Eyre Peninsula Landscape Board

PEST SPECIES REGIONAL MANAGEMENT PLAN

Wild dog and dingo

Canis familiaris

This plan has a five-year life period and will be reviewed in 2027.

INTRODUCTION

Synonyms

Dingo, wild dog

Canis lupus dingo, *Canis familiaris* ssp. *dingo*, Canis *antarcticus* (Kerr 1792), *Canis dingo* (Barker & MacIntosh 1978)

Biology

The dingo is a primitive breed of dog that is a communal living, highly carnivorous member of the family Canidae from Australia.

The average adult dingo in Australia stands 570 mm (range 440-620 mm) at the shoulder, is 1230 mm (range 1145-1540 mm) long from nose to tail-tip and weighs 15 kg (range 12-24 kg)**[1-3]**. With the loss of the thylacine (*Thylacinus cynocephalus*) the dingo is now the largest terrestrial mammalian predator in Australia.

Dingo coats are naturally highly variable in colour. The variation does not arise through hybridisation with dogs. An examination of 19th century dingo skins shows there was considerable variation in the colour of dingoes, including various combinations of yellow, white, ginger, and darker variations from tan to black **[4]**. The coat colour is typically ginger but varies from sandy-yellow to red-ginger and is occasionally black-and-tan, white or black **[1]**. Most dingoes have white markings on feet, tail tip and chest, some have black muzzles, all have pricked ears and bushy tails **[1, 3]**.

Following recent research, the dingo is no longer classified as a subspecies of the grey wolf, but is considered a distinct species *Canis dingo* **[4]**. The dingo's taxonomic status is clouded by hybridisation with feral dogs and confusion about how to distinguish 'pure' dingoes from dingo-dog hybrids **[5]**. 'Pure' dingoes are distinct from similar looking domestic dogs and hybrids because they breed once a year, and have skulls with narrower snouts, larger auditory bullae (ear sounding box) and larger canine (holding) and carnassial (cutting) teeth **[4, 6]**. They can be distinguished from hybrid dogs by their DNA **[7]** and the dogs' phenotypes can be differentiated by their skull morphology **[6]**. There is difficulty however in visual assessment as dingoes have been crossed with domestic dogs purposefully during the days of early European settlement. The highly valued Australian cattle dogs were originally bred by crossing various domestic breeds including Dalmatian with dingo in order to breed in 'positive dingo traits' such as courage.

Dingoes are opportunistic carnivores, eating mostly mammals **[1]**. They eat a diverse range of foods; preferring medium sized and large vertebrates **[6, 8]**. They overwhelm rabbits and macropods. They also eat reptiles, arthropods, carrion **[1]**, birds and vegetation **[2]**. During flush seasons their staple prey in desert regions is rabbits and possibly red kangaroos, with rodents an important supplementary prey **[9]**. In northern NSW the predation rate on kangaroos is 0.38 kg prey/dingo/day **[2]**. Dingoes consume approximately 7% of their body weight in food per day and in desert regions about 70-100 mL/kg/day in water in addition to fluids absorbed from prey **[2]**.

Hunting tactics change to suit the size of available prey **[10, 11]**. Larger groups of dingoes are more successful when hunting large kangaroos and cattle **[10, 11]**, and solitary dogs are more successful when hunting rabbits **[12]** and smaller macropods **[13]**. Single wild dogs can easily pull down sheep **[14]**, although groups of dogs will cooperate in kills **[10]**, and all wild dogs that enter sheep-grazing lands will eventually attack or harass sheep **[14]**. Predation of livestock is greater when alternative food is scarce **[11, 15]**.

Many individuals belong to socially integrated packs (3-12 individuals) whose members meet every few days or coalesce during the breeding season to mate and rear pups. At such times scent marking and howling is most pronounced. Dingoes use scent-posts to indicate currently shared hunting-grounds, to mark territorial boundaries, and possibly to synchronise reproduction between pairs. Dominance hierarchies, with a dominant pair, subordinates, juveniles and omega (lowest ranking) animals are observed in the wild [2].

Most female dingoes become sexually mature at two years and have only one oestrus period each

year, although some do not breed in droughts **[3]**. Dingoes generally have four biological seasons per year: breeding, whelping, rearing, and training (Table 1) **[2]**. The dominant pair are usually the only successful breeders **[1]**. Gestation takes about 63 days (range 61-69 days **[2]**) and litters of 1-10 pups (average is five) are whelped during the winter months usually in an underground den **[1, 3]**. Pups usually become independent at 3-4 months or, if in a pack, when the next breeding season begins. Pups remain with their parents for up to two years. During their second year they assist with the rearing of the next litter **[6]**.

Table 1: The annual biological seasons of dingoes. Source: [2]

Breeding (Autumn)				Whelping (Winter)				Rearing (Spring)				Training (Summer)		
Mar	Apr	May	•	Jun	Jul	Aug	•	Sep	Oct	Nov	•	Dec	Jan	Feb

Activity patterns of dingoes are generally highest at dawn and dusk, low during midday and lowest during the night **[2]**. This general crepuscular activity pattern may vary between discrete elements of the annual biological cycle.

Dingoes form stable pack-based territorial home ranges **[2]**, where the home ranges of individuals vary between 10 and 300 km^2 **[16]**. Being larger in the more arid regions **[16]** and smaller in the more productive areas in south-eastern Australia **[17, 18]**. Packs are usually stable **[16]** but some animals will disperse **[10, 19]**, especially young males **[3]**, with the longest recorded dispersal of 250 km over 10 months in Central Australia.

Origin

Genetic evidence suggests that dingoes originated from domestic dogs from East Asia **[20]**. They arrived in Australia 3000 to 5000 years ago **[21-23]**. Recent genetic research has shown that the Australian dingo population is descended from a very small number of animals (hypothetically a single pregnant female), and most likely from a single introduction event. This means that Australian dingoes are the product of a genetic bottleneck and are genetically and phenotypically distinct from Asian dingo populations **[21]**. Since its arrival in Australia, and prior to the arrival of European colonists, the dingo has been subject to at least 3000 years of isolation from other canids. During this period it was presumably subject to genetic drift and natural selection leading to it becoming a unique canid **[24]**.

Distribution

Formerly throughout the continent, and never in Tasmania **[1]**. At present wild dogs are dispersed over most of mainland Australia (Figure 1), except the intensively farmed areas of south-west Western Australia, South Australia, New South Wales and Victoria. Abundance is generally low south of the wild dog barrier fence **[18]**.

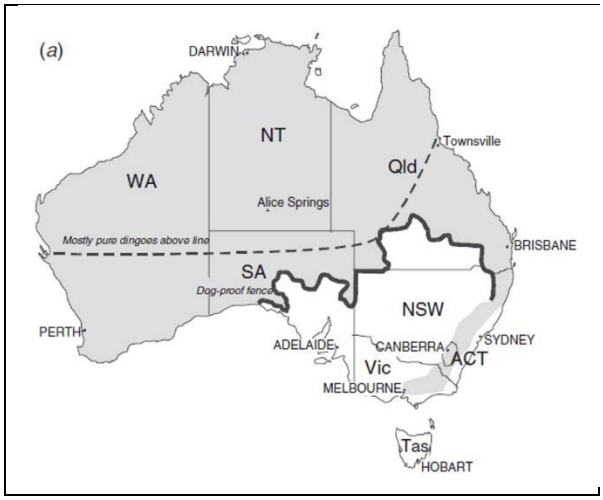

Figure 1: The distribution of wild dogs in Australia. Wild dogs above the dashed line are mostly pure dingoes [6]. The solid line is the 'barrier fence'. Wild dogs are present at varying densities from naturally sparse to common (light grey shading) to mostly absent (no shading). Source: [25].

In SA, remnant populations occur south of the fence, most notably at Ngarkat Conservation Park in the South East. Small numbers occur, at least transiently, on most pastoral sheep properties extending 100 km south of the fence. Pastoral enterprises switching from sheep to cattle south of the fence has recently resulted in more dingoes inside the fence.

RISK ASSESSMENT

Pest risk

Wild dogs, which include dingoes (*Canis dingo*), feral domestic dogs (*C. lupis familiaris*) and their hybrids, were estimated to cost the livestock industries of Australia $66.3 million per annum in production losses and control activities in 2004 **[26]**. Production losses from wild dogs vary with stock value. In 2004, they were highest in the sheep industry, followed by the cattle and the goat industries **[27, 28]**. The impact of wild dogs on both sheep and cattle production in Australia can be highly variable between properties **[18, 25]**.

Dingoes are a critical causal factor in the distribution of sheep at the national, regional and local levels **[29]**. Sheep and goats are more vulnerable to wild dog predation than cattle, primarily due to the fleeing and mobbing behaviour of sheep and goats in response to the presence of wild dogs, and the hunting style of dogs and their efficiency in handling sheep and goats **[30]**.

Estimates of predation losses of calves and weaners in normal conditions in rangeland grazing areas are in the range of 0–29.4% per annum **[31]**. Attacks on young calves are the major cause of cattle loss to wild dogs, but weaners and older cattle are sometimes killed or injured by packs of wild dogs **[19, 28, 31]**. Relatively few sheep that are killed or mauled by wild dogs are eaten, and, often little of the animal is consumed **[14, 32]**. Because of surplus killing (where a predator kills in excess of its energy and nutritional requirements) **[33]** and changeable hunting tactics, the damage experienced by livestock producers is independent of the density of wild dogs **[9, 25]**. Surplus killing means that a few wild dogs can be responsible for many losses, and changing tactics from hunting alone to hunting in packs results in many hunters causing few losses **[18]**. The propensity of Australian merino sheep to circle and form a mob exposes them to surplus kill predation **[30]**.

The mesopredator release hypothesis (MRH) proposes that the elimination of top-order predators results in an increase in the abundance, activity and impact of smaller, second tier predators (mesopredators) due to a reduction in predation and competition within the predator community **[34-36]**. According to the MRH, larger predators may provide refuge to the prey of mesopredators, by reducing the frequency of fatal encounters between mesopredators and their prey.

In recent years there has been growing awareness of the role that dingoes may play in the conservation of Australian wildlife through its interactions with the red fox **[23]** and other invasive species **[37-39]**. The MRH predicts that the removal of dingoes would result in an increase in red fox populations and subsequently, the negative impact of foxes on native prey species through increased predation. Consistent with the MRH, several studies have found negative relationships between dingo and fox abundance **[39-41]**, and dingo and cat abundance **[41]**, and positive relationships between dingo abundance and the persistence of medium-sized marsupials and native rodents **[38, 42-44]**.

Hybridisation between dingoes and domestic dogs has been postulated to increase cattle predation **[9]**. In central Australia hybridisation appears to be limited to localised areas, mostly in the vicinity of human habitation **[9]**. Dingo control severely fractures dingo social structure breaking down their highly territorial and aggressive pack structure that normally makes it difficult for feral dogs to join stable packs **[25, 45]**. Baiting reduces dingo numbers, changes age structures yet often increases calf losses **[9, 15, 46]**.

Studies comparing calf loss, subsequent to confirmed pregnancy diagnosis, in beef cattle herds showed that in most years wild dogs do not cause detectable predation losses **[30]**. When wild dog populations were baited on part of the property, annual predation losses increased both in frequency (number of years predation loss is detected) and magnitude (percentage of calves killed by wild dogs) **[30]**. Calf losses occurred when prey populations were low, when below-average, annual rainfall had preceded, and most importantly, when baited areas had been re-colonized by wild dogs **[30]**. Young, dispersing wild dogs are likely to re-colonise after baiting, and more predisposed to attacking calves than stable wild dog populations. Thus, attempts to reduce predation losses by controlling wild dogs on individual cattle properties may not only be ineffective but counterproductive.

A large body of research now indicates that dingoes regulate ecological cascades, particularly in arid Australia. The loss of dingoes from areas has now been linked to widespread losses of small and medium-sized mammals, the depletion of plant biomass due to effects of irrupting herbivore populations and increased predation rates by red foxes **[47]**.

Apex predators suppress populations of large herbivores **[48]**. Dingo control (poisoning, shooting) is associated with increased densities of wild herbivores on Eyre Peninsula (e.g. kangaroos, wombats). The persecution of dingoes following the arrival of Europeans apparently caused a rapid rise in kangaroo abundance **[49]**. Kangaroo density is higher inside (south of) the dingo fence where control is intensive than outside where control is less coordinated and less effective **[50-52]**, although other factors such as the provision of new water points may also contribute to this difference.

A simulation of the effects of dingo abundance on rangeland ecology (pasture biomass, kangaroo density) and enterprise performance (cattle live-weight gain, gross margin) **[53]** suggests that the potential improvement in vegetation biomass and structure through dingo-mediated trophic cascades might actually benefit cattle production by providing more forage for cattle. This can lead to reduced cattle/sheep condition and fertility through competition for pasture. Assuming a typical stocking density for semi-arid rangelands, the model estimated that kangaroo control by an unbaited dingo population would increase pasture biomass by 53 kg / ha, improve gross margins by $0.83 / ha, and reduce inter-annual variability in profits. Equivalent to $50,000 to $150,000 more earned per year (Average Australian cattle station 50,000 to several 100,000 ha's).

Maintaining or restoring populations of dingoes may be useful strategies to mitigate the significant impacts of introduced mesopredators (e.g. red fox, cats) and overgrazing by herbivores.

Feasibility of control

The erection of exclusion fences for controlling the ingression of wild dogs began in the 1880s, becoming more widespread after the introduction of prefabricated wire netting at the beginning of the 20th century **[27]**. Fence designs vary, but are usually 1.8 m wire netting or mesh conventional fences (e.g. the barrier fence along the SA – NSW northern border). Advances in electric fencing technology have resulted in the widespread use of electrified wires, either in the body of new fences or offset to existing exclusion fences **[54]**.

The SA dog fence links up with fences in NSW and Qld to form a continuous fence of approximately 2600 km of which 2187 km is in SA. It starts at Fowlers Bay on the Great Australian Bight in South Australia. Before the shortening of the Queensland section of this fence in 1989, the dog fence was 5400 km long.

The State Government's *Dog Fence Act 1946* (the Act) provides for the establishment and maintenance of a dog proof fence in SA in order to prevent the entry of dingoes and wild dogs into the pastoral and agricultural areas and for incidental purposes. Under the Act wild dog means: a dingo or a dog that is any cross of a dingo; or a feral dog.

The fence in South Australia is owned by either the Pastoral Lessees whose properties abut it on the inside, or by the Local Dog Fence Board (LDFB). On Eyre Peninsula, the Fowlers Bay LDFB, the Penong LDFB and the Pureba LDFB manage the western section of the Fence, which follows roughly the EP and Alinytjara Wilurara (AW) Landscape regions. The Dog Fence Rate pays for maintenance of the South Australian Dog Fence. It is collected from all properties greater than 10 km^2 lying inside the fence and is matched by the State Government. The South Australian Sheep Industry Fund collects additional monies through the Sheep Transaction Levy which is applied to all sheep sales. In total almost $1 million is collected annually for the fence. Funding for dingo control is collected from landholders through Landscape levies. The South Australian Arid Lands Landscape Board is responsible for the vast majority of dingo control in the state. South Australia's dog fence budget was $1040 in 2014/15.

Because of its relative specificity and the particular susceptibility to it shown by canids and felids, compound 1080 is an important toxin for controlling wild dogs in Australia.

Alternative methods of toxin delivery and improved attractants are also being used. Mechanical ejectors have been used in the United States of America since the 1940s for the destruction of livestock predators, principally coyotes (*Canis latrans*). The Pest Canid Injectors (previously called mechanical ejectors or M-44 ejectors), is a tube that is set into the ground with a toxin capsule mounted on a spring-driven plunger oriented vertically. A canid attractant on the capsule stimulates the dog or fox to bite and pull the capsule upwards, triggering the plunger and causing the device to eject a lethal dose of toxin (generally sodium cyanide) into its mouth, where absorption is rapid, and death is almost immediate **[58]**.

The employment of professional trappers by government agencies, wild dog control organisations, and sometimes by groups of landholders, is an important strategy for wild dog control **[18]**.

An alternative to lethal control of wild canids is the use of livestock guarding animals (LGA) to deter predators **[59]**. The main animals used are alpacas and llamas, and guarding dogs. However, uptake of this technology has been limited, mainly because producers require scientific testing of different guarding animals before they will try them **[59]**. American producers began using livestock guarding dogs (LGD's) in the 1970s. Since then they have become progressively more popular. In

Colorado, the use of LGDs by producers increased from 7% to 68% in seven years **[60]**. Dogs are the most popular species used for livestock protection in the USA, and alpacas, llamas and donkeys are also used by some producers **[61-65]**. By 1998, 20% of all US sheep producers were using LGA's either as their sole means of controlling predators (mainly coyotes) or as an adjunct to conventional lethal and/or non-lethal predator control activities undertaken on their farms **[66]**. By 2000 this had risen to 28% **[67]**. A recent review of the effectiveness of LGD's in Australian grazing systems **[68]**, found 65.7% of respondents reported that predation ceased after obtaining LGD's and a further 30.2% reported a decrease of predation. Provided a sufficient number of LGDs are used, they can be effective in protecting livestock on large properties with large numbers of livestock as they are in small scale farming **[68]**. Importantly the cost of obtaining a LGD is returned within 1-3 years after the dog starts work **[68]**!

A strategic approach to the management of wild dogs is recommended **[69]**. It involves defining the problem, i.e. identification of which stakeholders have a wild dog problem; which stakeholders are affected or potentially affected by management actions; what harm the wild dogs cause; where, when and why damage occurs; and the costs of damage and control **[70]**; developing a plan of action; undertaking the plan; monitoring everything and evaluating the plan; and encourages involvement of all major stakeholders and allows iterative improvements at local and regional scales. This process is being applied with some success to wild dog management in NSW and the ACT **[71]**.

Status

Dingoes are now listed as Vulnerable to extinction by the IUCN (2013), due to hybridisation with domestic dogs.

Management of dingoes relies substantially on the State Policy. It was formulated in 1977 with broad public input and was the first of its kind in Australia. Management is the responsibility of landholders with assistance from Biosecurity SA and Landscape Boards.

The policy seeks a compromise between adequately protecting the grazing industries and conserving the dingo as a legitimate wildlife species. Dingoes and wild dogs are managed according to the risk they pose to the livestock present.

In the state south of the Dog Fence, where sheep are the predominant livestock, the dingo is a declared for destruction under the *Landscape South Australia Act 2019*. Coordinated biannual bait injection services provided by Landscape Boards assist landholders to control dingoes which penetrate or breed inside (south of) the Dog Fence.

It is illegal to keep pet dingoes or their hybrids south of the Dog Fence other than in permitted zoos or wildlife parks due to their unsuitability as pets and the risks they pose to humans, pets and livestock.

To the north of the Dog Fence, where cattle are the only livestock, or there are no livestock at all, the state declared animal policy for wild dogs and dingoes recognises dingoes as a legitimate wildlife species.

REGIONAL RESPONSE

Special considerations/Board position

Resilience of farmers on Eyre Peninsula to incursion by dingoes and feral dogs inside the Dog Fence is low.

Outcome

To minimise impact of wild dogs, including dingoes and their hybrids, on primary production.

Objectives

To:

1. respond to community complaints;
2. eradicate dingoes, feral dogs and hybrids south of the dog fence;
3. continue partnership with dog fence board;
4. increase resilience of sheep farmers to dingo / feral dog attack south of the dingo fence; and
5. participate in SA wild dog advisory group.

Area/s to be protected

Areas in the Eyre Peninsula Landscape Board region south of the Dog Fence.

Actions

Land managers to:

1. undertake control programs on their property; and

2. report sightings or evidence of dingoes/wild dogs south of the dog fence.

Landscape Board staff to:

1. assist landholders with advice about control methods to minimise impacts for dingoes, wild dogs and hybrids south of the Dog Fence;
2. assist landholders with the supply and injection of wild dog baits;
3. provide a regional representative on the SA Wild Dog Advisory Group;
4. develop localised annual action plans to achieve the objectives and actions of this management plan and goals of the State policy for wild dogs and dingoes;
5. develop WildDogScan groups to enable landholders, staff and contractors to systematically collect data (numbers, location controlled/sighted) and storage in a central spatial database; and
6. encourage, facilitate or enforce compliance with Landscape Act where appropriate.

Evaluation

Evaluation of success will be based on:

1. annual analysis in July of monitoring data to evaluate the success of the pest plan actions (including the update of spatial layers);
2. analysis of compliance database for issues as appropriate;
3. statistics on reports of wild dogs seen and killed inside the dog fence, control actions and stock losses; and
4. review of this pest management plan every five years.

Declarations

Under section 185(1)(a)(i) of the *Landscape South Australia Act 2019*, the Minister for Environment and Water has declared that provisions: 186(1)(3), 187(1), 188, 189, 191(1), 192(1) apply to dingoes, *Canis familiaris,* south of the Dog Fence (Table 2). This declaration means that you cannot bring dingoes into the region south of the Dog Fence or move them within the Declared Area. You cannot keep, sell or release dingoes, must comply with instructions of an Authorised Officer, and must destroy all wild dogs on your land.

Table 2: Dingo – relevant sections of the *Landscape South Australia Act 2019*. Provisions for south of the Dog Fence excluding all offshore islands

Section	Description of how the section applies
186 (1) (3)	Cannot bring dingoes into the region Cannot spread dingoes to areas where it doesn't already exist
187 (1)	Cannot keep a dingo
188	Cannot sell a dingo
189	Must not release dingoes
191 (1)	Landholders who possess or control a dingo south of the Dog Fence must comply with instructions of an authorised officer with respect to keeping or management of the animal.
192 (1)	Landholders south of the Dog Fence must destroy all dingoes on their land

More information

Contact your local Eyre Peninsula Landscape Board office

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