

5. Past and current management

Summary

In the past, legislation for the management of wild dogs has included punitive Acts and Acts dealing with the conservation of wildlife. Dingoes have been included with other dogs in early colonial legislation designed to remove troublesome dogs and to reduce the threat of predation of livestock. Management of wild dogs relied heavily on labour-intensive techniques of trapping, shooting and ground baiting, with bounty payments being offered as an incentive to kill dogs. With cheap labour and materials, and a profitable grazing industry, the erection of exclusion fencing was also feasible in some parts of Australia, and became an essential element of wild dog control in those areas. Much of the control work was reactive, dealing with problems as they arose. Nevertheless, some strategic, preventative control was carried out, and in extreme but misguided cases, efforts were made to control wild dogs hundreds of kilometres from the nearest sheep grazing enterprises.

The dingo is extinct in much of the sheep and cereal production zones of eastern and southern Australia because of habitat modification and the success of early poisoning campaigns. The areas largely without wild dogs are mostly separated from areas where they are present by dog-proof fences that were erected around the turn of the century.

In most States and Territories, obligations or provisions are made for the destruction of wild dogs in sheep and cattle grazing zones. The Dog Fence, which runs for about 5600 kilometres from Fowlers Bay in South Australia to south of Dalby in south-eastern Queensland, is maintained or subsidised by government agencies. Poisoning programs form the basis of most lethal control efforts, although trapping and shooting are important in some contexts. Groups and boards have provided finances that allow for better management.

The scientific information on the biology and movements of dingoes and other wild dogs did not begin to accrue until the late

1960s. Since then, research has served to correct or refute much of the folklore and mythology surrounding dingoes and enabled management programs to be more soundly based. In addition, research has allowed for the objective evaluation of control techniques and strategies. For example, the demonstration of the effectiveness of aerial baiting with 1080 in pastoral regions of Western Australia led to this technique being adopted far more widely than previously. A further influence on wild dog management has been a growing public interest in conservation and animal welfare; control programs had to be not only effective but to show due regard to welfare and risks to non-target species.

Current management strategies focus on the objective of minimising the impact of predation on livestock, not on killing wild dogs. Aerial baiting with 1080 baits forms a major part of most management programs and is primarily targeted at limited zones and buffers adjacent to livestock grazing areas. Larger coordinated campaigns have generally been adopted, being more efficient and effective than localised, ad hoc efforts. Ground-based baiting and trapping are still carried out, although to a lesser extent than earlier times. Far fewer professional doggers are now employed, although they still play an important role in targeting specific animals and in monitoring buffer areas. Bounty payments have not been successful in reducing predation by wild dogs and are subject to abuse. The use of government-subsidised bounties should cease.

The greatest threat to the survival of dingoes is hybridisation with domestic dogs. In the more settled coastal areas of Australia, and increasingly in outback Australia, the barriers between domestic dogs (feral and owned) and dingoes are rapidly being removed. Hence hybridisation is becoming more common and the pure dingo gene pool is being swamped. Already in the south-eastern highlands, more than half of wild dogs are hybrids. The extinction of pure dingoes on the mainland is probably inevitable

unless there are changes to community attitudes and government policies on wild dogs. In particular the keeping of 'dingoes', which are often hybrids that later 'go bush', can increase the rate of hybridisation of wild dingo populations.

Conservation of dingoes was indirect until the 1970s and 1980s when dingoes were listed on conservation schedules in some States and Territories. Policy and legislation to encourage the conservation of pure dingoes is required in some States and a concerted nation-wide effort is needed to ensure that dingo conservation is not thwarted by conflicting legislation. Simultaneously, the control of wild dogs, including dingoes, must be permitted where there is a recent history of livestock predation.

The main hope of conservation is to educate people about the plight of dingoes and to manage pure dingoes on large islands such as Fraser Island and Melville Island.

5.1 Past legal status and management

5.1.1 Control measures and legislation

During the 1800s, the combination of clearing for farming, exclusion fencing, poisoning and trapping resulted in the dingo becoming extinct over much of its previous range in southern Queensland, New South Wales, Victoria and South Australia. By 1889, all mainland States and Territories had enacted legislation to facilitate and administer the control of wild dogs. Control was organised by government agencies or regional semi-government organisations, run by boards of local landholders, and funded by government and by rates levied on landholders. There were four elements to wild dog control.

The bounty system

Bounties were paid on presentation of a wild dog scalp to the appropriate authority. The first record of a bounty system is from 1836 in the Melbourne district (Breckwoldt 1988). A bounty system was soon introduced in all

mainland States and Territories and persisted until recently. The aim was to create an incentive for the control of wild dogs. This encouraged the perception that every wild dog was a sheep killer regardless of its access to sheep, the hunting and trapping of wild dogs by individuals rather than groups, and fraudulent claims (Tomlinson 1958a).

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The control value of bounties has long been debated. In 1930, the Royal Commission into the Dingo and Stock Route Administration in Queensland concluded that bounties should not be paid as they were subject to fraud (Holden 1991). Tomlinson (1958a) outlined arguments for and against the system, concluding that the evidence was overwhelmingly against bounties. A resolution recommending that all bounties in Australia be stopped was passed by the Vertebrate Pests Committee in 1975 (Smith, 1990). Bounties were accordingly reduced to \$2 (around \$10 in current values) in South Australia in 1975 and were phased out in 1990. Another inquiry, held in Queensland in 1975, recommended that the bounty system be abolished there (Smith 1990). Saunders et al. (1985) proposed significant changes to wild dog management in New South Wales including the abolition of bounties. Because of that review, bounties are no longer paid for wild dog scalps in the Eastern Division of New South Wales. A wide-ranging review of bounty payments by Smith (1990) concluded that all bounty systems were subject to fraud, were ineffective in creating incentive, not cost-effective and were not related to wild dog abundance. More recently, Hassall and Associates (1998) concluded that, worldwide, most bounty schemes have failed to deliver effective vertebrate pest control. In response to the recommendations of Smith (1990), new legislation in Queensland will remove the provision for bounties although local governments can still pay them. (C. McGaw, Department of Natural Resources, Queensland, pers. comm, 1999).

Despite the millions of dollars paid in bounties, there is little evidence that the bounty system is or was an effective tool for managing wild dogs. In north-eastern New South Wales, Harden and Robertshaw (1987) found that between 1958 and 1983, two-thirds of bounties were paid to graziers, the group at risk from wild dog predation. The incentive of the bounty was questionable because of there was no relationship between the value of a bounty and the number of bounties claimed.

Professional doggers

The employment of professional doggers by government agencies, wild dog control organisations, and sometimes by groups of landholders, was an important part of the implementation of wild dog control. Doggers were responsible for both strategic and reactive control of wild dogs by trapping, shooting and poisoning. They were sometimes offered substantial additional bounties by landholders to kill particularly troublesome dogs.

‘As fencing materials became more sophisticated and more readily available, the use of exclusion fences became feasible.’

In some areas (for example, south-east New South Wales, Victoria, the Australian Capital Territory and some parts of Western Australia) doggers are still an integral part of ongoing wild dog control. In much of rangeland Australia, however, increasing labour costs and the introduction of mandatory wages for Aboriginal workers in the 1960s, plus the declining profitability of the pastoral industry, resulted in most stations ceasing to employ specialist doggers. For these reasons, and because of the greater adoption of large-scale aerial baiting, the number of government-funded doggers has also fallen dramatically.

Shepherding and exclusion fencing

Before the extensive fencing of pastoral runs to manage the movements of sheep, the first

method used to reduce predation by wild dogs was shepherding of flocks by paid shepherds. Shepherds were often sent into isolated areas where they had to protect their stock from human and wild dog predation. Clearing and fencing of pastoral lands and extensive strychnine baiting programs pushed wild dog populations towards the fringes of the ‘improved’ country as graziers radiated from the central settlements. Shepherding to prevent predation by wild dogs is now only practised as a last resort (C. Young, grazier, New South Wales, pers. comm. 1984) because of the expense and time constraints.

As fencing materials became more sophisticated and more readily available, the use of exclusion fences as barriers to wild dog movements into sheep country became feasible. Exclusion fencing for wild dogs began at least 100 years ago with the erection of 13-wire, 1.8 metre high fences laced with vertical wires at about 15 cm intervals (Harden, unpublished data 1991), and became widespread after the introduction of wire netting. Often a continuous fence resulting from adjoining landholders fencing around their own properties, protected groups of properties. As examples: in Western Australia fences were erected around holdings to keep emus (*Dromaius novaehollandiae*) out and were maintained dog-proof (Holden 1991); and at least 1000 kilometres of non-continuous barrier fencing was erected by landholders on the New England tablelands in New South Wales in the 1920s and 1930s (NERDA undated c. 1966). Similarly, in South Australia, about 3800 kilometres of private dog fences were erected by 1908. Between 1896 and 1908, an additional 5000 kilometres of fencing was erected to maintain the State Vermin Fenced Districts of South Australia (Holden 1991).

Governments and control organisations wholly funded or subsidised the erection of other barrier fencing. The best known such fence (known as the Dog Fence or barrier fence) extends 5614 kilometres from near Dalby in south-eastern Queensland to Fowlers Bay on the Great Australian Bight in South Australia (Figure 2). Prior to shortening of the Queensland section of this fence in 1989, it was 8614 kilometres long (Breckwoldt 1988).

The Queensland–New South Wales fence (359 kilometres) was originally built as a rabbit-exclusion fence. This failed and it was converted to a dog-proof fence in 1914. However, the agreement between the States requires that the fence be maintained rabbit-proof. The fence between South Australia and New South Wales was converted from a rabbit-proof fence to a dog-proof fence in 1917. The New South Wales *Wild Dog Destruction Act 1921* placed the responsibility for the exclusion fence under the Western Lands Commission and an amendment to the Act in 1957 established the Wild Dog Destruction Board (WDDDB) which retains responsibility for the fence and the payment of bounties for scalps. The South Australian dog fence replaced a series of separately fenced vermin district fences in 1947 following introduction of the *Dog Fence Act 1946*. Responsibility for the fence is with the Dog Fence Board, membership of which is mostly landholders.

Poisoning

From the early 1800s, when strychnine was found to be useful for poisoning wild dogs, control programs were instigated at the property level or cooperatively. Cooperation between landholders was necessary because strychnine was expensive and could only be imported in quantities too large for individual landholders. Stockmen carried strychnine that they inserted into carcasses they found, and in some areas bait stations were established and maintained. In 1946, a manufactured brisket fat and strychnine bait wrapped in paper (the ‘Minty’ bait) was developed in Queensland and was subsequently used in Queensland, New South Wales, Western Australia and the Northern Territory.

Aerial baiting began with experimental drops of the Minty bait in Western Australia and Queensland in 1946 (Tomlinson 1954), and continued for a number of years there, in the Northern Territory and in South Australia. It was also used on the coast and tablelands of New South Wales from 1957.

Since the mid-1960s, 1080 (sodium fluoroacetate) has largely replaced strychnine in baits. However, strychnine can still be used in baits in South Australia, Queensland and

parts of Western Australia. Because 1080 is closely regulated, baiting programs are under much tighter control than previously. Both fresh meat and manufactured baits are used.

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1080 meat baits were first aerially distributed in the Northern Tablelands of New South Wales in 1964 and had replaced strychnine baits in aerial baiting programs in most areas by the late 1960s. Aerial baiting was generally regarded as successful and many dog fences were allowed to fall into disrepair. The reduction in the area of Queensland protected by the barrier fence could be attributed to the perceived success of 1080 baiting, especially aerial baiting (Holden 1991). Fixed-wing aircraft were used until 1986, when helicopters became mandatory for aerial baiting in the east of New South Wales because baits could be placed with more accuracy (Thompson et al. 1990). Aerial baiting with 1080 has evolved considerably to increase its efficacy against wild dogs while reducing potential non-target effects. It is now generally accepted as a cost-effective, safe method for the extensive strategic management of wild dogs (Thomson 1986; Thompson and Fleming 1991), and is used in Queensland, New South Wales, Western Australia and the Northern Territory.

Aerial baiting is the major control method in Western Australia where, in 1996–97, 823 900 baits were dropped during 505 flying hours; the average number of baits used annually has varied little over the past decade. Similarly, in north-eastern New South Wales, aerial baiting using helicopters is the primary form of wild dog control.

Fixed-wing aircraft are used for baiting in Queensland, western New South Wales and Western Australia but not in the other States and Territories.

5.1.2 Past management strategies

When labour was cheaper, and before scientific information about dingo movements and behaviour began to emerge, many control operations took place that would now be viewed as inefficient and inappropriate. In Western Australia, for example, there was a strong belief in dingo migration routes from far distant ranges and deserts to the grazing leases (Tomlinson 1958b). The attitude that any dingo killed would be 'one less to attack a sheep' prevailed. This led to major expeditions being mounted to seek out dingo 'breeding areas' (Tomlinson and Blair 1952), and to considerable effort being expended in attempts to control dingoes in these remote areas, hundreds of kilometres from the closest livestock.

Despite much wasted effort in earlier times, there was still the recognition that a coordinated, community approach to wild dog control was the most effective strategy. This generally took place in the form of 'baiting drives', including aerial baiting (Tomlinson 1954). Tomlinson (1958b) wrote:

'Wild dog baiting drives, organised on a district-wide basis and combining all available manpower and aids such as aerial baiting, are without doubt the most effective destruction method.... Careful planning and organisation to ensure the work is properly coordinated, is carried out at the best possible time, and gives the most effective coverage, is essential. Possibly, the most important requirement is to secure the participation of the landholders in these drives and the continuation of control work afterwards.'

Over the years, this approach has been refined, promoted and increasingly adopted, as outlined in Section 5.1.3.

5.1.3 Historical /past organisation of control

Since European settlement, two organisational levels of wild dog control have existed:

- By 1889, all mainland States had enacted legislation to facilitate the control of wild dogs (Breckwoldt 1988). Semi-government administrative structures, usually governed by boards of local landholders,

were created and empowered to levy rates on landholders to fund the bounty system and other control measures. These funds were commonly supplemented by government subsidies. For example, until the mid-1980s, most of the control of wild dogs in Victoria was by Government-employed doggers. Groups to facilitate the control of wild dogs were common in eastern Australia where the resources of the local groups were supplemented by government contributions and rates collected by the boards of management. Until recent times, wild dog control groups often held important social significance. Dog drives and poisoning programs served as meetings where neighbours could get together to socialise and discuss other issues affecting their holdings.

- Many properties, leases and runs employed doggers and boundary riders who had responsibility for trapping 'vermin' and maintaining fences in dog-proof condition. Privately employed doggers were more common in the extensive pastoral leases in northern central Queensland, South Australia and Western Australia.

5.2 Current legal status (around Australia)

5.2.1 Legislation

The legal status of dingoes and other wild dogs varies between States and Territories (Table 4). This status affects the control measures that are applied and the level of cooperation between individuals and groups.

Western Australia

Dingoes and hybrids are 'declared animals' under the *Agriculture and Related Resources Protection Act 1976* and are placed into Categories A4, A5 and A6. These categorisations are determined by the Agriculture Protection Board (APB) and are administered by Agriculture Western Australia (AGWEST). Populations must be controlled and animals

cannot be introduced or kept in captivity except in approved institutions or under a permit which carries specific conditions. Although category A5 requires that populations should be controlled throughout the State, it is recognised that dingoes pose no threat in vast areas beyond the limits of pastoral or agricultural land. APB policy restricts control activities to stocked land and its immediate environs. Domestic dogs (run wild, feral, or being at large) are classified in Category A5, meaning that they must be controlled. In municipal areas, domestic dogs are covered by the *Dog Act 1976*.

Dingoes are covered by the *Western Australian Wildlife Conservation Act 1950*, administered by the Department of Conservation and Land Management (CALMWA). Under this Act, they have been listed as 'unprotected fauna', although they are not subject to control in fauna reserves and National Parks without appropriate consultation between CALMWA, landholders and AGWEST. Despite the declared pest status of dingoes outside conservation estates, they are not controlled over most of their range.

Part of the funding for wild dog control in pastoral areas of Western Australia is derived from rates levied on pastoral leases matched by government funds.

Northern Territory

Dingoes are undeclared in all areas of the Northern Territory (Table 4). They are unprotected in all areas of the Northern Territory outside parks, reserves, sanctuaries, wilderness zones and the Arnhem Land Aboriginal Reserve (*Parks and Wildlife Conservation Act 1993*). Although there is no obligation on landholders to control them, the Parks and Wildlife Commission organises aerial and ground control programs if requested by graziers. The dingo has been protected within national parks and nature reserves since 1984 when dingoes were removed from the declared vermin list. The *Aboriginal Land Rights (Northern Territory) Act 1976* requires that traditional owners be consulted before any wild dog management programs are undertaken on their lands. Dingoes are unprotected in Arnhem Land Aboriginal Reserve.

South Australia

Dingoes and hybrids are 'proclaimed' pests under the *Animal and Plant Control Board (Agricultural Protection and Other Purposes) Act 1986* in the sheep zone south of the Dog Fence (Figure 2). Dingoes must be controlled and can only be kept there in authorised zoos and wildlife parks. Monies for the control of dingoes (Dingo Control Fund) is levied from all landholders with more than ten square kilometres and is matched by the government.

North of the dog fence the dingo is regarded as a legitimate wildlife species and although unprotected, is afforded a level of protection by the South Australian Dingo Policy (Animal and Plant Control Commission 1993). This policy was formulated in 1977 with input from the Vertebrate Pests Control Authority (now Animal and Plant Control Commission), pastoralists, the Dog Fence Board, the Pastoral Board and the Australian Conservation Foundation. Beyond a 35 kilometre-wide baited buffer zone, conservation of dingoes is enhanced by restrictions to ground baiting, prohibition of aerial baiting and phasing out of bounties.

The Dog Fence Board, under the *Dog Fence Act 1946*, administers maintenance of the 2178 kilometre dog fence. Funding is shared equally between the Government and landholders receiving protection of the fence.

Queensland

Dingoes and other wild dogs are declared pests under the *Rural Lands Protection Act 1985*. The responsibility for wild dog control in Queensland lies with landholders and is administered by the Land Protection Branch of the Department of Natural Resources (QDNR) and local governments. Dingoes and dingo hybrids can only be kept with ministerial approval and this is restricted to zoos and wildlife parks. The Queensland barrier fence (about 2500 kilometres long) (Figure 2) and funding for its maintenance has averaged around 60% from State funds and 40% from 'precepts' (levees) charged within the 'benefited area' over the long term. Local governments also maintain a number of smaller 'check' fences. A team of

people employed by QDNR is responsible for the continued maintenance of the fence.

New South Wales

The *Act to Consolidate the Acts for the Protection of Pastures and Live Stock from the Depredations of Noxious Animals 1898* in New South Wales declared certain animals including ‘native dogs’ noxious and obliged land owners to control them. The Pastures Protection Act 1939 reiterated this position as did the *Rural Lands Protection Act 1989* and the *Rural Lands Protection (Amendment) Acts 1994* and *1997*. The wild dog policy of the National Parks and Wildlife Service (*National Parks and Wildlife Act 1974*) effectively protects dingoes within national parks and nature reserves, and the dingo is recognised as a native species under the *Threatened Species Conservation Act 1995*. The *Rural Lands Protection Act 1998* allows wild dogs to be declared as pest animals and requires that the government be responsible for their management on government lands. Dingoes can be kept as pets under the restrictions of the *Companion Animals Act 1998*.

In the Western Division of New South Wales, the WDDDB administers the control of wild dogs and is responsible for the maintenance of the 584 kilometres of the Dog Fence (Figure 2). The Board was established under the *Wild Dog Destruction Act 1921* and is funded by rates on Western Division landholdings and State Government subsidies.

Australian Capital Territory

The *Nature Conservation Act 1980* in the Australian Capital Territory defines protected species in the Territory which includes dingoes. Control of wild dogs, including dingoes, on private lands is allowed subject to a permit authorising the killing of a protected species being issued by Environment ACT.

Victoria

In Victoria, dingoes are offered some protection within the lands administered under the *National Parks Act 1975* through the Wild Dog Policy of the National Parks and Conservation Reserves Guidelines and Procedures Manual.

Elsewhere they were ‘declared vermin’ as were all wild dogs under the *Vermin and Noxious Weeds Act 1958* and, since its repeal, under the *Catchment and Land Protection Act 1994*. Landholders have a legal obligation to control declared animals on land they own or occupy.

Tasmania

There have never been dingoes in Tasmania and the import of dingoes is banned along with a schedule of other exotic animals (*National Parks and Wildlife Act 1970*). Punitive action against feral and commensal dogs preying upon livestock is covered under the *Dog Control Act 1987*.

5.3 Current management strategies

5.3.1 Threats to livestock

It is now widely accepted that the threat to livestock from wild dogs comes from within the stocked areas and immediately adjacent ‘refuge’ areas. This has been supported by considerable scientific research (Section 2.4). With the increasing need to achieve the optimum cost-effectiveness of control work, the message to managers about confining work to high-risk areas becomes even more attractive. This coincides with a greater public interest in the preservation of dingoes (Chapter 3), and a greater public scrutiny of lethal control methods (Chapter 4).

One of the major changes in management strategies has been the abandonment of the bounty system in some States and Territories (Section 5.1.1). Many of the arguments surrounding bounties are well recognised, although it is worthwhile emphasising several that have undoubtedly hampered effective wild dog control in the past, and may well still do so in some areas. Apart from the encouragement of fraudulent practices, the payment of bonuses encourages a ‘scalp count’ mentality. This can result in the targeting of areas where dogs are easy to catch, rather than areas where dogs are posing the greatest risks to livestock. As well, bounties clearly encourage the use of techniques that yield easily-found carcasses (trapping, shooting, and the

use of inappropriate poisons). There is strong evidence in Western Australia that the use of highly efficient 1080 baiting is not undertaken by some operators because carcasses are seldom found (Chapter 6). Success of control operations should be measured by a reduction or elimination of livestock losses, not by a scalp count.

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The one exception to the general failure of bounties in preventing livestock losses is the case of affected landholders paying large bounties for the destruction of identifiable dogs responsible for extensive predation on sheep (that is a ‘rogue animal’ bounty or ‘smart’ bounty, Hassall and Associates 1998). Because ‘rogue’ animals have often thwarted considerable attempts to kill them, they may take a long time to catch, and although the sums offered may appear large (\$100–\$1000, E. Lackey, Rural Lands Protection Board (New South Wales), Inverell, pers. comm. 1984), the effort required to catch the offending dog(s) and the cost of their impact may also be large. This happens on a case-by-case basis and is different from the standard bounty system.

All of these factors have driven control authorities to adopt cost-effective, target-specific and humane control techniques and strategies. The major features of current wild dog management in Australia are summarised below:

- A strategic approach to management, with an emphasis on identifying and concentrating control in areas where stock are at risk.
- A streamlined control effort to reflect the degree of risk (the objective in sheep grazing areas being to keep paddocks free of wild dogs, with less stringent requirements in the case of cattle enterprises).

- Conducting control work in buffer areas immediately adjacent to stocked paddocks, to provide a sink for dispersing wild dogs to settle before they reach the paddocks.
- The application of control on a larger scale and integrating the efforts of different groups.
- An increased use of aerial and ground baiting with 1080 as cost-effective, strategic control methods.
- Less reliance on professional doggers and the bounty system than previously (although bounties are still paid in Queensland, the Western Division of New South Wales, and parts of Western Australia).
- Acts and policies to protect dingoes within national parks and similar fauna reserves in some States and Territories providing a legislative framework by which dingoes can be conserved.

5.3.2 Attacks on people

Wild dogs which come into close contact with people may become aggressive (Section 3.7). Authorities have attempted to manage such problems through culling and/or legislation to control the feeding of wild dogs and through a public education program. Warnings about the dangers (to humans) of feeding wild dogs and seeking close contact are sometimes provided in signs and brochures. People, especially children, who live in areas where wild dogs (including dingoes) are present, need to be taught safe and appropriate behaviour towards dogs.

In addition to culling, methods to minimise wild dog–human interactions in tourist areas may include aversive conditioning techniques that educate dingoes to avoid specific areas (Tauchmann 1998). For example, food scraps spiked with lithium chloride, which if eaten will cause dingoes to vomit, can be placed around camp grounds. Similarly, devices which emit high pitched sounds and impinge on the dingo’s sensitive hearing might be a deterrent; as are electric shocks administered by modified cattle prodders (dingo prodders) or electrified fences (Bird 1994). Other deterrents include weapons that fire kinetic energy

rounds (sting balls), bean bags, or sponge cartridges (containing an irritant) (English and Taske 1998). The effectiveness of all these approaches for deterring dingoes is largely unevaluated (Section 8.7).

5.3.3 Conservation of dingoes

(i) *Public and government education*

Education programs are required to help people recognise the dingo as a native Australian species, understand its ecological role and its plight, and push for policies to retain it as part of Australia's national heritage.

'Governments can use improved knowledge of dingo ecology to instigate better control methods.'

To prevent hybridisation, people who wish to keep pure dingoes or hybrids as pets should require permits and these animals should be neutered. Hybridisation would also be reduced if domestic dogs kept in outback mining towns, outback cattle stations and Aboriginal settlements in wilderness areas such as Jabiru in Kakadu National Park, were neutered unless they are specifically kept for breeding. However, introducing such changes would require extensive consultation with dog owners in these places.

State and Territory governments can play their part here by recognising the overall role dingoes and other wild dogs play in wilderness and pastoral areas, and by legislating accordingly. The Northern Territory removed dingoes from the pest list in 1976 but does not protect them, except in parks, reserves and in Arnhem Land. In South Australia in 1977, dingoes north of the Dog Fence (60% of the State) were declassified as pests, but not protected. Survival of the dingo is ensured by restricting the availability of organised baiting campaigns to certain areas and to times when dingoes are present in excessively high numbers and causing hardship for cattle producers. No bounties are paid on dingo scalps and trapping and the aerial laying of baits is prohibited outside

the Dog Fence. Dingoes remain proclaimed pests in the 40% of the State inside the dingo fence. New South Wales protects dingoes only in national parks and the conservation estate, as does the Australian Capital Territory. Dingoes remain 'declared pests' subject to various levels of control throughout Queensland, Victoria and parts of Western Australia. Any new laws on the keeping of dingoes by the general public should take into account the fact that such general ownership will increase the rate of hybridisation (Corbett in press).

Governments can also use improved knowledge of dingo ecology to instigate better control methods. For example, the Northern Territory Government was the first to stop annual broadscale aerial baiting and the Western Australian Government drew on new knowledge about dingo movements to set up buffer zones (nominally two dingo territories wide) between pastoral and wilderness areas.

(ii) *Dingo preservation societies*

The Australian National Kennel Council (ANKC) is a co-ordinating body for State and Territory canine controlling organisations. The ANKC recognises the dingo as an official dog breed and has adopted it as Australia's national breed with the proviso that exhibition, breeding or ownership of dingoes is not allowed in States where these activities are prohibited. In some States, preservation societies (such as the Australian Native Dog Conservation Society Ltd at Bargo, the Australian Dingo Conservation Association Incorporated at Erindale in New South Wales and the Dingo Farm at Chewton in Victoria) legally obtain dingoes to preserve and enjoy them. The philosophy and attitude of such societies is admirable and their aims can be achieved if they take a united and scientifically valid approach. This is being done by the Bargo and Erindale groups that are collaborating with researchers at the University of New South Wales (Barry Oakman, Australian Dingo Conservation Association Incorporated, New South Wales, pers. comm. 1999). Otherwise dingoes may become inbred or the artificial environment and selective breeding may discourage the natural selection of wild characteristics. The best scientific knowledge must

be used to ascertain the dingo's general and specific characteristics and this knowledge should be derived from samples collected over most of the dingo's huge geographic range in Australia and Asia.

With agreement from ANKC affiliated State and Territory canine councils or associations and the dingo preservation societies, a national register of dingoes and breeders could be constituted. The following recommendations would ensure that only pure dingoes were registered:

- Registered dingo breeders ensure that their stock comprises only pure dingoes. At present, this can only be done using skull measurements from dead animals supported by coat colours and breeding patterns. In future, dingoes may be assessed for purity by DNA fingerprinting techniques (Wilton et al. 1999) or possibly by skull measurements from x-rays of live dingoes.
- Only verified pure dingoes be included on the national register; that is, animals whose parents are both from a pure dingo breeding line confirmed by the skull measurements or DNA analysis of the founding parents of that line. During the initial years when stocks of proven pure dingoes are low, care must be taken to minimise inbreeding and other genetic problems. It should be a registration requirement that the purity of every third generation of each breeding line is confirmed by reference to skull measurements.
- The overseeing canine controlling bodies, dingo preservation societies and registered breeders be encouraged to educate the general public about the plight of dingoes and the measures being taken to preserve them. This education should include the responsibilities and problems of keeping dingoes in captivity and the reasons why most people would not qualify to keep a dingo. In addition, close collaboration with the Royal Society for the Prevention of Cruelty to Animals (RSPCA) and other dog 'shelters' should be established to ensure that suspected dingoes and hybrids are culled rather than 'recycled' to members of the public.

- Most importantly, considerable effort be made to win over members and supporters of the pastoral industries, particularly those in the sheep industry. Accordingly, the interested bodies should assist governments to pass legislation that not only ensures the preservation of pure dingoes, but safeguards the credibility of preservation societies and combats the chicanery that unscrupulous 'dingo breeders' might employ.

(iii) *Island refugia*

It is unlikely that most Australian mainland habitats will stay or become free of hybrids, so that large offshore islands and other refugia offer the best hope of preserving pure dingoes in their natural habitat (Corbett 1995a). There are many islands around the Australian coastline, representing many climates and habitats, excepting hot deserts. Some, such as Fraser Island, Melville Island and Groote Eylandt, are large enough for dingoes to live and breed in natural conditions.

Hybrids would need to be eliminated. Dingo populations would need to be managed so that they did not over-exploit their natural food supply and crash. Also, local regulations banning the hand-feeding of dingoes must be enacted and strictly adhered to; otherwise many dingoes will not only become dependent on food handouts but also become accustomed to the close presence of humans. This increases the risk of dingoes annoying or biting people. Management plans, such as the one developed for Fraser Island (Queensland Parks and Wildlife Service 1999), are essential for the management of dingo populations on island refugia.

Islands do not necessarily need to be offshore. They could be islands of well-protected and maintained sanctuaries on the mainland, which would have the advantage of additional habitats, such as deserts, not available on offshore islands. Such sanctuaries already exist on the mainland for conservation of endangered mammals and birds (Wamsley 1998).

Table 4: Australian legislation and policies for dingoes and other wild dogs. D= Declared animal which land owners and occupiers are obliged to control; U= Undeclared animal which land owners and occupiers have no obligation to control or protect; P= Protected animal which it is an offence to kill; N= Not declared noxious within lands managed by some State agencies; some protection afforded to dingoes either through policy or in practice.

	QLD	NSW	WA	NT	SA	VIC	ACT	TAS	Commonwealth
Status of dingoes	D whole State	D pastoral areas N NPWS land	D pastoral areas N National Parks	U ¹	D inside barrier fence N other areas	D pastoral areas N National Parks	P	Not present Import prohibited	Export not permitted P National Parks
Status of wild dogs	D	D	D	U ¹	D	D	Dangerous dogs may be destroyed	Subject to control	Controlled where impact demonstrated
Agencies responsible for management	Department of Natural Resources; local government	NSW Agriculture; Rural Lands Protection Boards	Agriculture Western Australia	Parks and Wildlife Commission	Animal and Plant Control Commission	Department of Natural Resources and Environment	ACT Parks and Conservation Service	Department of Primary Industries, Water and Environment	Environment Australia
Landowner or occupier responsibility	Landholders required to control in all areas	Obligated to control in pastoral areas	Obligated to reduce/control numbers where causing damage	No obligation to control or protect	Obligated to control in sheep pastoral areas	Obligated to control in pastoral areas	It is an offence to kill these animals	Import prohibited	Dingoes protected on Commonwealth land
Relevant legislation	Rural Lands Protection Act (1985); Nature Conservation Act 1996	Wild dog Destruction Act 1921; National Parks and Wildlife Act 1974; Threatened Species Conservation Act 1995; Rural Lands Protection (Amendment) Act 1998; Companion Animals Act 1998	Agriculture and Related Resources Protection Act 1976; Wildlife Conservation Act 1950	Territory Parks and Wildlife Conservation Act 1993	Animal and Plant Control (Agricultural Protection and Other Purposes) Act 1986	Catchment and Land Protection Act 1994; National Parks Act 1975	Nature Conservation Act 1980; Dog Control Act 1975	National Parks and Wildlife Act 1970; Dog Control Act 1987	Wildlife Protection (Regulation of Exports and Imports) (Amendment) Act 1995

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Table 4 continued

	QLD	NSW	WA	NT	SA	VIC	ACT	TAS	Commonwealth
Bonuses paid²	Yes	Western Division only	Yes (Pilbara and Gascoyne/Murchison)	No	No	No	No	No	No
Government finance³	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Coordinated control⁴	Yes	Yes	Yes	No	No	Yes	No	No	Yes

¹Dingoes are undecleared in all areas of the Northern Territory and are unprotected outside parks, reserves, sanctuaries, wilderness zones and the Arnhem Land Aboriginal Reserve.

²Bonuses paid on presentation of proof of destruction of a wild dog; usually a scalp. Bonuses are not paid under Conservation or Wildlife Acts.

³Government assistance to control wild dogs provided through barrier fence maintenance, the employment of doggers and subsidisation of baiting costs. Government finance is not available under Conservation or Wildlife Acts.

⁴Coordinated control groups are encouraged or required.