ul style="list-style-type: none"> • Investigate feasibility to use aerial baiting to control wild dogs in the buffer zone 	Biosecurity SA, Coordinator, DFB, SAAL NRMB

+Actions enshrined in the Dog Fence Act and already achieved under the direction of the Dog Fence Board ongoing.

* **Bold** = lead responsibility (may be more than one organisation/group).



GOAL 3

Protect the cattle industry and human safety whilst maintaining the ecological and cultural roles of wild dogs outside the dog fence

Background

About 60 percent of the state lies outside the dog fence. Almost half of that area (east and west of the Simpson Desert-Lake Eyre region) is devoted to beef cattle production. The other half of that area (35 percent of the state), which largely comprises conservation reserves and Aboriginal Lands, does not support cattle production except in the far northern area (Fig. 4).

Baiting of wild dogs does not occur in non-production areas, unless very rarely to protect public safety.

On cattle properties outside the dog fence, baiting of wild dogs is permitted if it meets the requirements of State Government legislation and policy, and industry requirements such as organic accreditation.

The management of wild dogs outside the dog fence is controversial due to competing perceptions around their ecological and cultural roles and their impacts on the cattle industry (refer section 4).

The objective for Zone 3 is an appropriate balance between protecting the cattle industry from excessive wild dog impacts and maintaining important ecological and cultural roles of wild dogs.

Dingoes are an iconic species with cultural and ecological significance, but dingoes and wild dogs can have serious impacts on the cattle industry and they pose a low risk to human safety, particularly to children. The risk increases when people feed wild dogs and they lose their fear of people.

Dingoes are an integral part of Aboriginal culture, featuring in camp life, diet, oral literature, beliefs and practices. It is also a totemic animal for many Aboriginal groups. Some of these cultural values are being impacted by domestic dogs, which live

in remote indigenous communities, and hybridise with dingoes.

Wild dogs are the apex predator and a keystone species in northern South Australia. Scientific evidence is variable, but they are thought to limit populations of feral goats and over-abundant kangaroos as well as suppressing foxes and feral cats. These services provide potential biodiversity benefits.

Wild dog predation has serious impacts on the cattle industry. Wild dogs have increased in abundance in cattle production areas since European settlement due to increased water and prey availability such as rabbits, kangaroos and cattle.

Scientific evidence from South Australia and elsewhere indicates that the risk to cattle is low when other prey are abundant, but increases when conditions are poor and other prey are scarce. The risk of wild dogs to cattle also increases when wild dog numbers are high.

These conditions are seasonal and reasonably predictable. At times of high risk, land managers need to be able to manage wild dogs before they begin to impact cattle. At times of lower risk, wild dogs provide ecological services that are likely to benefit both cattle production and ecological values and it is prudent not to control their populations. Indeed, there is some scientific evidence that doing so can be counter-productive for cattle production both in terms of pasture availability for cattle and in damage from wild dogs.

South Australian government regulations and policies permit the management of wild dogs outside the dog fence. Management aims to maintain healthy populations of wild dogs, but to reduce their impacts on cattle.

Trapping is not permitted 100 m beyond the dog fence. Authorised officers are able to supply 1080 baits to landholders in South Australia, but under the 2011 *South Australian Dingo Policy*, aerial baiting for wild dogs is not permitted outside the fence.

The decision about whether to control wild dogs draws on the available science and the knowledge and experience of land managers. Before requesting baits, the risk of impacts on cattle is assessed by land managers, who also consider the seasonal conditions, and the abundance of wild dogs and their prey. Land managers who require wild dog population control are also required to coordinate activities through their local Wild Dog Planning groups.

To support the ecological role of wild dogs, the *SA Arid Lands Wild Dog Management Plan* also limits the amount of bait to be used on each property.

GOAL 3 - PROTECT THE CATTLE INDUSTRY AND HUMAN SAFETY WHILST MAINTAINING THE ECOLOGICAL AND CULTURAL ROLES OF WILD DOGS OUTSIDE THE DOG FENCE		
ACTION	ACTIVITY	RESPONSIBILITY*
3.1 Ensure a strategic and balanced approach to regional wild dog management planning outside the dog fence	<ul style="list-style-type: none"> Review regional wild dog management plans on an annual basis for consistency in achieving Goal 3 Develop and promote a simple decision-making tool for local action planning groups and individual land managers to determine the need for annual baiting, that considers risks and benefits (as per 3.2-3.7) Monitor annual spatial and temporal trends in 1080 bait use Coordinate wild dog management in border region between SAAL and AW regions as required Liaise with relevant interstate authorities for NT, Qld and the NSW border as required 	SAAL NRMB, AW NRMB, Biosecurity SA
3.2 Protect the cattle industry from excessive wild dog impacts	<ul style="list-style-type: none"> Facilitate timely supply of baits when land managers have assessed cattle predation risk to be high and wild dog control to be of immediate net benefit Review current SAAL bait supply processes on an annual basis Promote best practice wild dog control using the latest research findings 	SAAL NRMB, Biosecurity SA
3.3 Manage risk to public safety from habituation by wild dogs	<ul style="list-style-type: none"> Identify and manage sites at high risk of wild dogs habituating to humans and where children are likely to be present, e.g. desert camp-sites, mine sites, dumps Promote behaviours which minimise habituation, e.g. non-feeding Manage sites so as to minimise access to food, e.g. installing dog-proof bins and fencing refuse dumps Educate public on strategies to minimise risk to safety from wild dogs Remove individual wild dogs that pose an unacceptable risk to public safety 	LMs (e.g. DEWNR, Co-management Boards, Aboriginal Lands, Mining companies), SAAL NRMB, AW NRMB, Biosecurity SA, Coordinator
3.4 Improve understanding of the impacts of wild dogs on production and biodiversity outside the dog fence	<ul style="list-style-type: none"> Finalise and promote outcomes of research to improve understanding of the relationships between wild dogs, cattle production and wildlife, including kangaroos and introduced meso-predators (foxes and cats) Engage with cattle industry on potential benefits to pasture production from wild dogs due to their predation on kangaroos and other herbivores 	SAAL NRMB, Coordinator, Biosecurity SA, MLA
3.5 Conserve the genetic integrity of dingo populations	<ul style="list-style-type: none"> Minimise hybridisation of domestic dogs with dingo populations, e.g. by sterilisation and confinement of domestic dogs whilst on heat Improve management of domestic dogs through education and on-ground services in remote communities, e.g. by provision of dog sterilisation services 	AMRRIC, LMs, Coordinator, SAAL NRMB, OCA,
3.6 Maintain the ecological role of dingoes in the landscape	<ul style="list-style-type: none"> Continue to refine decision making framework for baiting in cattle production areas, through annual revision of regional wild dog management plans Limit the amount of bait available for a property on an annual basis to not exceed long-term historical averages Ensure regional management plans limit wild dog control only to those land uses where significant impacts on livestock or public safety are likely 	SAAL NRMB, AW NRMB, Coordinator
3.7 Recognise and incorporate Aboriginal cultural values of dingoes	<ul style="list-style-type: none"> Improve understanding of cultural values of dingoes to indigenous groups and incorporate into future plans and policies 	SAAL NRMB, AW NRMB, Coordinator, Aboriginal communities, Co-management Boards

* **Bold** = lead responsibility (may be more than one organisation/ group).

GOAL 4

Ensure good governance for management of wild dogs across South Australia

Background

Effective management of wild dogs in South Australia requires transparent decision-making processes and peer oversight for legislation and policy frameworks and planning. It also requires implementation of best practice on-ground actions. Good governance is essential for ensuring that wild dog management is adequately funded over reasonable time frames and funds are effectively used.

Wild dog management involves a broad range of stakeholders. It is important that each be given a voice to help build a sound platform for strategic management. Accordingly, the *SA Wild Dog Advisory Group* (SAWDAG) was convened to advise on all aspects of management (see SAWDAG terms of reference in Appendix 2). SAWDAG has representation from livestock production, conservation and indigenous organisations, *NRM Boards*, the *Dog Fence Board* and government departments (Fig. 5).

Wild dogs occupy large home ranges and can travel long distances. Even small numbers of animals can disproportionately impact sheep production.

Effective landscape-scale control of wild dogs in the sheep zone requires that all land managers are aware of their responsibility to control wild dogs on their property, irrespective of land use.

This necessitates a coordinated approach involving a mix of appropriate incentives and compliance to ensure a minimum level of participation by all land managers.

Fig. 5: Decision-making structure for wild dog management in SA



Communication and collaboration are vital, with consistent messages and strong linkages forged between organisations responsible for facilitating control (*NRM Boards*, *Dog Fence Board*) and land managers. It is also important to build and maintain strong linkages with practitioners from other national and state bodies to share information.

These include the *National Wild Dog Action Plan's Stakeholder Consultative Group*, interstate government biosecurity agencies and dog fence managers, and industry groups responsible for research, control and funding. Particularly important is the need to share research and development on new and existing tools to increase capacity by land managers to undertake control.

Adequate monitoring, evaluation and reporting of actions are essential to inform, modify and continuously improve future programs including this *Wild Dog Strategic Plan*.

The broader community has high animal welfare expectations in conducting wild dog control. Other than the dog fence, all current control methods are lethal. Opportunities for better animal welfare outcomes should be pursued wherever possible.

This *Wild Dog Strategic Plan* aligns with the *National Wild Dog Action Plan* released in July 2014. Wild dog agency staff contributed to the National Plan and advanced drafts were reviewed by SAWDAG to ensure consistency between the two plans.

Key governance issues for this goal are ensuring a sustainable funding model and stakeholder collaboration to implement the plan.

GOAL 4 - ENSURE GOOD GOVERNANCE FOR MANAGEMENT OF WILD DOGS ACROSS SOUTH AUSTRALIA		
ACTION	ACTIVITY	RESPONSIBILITY*
4.1 Coordinate wild dog management at a state level	<ul style="list-style-type: none"> Maintain the South Australian Wild Dog Advisory Group with broad stakeholder representation Establish a state wild dog coordinator role to assist the implementation of the plan Improve communication and reporting networks between organisations with statutory responsibilities for wild dog management at regional and state levels Ensure all NRM regions have wild dog management plans 	SAWDAG, Coordinator, DEWNR, Biosecurity SA, NRMBS, DFB
4.2 Monitor implementation of the plan	<ul style="list-style-type: none"> Develop an annual Monitoring, Evaluation, Reporting and Improvement (MERI) plan to enable tracking of progress with the strategic plan's implementation and continuous improvement Review current datasets on wild dog distribution, impacts and controls to develop metrics for assessing effectiveness of on-ground actions 	SAWDAG, Coordinator, Biosecurity SA
4.3 Develop a sustainable funding model for ongoing control of wild dogs	<ul style="list-style-type: none"> Identify beneficiaries of wild dog control and communicate this to broader community Foster and further develop investment partnerships between beneficiaries, e.g. sheep industry and NRM boards 	SAWDAG, NRMBS, DFB, Industry (AWI, MLA, SASAG)
4.4 Review policies and legislation	<ul style="list-style-type: none"> Review the South Australian NRM Act dingo policy Use consistent wild dog/ dingo terminology in policies, plans and extension materials 	Biosecurity SA, NRMBS
4.5 Maintain national linkages and share information with other states	<ul style="list-style-type: none"> Maintain active membership of the National Wild Dog Action Plan's Stakeholder Consultative Group Maintain national linkages with wild dog researchers, agencies, dog fence staff, producer groups and funding agencies Establish and maintain cooperative wild dog control across state borders, e.g. Victorian-Big Desert Wild Dog Management Group 	Biosecurity SA, NRMBS, Coordinator, National Wild Dog Facilitator, IACRC, BFDCCC
4.6 Increase awareness of wild dogs among land managers and the community	<ul style="list-style-type: none"> Develop an engagement and communications plan Conduct community extension activities to promote awareness of impacts and control of wild dogs Disseminate regular updates on the progress of wild dog management across the state Provide best practice management information in a variety of formats including through social media 	Coordinator, NRMBS, Biosecurity SA
4.7 Guide and support research on wild dog biology, impacts and control	<ul style="list-style-type: none"> Maintain links with the National Wild Dog Action Plan's R&D Working Group and the Invasive Animals Cooperative Research Centre's wild dog research program Foster research into ecology, impacts and control, including measuring the effectiveness of coordinated on-ground programs Adopt research outcomes and technologies from interstate and overseas as appropriate for SA 	Biosecurity SA, NRMBS, IACRC, University of Adelaide, Coordinator
4.8 Maintain existing control tools through compliance with chemical registration and animal welfare legislation	<ul style="list-style-type: none"> Support continued use of 1080, traps and other tools for wild dog control Collaborate with national and state licensing authorities to ensure compliance with chemical regulations and directions for use of agricultural chemicals Ensure all control methods comply with Animal Welfare Act and Codes of Practice (COPs), and where possible, seek more humane or non-lethal methods for protecting livestock Support use of approved toxins for organically-accredited producers 	Biosecurity SA, NRMBS, DFB, DEWNR, LMs
4.9 Prevent the keeping of dingoes without a permit	<ul style="list-style-type: none"> Publicise non-keeping policy to broader SA community Ensure compliance with non-keeping policy (including permit oversight for zoos and wildlife parks) Engage with interstate dingo suppliers to ensure they are familiar with the prohibition on keeping dingoes in SA 	Biosecurity SA, NRMBS
4.10 Succession planning	<ul style="list-style-type: none"> Maintain technical knowledge base within State Government 	Biosecurity SA

* **Bold** = lead responsibility (may be more than one organisation/group).

3.3 Stakeholder roles

The following stakeholders have key roles in the effective management of wild dogs in South Australia.

Aboriginal Land Management Authorities

A number of authorities assist traditional land owners to manage their land. These include APY Land Management, Maralinga Tjarutja and Yalata Aboriginal Community Council (Alinytjara Wilurara NRM Region), and the Aboriginal Lands Trust. The role of these authorities is to work with traditional owners to ensure that the ecological health of the land is retained.

Animal Management in Rural and Remote Indigenous Communities

AMRRIC is an independent group of veterinarians, academics and health professionals that work to improve the health and wellbeing of companion animals in remote Indigenous communities. They facilitate sustainable, culturally-sensitive, professional dog health programs in many Indigenous communities around Australia.

Australian Government

The Australian Government is responsible for management of Commonwealth lands, provides for coordination in pest management between Jurisdictions, and has legislative responsibilities under the *Environment Protection and Biodiversity Conservation Act 1999*.

Biosecurity SA

Biosecurity SA provides technical, policy and scientific expertise for the control of declared animals and plants under the NRM Act. It develops State policies and provides legislative recommendations to the Minister for Sustainability, Environment and Conservation. It also works closely with NRM boards and other stakeholders to implement policies for management of pest animals in SA, including the use of toxins such as 1080 poison.

It is also responsible for overseeing implementation of the *State and National Wild Dog Plans* in South Australia.

DEWNR

DEWNR provides integrated environmental and natural resources services including management of the public land estate (parks, reserves and crown lands). DEWNR's role in managing the State's natural resources ranges from policy leadership to on-ground delivery for regional Natural Resources Management Boards, including issues relating to sustainable land management and biodiversity conservation.

Dog Fence Board

The Dog Fence Board administers the *Dog Fence Act 1946*. The board has responsibility to ensure that the fence is properly maintained and is at all times dog proof. This requires that it is properly inspected, and that wild dogs are destroyed in the vicinity of the dog fence. The Board is responsible for overseeing the collection of rates, and budgets for four Local Dog Fence Boards. It also oversees maintenance of the 35 km buffer zone.

Private land managers

Wild dogs are recognised under various legislative frameworks in South Australia. It is a land owner's responsibility to meet all requirements for the control, monitoring and keeping of wild dogs in SA. In particular to:

- collect and maintain property records of wild dog reports, stock losses and wild dogs controlled

- conduct regular autumn and spring baiting where wild dogs are likely to be present in compliance with NRM Regional Plans; and targeted baiting programs in other areas when the need is determined through land manager consultation.
- restrict the incidence of inter-breeding between domestic and wild dogs through sterilisation and confinement of domestic dogs while on heat.

Natural Resources Management Boards

Eight regional NRM boards provide strategic oversight for local and regional control programs for pest animals.

The role of NRM boards is to lead regional natural resources management through developing regional NRM plans, advising government and connecting government to communities on relevant issues.

NRM boards develop regional and local (NRM Group) pest management plans with priorities based on species risk assessments and assets at risk. Wild dogs are a declared species inside the dog fence under the NRM Act. Regional NRM boards are supported by DEWNR staff. Within each board are several regional District NRM Groups which will have a key role in implementing this plan.

Research Organisations

Research is conducted by a range of organisations to better understand the benefits, impacts and control of wild dogs. In particular it is conducted by various government, university and industry partners of the Invasive Animals Cooperative Research Centre (IACRC). Contributors to this research include Biosecurity SA, NRM Boards and peak National industry partners Australian Wool Innovation and Meat and Livestock Australia.

The IACRC conducts research on the economic and social impacts of wild dogs and on new tools for wild dog control such as PAPP, Canid Pest Ejectors, Lethal Trap Devices and Wild Dog Alert - an automated recognition and messaging system for wild dog management. It also supports the National Wild Dog Facilitator whose role includes supporting state agencies and landholders to develop local wild dog management plans.

SA Sheep Advisory Group (SASAG)

The SASAG, established under the *Livestock Act 1997*, provides advice to the Minister for Agriculture, Food and Fisheries on a range of matters relating to the sheep industry. It also advises the Minister on the use of the SA Sheep Industry Fund, collected from sheep transactions. The fund is currently used for a range of programs including minimising the impacts of wild dogs by contributing to *Biteback* and the dog fence.

Livestock SA (LSA)

LSA represents and promotes the interests of sheep, beef cattle and goat producers as the peak organisation.

SA Wild Dog Advisory Group (SAWDAG)

SAWDAG provides guidance, direction and policy advice for the management of wild dogs across the state. A key role for the group is the delivery of the strategic plan following stakeholder consultation, and driving its implementation. It ensures a diversity of community and agency views are represented for effective implementation of the strategic plan including to:

- implement monitoring and reporting protocols for the plan
- prioritise and develop timeframes for the delivery of activities identified in the strategy
- develop measurable targets to enable effective monitoring and evaluation of the strategy
- assist in the development and implementation of programs and initiatives that support strategic actions

- coordinate and facilitate the exchange of information relating to wild dog management between government agencies, industry groups and the community
- build and maintain partnerships with key stakeholders to improve strategic wild dog management
- develop and implement communication and extension plans where appropriate.

Conservation Council of SA (CCSA)

The CCSA is the peak conservation body in SA representing over 50 member groups. It provides advice on a variety of matters relating to the conservation and protection of the environment.

The Nature Conservation Society of SA is one of the member groups under CCSA. Its objects include fostering conservation of the State's wildlife and natural habitats. NCCSA contributed to the development of the *SA Dingo Policy* in 1977.

3.4 Implementation, monitoring, evaluation and reporting

This Strategy will be implemented under the direction of the *SA Wild Dog Advisory Group* and supported by Biosecurity SA. Following its creation, a key role for SAWDAG was to prioritise preliminary actions from the draft plan.

SAWDAG will continue to prioritise and develop annual plans of activities based on actions identified in the plan and with achievable timelines for their completion.

A State Wild Dog Coordinator will be appointed to oversee the delivery of these activities, subject to funding.

Annual reports by the advisory group will include a review of actions implemented under the strategy and relevant actions under other related strategies and plans including:

- the *National Wild Dog Action Plan*
- NRM Board regional pest management plans/strategies
- landholder property management plans
- management plans for conservation reserves.

Monitoring, evaluation and reporting are critical to the continued development of the strategy to improve the effectiveness of management actions. This strategic plan is subject to a five-year review.

Evaluation should include monitoring changes in the number and distribution of wild dogs and stock losses, both inside and outside the dog fence. Evaluation should also consider the efficacy of control techniques and the development and release of new technologies.

The success of wild dog control depends on an ongoing program of monitoring due to the opportunistic nature of their invasion and spread. Property-level monitoring should be undertaken:

- during autumn and spring baiting programs (i.e. during lambing/calving)
- following flood events that have the potential to impact on the integrity of the dog fence
- during times of favourable seasonal conditions likely to promote increased wild dog populations.

The national NRM Monitoring, Evaluation, Reporting and Improvement framework has been adopted by the South Australian Government for monitoring natural resource management targets. Applied to this plan, the Monitoring, Evaluation, Reporting and Improvement framework should measure the effectiveness of specific management actions for achieving measurable outcomes. Measurable outcomes could be based on the following performance indicators:

- adoption of data collection standards and sharing of data between managers
- improved knowledge of the current distribution of wild dogs across the state
- improved understanding of the benefits and costs associated with wild dogs
- increased participation in the coordinated management of wild dogs
- reduction in the sightings of wild dogs inside the dog fence
- reduction in reported livestock impacts inside the dog fence
- increased resources for on-ground actions such as ground and aerial baiting and trapping by professional doggers
- increased participation in alternative wild dog management strategies.

4. TECHNICAL BACKGROUND

4.1 Taxonomy, origin, and hybridisation with domestic dogs

The dingo, like all domesticated dogs, was long thought to be derived from the grey wolf *Canis lupus*. Recent research, however, suggests that *C. lupus* may be a species complex of more than one species (Aggarwal *et al.* 2007; von Holdt *et al.* 2011), and that neither the dingo nor domestic dog lies within any modern wolf group.

Accordingly it has been argued that because the ancestry of dingoes is unknown, and because they differ in many behavioural, morphological and molecular characteristics they should be considered a distinct species. Furthermore, because the dingo was first described as *C. dingo* it has been proposed that this name be retained (Crowther *et al.* 2014). This is, however, currently under dispute.

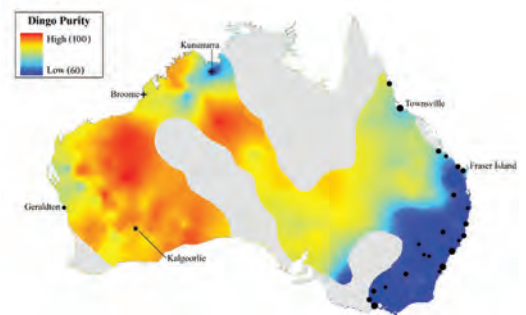
Timing of the arrival of dingoes in Australia is also disputable. Most commentators agree that dingoes were brought to Australia 3500-5000 years ago as a relatively early form of undifferentiated dog and remained effectively isolated until European settlement. Recent genetic studies support a south-east Asian origin, centred on southern China (Savolainen *et al.* 2004, Sacks *et al.* 2013). The founder population is thought to have comprised as few as two to four animals.

Because dingoes and domestic dogs share a common ancestor they freely interbreed to produce fertile hybrids. Recent research using microsatellite DNA markers has shown that hybridisation has occurred widely in Australia since European settlement (Stephens 2011).

The proportion of hybrids varies considerably depending on proximity to human populations. Hybridisation is most evident in highly settled areas of eastern Australia where very few purebred dingoes now remain.

The wild dog population in Australia is a mixture of dingoes and wild dogs and their hybrids. Hybridisation is least evident in outback areas of the Northern Territory and Western Australia. Northern South Australia has an intermediate incidence of hybrids (Fig. 6).

Fig. 6: Dingo purity from DNA samples (from Stephens 2015).



Of 148 South Australian wild dogs tested in 2008-09, 57 percent were scored as pure or likely pure dingoes and 79 percent were considered to be ≥ 75 percent pure. Only 6 percent were considered to be < 65 percent pure (Stephens pers. *comm.*).

Some have suggested that hybrids are responsible for a greater proportion of livestock attacks than purebred dingoes but this has not been scientifically studied.

The Action Plan for Australian Mammals 2012 lists the dingo as 'Near Threatened' due to genetic swamping from domestic dogs (Woinarski *et al.* 2014). They list the following conservation objectives:

- measure rate of introgression of domestic dog genes into dingo subpopulations.
- maintain 'pure' dingoes in semi-captivity and captivity.

4.2 Past and current distribution and abundance

At European settlement dingoes occurred throughout mainland South Australia. Conflict with the sheep industry led to their intensive control and ultimately their virtual eradication from southern sheep-growing areas within one hundred years of settlement.

Today permanent populations are largely confined to the arid north of the state lying outside the dog fence. This comprises an area of about 580,000 km² or 60 percent of the State (Fig.4).

Outside the dog fence, wild dogs tend to be most common in pastoral cattle production areas in the north-east and north-central areas either side of the Simpson Desert and Lake Eyre. Here, wild dogs have increased in abundance since European settlement due to the provision of permanent waters, the introduction of rabbits and cattle and the increase in kangaroo numbers, all of which are now important dietary items for wild dogs in the region (Allen 2012a).

Wild dogs are also common on the Nullarbor Plain when seasons are good and rabbits abundant. Elsewhere in desert areas, wild dogs are generally sparse due to the lack of permanent water, although numbers may increase in good seasons.

Isolated populations persist inside the dog fence, most notably in the Ngarkat Conservation Park in the upper South-East where a permanent population of wild dogs is shared with the Big Desert region of adjacent north-west Victoria.

Smaller numbers also occur at least transiently on many pastoral properties extending 100 km or more inside the dog fence. These animals are sometimes the result of recent incursions through the fence but most often are born inside. While most occur on properties close to the dog fence, there are increasing reports of wild dogs from southern pastoral and even agricultural areas.

Historically, the incidence of wild dogs inside the dog fence fluctuated according to their density outside the fence coupled with the condition of the fence. In most years there are very few incursions but in years when high densities of wild dogs coincide with fence-breaking rains, incursions can be more frequent. In 1990-91 for instance, an estimated 384 wild dogs breached the fence and killed 13,910 sheep (United Farmers and Stockowners Meeting, Hawker - in Bird 1994).

Wild dog numbers outside the fence range from sparse to abundant depending on prey availability and the level of control exerted by land managers. Numbers declined somewhat in the wake of the introduction of rabbit haemorrhagic disease in 1996 but have recovered following a gradual resurgence in rabbit populations since (Mutze *et al.* 2014).

4.3 Physical characteristics

The average male wild dog from central Australia (including far northern SA) stands about 59 cm at the shoulder, is 121 cm long from nose to tail tip and weighs 15 kg. Females are slightly smaller (Corbett 1995).

The dingo is characterised by a broad head, tapered muzzle, pricked ears, short coat and bushy tail.

The coat is often sandy yellow to ginger in colour, but may be black-and-tan, white or black with or without white socks, tail tip and chest markings. Some individuals, including specimens collected soon after European settlement, exhibit sable colouration (black hairs along the back and sides). (Crowther *et al.* 2014)

Hybrids with domestic dogs may appear indistinguishable from purebred dingoes or may vary in body size, conformation and coat colour, reflective of their domestic dog parentage. Coat colour in hybrids sometimes manifests as brindle or with white patches.

4.4 Social structure, home range and movements

Wild dogs are social animals typically organised into packs of two to fifteen animals which share a stable territory. Each pack consists of a dominant (alpha) male and female together with young of one or more years. Individual group members often hunt alone or in pairs but come together for territorial defence (Fleming *et al.* 2001).

Territories of neighbouring packs rarely overlap although they often share sparsely distributed watering points, the territories radiating out from the water like the petals of a flower (Allen 2012b).

The size of individual home ranges varies according to the type and availability of resources. At three semi-arid and arid sites in central and western Australia, mean home range size varied 25-77 km² (range 7-126 km²) (Corbett 1995). In north-east South Australia the mean home range of 11 individuals was about 24 km² in a good season (Allen 2012b).

Daily movements by wild dogs within their home range are rarely more than a few kilometres. Dispersals - permanent movements beyond their natal home range - can involve much greater distances. For example two adult male wild dogs collared in north-east South Australia moved 150 km and 225 km respectively after the dam at which they were watering dried up (Bird 1994).



Adults disperse more frequently than juveniles and males more than females (Corbett 1995). Dispersals occur most frequently when population density is high and when food supply is low but may also occur in response to drying of surface waters or after exceptional rainfall. Dispersers often settle in territories made vacant by the death of resident dogs, especially after control activities.

While dispersals can occur at any time of year (Corbett 1995), typically there is a seasonal build-up of wild dogs along the South Australian dog fence in March and April of most years. This is likely a response to heightened aggression by dominant males prior to the breeding season. It also coincides with the time of year when rabbits are least available.

Satellite-tracking of wild dogs in sheep grazing areas *inside* the Queensland dog fence have revealed movements of up to 550 km in 31 days and 1,300 km in four months. (Allen 2009). These exceptionally long movements may relate either to individuals seeking out other wild dogs or avoiding control attempts by land managers. Wild dogs recently recorded more than 300 km south of the South Australian dog fence (e.g. Swan Reach, August 2013) may have been inside the fence for some time but conceivably are the result of similarly large movements to those above, recorded interstate.

4.5 Diet

In northern South Australia wild dogs utilise a wide range of foods. A dietary study at five sites identified 21 prey types in 5207 wild dog scats (Allen 2012a, Allen and Leung 2014). Rabbits, rodents (mostly hopping mice, house mice and long-haired rats) and red kangaroos were staple prey, supplemented by cattle, invertebrates and reptiles.

Rabbits and rodents were more important at sandy sites in the north-east while kangaroos and cattle were more important at stony sites in north-central areas.

The results reaffirmed earlier dietary studies which showed that the diet of wild dogs fluctuates with the availability of staple prey (Thomson 1992; Corbett and Newsome 1987). Wild dogs preferred small to medium prey when available, especially rabbits and rodents, probably because they were more easily captured. As these declined in drought, larger prey, red kangaroos and cattle (mostly as carrion), became more important in their diet.

Corbett and Newsome (1987) proposed a hypothesis of 'alternation of predation' whereby wild dogs fed sequentially on prey of increasing size (rodents, rabbits, red kangaroos and cattle) as conditions deteriorated from flush times through to drought, although always concentrating on the staple prey of rabbits. Cattle carrion becomes increasingly important in severe drought (Allen 2010).

Wild dogs are dependent on free water for survival. Accordingly they are often common in the pastoral cattle zone due to the proliferation of stock watering points. In contrast they remain generally sparse in the Great Victoria and Simpson Deserts where free water occurs irregularly, although numbers may increase following years of high rainfall.

Visitation to waters by wild dogs varies according to factors such as temperature, food availability, lactation and social dynamics. When prey is abundant wild dogs are able to obtain sufficient water from their food.

A study in north-east South Australia showed that some wild dogs only visited water points every three to five days and sometimes went as long as 22 days without visiting water points (Allen 2012b).

4.6 Reproduction

Unlike domestic dogs that breed twice a year, female dingoes produce only one annual litter of pups. In central Australia bitches reach sexual maturity by their second year and usually come into oestrous and mate between April and May. Males reach full sexual maturity in one to three years. Females produce an average litter of five pups (range 1-9) following a gestation of 64 plus or minus three days (Corbett 1995).

Peak whelping occurs in June-July although births can be spread over the five-month period May to September. Most den sites are enlarged rabbit burrows and located close to water.

Wild dogs exhibit several social behaviours which serve to naturally suppress population growth in the group. These include inhibition of breeding, mating preferences and infanticide (Corbett 1995). The latter involves the dominant female killing the pups of lower-ranked females. A consequence is that lower ranked females then assist with provisioning the pups of the dominant bitch ensuring that some pups probably survive even in drought years.

It has been argued that dingo control may unwittingly enhance breeding and survival rates in wild dog populations. Control such as baiting tends to remove younger and older wild dogs, leaving behind the most productive animals with more abundant food resources. Control also fractures packs into smaller units potentially interfering with natural breeding controls such as infanticide (Corbett 1995).

4.7 Ecological role

Dingoes assumed the role of apex predator on the mainland sometime after their introduction at least 3500 years ago and following the extinction of the thylacine and Tasmanian devil (Corbett 1995).

As apex predator the dingo is considered to be a *keystone* species in some systems, i.e. it has a disproportionately large effect on its environment, relative to its abundance. Keystone predators play an important role in maintaining the structure of ecological communities and affecting many other organisms in an ecosystem (Glen and Dickman 2014).

Healthy wild dog populations have the ability to suppress populations of some feral species including goats, donkeys and pigs (Dickman *et al.* 2014). Feral goats in particular are very susceptible to wild dog predation, being rarely present unless wild dogs are absent or regularly controlled to low densities (Parkes *et al.* 1996).

Wild dogs also suppress kangaroos, with typically much lower densities outside the South Australian dog fence than inside (Pople *et al.* 2000). Because kangaroos compete for pasture with cattle, the presence of wild dogs potentially has benefits for cattle production.

Studies comparing the net benefits to beef production from wild dog control in northern South Australia found that especially in favourable seasons the costs of kangaroo competition outweighed the benefits of controlling wild dogs. Consequently it was not in a beef producer's interests to implement control in most years because it was unlikely to return a benefit (Wicks and Allen 2012; Allen 2015).

Modelling of cattle production systems has similarly suggested that wild dog-mediated control of kangaroos increases pasture biomass for cattle leading to a net profit for cattle pastoralists despite some calf mortality (Prowse *et al.* 2014).

It has also been argued that wild dogs are able to suppress populations of introduced foxes and feral cats that threaten many wildlife species in South Australia (Letnic *et al.* 2009; Ritchie and Johnson 2009; Letnic *et al.* 2011; Moseby *et al.* 2012). This had led to calls

for the cessation of wild dog control, abandonment of dog fences and introduction of wild dogs back in to landscapes from which they have been eradicated. This is controversial and there are studies that challenge the notion that wild dogs effectively suppress meso-predators (Allen *et al.* 2013) and caution against positive management of wild dogs (Fleming *et al.* 2012).

4.8 Dingo conservation

Implicit in the *South Australian Dingo Policy* is that survival of the dingo as a wildlife species will be ensured. Management of dingoes for conservation is a complex issue, with several factors potentially impacting upon long-term conservation. These include:

- hybridisation with domestic dogs
- control outside the dog fence
- control in Ngarkat Conservation Park
- aerial baiting
- keeping of dingoes.

4.9 Cultural significance

The dingo has been of great significance to Aboriginal people for a very long time – long enough for it to have become an integral part of camp life, the diet, oral literature, beliefs and practices (Tunbridge 1991). Tunbridge describes the dingo as probably the mammal with the most significant role in Aboriginal life, having a status somewhere between other mammals and people.

The dingo is a totemic animal for many groups including the Adnyamathanha and Dieri peoples. Although the significance of this has diminished as Aboriginal people have lost contact with traditional practices, the dingo remains an animal with deep cultural significance for many Aboriginal people.

The following statement was provided by Aboriginal people consulted during development of the plan:

Aboriginal people have a very strong connection with the dingo and wild dogs across South Australia. There are stories traversing the state which are important to our culture, our families and our individual wellbeing. We request that management of dingoes in South Australia recognises and respects this connection and its importance to the wellbeing of our culture and country and reserve the right to make comment on these plans into the future.

The word 'dingo' is derived from an aboriginal word from eastern Australia. Each tribal language group had their own name, often distinguishing between wild dingoes and those that lived in camp. South Australian examples include:

Kadli

Kaurna, Adelaide Plains

Kinthala

Diyari, Northeast

Kurdninyi

Barnjarla, Eyre Peninsula

Papa Inura

Pitjantjatjara, Northwest

Urdninyi (wild) Wilka (domestic)

Adnyamathanha, Flinders Ranges

4.10 Impacts

Agricultural impacts

Wild dogs have significantly influenced the historical distribution of sheep across Australia. More recently wild dog predation has contributed substantially to the contraction of the sheep industry. Rangeland production of wool and sheep meat is predicted to disappear within 30–40 years if the present rate of contraction continues unabated (Allen and West 2013).

The SA Dingo Policy (Biosecurity SA 2011) recognises that wild dogs impact most significantly on the sheep industry. Simply put, sheep and wild dogs are incompatible.

This was recognised early in the state's history and continues to be true today. It is why the dog fence was constructed and why the dingo is a declared species inside the fence. Wild dogs harass and kill substantial numbers of sheep. They often engage in surplus killing far in excess of their food requirements and often do not feed on the carcasses.

Apart from direct killing of sheep, losses arise from flystrike, secondary infection and down-grading of carcasses from bites. Even the chasing of sheep or simply the presence of wild dogs can cause losses in production through such things as mismothering of lambs and being kept off waters. (Fleming *et al.* 2001).

Cattle are not impacted to the same extent as sheep due to their size and intimidating behaviours, but calves and animals in poor condition may be killed or damaged. Greatest losses occur when seasonal conditions are poor and prey (native and feral animals) is limited, and when wild dog populations are high.

A case study modelling the potential economic benefits of wild dog control to cattle production outside the dog fence estimated the benefit-cost ratio of control to range 4.25-80 if rates of attack were to increase by two to twenty percent (Wicks *et al.* 2014). This translates to a net present value of benefits estimated to be between \$1.4 and \$34 million.

Controlling wild dog populations however does not necessarily reduce this damage. Long-term studies in the Northern Territory (Eldridge *et al.* 2002) and Queensland (Allen 2013) found that calf losses only occurred in seasons of below-average rainfall suggesting that control was unnecessary in most years because wild dogs did not routinely prey on calves.

Indeed the Queensland study found that baiting could exacerbate damage due to behavioural changes in the way that surviving or re-colonising wild dogs interacted with livestock. The study concluded that baiting was not economically justified in most years (Allen 2013).

A six year study which compared baited and unbaited treatments on five cattle properties in northern South Australia similarly found no consistent effect of baiting on calf production (Eldridge, *et al.* 2016). Although wild dogs caused obvious predation especially during drought, even twice-yearly baiting that reduced wild dog activity by 60 percent did not significantly reduce calf mortality.

Wild dogs would potentially impact the farmed and feral goat and kangaroo harvest industries inside the dog fence if allowed to build up in numbers (Pople *et al.* 2000).

No comprehensive assessment has been made of the economic impact of wild dogs in South Australia. Past estimates of production losses across Australia include \$48 million (McLeod 2004) and \$49 million (Gong *et al.* 2009) but others assert that losses total hundreds of millions (WoolProducers Australia 2014).

Environmental impacts

The impact of wild dogs on native wildlife is controversial. The possible role of dingoes in the decline and extinction of many South Australian native mammal species is poorly understood. Some have suggested that dingo populations boosted, by increased availability of waters and by rabbits, may have contributed to the early extinction of some medium-sized mammals in arid Australia (Corbett 1995) and continue to threaten some species (Invasive Animals CRC 2011). Others argue that the extinctions were more likely due to predation by introduced foxes and feral cats, as a consequence of high levels of wild dog control (Johnson 2006).

Wild dogs prey on a range of native wildlife, some rare or threatened. In South Australia, this includes rodents such as Dusky Hopping Mouse and Plains Mouse (Allen 2012a).

Social impacts

The social impacts of wild dogs can be severe. A study by the Social Sciences Unit of Australian Bureau of Agricultural and Resource Economics and Sciences found that many landholders who experienced prolonged attacks on livestock by wild dogs suffered extreme psychological stress (Please *et al.* 2011). Levels of trauma among the landholders were similar to those of people who had experienced life-threatening events.

Disease impacts

Wild dogs are vectors of several endemic and exotic parasites and diseases that potentially impact livestock, domestic pets, wildlife and human health (Fleming *et al.* 2001). These include rabies, canine distemper, parvovirus, heartworm, hepatitis, hydatids, sheep measles, mange and *Neospora caninum*. Little work has been conducted in South Australia to assess the risk but the high prevalence of *N. caninum* infection in Aboriginal community dogs, including in arid regions, suggests that free-ranging dogs may be important contributors to the life cycle of *N. caninum* (King *et al.* 2012).

4.11 Control

Animal welfare

This plan recognises that the welfare of animals is paramount. This includes both the adequate protection of livestock and the humane destruction of wild dogs. The plan supports the use of techniques described in the Model code of practice for the humane control of wild dogs, and associated Standard Operating Procedures (Sharp and Saunders 2012).

General

Control techniques used throughout Australia are described by Allen (2011) and Fleming *et al.* (2001). Effective wild dog control requires careful planning and a strategic approach using a range of techniques to effectively address the impacts rather than the number of animals (Allen *et al.* 2011a; Allen *et al.* 2011b).

Ground baiting

Lethal baiting is considered to be the most cost-effective control method currently available and is the only practical means for achieving population control in remote and inaccessible areas (Sharp 2012c). Poison baiting using sodium fluoroacetate or '1080' poison is the primary technique for control of wild dogs in South Australia. 1080 was introduced in South Australia in 1972, largely replacing strychnine as the preferred toxin. Strychnine was phased out for use on baits in 2009 on animal welfare grounds, but is still mandatory in leg-hold traps to expedite death.

Baits are prepared by cutting 150 g chunks of red meat and injecting with six mg of 1080 to produce a bait of 0.004 percent concentration. Typically the bait meat is supplied and cut by land managers, the baits injected by authorised NRM officers, and the resulting baits laid by land managers.

Baits are laid according to the Directions for use of *1080 wild dog baits in South Australia*. The Directions specify how baits will be laid including distance restrictions and requirements for neighbour notification, signage, storage, transport and disposal. Baits are typically laid around waters and along accessible tracks in areas where wild dogs are present.

Ground baiting is conducted in three situations:

- regular autumn and spring campaigns inside the dog fence to target incursions by wild dogs
- regular preventative baiting in a buffer zone immediately outside the dog fence to reduce the risk of incursions
- irregular baiting outside the fence to protect calves.

Aerial baiting

Privately financed aerial baiting began in the late 1940s in north-east South Australia. Widespread government-sponsored aerial baiting with strychnine was introduced in May 1952 in conjunction with neighbouring parts of Queensland (Osborne 1960).

Aerial baiting was conducted over a large part of the pastoral cattle zone outside the dog fence east of a line running through Coober Pedy. At its peak the program saw the annual distribution of over 300000 strychnine baits with baiting continuing into the 1960s.

The widespread laying of baits from aircraft was considered a threat to the survival of dingoes in remote areas of South Australia and prohibited in 1977 under the newly-adopted *South Australian Dingo Policy*.

The policy was subsequently altered in 2011 to allow aerial baiting, inside the dog fence in the SA Arid Lands NRM region, to combat increased numbers of wild dogs in the sheep zone.

A trial was conducted in 2012 and, following widespread support, aerial baiting was adopted subject to ongoing funding. In autumn 2015 this resulted in 50000 baits being laid onto 97 properties.

Aerial baiting remains prohibited outside the dog fence under the 2011 policy, although there is support to allow baiting in the buffer zone to ensure timely and uniform control of wild dogs there.

Canid Pest Ejectors

The canid pest ejector is a spring-activated device that propels the 1080 poison contents of a capsule into the mouth of a wild dog or fox when it pulls on a baited lure head with sufficient force. The capsules used in the device were registered nationally for use in 2016. Once placed in the ground they cannot be easily moved and thus pose a lesser risk than baits to domestic dogs.

Trapping

Trapping using leg-hold traps is useful for targeting problem animals or as a follow-up after 1080 baiting programs, but is regarded as an inefficient method for general population control (Sharp 2012a). In South Australia it is an important control method inside the dog fence. It is especially useful for controlling bait-shy wild dogs and critical for controlling those killing sheep.

Traps are typically set on the edge of tracks or stock pads and lured to attract passing wild dogs.

Professional government trappers are widely used in other states, but rarely in South Australia. In 2015 a trapper was employed in the SA Arid Lands region to remove wild dogs inside the dog fence with some success.

Leg-hold traps rate poorly in relative humaneness compared with other control methods (Sharp and Saunders 2012). Consequently, South Australian animal welfare legislation restricts the type of trap and the manner in which they may be used to improve their humaneness. For example, steel-jawed traps are no longer legal.

Section 9 of the *South Australian Animal Welfare Regulations 2012* states that: A person must not set a jawed leg hold trap for a wild or feral dog unless –

- (a) the trap is set on land outside the area of a municipal council; and
- (b) the trap is set on land that is inside, or not more than 100 metres outside, that part of the State bounded by the dog fence established under the *Dog Fence Act 1946*, the eastern border of the State and the coast of the State; and

- (c) the jaws of the trap—
- (i) are not serrated; and
 - (ii) are offset so that there is a distance of at least 6 millimetres between the metal parts of the jaws when the jaws are closed; and
 - (iii) are padded with rubber pads; and
 - (iv) are treated with an agricultural chemical product approved by the Minister sufficient to ensure a rapid death for any animal caught in the trap.

The dog fence

During the late 1800s, following the introduction of rabbits, dingo numbers increased to such an extent that more affluent pastoralists began to erect dog-proof netting fences to protect sheep flocks.

Neighbouring properties often combined, forming small informal co-operatives to share the cost and maintenance.

These were formalised with the *Vermin Districts Act* in 1894. By 1931 there were 64 Vermin-Fenced Districts and an estimated 55000 km of vermin fence in South Australia (Breckwoldt 1988).

Once dingoes were effectively eradicated from the Vermin-Fenced Districts, these were superseded and, with the passing of the *Dog Fence Act 1946*, the northernmost extension of fence was adopted as the official dog fence in South Australia (Yelland 2000)

Today the dog fence starts on the cliffs of the Great Australian Bight and winds its way 2187 km north and east to the NSW border north of Broken Hill where it joins the NSW State Barrier Fence.

Together with the NSW and Queensland fences, it forms a continuous 5600 km barrier to protect the south-eastern Australian sheep industry.

Overall management of the South Australian dog fence is overseen by the Dog Fence Board, which ensures the fence is regularly inspected at intervals of not more than 14 days and is maintained in a dog-proof condition.

The board consists of five members, mostly pastoralists, who meet four times a year. Management of regional sections of fence is overseen by four Local Dog Fence Boards, each comprising local pastoralists.

If the dog fence is in a Local Dog Fence Board area then ownership is vested in that Board. Where there is no LDFB the lessee of the property inside the fence is taken to be the owner.

The LDFBs employ contractors to patrol and maintain sections of fence, each roughly 300 km long.

The total expenditure on the dog fence was \$1,105,000 in 2013-14 (Dog Fence Board 2014).

Funding for the fence is collected from landholders via the dog fence rate and matched by the State Government. In 2014 all pastoral properties and far west coast farming properties of more than 10 km² and protected by the dog fence, paid a dog fence levy of \$1.20/ km².

Other non-pastoral sheep producers contribute to the SA Sheep Industry Fund via a contribution (the Sheep Transaction Levy) on the sale of all sheep in South Australia. A proportion of this fund is then used toward the dog fence.

The dog fence is constructed mostly of conventional wire netting and wooden posts about 1.7 m high.

The fence incorporates 'foot netting', an apron of wire netting extending along the ground outside the fence to prevent animals from digging underneath it.

Increasingly since the late 1980s the dog fence has also incorporated sections of solar powered electric fence. Designs vary from 8-10 wires with some incorporating a combination of plain wires and wire netting.

Off-set electric wires are also used to protect netting fences from damage by hairy-nosed wombats in the far west and feral camels in the north-west. Ongoing concern about the efficacy of electric fences has seen some sections re-built as netting.

While some have questioned the cost and relevance of the dog fence (Bradshaw and Ritchie 2012), and fences are expensive to erect and maintain, dog fences are likely to remain a pillar of wild dog management for livestock protection in the future (Appleby 2015).

Buffer zone

A baited buffer zone extending 35 km outside the northern dog fence was created in 1993 to provide additional insurance against incursions by wild dogs.

Until then, preventative baiting was conducted only in the immediate vicinity of the fence and was considered largely ineffectual (Bird 1994).

Buffer zones reduce the risk that wild dogs will need to move to the southern side of the fence by reducing the density of wild dogs to the north of the fence so that area is available to wild dogs that are dispersing. Baiting is conducted in autumn and/or spring to maintain the buffer zone. Baiting is regularly conducted once or twice a year in autumn and spring to maintain low densities.

The recommended width for buffer zones is the width of two wild dog territories. The decision to use 35 km as the South Australian buffer was based on data from the Western Australian section of the Nullarbor Plain (Thomson undated) in the absence of local data on wild dog territory size.

Other control methods

Shooting is a humane method of destroying wild dogs when it is carried out by experienced, skilled and responsible shooters; the animal can be clearly seen and is within range; and the correct firearm, ammunition and shot placement is used (Sharp 2012b).

Shooting is used by land managers and professional kangaroo shooters to control wild dogs inside the fence when they are encountered. While this technique is mostly opportunistic, it does remove significant numbers of wild dogs from inside the fence.

Shooting is also employed on many cattle properties outside the fence to keep wild dogs in check. It is the only realistic control method for the increasing number of properties that are accredited for organic production, and where the use of poison baits is currently restricted.

Some property managers encourage recreational hunters, either individuals or groups, to hunt on their properties. These hunters usually target pest herbivores such as feral goats but typically remove wild dogs when encountered.

Guardian dogs such as Maremmas, can be useful in protecting livestock from wild dogs on smaller holdings (van Bommel 2010). Similarly, donkeys and alpacas are also used as guardians.

While Maremma dogs have shown some potential in Queensland rangelands, the lower productivity and relatively larger property sizes in the South Australian rangelands suggest they are unlikely to be viable here. They are not without their problems and require a high level of commitment to be managed successfully.

Government bounties (bonuses) have been used extensively in South Australia since 1852 as an incentive for control. The initial bounty was 7/6 shillings, equivalent to about \$85 today. Bounties were ultimately discontinued in 1990 following a review which found them to be an inefficient use of resources and encouraged control of wild dogs in areas remote from livestock production areas.

4.12 Public safety

Wild dogs are large, powerful, potentially dangerous animals capable of causing injury or death to humans. They present a significant public safety risk in two particular situations: when habituated to people at outback settlements and campsites; and when kept as pets.

Wild dogs are sometimes attracted to isolated outback settlements and campsites by the presence of food and water. If undisturbed, these animals gradually lose their fear of humans, especially if further encouraged by feeding.

In South Australia wild dogs habituated to people have been reported congregating at places such as Nullarbor Roadhouse, Cook, Maralinga, Moomba, Dalhousie and Cooper Creek. Habituated animals pose a particular risk to children. Several attacks on humans have been reported in Australia in recent years, most notably on Fraser Island where a nine year old boy was killed by wild dogs in 2001.

In response to this risk a document *'Management of dingoes around isolated settlements in South Australia'* was developed by Biosecurity SA to advise those living in or visiting isolated areas how to manage the risk.

Similarly a risk assessment and public safety management plan was produced by DEWNR to assess and manage the risks to human safety from dingoes at campsites in Witjira National Park (Clark 2010).

Strategies to minimise risks include discouraging people from feeding wild dogs; denying access to garbage bins, dumps and waters; actively scaring wild dogs; and erecting signage warning of the risks.

While it is acknowledged that for many outback visitors the howl of the wild dog is the soundtrack of their experience, the only option is to destroy problem animals if the above strategies prove ineffectual.

This is best done by shooting, baiting or trapping. In each case the aim is to destroy the specific animal(s) as quickly and humanely as possible.

In NSW, where it is legal to own dingoes, statistical data on reported attacks on humans by owned dog breeds showed that in 2009-10 dingoes were relatively the second most dangerous breed behind American pit bull terriers in rate of attack (Anon 2011). Cross-bred dingoes also featured highly in attack statistics.

4.13 Keeping dingoes

In accordance with a national risk management approach recommended by the Natural Resources Management Standing Committee, the South Australia government restricts the keeping of certain exotic vertebrate animals, because of their threat to agriculture, the environment and public safety.

The keeping and sale of dingoes and dingo crosses is prohibited under the *Natural Resources Management Act 2004*, except by permit. Permits are generally restricted to institutions with appropriate educational or conservation objectives such as zoos and wildlife parks.

Dingoes are intelligent, highly active animals with strong hunting instincts. This makes them prone to escape and to kill livestock and pets. Because dingoes have not been domesticated these undesirable behaviours are relatively common. They require dedicated and specialised care and facilities not easily provided by private individuals.

Dingoes make a demanding pet and many end up living a life of stress in a small enclosure, successfully escaping and never being found, shot or euthanased, given away to another dingo owner or organisation, sent back to the breeder, or illegally released into the wild (Smith 2015).

Pet dingoes are potentially dangerous (see above section). They may interbreed with domestic dogs and the progeny find their way back into the wild thereby reducing the purity of wild dingoes (see hybridisation process described by Corbett, 1995, pp 168-9).

Permits may be issued to private zoos and wildlife parks on the basis of their ability to manage the risk associated with keeping a species of high pest potential.

To be considered for a permit the facility must show it can provide a high level of community benefit through public education and conservation and that it can effectively manage the risk of keeping a species of high pest potential.

The facility must be open for public access on a regular basis and demonstrate a commitment to public education through a management and interpretation plan.

The risk of keeping a species of high pest potential is managed by ensuring that permits are only issued to facilities that demonstrate high standards of physical security, staff expertise, housing and animal management.

South Australia is one of only two states which does not allow the keeping of dingoes. This causes some problems because dingoes are now widely available and likely to be imported into this state.

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6. APPENDIX 1. GLOSSARY OF TERMS

Terms relating to wild dogs

The terms wild dog, feral dog, dingo and hybrid mean different things to different people. To avoid confusion, the various meanings mostly defined by Fleming et al (2001) are used in the National Wild Dog Action Plan and are reproduced here:

Canid: Any animal of the dog (Family Canidae), includes dingoes (*Canis lupus dingo*) and feral dogs (*Canis lupus familiaris*), as well as hybrids of the two.

Dingoes: native dogs of Australia and Asia. Dingoes were introduced into Australia more than 4000 years ago (Oskarsson et al 2011). Pure dingoes are populations or individuals that have not hybridised with domestic dogs.

Domestic dogs: dog breeds (other than dingoes) selectively bred by humans, initially from wolves and/or dingoes, that usually live in association with humans. Introduced to Australia by European settlers. In South Australia a dog kept in compliance with the *Dog and Cat Management Act 1995*. Under this Act a dog does not include a dingo or cross of a dingo.

Hybrids: dogs resulting from crossbreeding of a dingo and a domestic dog and the descendants of crossbred progeny.

Wild dogs: all wild-living dogs (including dingoes and hybrids).

Feral dogs: wild-living domestic dogs.

Free-roaming dogs: dogs that are owned by humans but not restrained and so free to travel away from their owner's residence.

Commensal dogs: wild dogs (including dingoes and free-roaming domestic dogs) living in close association with but independently of humans.

Other terms

1080: Sodium fluoroacetate, known in pesticide form as 1080. In Australia is the primary pesticide for control of mammalian pest species including wild dogs.

Buffer Zone: Here refers to the strip of land extending 35 km north of the dog fence where wild dog control is routinely applied to reduce populations and minimise the risk of fence breaches.

Dog fence: the South Australian fence built to protect sheep in southern parts of the state from wild dogs in the north. Adjoins the NSW Dingo Barrier Fence. Currently about 2187 km long.

Inside the dog fence: Refers to the area lying south of the dog fence, comprising about 40 percent of the state (Fig 1).

Outside the dog fence: Refers to the area lying north and west of the dog fence, comprising about 60 percent of the state (Fig 1).

Keystone species: A species that has a disproportionately large effect on its environment relative to its abundance.

Mesopredator: Middle trophic level, medium-sized predator that predated and is predated upon. In Australia often used to describe introduced foxes and feral cats.

7. APPENDIX 2. SA WILD DOG ADVISORY GROUP TERMS OF REFERENCE

1. Advise on improvements to the management and control of wild dogs in South Australia, including:

- a. measures to maximise participation in coordinated control programs between stakeholders
- b. existing and new measures to prevent wild dog impacts inside the dog fence
- c. early detection and response for wild dog incursions inside the dog fence
- d. managing the balance between impacts on livestock production and ecological roles of wild dogs (dingoes) outside the dog fence.

2. Propose sustainable funding models for long term wild dog management in SA.

3. Monitor implementation of the National Wild Dog Action Plan in SA.

4. Develop and implement the State Wild Dog Strategic Plan, consistent with the national plan.

8. APPENDIX 3. PRINCIPLES UNDERPINNING THE STRATEGIC PLAN

The following principles are adapted from the Australian Pest Animal Strategy (NRMMC 2007):

1. Wild dog management is an integral part of the sustainable management of natural resources for the benefit of the economy, the environment, human health and amenity.
2. Combating wild dog problems is a shared responsibility that requires all parties to have a clear understanding of their roles and responsibilities.
3. The development, monitoring and review of integrated wild dog management strategies need to be underpinned by good science.
4. Setting priorities for and investment in, wild dog management must be informed by a risk management approach.
5. Prevention and early intervention are the most cost-effective techniques for managing wild dogs.
6. Wild dog management requires coordination among all levels of government in partnership with industry, land managers and the community, regardless of land tenure.
7. Effective wild dog management requires capacity-building across government, industry, land managers and the community.
8. Management of wild dogs should aim to address actual, rather than perceived, problems and to reduce impact rather than simply wild dog numbers.
9. Management should be strategic in terms of determining where management should occur, the timing of management, being proactive and using appropriate techniques.
10. Where there is a choice of methods, there needs to be a balance between efficacy, humaneness, community perception, feasibility and emergency needs.
11. The benefits of management should exceed the cost of implementing control.

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