

Last howl of the dingo: the legislative, ecological and practical issues arising from the kill-or-consume dilemma

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ABSTRACT

There is little doubt that the dingo is the most reviled of all Australian mammals. Former dingo trapper Sid Wright emphasised the enmity of people towards the dingo, but argued that this “wild, magnificent creature” should be conserved in our national parks and reserves. It is the only native mammal not protected in NSW by the State’s fauna legislation yet, in a bizarre twist, it is currently under consideration by an independent scientific committee for listing as a vulnerable species in NSW. This Symposium on the Dingo was convened to explore the kill-or-consume dilemma. Stock protection remains a primary matter of rural concern today, and this is a concern for all wild dogs and not just dingoes, although no distinction can be made between them in control programs because it is not possible to separate them in the bush. Thus there is no method of selectively controlling wild dogs. As journalist Peter Austin explained to the readers of *The Land*: “The problem is not made any easier for the National Parks and Wildlife Service by the fact that it is required on one hand to protect dingoes on its lands as a native species, while meeting its obligation under the recently amended Rural Lands Protection Act to control wild dogs (dingoes included) that pose a threat to domestic stock”. Recent research by geneticist Alan Wilton gave rise to his unambiguous position: “The dingo in the wild is endangered due to hybridization with domestic dogs”. This confirms earlier work by Laurie Corbett and Alan Newsome. The NSW NPWS recognises that “wild dogs, including dingoes, cause substantial livestock losses and there is an expectation by rural communities that damage by these animals be minimised ... However, as the dingo is a native animal, there is a public expectation that dingoes should be conserved”. The Service, as the leading wildlife conservation agency in NSW, accepts this responsibility as spelt out in its policy on Wild Dogs. One conservation option being negotiated is the establishment of dingo management areas, as presented in an interdepartmental joint submission to the NSW Parliament in a “Report on the Regulatory Controls Relating to Dingoes”. However, the management of dingoes at the interface of public lands and grazing properties will remain a contentious issue because of the need to balance the conflicting objectives of protecting dingoes while meeting the obligations of public land managers under the *Rural Lands Protection Act 1998*. Under the changes, the Crown is bound to control pest animals declared through Pest Animal Control Orders “to the extent necessary to minimise the risk of the pest causing damage on any land”. Management dilemmas can paralyse the decision-making process for land and wildlife managers, so this paper aims to advance the debate by examining matters of great concern to the wildlife manager and to the land manager: respectively, they are scientific evidence for genetic hybridisation of the dingo, and innovative management options. This paper suggests areas of compromise and reiterates Alan Newsome’s conclusion that “there are no simple answers, and sometimes no easy compromises between the two imperatives, to eradicate and to conserve”.

A term of extreme contempt

In 1973, Country Party politician Doug Anthony declared of Prime Minister Gough Whitlam: "All I can say of him in the Australian language is that he is a dingo". This quote, taken from *The Australian* 21 November 1973, is Gerry Wilkes' final entry on the word "dingo" in his book *A Dictionary of Australian Colloquialisms* (1978). According to Wilkes, "dingo" is an "Aboriginal word for the native dog, a term of extreme contempt applied to a man, because of the animal's reputation for cowardice and treachery".

The term remains with us in public life and its use doubtless influences, or at least reflects, public attitudes to dingoes. In Federal Parliament in February 2001, responding to a challenge from Opposition Leader Kim Beazley on the controversial petrol taxes, Prime Minister John Howard replied that while he had put his point of view Beazley would not declare his position, and so Beazley had "dingoed it". Petrol taxes were a volatile political issue in the weeks leading up to the Western Australian and Queensland State elections of February 2001, and strong words were called for. In this exchange, the word "dingo" assumed an additional role as a verb, thus further entrenching it in the Australian lexicon of colourful invective.

There is little doubt that the dingo is the most reviled of all Australian mammals. It is the only native mammal not protected in NSW by the State's fauna legislation, the *National Parks and Wildlife Act 1974*, and so it was not considered when the first review of the status of NSW vertebrate fauna was undertaken in 1992 (Lunney *et al.* 2000). However, the dingo, along with other wild dogs, is covered by a Pest Animal Control Order under the *Rural Lands Protection Act 1998*, as it was by the legislative predecessors of this Act. Yet, in a bizarre twist, the Scientific Committee established under the *NSW Threatened Species Conservation Act 1995* is currently considering whether it should be included on the schedule of NSW vulnerable species.

The Symposium on the Dingo was convened by the Royal Zoological Society of NSW and held at the Australian Museum in May 1999 to explore the kill-or-protect dilemma by seeking expert opinion and listening to questions from the floor to unearth opinions about and attitudes towards proposals for dingo management. The day was extraordinary because of the range of views presented in quick

succession, the insights contained in questions from the floor and the quality of the responses. During the symposium, long-term dingo researcher Alan Newsome remarked that this kind of meeting would not have happened 20 or 30 years ago and that it was really good to see that it had succeeded so well on the day.

In his compilation of the best Australian nature writing, Chisholm (1964) selected a small piece entitled "Lady Myall, the Dingo" by Donald Macdonald. In the paragraph he wrote as an introduction to the piece, Chisholm explained the dingo to his literate audience whom he hoped to encourage to enjoy natural Australia. The revealing summary is presented here to illustrate the mood of a nation that still saw itself as riding to prosperity on the sheep's back: "Australia's wild dog, the dingo or warrigal, appears to have been brought to this land by the ancestral aborigines. Spreading throughout the continent (but not reaching Tasmania), it fed mainly on small marsupials, but since settlement began it has freely attacked sheep, lambs and calves. Enmity of man being thus aroused, the dingo has been forced to exercise cunning, and the extent to which it has done so is suggested in Macdonald's posthumous book, 'The Brooks of Morning'".

Writing four years later in *The Way of the Dingo* (1968), former dingo trapper Sid Wright again emphasised the hostility of people towards the dingo, noting that "In the outback it was accepted without question that the dingo was a slinking, cowardly animal". Interestingly, Wright did not share this opinion. From his own observations, he thought the dingo a "wild, magnificent creature" and even argued that we should strive to conserve it in our national parks and reserves.

Despite such occasional ambivalence, antagonism towards the dingo has been profound and far reaching, as found by Glen and Short (2000) in their historical study of the control of dingoes in NSW. They discovered that 280,000 bounties had been paid for dingoes between 1883 and 1930, by which time dingoes had become scarce in all but the north-eastern corner of the State, where sheep numbers were lowest. The main incentive for the destruction of dingoes was the protection of stock.

Stock protection remains a primary matter of rural concern today, as outlined in the paper by Helen Cathles in this symposium. The concern

is for all wild dogs and not just dingoes, but no distinction is made in current control programs because it is not possible to separate them in the bush. Thus there is no method of selectively controlling wild dogs. Helen Cathles was attacked from the floor on animal welfare issues, but she stood her ground, as well she might, because of the welfare implications for livestock attacked by wild dogs and the economic impacts they cause. These matters underpin the strength of feeling in her constituency – rural NSW – on this issue.

“Liz Chappell, a director of the Northern New England Rural Lands Protection Board, says sheep losses from wild dog attacks in her board area and the adjoining Armidale board district amount to more than 2000 a year, and now calves are also being attacked.” This quote, which corroborates Cathles’ position, is from an article entitled “Getting on with the neighbours” by Peter Austin in *The Land* (21 September 2000). The article examined “the changes taking place in park management and some of the problems encountered by neighbouring, and not-so-neighbouring, landholders”.

Austin expanded on the management problem: “Since the NPWS took over the management of the huge areas of wilderness that now make up the Kosciuszko National Park and the sprawling complexes of the Blue Mountains and the Northern Tablelands, preying wild dogs have become a serious pest for surrounding graziers”. Bob Harden from NPWS, and Paul Meek and Jim Shields from the other large holder of Crown Lands, State Forests of NSW, presented papers dealing with this significant land management issue. These authors acknowledged the need to control pest populations of wild dogs while still conserving the genetic stock and the ecological function of dingoes in the landscape. The latter issue was taken up by Alan Newsome, who pointed to the paradox that, while the dingo kills stock, it also kills a range of unwanted pest species and effectively suppresses rabbits over large areas. The point being emphasised here is that management of wild dogs, including dingoes, is a complex issue in rural NSW.

As Austin explained to the readers of *The Land*: “The problem is not made any easier for the NPWS by the fact that it is required on one hand to protect dingoes on its lands as a native species, while meeting its obligation under the recently amended Rural Lands Protection Act to control wild dogs (dingoes included) that pose a threat

to domestic stock.” In a caption accompanying a photo of a dog/dingo in Austin’s article, the problem is put more starkly: “Graziers oppose a proposal to declare the dingo a threatened species, and the NPWS says it is unnecessary. Dingoes and wild dogs have forced some producers to run cattle on country better suited to sheep”. Austin succinctly puts the matter from a rural perspective: “The committee charged with determining listings under the Threatened Species Conservation Act has received an application seeking to have dingoes included on the list – a proposition that scares the daylight out of graziers – but it has deferred a decision while more information is gathered”.

This symposium was convened to gather more information and to give people the opportunity to appraise the matter and to recognise that if one piece of legislation can shield a species that is a pest under another, an intelligent solution is essential. All parties involved will need to consider the legislation, the rural concerns, the conservation issues, and the practicalities. This will require good skills in negotiation and communication and the ability to be firm and avoid the tag of “dingo”. There will be no place for cowards or for treachery in this course of action! Fortunately, this process has proceeded constructively since this symposium which is, we hope, a significant contribution to furthering the debate.

Is it an Australian mammal and does it matter?

That other wild canid in Australia, the red fox *Vulpes vulpes*, is universally despised both by the rural community and by those interested in the conservation of native fauna. There is a Commonwealth Threat Abatement Plan (TAP) (Anon. 1996) and a NSW draft TAP produced under the NSW *Threatened Species Conservation Act 1995* (Mahon 2001). The fox was introduced into Australia in the 1860s and is now a widespread, major pest in the southern half of Australia (Coman 1995). There is no evidence of a call for its protection anywhere. The dingo is different because it was in Australia when European settlement started, but can it be called an indigenous species? Culturally, and potentially legally, this question does matter.

The famous 19th naturalist John Gould (1863) ruminated on this question: “It may be expected also that I should myself have formed an opinion as to its claim to be regarded as

indigenous or otherwise; and if this opinion should be at variance with those of some Australian zoologists who have lately written on the subject, I may state that it has not been formed without due consideration. Without going into the probable origin of this particular race of dogs, or offering reasons why it should not be considered indigenous, I may briefly state that I believe it has followed the black man in his wanderings from Northern Asia through the Indian Islands to Australia...".

In a delightfully dated chapter "Non-marsupial or higher mammals" in his famous book *Furred Animals of Australia*, Troughton (1962), asked: "Was the dingo, or native wild dog, evolved as an original inhabitant of the Australian continent?" Troughton noted that "the question was for many years the subject of scientific debate", but concluded that "ancestral aborigines, or Malayan peoples, have brought the dingo by sea-route to Australia". Troughton noted that "there is no marked difference between a dingo and the normal types of domesticated sheep- and cattle-dogs. The most noticeable distinctions are that ... it does not bark but utters yelping sounds which change to mournful howls".

The dingo was included in Strahan's (1995) *The Mammals of Australia*, which is a definitive text for zoologists, particularly for editors seeking consistency. It also provides a common point of reference for both the author and the reader, because the book included introduced species such as the fox and the cat. However, the dingo had been excluded as a separate entry from his earlier book *What mammal Is That?* (Strahan 1987). Strahan included only bats, rodents, dugongs and seals as Australia's native eutherians. He did not comment specifically on the dingo, although it is mentioned in passing: "In ways of life, such as hunting, where flexible behaviour, learning and prediction are at a premium, we may expect a placental mammal to displace a marsupial and this seems to have happened, for example, when the Dingo came into competition with the Thylacine". Corbett (1995a) put it bluntly in the widely read journal of the Australian Museum, *Nature Australia* "Contrary to popular opinion, Dingoes are not indigenous to Australia. They do not share an antiquity with the marsupial megafauna."

The significance of the review here is not to establish a ruling on the matter -Corbett has reviewed the science well in his paper where he summarises a life-long effort on this question

(Corbett 1995b) - but to look at the dingo's cultural status. Troughton (1962) called it the "native wild dog" while acknowledging that it did not evolve here. So what does indigenous mean? The Macquarie Dictionary, 1981 edition, defines it as "originating in and characterising a particular region or country; native...". Therefore, is the dingo not indigenous because it did not originate in Australia, or is it indigenous because it now characterises wild Australia and was native to it when Europeans settled?

Legally, there is no question in NSW. Under the NSW *Threatened Species Conservation Act 1995* a species is considered indigenous if it was established in NSW before European settlement. On these grounds the dingo would justify protection under the *National Parks and Wildlife Act 1974*, even if it is a pest. Pests may be, and are, killed under this Act. If it were to go extinct, would it go onto the list of extinct Australian mammals? If yes, then it would also warrant protection under the NSW *Threatened Species Conservation Act 1995* if the likelihood of endangerment or extinction can be demonstrated.

Is the dingo threatened?

This question is pivotal. Fortunately, Alan Wilton has in his symposium paper produced an answer using contemporary methods of biochemistry and genetics. His opening sentence is unambiguous: "The dingo in the wild is endangered due to hybridisation with domestic dogs". The plenary discussion provided additional information and ideas, and extracts are presented here to amplify Wilton's direct answer. The question then to be answered is not whether the process of extinction through hybridisation is underway, but whether it has reached a threshold for the dingo to be listed as a vulnerable species, an endangered species, or a series of endangered populations under the NSW *Threatened Species Conservation Act 1995*.

Hybridisation, according to Laurie Corbett, commenced when the first Europeans brought their dogs to the new colony. This is not surprising. Species within the genus *Canis* are closely related, and most can interbreed if given the chance (Wayne *et al.* 1997). Europeans have provided this chance by moving dogs to many parts of the world, and the dingo is not the only species of *Canis* at risk (Vila and Wayne 1999). Corbett went to Asia to try and find the purest population of dingoes to compare with the Australian dingo. He found that Thailand had the purest dingo population because it is only in the last 50 or so years that the local dingo population has had

much contact with European dogs.

Alan Wilton noted that people often ask how we know a dingo is purebred. This, he said, is the real question. In response, Martin Denny opined in the plenary session that we were losing the plot. If we are going to start distinguishing between dingoes as purebred animals and non-dingoes as pest species, he asked, how are we going to tell them apart in the field? He identified a major point: if we are talking about conservation, how do we stop the increasing menace of hybridisation from sweeping the continent?

Laurie Corbett made two clear points: Firstly, you cannot tell at present what an animal's purity is in the bush. As Bob Harden and Alan Newsome had already noted, Corbett stressed that the genetic status of the animal was less important than its ecological role in the bush. The thylacine surrendered to dingoes as top predator and in this case it really does not matter who is running around the bush as long as the predator's role is being maintained. Secondly, if the dingo is worth saving as a native Australian species, as a great Australian icon, then the hybrids should be separated from the purebreds and the purebreds preserved. If the breed is to be preserved, it is best done on islands where their populations can be monitored and people and their domestic dogs can also be controlled. On any island where there are pure dingoes people can be prohibited from having domestic dogs or be required to neuter their dogs. Until recently, Corbett thought that Kakadu National Park in the top end of Australia was mostly free of hybrids, as only ginger dingoes are found there, but in the last couple of years hybrids have been turning up and Corbett says this is because of the advent of tourists and their dogs.

Corbett provided an answer to the question of where in New South Wales the most pure populations are likely to be. He said he could only speak from data on skull morphology. Samples from the coastal regions and the north-east of New South Wales, Bob Harden's country, indicate that these seem to be the best places for finding pure dingoes. Most of Corbett's skulls were fairly old, having been collected in the 1960s and 1970s, and a lot could have happened to the local dingo population since then. The important thing was that they were similar to skulls from "good" dingoes from the rest of Australia. It is important now to collect and examine more recent samples. We note, as editors, that this research is underway as we go to press.

During the plenary session, Eric Davis acknowledged that this was an important issue and worthy of debate, but that at a practical level, there were people out in the paddocks trying to implement wild dog control. This practical matter is of primary concern in papers by Davis, Fleming, Cathles and Wise, with the papers by Harden and Meeks and Shields not far behind. They all repay careful reading and collectively identify the problem of control of wild dogs. The nicety of whether an animal is a pure dingo cannot be their main concern at this stage. The cultural, ecological and scientific aspects of the debate occupy Newsome, Corbett, Breckwoldt, Oakman and Wilton although each was aware that their focus was closely linked to one of the major issues in wildlife management in Australia today.

Dingo management areas: one solution to treading the fine line

In his article in *The Land* of 21 September 2000, Peter Austin gave considerable space to the NPWS viewpoint on dingo management, and especially to NPWS manager Terry Korn, who was quoted as having said that there had been a "significant change" in NPWS management approach to pests in the past five years. Austin wrote that this reflects a belated realisation by the State Government that more funding and personnel resources were needed. He also noted that: "NPWS co-ordinator of pest management, Andrew Leys, says the Service is bound (like other Crown Land managers) by an Environmental Planning and Assessment Act requirement for it to assess the possible impact on native plants and animals before any intrusive activity (such as baiting or spraying)". Furthermore, "... since the gazettal of the Threatened Species Conservation Act, assessments must include the likely impact on species that qualify for the 'threatened' tag". Austin noted that Leys describes this process as being "at arm's length from the NPWS, in that an independent, autonomous committee of 10 scientists determines what species may be regarded as 'threatened'".

As stated in its *Annual Report 1999-2000* (NPWS 2000), the NSW NPWS recognises that "wild dogs, including dingoes, cause substantial livestock losses and there is an expectation by rural communities that damage by these animals be minimised." Recent amendments contained in the *Rural Lands Protection Act 1998* provide for pest animals to be controlled on Crown

land [including parks and reserves]. Wild dogs, including dingoes, will become pest animals throughout NSW. “However, as the dingo is a native animal, there is a public expectation that dingoes should be conserved”. (NPWS 2000) As the leading wildlife conservation agency in NSW, the Service accepts this responsibility as spelt out in its policy on Wild Dogs. However, the Service has put the position that it would prefer that the dingo were not listed as a threatened species because it would create a conflict between the *Threatened Species Conservation Act 1995* and the new *Rural Lands Protection Act 1998* since the latter does not allow for a threatened species to be listed as a pest animal (A. Leys NPWS February 2000 pers. comm.). However, placing the dingo on the schedule of threatened species does not preclude it being killed under the *Threatened Species Conservation Act 1995*. The novel problem here is that one cannot, in the field, determine whether the animal is a dingo or not, so a practical solution is necessary that allows wild dogs to be killed.

The management of wild dogs and dingoes at the interface of NPWS lands and grazing properties must therefore be handled carefully because the Service has to balance the objectives of preventing attacks on livestock from wild dogs moving out of its reserves and conserving dingoes in their core habitat on Crown land. An approach which sought to achieve this outcome was outlined in a submission, prepared by NSW National Parks and Wildlife Service, State Forests of NSW, Department of Land and Water Conservation and Sydney Catchment Authority, regarding public lands to be covered by the pest animal provisions of the *Rural Lands Protection Act 1998* (Appendix 1 in Parliament of NSW 2000). The key to this approach is in identifying problem areas, and then developing and implementing appropriate management strategies in consultation with rural lands protection boards, wild dog associations and private land owners. The submission and the approach outlined therein has been the subject of a series of regional meetings in NSW. All but one of these meetings has given “in principle” support for the approach of developing local/regional management plans as outlined in the submission (A. Leys NPWS June 2001 pers. comm.). The issues in the far north-west of NSW surrounding Sturt National Park have yet to be resolved.

This submission (of March 2000) is paraphrased in the following section and provides a good example of a cooperative endeavour involving public agencies (NSW National Parks and

Wildlife Service, NSW Agriculture, Rural Lands Protection Boards, State Forests of NSW, Department of Land and Water Conservation and Sydney Catchment Authority) with a major responsibility for both land management, conservation and agricultural protection. It also shows how difficult it is to conserve a large predator in a fragmented landscape, even though many of the reserved areas – National Parks and State Forests – collectively merge to form large land units of hundreds of thousands of hectares. Despite their size, many of these areas border productive grazing land where wild dogs are a pest. A range of legal issues associated with control, such as poisoning and the potential impact on non-target species, are matters that are reviewed regularly allowing regulations to be updated as new information becomes available.

Pest animal provisions on public lands in NSW under the *Rural Lands Protection Act 1998*

The submission acknowledges that wild dogs, including dingoes, cause substantial losses and disruption to livestock enterprises and that there is an expectation by rural communities that their impacts be will minimised. A major amendment contained in the *Rural Lands Protection Act 1998* includes requiring the Crown (s. 146) to control animals that are declared pests under the Act. NSW Agriculture has worked with the Rural Lands Protection Boards and other public land managers to develop Pest Control Orders for wild dogs under the *Rural Lands Protection Act 1998* (p15-16 in Parliament of NSW 2000) that aim to satisfy the legislative requirements and deliver both agricultural protection and conservation objectives. Options considered include: a wild dog control order covering all public and private land in NSW; a wild dog control order covering only private land; wild dog control order/s covering all public land in NSW and making wild dog control on public land that is important dingo habitat, subject to a control/management plan (agreed by all stakeholders) that takes account of both agricultural protection and conservation objectives.

The parliament of NSW (2000) noted that the proposed arrangements relating to Pest Control Orders are being developed on a whole of government approach because of complexities of overlapping provisions of several NSW Acts. The review committee also noted wryly (Parliament of NSW 2000): “It is however anomalous that

the main NSW initiative to conserve the purity of the existing dingo populations is being taken under an Act that will classify them, statewide, as a pest requiring eradication.”

The *Rural Lands Protection Act 1998* does not allow protected fauna or threatened species to be declared pest animals. Dingoes, however, are not protected under Schedule 11 of the *National Parks and Wildlife Act 1974*. What is instructive is the conservation view expressed in the submission: “However, dingoes are a native animal and as shown by the strong support at the Dingo Symposium held in Sydney in May 1999, there is a public expectation that they should be conserved in New South Wales”. Although management issues were covered extensively at the symposium, as is evident from the array of papers on the subject, it is the implications of conservation that lie at the heart of the concern. The submission points out that: “the Scientific Committee (responsible for listings under the *Threatened Species Conservation Act 1995*) has deferred a recent application to list dingoes as a threatened species pending further research into techniques to determine the genetic purity and distribution of dingoes, and an examination of the impact of current wild dog management practices employed by the NSW National Parks and Wildlife Service (NPWS) and other public land managers”. What emerges is that the current legislation poses a dilemma that potentially generates conflict. One solution is to leave the dingo with its current status, and protect pure dingoes within those Crown lands where it is possible to do so. The problem is that the science of dingoes may be pointing to a different conclusion, which requires a modified legal and management approach to its protection. Our aim here is to clarify as many of the issues as possible to assist in that process.

Under the provisions of the *Rural Lands Protection Act 1998*, Pest Animal Control Orders can be written to specify which vertebrate pests will be declared pest animals, either on a statewide or local basis. The Minister for Agriculture may specify where animals will be declared pests and the conditions or factors that will apply in a Control Order. NSW Agriculture (Department of Agriculture) and the NPWS have worked together with public land management agencies to develop a Wild Dog Control Order that avoids creating conflict between the *Rural Lands Protection Act 1998* and the *Threatened Species Conservation Act 1995* by supporting both

control and conservation objectives. At a series of regional meetings public land managers were asked to identify public lands that are significant habitat for dingoes and to identify areas that would satisfy the dual objectives of complying with the requirements of the *Rural Lands Protection Act* and of conserving dingoes. The aim was to identify wild dog management areas whereby local management plans could cover both objectives.

The submission notes that the ecological importance of dingoes is often overlooked. (The issue has recently been covered in detail by Fleming *et al.* 2001) As top order predators, dingoes and their hybrids may have an important ecosystem function, such as their predation on native macropods and the consequent impact on native vegetation, and the reduction of fox numbers and the consequent effect on the predation of small to medium-sized mammals. The submission states that “dingo conservation is most feasible on large reserves where further hybridisation can be minimised (less chance of contact with domestic dogs and pig-hunting dogs than in smaller or dissected reserves). In larger areas there is also less likelihood of animals moving out of the core of the area to attack livestock. In a few cases, smaller areas have been included because they are considered to be high quality dingo habitat and there are no livestock enterprises nearby, e.g. Limeburners Creek Nature Reserve near Port Macquarie”. This map-based approach has the necessary hallmarks of a workable solution: it is dealing with the real world in the same way that landowners and managers deal with the real world.

The submission also tackles the matter of environmental impact assessment. The NSW NPWS manages more than 5.05 m ha in 495 reserves, as identified in the submission. (These figures have now increased, but were correct as at March 2000.) Similarly, State Forests of NSW manages 2.9 m ha in 770 State Forests for multiple uses including timber production and biodiversity conservation. Both bodies have a duty to ensure that their wild dog control programs are environmentally sound and have minimal effects on non-target species. As part of the Integrated Forestry Operations Approval in the Regional Forest Agreements, SFNSW is required to obtain a Threatened Species Licence to develop local area Predator Control Plans with minimum non-target impacts. All wild dog control programs for NPWS lands

require an assessment of their environmental impacts. If an initial analysis indicates impacts are possible, an assessment report in the form of a Review of Environmental Factors is required. The preparation of a more extensive assessment report, either an Environmental Impact Statement, or a Species Impact Statement, is required if the impacts are considered to be significant. The submission also points out that when private landholders are undertaking wild dog control as part of their routine agricultural activities they are exempt from the licensing provisions of the *Threatened Species Conservation Act 1995*. This provides exemption from prosecution for harming threatened species. Also, NSW Agriculture has been issued with a s.120 licence under the *National Parks and Wildlife Act 1974* to cover landholders against unintended harm to protected (non-threatened) species when they are controlling wild dogs. All landholders have an obligation to use best practice techniques to minimise non-target impacts.

A list and maps of reserves and forests, which are managed by the NSW NPWS, SFNSW, DLWC and the SCA and are considered important to the survival of dingoes, form a main part of the submission. Future management strategies for reserves on this list need to consider both the conservation of dingoes in the core of such areas and the management of their impacts on neighbouring agricultural lands. Information provided by RLPBs and WDAs on stock losses/attacks is of great assistance in identifying problem areas and developing management plans. A key aspect is that all stakeholders need to be involved and agree to any plan.

The DLWC manages 4 m ha in a large number of reserves, while the SCA manages 4 areas totalling 360 000 ha. Only 208 of these areas (NPWS 99; SFNSW 104; DLWC 4; SCA 1) have been included in schedule 2 of the Wild Dog Pest Control Order. Justification for inclusion in the Control Order, as outlined in the submission, includes the fact that the reserves and surrounding areas of publicly managed lands contain dingoes and important dingo habitat and that the reserves encompass a variety of landscapes including tableland, escarpment, coastal habitats and wildlife corridors. Moreover, a large proportion of the reserved area sustains significant populations of small- to medium-sized mammals. Wild dogs, as top order predators, may have an important role in these areas, irrespective

of whether they howl or bark.

The Review Committee made six recommendations (Parliament of NSW 2000) reflecting the complexity of the issues and the need for more thought and information. Three recommendations related to dingo conservation; one calling for a study of the “costs and benefits of the pest control order proposals to determine whether they adequately meet conservation values”, another suggesting a study of the “funding needed to support an adequate program to conserve the Australian dingo”, and third recommending that the Minister for the Environment examine whether his administration should have a more central role in determining conservation measures under the *Rural Lands Protection Act 1998*. The Review Committee also emphasised the need for an Australia-wide focus on dingo conservation.

The last howl of the dingo

Firstly, a funny story from the early 1970s when Alan Newsome’s CSIRO team was on a field trip in Nadgee Nature Reserve on the far south coast of NSW studying dingoes. One of us (DL) was sharing the research hut with the team of Mick Burt and Peter Catling. A volunteer, picking up some valuable field experience after having just gained a degree, also shared the hut. One quiet night Mick Burt said that he thought he heard a dingo, and went outside to check. After a few minutes we heard a terrifying howl and Mick rushed back into the hut looking wild-eyed and fearful. He gasped, “there are dingoes out there”. The volunteer was frightened; Peter Catling turned away so as not to reveal his smile as one of the bushie’s favourite leg-pulls had succeeded. It is still funny nearly 30 years later.

Nadgee is an extraordinarily beautiful coastal Nature Reserve just south of Eden. It is included in the submission on dingo management areas as follows: South East Forests, Mount Imlay and Ben Boyd National Parks, Nadgee Nature Reserve and Yambulla, East Boyd, Timbillica and Nadgee State Forests. The South East Forests National Park is an elongated escarpment connecting Wadbilliga National Park with Coopracambra-Kay National Park in Victoria. They form a contiguous area of about 265 000 ha. The coastal reserves of Nadgee NP and Ben Boyd NR adjoin East Boyd and Nadgee State Forest which connect through Timbillica and Yambulla State Forests and Mount Imlay National Park with the South East Forests National Park. The

main areas where dingoes cause problems are on the western interface of the South East Forests National Park (and associated State Forests) and grazing lands and also some in-housing in the southern part of the national park. Control programs are being undertaken in conjunction with the Bombala and South Coast Rural Lands Protection Boards, State Forests of NSW and the Victorian Department of Natural Resources and Environment. These control programs will continue when required.

Endless barking by domestic dogs can be most irritating for humans, but communication is important for dogs, including dingoes and other wild dogs. Dingoes do not bark in the wild, although domestic dogs and hybrids do, but howling is common to all wild dogs (Corbett 1995a). Wild dogs are widespread through the south-east region of NSW around Eden. Will hybridisation eventually cause the dingoes of Nadgee to bark like a dog? If the answer is yes, and the pointers from this symposium say it is, then the dingo is a threatened species, but whatever their status, the wild dogs of the Eden region will pose the same problem for local land managers. That is the conundrum that lies at the heart of this symposium. Even though this symposium was principally focused on NSW, this concern to achieve an effective balance between control and conservation is also Australia-wide.

As this set of transactions went to press, an excellent new book had just appeared (Fleming *et al.* 2001). We read an advance copy as a CD-ROM and concluded that it must become compulsory reading for all those seeking a summary of the science of dingoes and wild dog management in Australia. We summarise a short section below from near the end of that book and stress that one needs to read the book to see how the authors derived their conclusions. What we recognise is the similarity of the conclusions of the symposium and the authors' conclusions which reflect a national perspective. In one sense this is not surprising in that there is an overlap of authors and the time period is the same with the same basic set of references. However, what is intriguing is the way the puzzle of how to manage a species that is both threatened and a rural pest is approached. There is no doubt that the decisions taken now are dictating the options for future managers, either of rural lands or for conservation of biodiversity.

The national perspective

Fleming *et al.* (2001) present the following options on the national perspective which are summarised here from material under their heading "Current management strategies". Research on threats to livestock from wild dogs comes from stocked areas and adjacent refuges. It is cost-effective to confine control to high-risk areas, particularly as there is now greater public interest in the preservation of dingoes and more public scrutiny of lethal control methods. One of the major changes has been to abandon the bounty system in some states and territories. The payment of bonuses encourages a "scalp count" mentality, which can result in the targeting of areas where dogs are easy to catch, rather than areas where dogs pose the greatest risks to livestock. The success of control operations should be measured by a reduction of livestock losses, and not by a scalp count. The one exception is the offering of large bounties for rogue dogs responsible for extensive predation on sheep. The major features of current cost-effective, target-specific and humane control techniques and strategies for wild dog management in Australia are: identifying and concentrating control in areas where stock are at risk; controlling effort to reflect the degree of risk; controlling work in buffer areas adjacent to stocked paddocks to provide a sink for dispersing wild dogs to settle before they reach the paddocks; controlling on a larger scale by integrating the efforts of different groups; increasing the use of aerial and ground baiting with 1080 as a cost-effective, strategic control method; placing less reliance on professional doggers and the bounty system than previously; introducing Acts and policies to protect dingoes within national parks and similar reserves in some states and territories to provide a legislative framework for the conservation of dingoes.

The Australian Conservation Foundation Policy Statement No. 42: Dingoes

The ACF policy on dingoes was adopted in November 1984 and now appears prescient, or even an unacknowledged precursor to many current solutions. It was fading in the hippocampus of one of us (DL), who is a long-term member of the ACF, but it was not in the reference list of Fleming *et al.* (2001), nor referred to in any of the presentations at the symposium.

It is reproduced here from the ACF webpage acfonline.org.au/policy. It does have a supporting statement and references.

1.1 Classification as protected wildlife

Since the dingo (*Canis familiaris dingo*) is a native animal it should be classified as a protected species under the relevant State and Territory wildlife protection legislation.

1.2 No killing without proper justification

Although wildlife protection legislation in Australia allows for the limited killing of protected wildlife under permit, this should only be done with proper justification (such as verified loss of stock to dingoes).

1.3 Removal from noxious animal, pest and vermin lists

Legislation requiring the mandatory destruction of dingoes should be replaced by approved management plans to ensure their conservation, and dingoes should be removed from all noxious animal, pest and vermin lists.

1.4 Elimination of bonus and bounty systems

Bonus or bounty systems for dingo destruction should be eliminated throughout the country.

1.5 Conservation management plans to be developed

Approved management plans for dingo conservation should be developed by governments through a process of full and open public participation.

1.6 Management to minimise problems of hybridisation

Since dingoes are not reproductively isolated from domestic dogs (*Canis familiaris familiaris*) and hybridisation presents a continuing threat to their genetic integrity, management should be directed to minimising this threat.

1.7 Forest and National Parks required for survival of pure dingo populations

In the intensive agricultural areas (high-rainfall, and wheat/sheep zones), large tracts of forest and national park are vital for dingo conservation and they must be adequate to guarantee survival of viable populations.

1.8 Development of non-lethal control measures

Non-lethal methods should be developed and implemented where dingo populations require control including:

- careful zoning of land use around forests, national parks, etc where dingo conservation is a management objective (eg sheep grazing should be kept away from the boundaries), and
- well-designed and carefully located exclusion fencing.

1.9 Broad-scale and indiscriminate control measures not to be employed

Broad-scale and indiscriminate lethal "wild dog" control measures should not be employed, especially the widespread use of leghold traps, nooses and the aerial broadcasting of non-specific and highly toxic baits, because such methods are unnecessarily cruel and cause substantial losses of non-target species.

1.10 Funds for Research

Federal and State funds should be provided for the development of non-lethal control measures and for general research into the dingo's habits, lifecycle and interactions with other species.

2. Supporting Statement

2.1 Classification as protected wildlife

The dingo is a distinct subspecies of the genus *Canis* and is recognised by the scientific name *Canis familiaris dingo* (1).

Dingoes are a unique component of Australia's fauna introduced by Aborigines about 4,000 years ago (2) and their distribution in the wild is confined to mainland Australia.

Commonwealth Wildlife Protection Legislation clearly defines the dingo as a native wildlife species, but its status under State and Territory legislation is variable.

The Australian Conservation Foundation wishes to see dingoes managed within the spirit of the Commonwealth's Wildlife Protection Legislation as a protected animal and an integral component of Australia's wildlife heritage.

2.2 No killing without proper justification

Although the individual State and Territory wildlife protection Acts differ, once a species has the status of protected wildlife, individuals can only be killed under permit and with proper justification.

2.3 Removal from noxious animal, pest and vermin lists

The Australian Conservation Foundation is concerned that in most States/ Territories, the dingo is classified as a noxious animal, pest or vermin species and that this status requires its destruction.

2.4 Elimination of bonus and bounty systems

The existence of bonus and bounty systems for dingo destruction causes excessive killing, often well away from agricultural land.

2.5 Conservation management plans to be developed

The inclusion of dingoes on noxious animal, pest and vermin lists, and the existence of bonus or bounty systems means that dingo management plan objectives are for control and extermination, not conservation of a unique wildlife species.

2.6 Management to minimise problems of hybridisation

Dingoes are not reproductively isolated from domestic dogs (*Canis familiaris familiaris*) and they hybridise with feral domestic dogs in the wild (3,4).

2.7 Forest and National Parks required for survival of pure dingo populations

(a) High Intensity Agricultural Areas

Hybridisation presents an acute dingo conservation problem in the intensive agricultural areas (High Rainfall and Wheat/Sheep Zones [5] of mainland Australia where dingo populations are very restricted and domestic dog populations are dense [4]).

Large tracts of forest and national park are vital for dingo conservation in such areas and they must be adequate to guarantee survival of viable populations (4).

Pure dingoes are not significant predators of domestic stock in the high intensity agricultural areas, but feral domestic dogs do cause significant “wild dog” problems.

(b) Low Intensity Agricultural Areas
Hybridisation is less of a problem in the low intensity agricultural areas (Sheep/Pastoral and Cattle/Extensive Zones [5]), however stock losses to dingoes can be significant in some locations (4).

2.8 Development of non-lethal control measures

In many cases conflicts between wildlife and human interests can be overcome with careful planning of land-use and non-lethal control systems; wherever possible these should be developed and employed.

2.9 Broad-scale and indiscriminate control measures not to be employed

In accordance with the status of dingoes as noxious animal, pest and vermin species and in conjunction with bonus and bounty systems, broad-scale and indiscriminate lethal control methods have often been employed against dingoes and feral domestic dogs.

2.10 Funds for Research

In order to obtain essential objective data on the biology of dingoes and on their impact on ecosystems, it is vital that continuing research programs are developed and adequately funded.”

“Genetic variation in the Australian dingo”

This heading is the name of the web reference found on 4 March 2001 by typing in “dingo Alan Wilton”. The first paragraph begins as follows: “The dingo is in danger of extinction in the wild. Hybridisation with domestic dogs is common. Hybrids are difficult to physically distinguish from pure dingoes. Conservation groups have begun breeding programs to preserve the dingo. The purity of their breeding stock is unknown. The DNA tests developed in this project will be used to identify pure dingoes”. No doubt this research will be pivotal in the decision-making process of the Scientific Committee under the *Threatened Species Conservation Act 1995*.

Conclusion

The dingo, from the scientific (genetic) analysis presented by Wilton, is a species threatened by hybridisation – a threatening process long recognised as affecting dingoes (see Corbett). This process raises a number of questions which, from a conservation perspective, are novel to consider in NSW since the overwhelming threat for most species is habitat loss, followed by feral pests and historical shooting for trade or as native pests. The questions focus on the practical side of the matter. At one extreme,

hybridisation may now be complete and no genuinely pure dingo remains, i.e. the dingo is extinct. At another extreme, hybridisation may have stopped or slowed down dramatically leaving populations in areas with pure or near pure dingoes that are surviving because they never have been of rural concern or because existing wild dog management practices have minimised the inflow of domestic dog genes. Surveys now underway suggest that there may be a number of such dingo populations extant in NSW in the large tracts of forested land, or even on some parts of the coast. This work is yet to be completed and interpreted. However, the weight of evidence to date suggests that through most of its former distribution in NSW the dingo no longer exists – it has been lost to hybridisation - and wild dog is the best definition and no conservation action can retrieve a dingo population. However, there do appear to be wild populations of dingoes that correspond to the management areas defined in the recently negotiated interdepartmental agreement, as outlined in the appendix to the Parliament of NSW (2000) report. If hybridisation is continuing – the Wilton thesis – then these populations may constitute endangered populations under the *Threatened species Conservation Act 1995*. Even if the hybridisation process is slow in such populations, it does appear to be inexorable. Corbett's Kakadu example is just one case. The conclusion that seems most consistent with the scientific information is that it is not feasible to consider the dingo as a threatened species because it no longer exists through most of the State, but that a reasonable case could be made for a series of endangered populations.

The dingo is a pest species, as are dingo hybrids and any wild dogs. Wild dogs cannot be distinguished from pure dingoes other than by individual genetic testing, which cannot be done in the field in a practical way, and certainly not from a distance. Consequently, it is currently impossible to manage individuals, but it is possible to manage populations, such as those in remote locations in large reserve systems, and to control wild dogs in paddocks and in refuge buffers adjacent to rural land. Legislative, regulatory and management practices are now converging on the need to reflect the current status of dingoes as a species threatened by hybridisation and the capacity to manage their populations in the landscape with its current configuration of reserves and rural properties.

A determination that the dingo is a threatened species would be consistent with the evidence in that it has disappeared from most of its range in NSW and the remaining populations are under threat. However, the practical implications of such a decision would be to never kill any wild dog because it might be a dingo, or obtain a license to kill any wild dog as threatened fauna. It does seem to be a strange way to approach the problem, with each Rural Lands Protection Board seeking a licence from the National Parks and Wildlife Service to kill threatened fauna, especially as it is evident that the dogs concerned are not likely to genetically qualify as dingoes. It does seem more realistic to consider dingoes to be surviving as a series of endangered populations surrounded by wild dogs. If a decision were taken by the Scientific Committee to list the dingo, that appears to be the most logical course on current information. Further, such a decision would have practical support in that it appears to be feasible on the ground in NSW as has been demonstrated in the recent interdepartmental submission in the report to the Parliament of NSW (2000).

It has been already noted that the Review Committee reflected on the irony of this position (Parliament of NSW 2000): "It is however anomalous that the main NSW initiative to conserve the purity of the existing dingo populations is being taken under an Act that will classify them, statewide, as a pest requiring eradication." Yet it may well be the novel solution to a novel problem. Indeed, Eric Davis and Andrew Leys presented a paper on this matter at the 12th Australian Vertebrate Pest Conference in Melbourne in May 2001. It reflects their endeavour to reconcile wild dog control and dingo conservation under NSW legislation. In one sense it is a response to the emphasis that appears in this paper; it was prepared as they critically read a draft of 'the last howl'. The paper by Davis and Leys is printed here as the last paper in this symposium. It does not differ in conservation content to 'the last howl', but it does differ in its stress on the need to reconcile antagonistic viewpoints and mesh legislation that may clash if not dealt with intelligently in the light of what is achievable on the land. Their efforts were conducted against the backdrop of a nomination to list the dingo as a threatened species and the broad conservation and agricultural protection implications this would produce. They did not have the option of considering discrete endangered populations as an alternative, and much less discordant way of reconciling these antagonistic viewpoints. It is instructive to note that their approach appears to accommodate the latter option.

One can hardly do better in concluding than to repeat the introduction to Alan Newsome's paper in this symposium. It reflects a lifetime of work on this very matter: "I wish to begin with some succinct statements: 1. Dingoes and sheep do not mix; 2. The presence or absence of dingoes basically determines whether cattle or sheep are run throughout Australia; 3. Dingoes, however, help control vertebrate pest species (kangaroos, emus, rabbits, foxes and feral pigs)...; and 4. There are no simple answers, and sometimes no easy compromises between the two imperatives, to eradicate and to conserve".

This can cause a paralysis in the decision-making process for land and wildlife managers, so the emphasis in this paper has been to acknowledge the scientific evidence that suggests the dingo is threatened by genetic hybridisation, and to examine the management options. The widespread debate, the carefully negotiated package by the major land management agencies in NSW, and the range and depth of opinion in this symposium confirm Newsome's conclusion and point to where that difficult compromise can be reached.

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References

(other than the papers and question and answer session contributors appearing in this symposium publication).

Anon. 1996. *Fox Threat Abatement Plan* (Fox TAP). Commonwealth of Australia, Canberra.

Chisholm, A.H. 1964. *Land of Wonder. The Best Australian Nature Writing*. Angus and Robertson, Sydney.

Coman, B.J. 1995. *Fox Vulpes vulpes*. Pp 698-9 in *The Mammals of Australia* ed by R. Strahan. Reed Books, Chatswood.

Corbett, L. 1995a. Dingoes: expatriate wolves or native dogs? *Nature Australia* 25(3): 46-55.

Corbett, L. 1995b. *The Dingo in Australia and Asia*. University of New South Wales Press, Sydney.

Fleming, P., Corbett, L., Harden, R. and Thomson, P. 2001. *Managing the Impacts of Dingoes and other Wild Dogs*. Bureau of Rural Sciences, Canberra.

Glen, A.S. and Short, J. 2000. The control of dingoes in New South Wales in the period 1883-1930 and its likely impact on their distribution and abundance. *Australian Zoologist* 31: 432-42.

Gould, J. 1863. *The Mammals of Australia*. Facsimile edn, 1976, with modern commentaries by J. Dixon. Macmillan Co. of Australia, South Melbourne.

Lunney, D., Curtin, A., Ayers, D., Cogger, H.G., Dickman, C.R., Maitz, W., Law, B. and Fisher, D. 2000. "The threatened and non-threatened native vertebrate fauna of New South Wales: status and ecological attributes." Pp 1-132. *Environmental and Heritage Monograph Series No. 4*. NSW NPWS, Hurstville.

Mahon, P.S. 2001. Draft NSW Threat Abatement Plan: Predation by the Red Fox (*Vulpes vulpes*). NSW NPWS, Hurstville.

NSW NPWS. 2000. Annual Report. NSW NPWS, Hurstville.

Parliament of NSW. 2000. *Report on Regulatory Control Relating to Dingoes. Regulation Review Committee*. Parliament of NSW, Report No 12/52, October 2000.

Strahan, R. 1987. *What Mammal is that?* Angus and Robertson, North Ryde.

Strahan, R. (ed.) 1995. *The Mammals of Australia*. Reed Books, Chatswood.

Troughton, E. 1962. *Furred Animals of Australia*. Angus and Robertson, Sydney.

Vila, C. and Wayne, R.K. 1999. Hybridisation between wolves and dogs. *Conservation Biology* 13: 195-8.

Wayne, R.K., Geffen, E., Girman, D.J., Koepfli, K.P., Lau, L.M. and Marshall, C.R. 1997. Molecular systematics of the Canidae. *Systematic Biology* 46: 622-53.

Wilkes, G.A. 1978. *A Dictionary of Australian Colloquialisms*. Sydney University Press, University of Sydney.

Wright, S. 1968. *The Way of the Dingo*. Angus and Robertson, Sydney.

Lead-in 1. What is the difference between Employment Law and Contract Law? 2. Lawyers are usually involved at the formation stage of a contract, which includes advising, drafting and negotiating. How could you describe all steps of the formation of a contract? 3. Name all clauses of a contract in your jurisdiction. Part I. Nature of contracts. Importance of Contract Law. Contract law is a body of rules governing the formation, performance, and enforcement of contracts. Its major purpose is to protect the reasonable expectations of individuals, businesses, and governments that contracts will be "To Kill a Mockingbird" is her first novel and after being published it was highly acclaimed and even was awarded the Pulitzer Prize in 1961, one of the most important awards in literature. The book became an international bestseller and was adapted into screen in 1962. The events of the novel "To Kill a Mockingbird" take place during a difficult time in the South in 1935. At that time black people were treated as people of lower level than white ones. Racial Discrimination was running high in the South as a whole, especially in Alabama. The main problem raised by the author is a problem of ju Several people are dead in northeast Nigeria after Boko Haram militants raided a mostly Christian village and burnt down a church on Christmas Eve. Local sources said at least 11 people had been killed, according to AFP news. Fighters rode into Pemi, in Borno state, on trucks and motorbikes shooting indiscriminately, a local leader told the news agency. Pemi is close to Chibok where 200 schoolgirls were kidnapped in 2014. Boko Haram have carried out a number of attacks in northern Nigeria where they are fighting to overthrow the government and create an Islamic state. They promote a version of 10. Chemicals used to kill unwanted animals and plants may be collected by rainwater runoff and carried into streams, especially if these substances are applied too lavishly. 11. Environmental engineers develop solutions to environmental problems using the principles of biology and chemistry. 12. Environmental engineers conduct research on the environmental impact of proposed construction projects, analyze scientific data, and perform quality-control checks. 25. Explain in Russian the meaning of the following word combinationÂ Negative ecological and economic factors are among the causes of the worsening demographic situation in Russia. Life expectancy has reached impermissibly low levels: 57 years for men, and 70 years for women. The commentary should incorporate, or could be followed by or complemented with, case study materials that derive from real-life instances of ethical dilemmas or tensions. The case study materials could be ethically analysed in either sanitized (i.e., anonymous) form, or can be made to reflect the parties involved (of course, only with the approval of the parties for their names to be included) (for example, Soskolne 1991). The objective behind case studies is not to seek retribution, but rather to provide examples for teaching purposes.Â The development of a code by any profession has almost invariably tended to be driven by issues having a direct bearing on that profession. Consequently, codes tend to have a focus narrowly defined by each profession's own concerns.