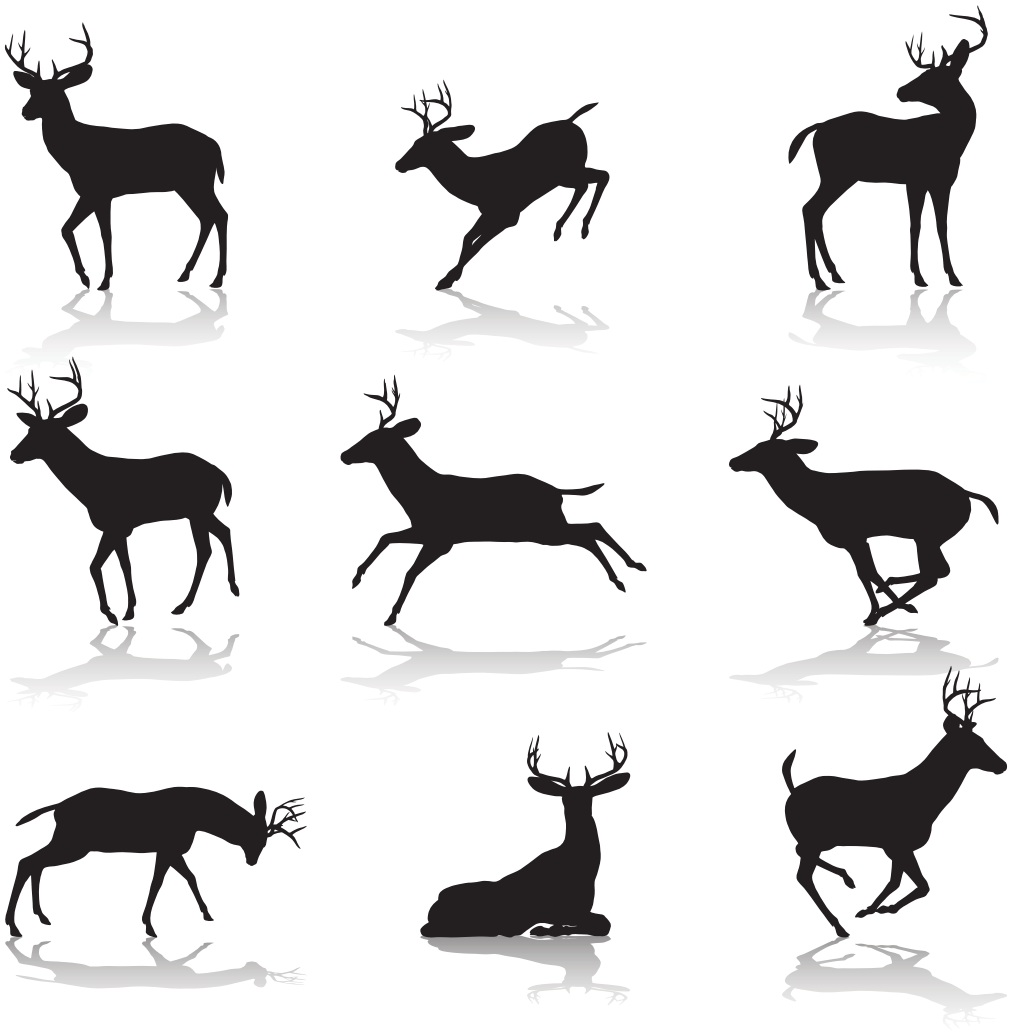
A DEER MISTAKE



The Victorian Government's Proposal to Promote Recreational Deer Hunting on Farms

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Invasive Species Council
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The Invasive Species Council is a national NGO that campaigns for better legislation, policy and action on invasive species that harm the environment. Along with habitat loss and climate change, invasive plants, animals and pathogens constitute one of the three greatest threats to Australian biodiversity. For further information or to join ISC, go to www.invasives.org.au.

Contents

Summary

The Victorian Government is inviting expressions of interest from landholders to participate in a scheme to facilitate recreational hunting of duck, quail and deer on private properties. Landholders would receive direct or in-kind payments from hunters and access to government incentives and subsidies to improve habitat and hunting conditions.

The Invasive Species Council has conducted a preliminary assessment of this proposal, focusing on deer hunting, and concludes that it would be environmentally damaging. This is despite the Department of Sustainability and Environment claiming that the primary aim of the scheme is environmental and that it will result in improved outcomes for biodiversity conservation. We question the sincerity of the Department in claiming that the scheme is for biodiversity conservation and suggest that the real agenda is to benefit hunters.

Feral deer are a serious and growing environmental problem in Victoria and other states, recognised by the Victorian government listing of Sambar as a threatening process and the New South Wales government listing of feral deer as a key threatening process. To protect vulnerable plant species, vegetation communities and faunal habitats, it is vital to protect them from deer grazing, browsing, trampling and other degrading impacts. This can be achieved only by eradicating deer where feasible and by control and containment in other areas to prevent and minimise damage.

We draw on previous studies to show that recreational hunting is of very limited value in controlling deer. Recreational hunters remove too few animals, focus on easily accessible areas, target male deer, and are limited by regulations designed to protect deer as a hunting resource.

Moreover, hunters are mostly motivated not to limit deer populations but to expand and increase them to make hunting easier and to increase hunting options. Most of the recent substantial increase in the number of feral deer herds in Australia has probably occurred due to hunters illegally translocating deer to new areas.

By providing incentives to landholders to facilitate recreational deer hunting the government will sponsor further increases in deer numbers and the creation of new populations on private properties. The scheme is likely to expand feral populations as deer spill out from participant properties and seek to escape hunting.

The scheme will make it politically and logistically harder to control deer populations for conservation reasons because it will create a larger constituency as well as a stronger financial basis for the deer hunting lobby.

Biodiversity will be much better served by ensuring protection of remnant vegetation threatened by deer populations (on and off private properties) than by creating more habitat for more deer.

The Victorian Government has so far failed in its obligations to protect Victoria's biodiversity where it is threatened by increasing numbers of deer. The Invasive Species Council urges that the scheme to foster recreational deer hunting on private properties be abandoned, and that the government focus shifts to (a) assessing deer populations and the harm they are causing to biodiversity and (b) implementing effective control programs to eradicate and reduce feral deer populations to limit harm to biodiversity. Feral deer should be treated as an environmental threat rather than protected as a hunting resource, and the protection of deer as wildlife should be rescinded.

Victorian government proposal to promote recreational deer hunting

chapter 1

On 19 November 2008 the Victorian Department of Sustainability and Environment (DSE) advertised for expressions of interest from landholders to participate in a "property based game management" program to foster recreational hunting of duck, quail and deer on private properties. The aims of the project were stated as:

- To increase biodiversity across the Victorian landscape
- To provide opportunity for the Victorian farming community to manage game species on their properties for reward
- To increase the hunting opportunities for licensed game hunters

There are no details available about the proposed program and how these aims will be met. At this stage, ISC has been told that the government is calling for expressions of interest, and the details will be worked out once landholder interest has been gauged.

The DSE has not (yet) responded to ISC's requests to provide information to substantiate the claimed biodiversity justifications for the proposal. The most that could be found in publicly available information came from the Victorian Government's recently released *Draft Hog Deer Management Strategy* (DSE 2008b), whose guiding principle is the maintenance of a "viable population [of Hog Deer] consistent with habitat and livelihood protection" and whose objectives include (see Box 1 for all objectives):

> Encourage partnerships between landowners and hunters to provide for quality Hog Deer hunting on private property, economic incentives for wildlife conservation, assistance with reducing impacts of Hog Deer on agriculture and improved relationships between landowners and hunters.

The relationship is to be developed through property-based game management (PBGM) plans, which are:

> property-specific, written documents outlining how game species will be managed on an individual property or group of properties. PBGM plans are a non-binding partnership arrangement between landowners and hunters designed to deliver benefits to both parties.

Box 1: Objectives of Draft Hog Deer Management Strategy

- **Maintain ecologically sustainable Hog Deer populations in Victoria.**
- **Ensure that management strategies provide for the sustainable annual harvest determined by the priorities of individual site plans.**
- **Promote and provide for diverse, quality recreational opportunities and experiences on public and, where possible, private land.**
- **Minimise impacts and enhance biodiversity values where Hog Deer occur.**
- **Encourage partnerships between landowners and hunters to provide for quality Hog Deer hunting on private property, economic incentives for wildlife conservation, assistance with reducing impacts of Hog Deer on agriculture and improved relationships between landowners and hunters.**
- **Foster and strengthen relationships between hunters, public and private land managers and the broader community for mutually beneficial outcomes.**

The DSE claims in the draft strategy that this "may" result in broader biodiversity benefits by increasing habitat for Hog Deer, for example "by increasing native vegetation for animal cover and re-establishing wetlands to facilitate preferred feeding opportunities" (DSE 2008b). But there is no substantiation of the claimed biodiversity benefits other than the citing of the apparent conservation benefits of the Para Park Cooperative Game Reserve on Sunday Island, established by deer hunters in 1965.

In a newspaper story about the recreational hunting scheme the biodiversity policy director of the DSE, Dr Paul Smith, was cited as saying that its primary aim was to help the environment by removing pest animals and improving habitats (Ker 2008). As an environmental NGO advocating reforms to better protect Australian biodiversity from invasive animals such as deer, the Invasive Species Council (ISC) is keen to support initiatives that reduce environmental damage caused by invasive species conserve biodiversity. However, given previous failures of recreational hunting

Box 2: A note on animal welfare

So far, most of the public commentary on the DSE recreational deer hunting scheme has been about its adverse impacts on animal welfare (eg. Ker 2008, 2008a). Although this report is focused on environmental issues, the author shares the welfare concerns already voiced.

Protecting Australia's biodiversity against harm from invasive animals often requires killing animals, and there are sometimes conflicts between environmentally justified culling programs and welfare concerns. Proposals to control deer populations have met with opposition for welfare reasons. But even from a welfare perspective deer control is justified because invasive animals cause suffering to other animals through their environmental impacts. Feral deer in Australia destroy the habitats of native animals, depriving them of shelter and food, and deer damage facilitates predation by invasive carnivores.

Animal welfare should be a primary consideration in all programs affecting sentient animals. For this reason, it is important to ensure that culling programs are only carried out when they are justified and will be effective, and by highly skilled personnel. It should be a priority to fund research to improve control methods. Ground shooting has been accepted by the RSPCA as a humane method of controlling large vertebrate animals under defined circumstances, and according to the Standard Operating Procedure for deer (Sharp & Saunders 2004) ground shooting can be humane "when it is carried out by experienced, skilled shooters; the animal can be clearly seen and is within range; and, the correct firearm, ammunition and shot placement is used." Recreational hunting cannot comprehensively provide these conditions. When carried out by skilled shooters, aerial shooting can also be done humanely.

The Invasive Species Council strongly objects to inhumane treatment of feral animals, and also wants to avoid demonising invasive species. Suffering caused by and to invasive animals is one of the many tragic outcomes of invasive species problems that we seek to prevent in advocacy to reduce their damage and to control feral animals using humane methods.

There has been criticism of the language used by invasive species advocates on the grounds that words like 'pest' and 'invasive' promote disrespect and cruelty towards animals that have been mislocated because of human activities. While we are sympathetic to this argument and aware of the power of language to influence attitudes, we use terms in this report that have well understood biological meaning. The term 'invasive' is used as defined by the IUCN (2000) to describe an introduced species "that becomes established in natural or semi-natural ecosystems or habitat, is an agent of change and threatens native biological diversity". The term 'feral animal' is used here to describe animal species that have escaped from domestication or captivity and returned to a wild state. The term 'pest' is mostly avoided, but is used where it is part of a quote.

to do this, it is incumbent upon the DSE to scientifically justify in detail how the program will contribute to conservation.

Here, we provide a preliminary critique of the DSE's claim that the hunting scheme will be beneficial for conservation by reviewing the scientific literature on deer damage and the effects of recreational deer hunting on deer populations. Other groups have criticised the hunting scheme on animal welfare grounds (see Box 2); our focus here is biodiversity. We are concerned mostly about the likely impacts of the scheme on feral deer population levels because unless the scheme contributes to much better control of deer populations – reducing and eradicating populations where they are damaging natural ecosystems – it is highly unlikely to lead to net biodiversity benefits. The sparse information provided about the claimed biodiversity benefits has focused on the benefits of creating better habitat for deer, which implies that the scheme will result in larger deer populations. While some native species may benefit from the sorts of habitats that deer prefer (more trees and wetlands are suggested for Hog Deer), the damage caused to remnant vegetation by maintained or increased deer populations is likely to far outweigh benefits produced by creating that habitat.

We refer to the proposed scheme here as the 'recreational deer hunting on private properties' scheme. This more accurately describes it, and distinguishes the deer focus of the scheme from the other targets (duck and quail hunting).

Threats of deer to Victorian biodiversity


Sambar (male)


Red Deer (male)


Hog Deer (fawn)


Fallow Deer (male)

Figure 1 Deer species feral in Victoria.

2.1 Population and legal status of feral deer

More than 200 wild deer herds of six different exotic species occur in Australia: Fallow Deer (*Dama dama*), Red Deer (*Cervus elephus*), Sambar (*Cervus unicolor*), Chital (*Axis axis*), Rusa (*Cervus timorensis*), and Hog Deer (*Axis porcinus*) (Moriarty 2004) (see Figure 1). They originated as deliberate introductions by 19th century acclimatisers (7% of herds identified in 2000), escapes and releases from deer farms (35%) and illegal translocations (probably mainly by hunters) (58%). About one-quarter of the feral deer herds and at least four species occur in Victoria.[1] NSW has 44% of herds, Queensland 15%, South Australia 11% and the other states each less than 10% (ibid). In Victoria feral deer occur mainly in coastal areas and along the Great Dividing Range, and they occupy many conservation reserves, as well as state forests and private properties (DSE 2008; Bilney pers. comm.).[2]

As no census has ever been conducted, the total number of feral deer in Victoria and Australia is unknown. In 2000 it was estimated (based on information from government land managers) that there were 200,000 feral deer in Australia (Moriarty 2004), but this is probably a considerable underestimate. A modelled estimate of Sambar numbers in Victoria alone (based on the estimation of Sambar densities[3] by experts and potential habitat) was 43,000 to 1 million deer (Ray and Burgman 2006). However, it is widely agreed that the number of feral deer is escalating due to the expansion of some existing herds and new releases and translocations (Moriarty 2004; Norris et al 2005; NSW DEC 2005; West & Saunders 2007, Low 2008).[4] Sambar, Hog Deer and Red Deer are the most populous species in Victoria (Moriarty 2004).

All feral deer species in Victoria are classified as 'protected wildlife' under the *Wildlife Act 1975*. This means they are managed not as harmful invasive species, but to conserve "ecologically sustainable" populations. They are also declared 'game' species, and can be killed under licence, limited by regulations designed to conserve populations. Hog Deer, with the most restrictive regulations, can be legally hunted only during an 'open season' in April, and hunters are limited to one stag and one hind (DSE 2008c).

2.2 Environmental threats of feral deer

In his classic book about feral animals in Australia, *They All Ran Wild*, Rolls (1969) claimed that "Deer have done no noticeable harm to Australia". We now know this to be untrue, that deer can wreak as much environmental harm as feral goats or pigs. But Australians have been slow to recognise

Footnotes:

1. Moriarty (2004) shows six species occurring in Victoria, but it is thought that Rusa and Chital no longer occur in the state.

2. Conservation reserves inhabited by feral deer include the Grampians National Park (Red Deer), Alpine National Park, Snowy River National Park, Mitchell River National Park, Errinundra National Park, Coopracambra National Park, Lind National Park, Alfred National Park, Croajingolong National Park, Lake Eildon National Park, Yarra Ranges National Park, Mount Buffalo National Park, Kinglake National Park, Baw Baw National Park (and all of Melbourne's water catchment) (Sambar Deer), Wilsons Promontory National Park and Corner Inlet Marine Reserve Gippsland Lakes Coastal Reserve, The Lakes National Park and Croajingolong National Park (Hog Deer), Otways State Forest. Deer also inhabit other state parks, state forest, wilderness areas and conservation reserves in eastern coastal Victoria (DSE 2008; Bilney pers. comm.).

3. The density estimate used was 1–7.5 Sambar/km2, which is within the density range found in the Sambar's native range.

4. West and Saunders (2007) in a survey of feral animals in NSW and ACT reported 30 new locations for feral deer between 2002 and 2004/05 (based mostly on incidental sightings), equating to an increase in total range by over 8000 km2. Areas classified as high density for deer had increased "substantially" since 2002.

and respond to the environmental threats of feral deer, mostly because of the strong influence of the hunting lobby and their perpetuation of the benign reputation of deer. There is very little funding available for deer management or research, and the limited scientific documentation of deer impacts has stymied efforts to manage deer for conservation purposes (Moriarty 2004).

New South Wales, Tasmania and Victoria protect deer as a hunting resource, and game management units within governments have also sought to deny or downplay environmental impacts. Hall and Gill (2005) of Tasmania's Game Management Services Unit claimed that it is only "traditional perceptions" of deer as exotic species that "lead people to believe that deer caused damage to agricultural, forestry, and conservation areas." They say that perceptions of deer damage are "often overestimated or wildly exaggerated" because deer are more visible than other species and because people fail to consider the capacity of vegetation for recovery.

But environmental concerns are gaining credibility and prominence as deer increase in number and expand their range, and as more evidence emerges of the damage they do. In recognition of their harm, feral deer have recently been listed as threatening processes in NSW (specifically the herbivory and degradation caused by five feral species) and Victoria (specifically the impact of Sambar on the biodiversity of native vegetation) (NSW DEC 2004; SAC 2007).[5] Low (2008) in *The Mammals of Australia* warns that "deer could be on their way to becoming Australia's next major pest".

A recent international review by Dolman and Wäber (2008) documented examples of dramatic vegetation change, and competition between native and introduced deer, occurring in Europe, South America, North America, and New Zealand:

> [D]eer often have a profound impact on ecosystem structure and act as keystone species in many forest systems. Deer herbivory can determine the structure and composition of forest herb layers, subcanopy and ultimately forest canopies through their impacts on regeneration, generally with an increase in unpalatable species or those resistant to browsing... In turn, this can have cascade effects on biodiversity, including songbird abundance and species composition..., nest predation rates..., the abundance and density of invertebrates..., and the abundance and seed predation activity of small mammals... [Cited references not included.]

A global review by Côté and colleagues (2004) of the impacts of overabundant native deer (in part due to natural predators being eliminated) on vegetation and fauna is also relevant in understanding the impacts of exotic deer populations. They found that deer "can tip forest ecosystems towards alternative states by acting as 'ecosystem engineers' or 'keystone herbivores', greatly affecting the structure and functioning of temperate and boreal forests".

In New Zealand, deer at high densities virtually wipe out the understorey in many forests (Nugent et al. 2001). At lower deer densities, the forests tend to recover structure but the vegetation is much less diverse and dominated by browse-resistant species. Despite most deer populations having been reduced by 75-95%, the regeneration of many deer-preferred plants is failing (with the species surviving in refugia). Subalpine scrub in the Tararua Range failed to regenerate and was converted to tussock grassland.

International reviews have had little to say about Australia. Dolman and Wäber (2008) noted that "Introduced deer are only now emerging as an issue in Australia, with attitudes influenced by economic value for hunting and a lack of evidence of impacts on native vegetation." They were clearly unaware of a paper by Peel, Bilney and Bilney (2005) documenting the impacts of Sambar on rainforest vegetation in East Gippsland in Victoria or the evidence assessed by the Victorian Scientific Advisory Committee of Sambar as a threatening process (SAC 2007).

Peel and colleagues (2005) reported that the effects of browsing by Sambar can be "devastating", especially for rainforest plants during drought. The understorey in heavily browsed areas becomes stunted and is eventually

Footnotes:

5. As a result of the listing of Sambar Deer as a potentially threatening process under Victoria's Flora and Fauna Guarantee Act 1988, a draft Action Statement will be prepared and released for public comment (probably in 2009).

Box 3: Plant species and vegetation communities affected by Sambar Deer in Victoria (SAC 2007) Based on plant status in DSE (2005)

(1) Endangered species: Buff Hazelwood (Symplocos thwaitsii), Maiden's Wattle (Acacia maidenii), and Slender Lignum (Muehlenbeckia gracillima);

(2) Vulnerable species: Shiny Phebalium (Nematolepsis wilsonii), Prickly Tree-fern (Cyathea leichardtiana), Timbertop Wattle (Acacia daviesii), Yellow Elderberry (Sambucus australasica), Black-stemmed Maidenhair (Adiantum formosum) and Creeping Loosestrife (Lysimachia japonica);

(3) Rare species: Yellowwood (Acronychia oblongifolia), Gippsland Hemp Bush (Gynatrix macrophylla), Yellow Milk-vine (Marsdenia flavescens) and Sandfly Zieria (Zieria smithii).

(4) Vegetation communities listed under the FFG Act: Warm Temperate Rainforest (East Gippsland Alluvial Terraces Community, Warm Temperate Rainforest (Coastal East Gippsland) Community, Warm Temperate Rainforest (Far East Gippsland) Community, Alpine Bog Community, Fen (Bog Pool) Community;

(5) Other vegetation communities: Littoral Rainforest [now listed under the EPBC Act], Riparian Shrubland, Riparian Forest, Estuarine Wetland, Sand Sheet Grassland, Salt Marsh and Swamp Scrub.

eliminated. Antler rubbing is also a serious threat to some rainforest plants, including the endangered Buff Hazelwood (*Symplocos thwaitsii*) and the threatened Yellowwood (*Acronychia oblongifolia*). Probably the most severe impact is the loss of regenerating plants due to the destruction of regeneration refuges (eg. thickets of thorny and stinging species) that protect palatable plants from browsing animals. Sambar damage has caused contraction of native plant communities in some areas and their replacement by weed-dominated grasslands or by bare ground. Regeneration is failing in many rainforest stands, and major tracts of rainforest may be lost (Peel et al 2005). Victoria's Scientific Advisory Committee listed 13 rare or threatened plant species significantly threatened by Sambar and five listed (threatened) ecological communities affected by Sambar (SAC 2007) (See Box 3). Another ecological community browsed by Sambar, Littoral Rainforest, has been listed as nationally threatened under the Environmental Protection and Biodiversity Conservation Act.

Native animal populations are affected by loss of habitat, and also by increased predation due to Sambar trails creating easy access for feral predators (Peel et al. 2005). And some predators are also benefiting from the several hundred tonnes of Sambar remains left each year in forests (when the hunters are interested only in antler trophies), which elevates their population, creating more problems for small


Antler rubbing of Yellowwood.


Failed gap regeneration and loss of Litteral Rainforest.


Muttonwood heavily browsed by Sambar in Dry Rainforest.


Damage to Muttonwood by Sambar browsing in Mitchell River National Park.


A Sambar rutting area in Alluvial Terraces Warm Temperate Rainforest at Lake Tyers.


A Sambar wallow in Salt Marsh at Lake Tyers.

Figure 2: Environmental damage caused by Sambar.

Photos courtesy Rohan Bilney

mammal species. Peel and colleagues concluded that even at current population levels, Sambar are disrupting and destroying many ecological processes in forests, and the situation could get much worse as they spread further and increase in number. See Figure 2 for photos of environmental damage caused by Sambar.

Browsing and antler-rubbing by Hog Deer also cause “severe damage” in natural rainforest and on rainforest restoration sites. Regeneration of their preferred species (such as Black Wattle, Varnish Wattle, Blackwood, Kangaroo Apple and Yellowwood) is being prevented, resulting in “the alteration of plant community composition and structure” in some areas (Bilney & Bilney 2008). Hog Deer also graze on a wide variety of plants, including in freshwater marsh communities (DSE 2008b), which are sensitive to trampling and disturbance.

The NSW Scientific Committee in their assessment of feral deer as a key threatening process found that several plant species and communities were at risk: nine threatened plant species or populations are known to be eaten by deer and another 14 species could become threatened, and the composition and structure of six endangered ecological communities and habitats of two threatened animal species could be altered by grazing, trampling and degradation (NSW DEC 2004). The Committee noted that the impacts of deer in conservation reserves include “overgrazing, browsing, trampling, ring-barking, antler rubbing, dispersal of weeds ..., creation of trails, concentration of nutrients, exposing soils to erosion/accelerating erosion, and the subsequent degradation of water quality in creek and river systems” (NSW DEC 2004). In Royal National Park there are fewer understorey plant species in areas with high deer density than in areas with low deer density: 54% fewer in Littoral Rainforest, for example (NSW DEC 2005).

An analysis of feral animal distribution and abundance across NSW and the ACT identified feral deer in NSW as the most serious emerging invasive problem (West & Saunders 2007). The same can be said of Victoria, where population densities of deer are much higher.

Deer control and recreational hunting

3.1 Does recreational hunting contribute to effective control of invasive deer?

There have been many assertions by hunting groups that recreational hunting effectively contributes to the control of feral animals (which are used to justify the opening up of state forests and national parks to recreational hunting). The Australian Deer Association claims that hunting is a legitimate and "the most effective" method of controlling populations according to pre-determined requirements (ADA 2006). But the evidence mostly suggests otherwise. In a recent review of methods for 'controlling' wallaby and pademelon populations in Tasmania for crop protection, Coleman and colleagues (2006) commented that recreational shooting "has never been seen as an adequate control tool in [Australia and New Zealand] for most vertebrate pest species." Most successful control programs using shooters have been achieved by professional shooters working in intensive campaigns (Orueta & Aranda 1998, citing various studies). The most effective control of deer in Australia and New Zealand has been achieved using aerial shooters (as documented in sections 3.1.2) At best, recreational hunting may effectively reduce deer populations in localised areas (eg. de la Cretaz & Kelty 2002) or provide an adjunct to more targeted control programs, but the efficacy of this approach in Australia has not been assessed (Coleman et al 2006).

One of the great fallacies of many control programs is that virtually any killing of feral animals is environmentally beneficial because it leads to a reduced population — "a good pest is a dead pest" mentality. The Australian Deer Association articulates this view when they claim (wrongly) that conservationists generally support them "because in their eyes we are removing an introduced animal from the Australian bush" (ADA 2008). This sort of thinking has justified numerous bounty programs. However, the repeated failure of these programs provides the main evidence contesting the idea that any killing of feral animals will necessarily help control populations and provide environmental benefits.

3.1.1 Bounties

Bounty schemes provide an economic incentive for hunters to target designated pest animals, and to increase hunting pressure on the target species well above that motivated by recreational pleasures alone (Hassall & Associates 1998). However, bounties and other subsidies have been mostly ineffective in reducing the damage caused by feral animals (Hassall & Associates 1998; Commonwealth of Australia 2007; Wilson 2008).[6] In fact, they have often proved counterproductive (Hassall & Associates 1998).

The trial fox bounty in Victoria in 2002-03 delivered more than 170,000 dead foxes, but was judged a failure and discontinued. An assessment by Fairbridge and Marks (2005, cited in Coleman et al. 2006) found that the killing of foxes was geographically clustered, and fox abundance was reduced in less than 4% of the state. There was anecdotal evidence that the scheme was abused (with foxes from interstate presented for payment) and that shooters deliberately left residual populations to secure future income. Similarly, a pig bounty run by Queensland Sugar Research Stations failed, probably eliminating less than 5% of the local population and with over half the payments thought to have gone for pigs outside the bounty area (Hassall & Associates 1998).

The fact that bounty schemes almost always fail is strong evidence that recreational hunting has little to contribute to feral animal control, because the hunting pressure without financial reward is likely to be considerably less than when incentives are offered. The arguments regularly advanced in favour of recreational hunting for control of feral animals are similar to those advanced for bounty schemes, relying on the fallacious equation that killing feral animals equals population reduction / control, which equals environmental benefit. Hunting is ineffectual in reducing wild animal populations when the death rate is lower than the replacement rate. The large animals killed by recreational hunters are soon replaced by

Footnotes:

6. Hassall & Associates (1998) say that the only successful bounty schemes have been those directed to animals widely disliked; for example, wildcats in Pennsylvania, wolves in areas of Russia and the coypu in Eastern England. Bloomfield (2005) notes that the bounty for thylacines in Tasmania was probably successful, but the species was probably already in decline.

younger animals that might otherwise not have survived. Various assessments have found that bounty schemes may reduce target populations by 2-10%, which is rarely sufficient to reduce populations. For some invasive species, up to 50% of the population must be culled to each year just to maintain the status quo (Bloomfield 2005). As Bloomfield says, bounties "are an example of powerful self-interest defeating reason".

3.1.2 Deer control

Australia: Feral deer are generally not well managed (or managed at all) in Australia, particularly where they are fully or partially protected under legislation as a recreational hunting resource (in Victoria, NSW and Tasmania). In Victoria, DSE are not conducting any control programs. In NSW, the limited control effort tend to be in response to crop damage (West & Saunders 2007) or focused on some national parks, e.g. the Royal National Park in NSW, where a management plan specifies a program of night shooting by trained shooters to reduce Rusa Deer populations in sensitive areas to a long-term population target (NSW DEC 2005). However, the first program from 2002-2005 was unsuccessful in reducing deer numbers, merely reducing the population increase from 10% per annum to 4%.

In South Australia deer are not protected and there are regulations requiring landowners to eradicate or control deer populations.[7] In response to increasing feral deer numbers, newly established herds (due to translocations and escapes from deer farms) and poor landholder compliance with regulations, the South Australian government has developed a strategy that includes facilitating "voluntary coordinated control programs amongst groups of landholders" and inspecting the fences of deer farms (DWLBC 2005).[8] There are also control programs for areas of conservation importance, including a program to eradicate Fallow Deer from Kangaroo Island (Masters 2006).

The relative ineffectiveness of recreational hunting for population control is demonstrated in the contrasting results of two efforts to reduce deer numbers at the 9,000 ha Gum Lagoon Conservation Park in South Australia. A 2002 trial using 65 recreational hunters in a directed hunt over four days resulted in 44 deer (18 female) shot (Anon 2004; Peacock pers. comm.)[9] The numbers shot were estimated to have been the equivalent of the annual population increase for Fallow Deer and one-third of the annual increase for Red Deer. In contrast, a four-hour helicopter cull in the same area in 2007 using one shooter resulted in 182 deer shot, estimated to be more than 90% of the population (Peacock, pers. comm.).

In Australia, the most effective and publicly acceptable control approach is generally considered to be culling of deer at night using spotlights,[10] focused on areas where large numbers of deer congregate and where the impact is greatest (Sharp & Saunders 2004). The use of 'Judas deer' (deer fitted with radio collars) to improve culling success has been used successfully in New Zealand and may be investigated in South Australia (DWLBC 2005; Masters 2006). Aerial culling has been occasionally used and has been effective, but concerns about animal welfare and public reaction have limited its use (West & Saunders 2007). An assessment of South Australian aerial control of camels reportedly found a high standard of animal welfare outcomes.

New Zealand: There has been much better recognition in New Zealand of the environmental problems caused by feral deer, and deer control is considered crucial to conservation (Nugent et al. 2001). Mostly due to commercial helicopter hunting, most deer populations have been reduced to 75-95% of the peak numbers seen in the mid 1900s) (ibid). Highest densities occur in tall forests where deer are protected from aerial hunters.

There is large-scale recreational deer hunting in NZ, with about 50,000 hunters killing about 54,000 deer each year (Fraser 2000). Deer are

Footnotes:

7. The South Australian deer strategy notes that the protection of deer in other states may cause confusion about the status of deer in South Australia and undermine compliance with legislation requiring deer control (DWLBC 2005).

8. This may include the use of recreational deer hunters or contractors. Where landowners do not participate, deer may be controlled using contractors and cost recovery sought (DWLBC 2005).

9. Hunters were restricted to shooting standing or walking deer for welfare reasons, and used stalking and spotlighting.

10. In Victoria, recreational deer hunters are not permitted to hunt at night.

classed as pests, so there are few restrictions on where they can be hunted or the numbers that can be killed (Nugent & Choquenot 2004). Deer are also hunted commercially (using helicopters) and subject to culling by the Department of Conservation (DOC). The culling is very limited; it occurs on only 1% of DOC land, and is focused on keeping deer out of the top third of the North Island and eradications on a few islands (Briden pers. comm.). Deer populations in the remaining 99% of DOC land are left to recreational and commercial hunters. Recreational hunters have exclusive access to eight Recreational Hunting Areas, covering about 200,000 ha, as well as another 1 million ha closed to commercial hunters.

NZ studies have shown that recreational hunting is of limited effectiveness in controlling deer populations and preventing environmental damage. Most of the recreational effort is concentrated close to access points and fewer than 5% of hunters account for more than half the deer killed (Orueta & Aranda 1998, citing Nugent 1988). Recreational hunters are less efficient than commercial hunters and state-funded hunters in terms of hunting effort per kill, which partly reflects recreational hunters' preference for bucks (Fraser 2000). Females are the reproductive sex and the important one to remove in polygamous species such as deer. An assessment by Nugent and Choquenot (2004) of the relative cost-effectiveness of recreational hunting, commercial hunting and state-funded culling in New Zealand for controlling deer populations found that trying to increase recreational hunting pressure was likely to be effective only where "demand for recreational hunting is high (relative to commercial shooting) and the desired reduction in deer density is relatively small." Where major reductions are required in extensive forest areas, paid ground-based deer cullers are likely to be most effective, and more modest reductions may be best achieved by supporting commercial helicopter operations. Fraser (2000) similarly concluded that recreational hunting could be effective where forest regeneration requires only a moderate reduction in deer numbers, and is best suited for small areas with good access and close to population centres with few other hunting opportunities.

United States: The White-tailed Deer (*Odocoileus virginianus*) is native to the USA, but with the elimination of natural predators and vegetation changes it has become a major environmental and economic problem due to overabundant populations (Côté et al. 2004).[11] Recreational hunting has been the major method of population control. Some affluent neighbourhoods employ nocturnal sharpshooters and there have been experiments with birth control, but they are expensive (ibid). Directed hunting has been used to effectively reduce deer populations in localised areas such as conservation reserves to protect habitat (eg. de la Cretaz & Kelty 2002; RBNC 2008).[12] However, for a variety of reasons recreational shooting has not been effective over broad areas (Côté et al. 2004). Hunting cannot take place on many private properties, in remote locations, and in urban and suburban areas. In contrast to natural predators, hunters don't focus on young animals and don't hunt year round. Hunters have been reluctant to allow more hunting of does and fawns, or to reduce deer populations, and the agencies that manage deer have different goals and operate under different paradigms from the agencies that manage vegetation. Côté and colleagues suggested that "deer may have surpassed the point where sport hunting can reliably control their numbers", and they concluded that even where there is agreement on the need to control deer, there is little consensus on how to achieve it.

Europe: With the elimination of natural deer predators and vegetation changes, there are also problems with overabundant native and introduced deer in parts of western Europe. In the Scottish Highlands, for example, Red Deer

Footnotes:

11. Populations were estimated to have risen from no more than half a million in the early 1900s to 24 million in 1996 (Fagerstone & Clay 1997). The goals of control of a native species overlap with, but are somewhat different from those directed at an introduced species: reduction of densities versus eradication, prevention of spread and reduction of densities.

12. Deer densities were reduced from 15-23/km2 to 1-3/km2 in the 21,000 ha Quabbin Reserve to protect vegetation. Hunting was permitted in four years since 1999 in the River Bend Nature Centre to reduce vegetation damage and protect rehabilitation projects.

numbers are higher than at any time in recorded history and are damaging native woodlands and other sensitive nature conservation sites (MacMillan & Leitch 2008). Landowners own the right to hunt, and are resisting conservation advice to reduce deer numbers. Most acknowledge responsibility for environmental caretaking, but their active conservation efforts are directed to game species (ibid).[13] One study by Aranda et al. (1996) found that hunting made no real difference to deer densities, and that deer avoided trails from where hunting was conducted (Orueta pers. comm.).

3.1.3 Other relevant species & situations

Shooting by about 5000 recreational and commercial hunters is the most widely used method to kill pademelons and wallabies in Tasmania to protect plantation trees, crops and pastures (Coleman et al. 2006). But there has been no proper assessment of the effectiveness of shooting. Recreational hunters were judged to be relatively ineffective compared to commercial and contract hunters, particularly in remote or broken country. Coleman and colleagues point out that "recreational hunters are often driven by the need to achieve long-term access to hunting rights rather than a desire to reduce browsing mammals to low levels" and that commercial hunters "are interested in long-term harvesting", both of which are inconsistent with the interests of land managers for crop or pasture protection.

Feral pig and goat hunting are comparable situations in which recreational hunting has limited effectiveness. In a pig control program to protect wetlands in Florida, where sites open to recreational hunting were compared over three years with sites subject to professional culling, recreational shooters in three years removed less than 13% of the pigs removed by targeted culling in two years (Engeman et al. 2007). The difference was attributed to the contrasting objectives of managing a habitat for conservation and managing a game animal.

However, recreational hunters have contributed to feral animal control where they have been part of a program using multiple methods. South Australia has conducted effective goat control in arid land reserves by combining controlled sequential hunts using recreational hunters who have a commitment to conservation with helicopter culls and opportunistic shooting by park rangers (Peacock, pers. comm.). There has been a strong focus on quality control by ensuring that hunters meet shooting standards and obey the rules and directions of departmental staff.[14]

3.1.4 Control thresholds required for conservation and recreational hunting

Côté and colleagues (2004) comment on the conflicting differences in goals and paradigms that exist between the US government agencies managing vegetation and those managing deer as a resource, which prevent effective control of deer populations for conservation. In Australia game management proponents advocate deer management to maintain "sustainable" or "ecologically sustainable" populations or to keep deer densities to within the "carrying capacity" of land. But their notions of acceptable levels of deer are often considerably higher than what is considered necessary to conserve biodiversity, particularly those species and vegetation communities most vulnerable to deer impacts. In New Zealand, for example, although deer populations are now often controlled well within what is considered the "carrying capacity" of the land, they continue to damage native forests and prevent regeneration of preferred browse species (Nugent et al. 2001). It is likely that in most natural environments, the level of deer compatible with conservation goals is below the threshold considered acceptable by most recreational hunters. It is telling that the biodiversity goal proposed in the *Draft Hog Deer Management Strategy* for Victoria is not to *prevent* "the impact of Hog Deer on significant biodiversity values" but to "minimise" this impact (DSE 2008b). Typically, there is no assessment of the conservation thresholds versus hunting thresholds. Fraser (2000) comments that legal

Footnotes:

13. MacMillan and Leitch (2008) found that landholder attitudes towards wildlife tended to be species specific. While there was active conservation of species targeted for hunting, species that preyed on game species were generally classed as vermin, including the Hen-harrier, a threatened raptor.

14. A history of the program can be found at http://www.hunt-cons.asn.au/html/history.html. It involves the Hunting & Conservation branch of the Sporting Shooters Association in South Australia, which formed specifically to achieve conservation control of feral animals. The website says they "have committed to providing our resources to help interested farmers, or organisations in achieving conservation related outcomes..." and activities include "organised culls, collection of research specimens, wildlife surveys, warren destruction, re-vegetation projects, or restoration of historic sites."

provisions underpinning Recreational Hunting Areas in New Zealand require the protection of indigenous (natural) values, but "there has been little, if any, assessment of whether recreational hunting afforded the desired level of protection."

As Fraser (2000) has pointed out for New Zealand, it is convenient, but too simplistic, to assume that reductions in deer density result in proportional reductions in impacts. The least vulnerable species are likely to benefit from some population reduction. But the biomass of seedling foliage produced by deer-preferred species in New Zealand forests is relatively small and highly vulnerable to browsing pressure, so that "the browsing pressure on such species is essentially independent of deer density". Their protection requires almost total removal of deer. The same findings probably apply to many native plant species in Australia, but the research has not been done.

Also in New Zealand, Duncan and colleagues (2006) compared the effectiveness of exclusion fencing, aerial hunting and recreational hunting on the recovery of mountain beech plots in New Zealand. They found (by extrapolation using a simulation model) that when plots were fenced they would obtain an adequate number of stems mostly within 20 years, and for all plots within 40 years. With aerial hunting most plots would need 20-40 years to obtain sufficient stems. But with recreational hunting only, it would take longer than 40 years for all plots, and some plots would take longer than 80 years. Recreational hunting would result in an increase in the amount of open forest, altered ecosystem processes and weed invasion.

3.2 Are the motivations of hunters compatible with conservation outcomes?

Recreational hunting is often promoted as a way of harnessing self-interest to the cause of biodiversity conservation. For example, in South Africa numbers of ground nesting birds in agricultural areas on the west coast have increased by allowing hunting tourists to do wing shooting on farms to the financial benefit of the farmers (Hattingh, pers. comm.). However, deer hunting differs from the typical case of self-interested conservation in that the desired target for protection (deer) is invasive. In this case, under the proposed scheme to assist farmers to improve deer habitat, while native species *may* gain some habitat, the self-interest of deer hunters and deer-protecting landholders is also likely to undermine the conservation strategy that requires reduction and eradication of deer populations.

3.2.1 Hunter goals for deer management

The vision of the Australian Deer Association spells out the problems of relying on recreational deer hunters to control deer populations. The ADA's vision is for deer to be managed across all tenures as a "valuable public resource", and "for the benefit of the deer themselves" (ADA 2006). They want Victoria's Sambar and Hog Deer herds to be "valued, protected and nurtured". With respect to the recreational deer hunting scheme being proposed for private properties, the ADA has been explicit in its advocacy for the scheme that its purpose is to protect deer, not control them for environmental reasons: "The objectives ... are to secure the viability of the district's hog deer population by giving landholders an incentive to produce hog deer on their properties and protect hog deer habitat" (ibid).

There are numerous examples globally where the goals of hunters conflict with those of conservation. In New Zealand, recreational hunters strongly objected to population declines of deer caused by commercial hunting (Fraser 2000). In response, commercial hunting was banned in 10 areas set aside for recreational hunting (which are now eight areas covering 178 000 ha). Diefenbach and colleagues (1997) reported on conflicts in Pennsylvania, USA, between ecological goals to reduce populations of native White-tailed Deer to reduce forest damage and hunting goals to maintain high deer densities. Hunter opposition undermined the capacity to achieve ecological goals, and the authors concluded that hunters "neither understand nor recognise the adverse effects of deer upon forested ecosystems." But efforts to improve understanding have not resulted in reforms (Côté et al. 2004). Waller and Alverson (1997), for example, note that the Wisconsin Wildlife Bureau's program to increase the killing of

female deer was not embraced "because hunters favor a tradition and management they see as contributing to, rather than diminishing, their prospects for hunting success."

There is often a very large difference between deer densities needed to protect the environment and those considered acceptable by many hunters. The largest difference is in circumstances, such as in New Zealand, where the protection of some vulnerable species requires the almost total removal of deer (Fraser 2000). The situation is likely to be the same in Australia.

The exception to the points made here is where hunters are specifically committed to conservation outcomes rather than the maintenance or improvement of hunting opportunities.

3.2.2 Failure to accept that deer cause environmental harm

The Australian Deer Association rejects the description or categorisation of deer as 'pests': "Sambar deer are not a 'pest'" they state (ADA 2008), and the organisation sought unsuccessfully to challenge the listing of Sambar as a threatening process under Victoria's *Flora and Fauna Guarantee Act 1988* through the courts (ADA 2008b).[15] The most the ADA acknowledges is that "some releases of domestic herds of fallow deer are troublesome" (ADA 2008). They assert that deer have "a very low impact on the environment [when compared to the dingo] when the population is managed using deer hunting." This attitude is also evident in government game management units, as exemplified by staff from Tasmania's unit claiming that people only perceive damage and wildly exaggerate it because of "traditional perceptions" that deer are exotic (Hall & Gill 2005). Such attitudes are not conducive to motivating hunters to reduce deer populations to a level that results in environmental benefits.

3.2.3 Hunter preferences

Hunter preferences for particular animals and particular hunting conditions limits their contribution to deer control. Hunters have a strong preference for shooting buck (male) deer for the trophy antlers, and in order not to reduce the reproductive capacity of deer populations (Fraser 2000).[16] NZ hunters "pass up opportunities to shoot fawns and / or hinds in favour of stags ... presumably in an effort to conserve the deer population." Consistent with the NZ situation, the Victorian DSE (2008b) acknowledge the "inherent desire for hunters to harvest stags" and the Tasmanian DPIW (2008) comment that "there is still resistance by some hunters to harvest does."

Recreational hunters also prefer easily accessible locations, which limits their contribution to deer control in environmentally valuable areas away from roads. In a recreational hunting area in New Zealand deer densities were three to four times higher in areas more than 3 km from access points than in areas next to access points (Fraser 2000, citing Nugent 1988). Hunting pressure in accessible areas is likely to push deer into more remote areas, increasing the pressure on environmentally valuable areas (see next section).

3.3 What are the likely effects on total deer pressure?

3.3.1 Factors mitigating against effective control by recreational hunters

Recreational hunters have widely varying abilities and are mostly not efficient hunters (Orueta & Aranda 1998) (in part due to legal restrictions where deer are protected): the average deer hunter in Australia apparently succeeds on only about one of six hunts (ADA 2006), consistent with the 85% failure rate recorded for New Zealand hunters (Orueta & Aranda 1998, citing

Footnotes:

15. In a media release about their unsuccessful legal action, the ADA (2008) stated: "The ADA Constitution obliges us to protect and better the status of deer and to ensure its perpetuity as a free roaming game animal. We had to fight this listing to the very end as it will, in layman's terms at least, categorise deer as a pest."

16. The motivation to shoot only bucks has apparently changed somewhat. Fraser (2000) says the average New Zealand hunter is now less motivated by the trophy and more by the "opportunity to take home some venison and enjoyment of the outdoor experience".

Nugent 1988). In 2007, 180 permits were issued for recreational deer shooting in three conservation areas in Tasmania, but no deer were shot (according to the 22% of returns filed, a legal requirement) (DPIW 2008). In Victoria in 2007, licences to shoot about 1500 Hog Deer (50% each for females and males) were issued, but only 175 were shot according to returns (DSE 2008c). Less than one-quarter of those who actively hunted were successful. The relative ineffectiveness of recreational hunting has been demonstrated where commercial hunting (eg. in New Zealand) or professional culling result in much larger rates of removal, as discussed. For example, in South Australia one helicopter shooter shot more than four times as many deer in four hours as 65 recreational hunters did in four days (182 v 44 deer). The former effort failed to match annual population increase while the latter reduced the population by more than 90%.

Hunting pressure has to be intense and sustained over a sufficiently large area to effectively control deer populations, for deer can reproduce rapidly and build up large populations. Hall and Gill (2005) of the Tasmanian Game Management Services Unit report "high productivity" in wild deer populations, with females reaching sexual maturity at an early age, and reproductive rates in females 2.5 years and over typically attaining 80% or more. In Royal National Park, the rate of increase of Rusa Deer was estimated at 10% (NSW DEC 2005). In the US, the annual increase is as high as 50% (Dizzard 1999). The tendency of recreational hunters to hunt in readily accessible locations (Fraser 2000) does not allow for widespread control, and deer may learn to avoid areas from where hunting is regularly conducted, as was documented in Europe around hunting trails (Orueta, pers. comm.).

Recreational hunters in Victoria (and elsewhere) are subject to regulations designed to protect, not control, deer populations. Hunting methods are restricted (in part to ensure that hunting is challenging), and for some species there are restricted hunting seasons and bag limits.[17]

Under the Standard Operating Procedure for deer control, night hunting is recommended for reasons of effectiveness and humaneness — "to keep stress to a minimum, shooting operations should occur on moonless nights with the aid of spotlights" (Sharp & Saunders 2004) — but it is prohibited under Victorian law for hunting because it makes shooting too easy.

Furthermore, the motivations of most recreational hunters, as discussed in section 3.2, are directed towards maintenance, increase and spread of deer populations, not reduction and containment, and definitely not eradication. Hunters who are motivated for biodiversity conservation purposes seem the exception.

3.3.2 Incentives to expand and spread deer populations

The recreational hunting scheme is promoted as a way for landholders to gain extra income by receiving cash or in-kind payment from hunters, and the DSE also proposes to provide incentives and subsidies. According to Hall and Gill (2005), agreements in Queensland between landholders and deer hunters have yielded farmers an average annual return of $12/ha. The financial return directly rewards hunting values, not environmental values, which are likely to be undermined by the maintenance of deer populations. It may damage environmental values both on and off the relevant property.

Recreational hunters typically prefer to hunt where their prospects of success are highest, which is likely to be where deer densities are highest. In New Zealand, hunters moved to other areas when deer numbers dropped below a certain level (Fraser 2000, citing Nugent & Mawhinney 1987). Landholders participating in the recreational hunting scheme are likely to be motivated to keep deer levels high in order to attract hunters, and perhaps to compete with other farms offering deer hunting.

More than half of the 218 feral deer herds in Australia identified in 2000 appear to have derived

Footnotes:

17. Hog Deer can be hunted for one month and Red Deer for two months a year, while Fallow Deer and Sambar can be hunted year round.

from illegally translocated deer, probably mostly to create more hunting opportunities (Moriarty 2004). There has been a dramatic increase in this practice in recent years,[18] and many deer have been translocated into national parks and state forests. Thirty new locations for feral deer in NSW were observed between 2002 and 2004-05 (West & Saunders 2007), although some reports may be due to greater awareness of deer. In NSW, deer with ear tags from deer farms located far away have been found, suggesting that hunters have bought the deer in one location and seeded them in another (NSW government officer, pers. comm.) Illegal translocations are also occurring with other feral species hunted for recreation. A genetics study in southwest WA found numerous pigs that had been illegally translocated, presumably by hunters (Spencer & Hampton 2005). This illegal movement — supplementing existing and creating new pig populations —is thought to be one of the main reasons for the expansion of pig populations. The recreational hunting scheme is likely to multiply motivations to illegally translocate deer, by creating incentives for farmers or hunters to spread deer to new properties or increase populations.

The scheme is likely to result in deer spread to or population increase in non-participating areas by a spillover effect or from deer escaping hunting pressure on participant properties. In western Queensland, feral goat numbers are "exploding" and undermining control programs in national parks because farmers are protecting them as a commercial meat source. At Currawinya National Park, where $350,000 was spent recently to eradicate 9,000 goats, goats are returning from neighbouring properties where they are being protected to the extent that the program was 'money down the drain" (Roberts 2008). In some circumstances, it is thought that under hunting pressure introduced ungulates disperse into wider areas faster than they otherwise would (Orueta & Aranda 1998, citing Uphan, 1980). There is little information about this dispersal effect of hunting.

In one study of feral pigs, a declining catch rate was thought to be due to pigs moving away from the control area to avoiding the hunting pressure (Nogueira et al. 2007).

3.3.3 Lack of environmental goals and programs

In Victoria the recreational deer hunting scheme is proceeding in the absence of goals and programs for controlling deer populations to prevent environmental damage, which is contrary to best practice for managing feral animal problems (Norris et al. 2005). As noted, the scheme is likely to forestall control programs with vague and unjustified claims that biodiversity is best served by managing deer as a hunting resource. But to protect Victoria's environment from deer it is important to develop programs that explicitly address the priority environmental threats of deer. This is meant to occur with the development of an action plan for Sambar as a result of the listing of this species as a threatening process. But for the reasons already discussed, this action plan is likely to be undermined by hunting considerations.

Evidence to date shows that recreational hunting has mostly been ineffective in control of deer for environmental protection. The Standard Operating Procedure for deer control (Sharp & Saunders 2004) recommends that shooting should only be conducted by skilled operators "as part of a co-ordinated program designed to achieve sustained effective control."

One example of a clearly defined management goal is in the NSW Royal National Park deer management program (DECC 2005). Shooting is conducted by trained and paid shooters (not recreational hunters) and the program targets females (to reduce future population growth) and herds at priority locations where damage is most environmentally significant. The long-term objective is to reduce the number of Rusa Deer to fewer than 1000 animals, which requires the shooting of at least 300 animals a year.

Footnotes:

18. According to Norris et al (2005, citing Jesser), the sale of live deer for stocking new areas has become an important source of revenue for deer farmers.

3.3.4 Threats to conservation management of deer populations

One of the most concerning aspects of the recreational deer hunting scheme is that it is likely to undermine efforts generally (beyond the private properties involved) to control deer for environmental reasons, by building a stronger constituency to protest against and stymie control programs. Already, hunters have proven a powerful anti-environmental lobby to stop deer culling. This has also been the case for control of deer and other species in other countries (Orueta & Aranda 1998; de Garine-Wichatitsky et al. 2006).

Governments are attracted to apparent 'win-win' solutions for environmental problems, where supporting self-interested motivations for use of wildlife also delivers environmental benefits. In the case of feral deer, governments attempt to promote two apparent synergies between the desires of recreational hunters and conservation: (a) by using recreational hunting as a means of controlling problem deer populations and (b) in the case of the scheme being critiqued, by promoting habitat creation for deer that will also provide benefits for some native species. But they neglect to realistically consider the potential long-term ecological and political costs for conservation. Outsourcing deer control to recreational hunters and subsidising habitat restoration for hunting purposes (discussed in section 4) are likely to be ineffective and environmentally adverse. But worse than the direct effects will be the long-term consequences of creating a stronger political, economic and social basis for recreational deer hunting that will even more strongly institutionalise barriers to controlling deer for conservation reasons. This problem is only occasionally acknowledged in strategies for control of feral animals. West and Saunders (2007) in assessing feral animal problems in NSW and ACT comment that recreational hunting "if planned, implemented and regulated very carefully" could be useful for deer management in NSW, but they recognise the potential downside: "caution is required to avoid the possibility of wild deer populations being treated as a sustainable recreational hunting resource." We suggest that where recreational deer hunting is treated as a major component of deer control strategies (for biodiversity conservation) the desire of hunters for a "sustainable" hunting resource will inevitably undermine conservation goals.

chapter 4

Claims about habitat improvement

The main biodiversity claim for the recreational deer hunting scheme appears to be that it will result in improved habitat for Hog Deer and thereby improved habitat for other species. (It is also meant to result in the control of feral species other than deer, but for reasons discussed this is likely to be limited conservation benefit.)

Different deer species require different types of habitat, as discussed by Hall and Gill (2005):

> Fallow, chital ..., rusa... and red deer are most strongly associated with woodlands in Australia and are not usually found in areas without at least some mature woodland habitat. This is not to say they are dependent on woodland, because fallow deer and red deer in particular often leave the woodland to feed in agricultural areas; however, if these species are excluded from woodland, juvenile survival, fertility, and growth rates are lower than normal [citing various]. In contrast, sambar ... and hog deer were introduced from their native India and Sri Lanka to Australia and are primarily associated with densely forested areas and adjacent heath. These deer are highly dependent on dense cover.

The biodiversity benefits of the scheme will allegedly arise when farmers plant trees and create wetlands to create better conditions for deer and for their hunting. To be of net biodiversity benefit the habitat improvements would have to outweigh the environmental damage caused on those properties and elsewhere by deer populations expanding and increasing as a direct or indirect result of the scheme. Remnant habitat has higher values than most regrowth or rehabilitated vegetation, and its conservation is regarded as the highest conservation priority. Furthermore, the threatened or declining plant species eaten or damaged by deer would have higher values than the deer-tolerant species that would be planted on properties under the recreational deer hunting scheme. Because deer are exotic rather than native species, a farmer could improve deer habitat by planting exotic rather than native plants, with no biodiversity benefit. There are likely to be limited benefits arising from the vegetation focus of the scheme, which will be far outweighed by the environmental costs.

Conclusion & recommendations

chapter 5

Despite the great damage deer do, the Department of Sustainability and Environment is managing them largely for the benefit of hunters. The Victorian Government cannot meet its obligation to protect native wildlife and vegetation while also managing deer as a hunting resource. The recreational hunting scheme, as proposed, will likely result in the DSE sponsoring even greater environmental harm. The purpose of the scheme appears to be to benefit hunters, although it has been disguised as something to benefit biodiversity.

Although the Australian Deer Association claims the scheme has environmental benefits (Ker 2008b), their concept of 'environmental benefits' is not one that is shared by the Victorian public. Their proposal to the DSE was clearly focused on improving their hunting resource: "The objectives ... are to secure the viability of the district's hog deer population by giving landholders an incentive to produce hog deer on their properties and protect hog deer habitat" (ADA 2006).

A common strategy of the pro-deer lobby is to portray those who hold genuine conservation values as extremist or old-fashioned. Hall and Gill (2005) of the Tasmanian Game Management Services Unit, for example, say that a "professional approach to wildlife management" requires moving away from "traditional paradigms of protection of native species and eradication of exotic species". They misrepresent the fact that most environmental advocates accept that eradication is impossible and want control prioritised to protect important environmental assets. And they underplay the legal and moral obligations Australia has to "protect native species" from the threat of invasive species like deer. The deer hunting advocates, including those within government, who downplay the threat of deer and seek to greenwash recreational hunting and deer protection as environmentally beneficial are a serious impediment to meeting these obligations.

The impediments to conservation likely to arise from the proposed recreational hunting scheme include:

- The scheme will further entrench a protectionist approach to deer by creating a larger constituency and a stronger financial basis for the deer hunting industry, which will politically undermine efforts to control deer for conservation reasons.
- The scheme will increase deer numbers, and thus increase damage to remnant vegetation and fauna habitat. As deer spread out from participant properties in a spillover effect or to avoid hunting, or as landholders and hunters translocate deer so as to participate in the scheme or increase deer numbers, the scheme will result in expanding and new deer populations elsewhere and greater environmental damage.
- Any incidental environmental gains from subsidised creation or protection of deer habitat on participant properties will be far outweighed by the costs of deer damage.
- Although hunters will claim to be managing deer populations at sustainable levels, recreational deer hunting is an ineffective method of deer control, because hunters have a strong incentive to maintain high deer populations for their hunting pleasure, they tend to limit hunting to where it is convenient, and they prefer hunting male rather than female deer.

ISC calls on the Victorian government to meet their obligations to conserve Australian biodiversity in the following ways:

1. Abandon the recreational deer hunting scheme for private properties.

2. Conduct surveys to census feral deer populations and assess the environmental damage they are causing.

3. Revoke the status of feral deer in Victoria as 'protected wildlife' under the Wildlife Act 1975.

4. Implement targeted government control programs to reduce environmental damage, by eradicating deer populations where feasible, and preventing spread and reducing the density of populations where that is necessary to protect natural ecosystems on both public and private land.

References

chapter 6

ADA (2006) The Deer Hunting and Wild Deer Management Strategy. Australian Deer Association. (Available at http://www.austdeer.com.au/docs/Deer%20Hunting%20&%20Management%20Strategy%2006.pdf).

ADA (2008) Response to DSE Green Paper 'Land and Biodiversity at a Time of Climate Change'. Australian Deer Association. (Available at http://www.austdeer.com.au/docs/ResponsetoGreenPaperonBiodiversity.pdf).

ADA (2008b) Flora and Fauna Guarantee does no such thing. Media release. 28 April. Australian Deer Association. (Available at http://www.austdeer.com.au/docs/FloraandFaunaGuaranteedoesnosuchthing.pdf.)

Aranda, Y., Orueta, J.F. and Fandos, P. (1996) Influencia de la caza sobre la estima de la densidad, mediante el transecto lineal, en una población mediterránea de ciervo (Cervus elaphus). Gibier Faune Sauvage-Game and Wildlife 13: 231-246.

Bilney, R.J. & Bilney, R.J. (2008) Hog Deer. In S. van Dyck & R. Strahan (eds). The mammals of Australia. New Holland Publishers, Sydney.

Bloomfield, T. (2005) Bounties and incentives in pest control: what works? Feral Animals, Threatened Species and the Role of the Community. Proceedings of a conference convened by the Threatened Species Network, Tasmania, Hobart, March 2005.

Coleman, J.D, Pech, R.P., Warburton, B. and Forsyth, D.M. (2006) Review of Research into Alternatives to the use of 1080 for Management of Browsing Damage by Mammals in Tasmania. Landcare Research, New Zealand, and Arthur Rylah Institute for Environmental Research, Melbourne. (Available at www.daff.gov.au/__data/assets/pdf_file/0010/50041/0506_144_final_coleman.pdf).

Commonwealth of Australia (2007) Background Document for the Threat Abatement Plan for Predation by the European Red Fox. Department of the Environment and Water Resources, Canberra. (Available at http://www.environment.gov.au/biodiversity/threatened/tap-drafts.html)

Côté, S.D., Rooney,T.P., Tremblay, J.P., Dussault, C., et al. (2004) Ecological impacts of deer overabundance. The Annual Review of Ecology, Evolution, and Systematics 35: 113-147.

de Garine-Wichatitsky, M., Chardonnet, P., and de Garne, I. (2006) Management of introduced game species in New Caledonia: reconciling biodiversity conservation and resource use? Game and Wildlife Science 21(4): 697-706.

de la Cretaz, A.L. and Kelty, M.J. (2002) Development of tree regeneration in fern-dominated forest understories after reduction of deer browsing. Restoration Ecology 10: 416-426.

Diefenbach, D.R., Palmer, W.L. and Shope, W.K. (1997) Attitudes of Pennsylvania sportsmen towards managing white-tailed deer to protect the ecological integrity of forests. Wildlife Society Bulletin 25(2): 244-51.

Dizard, J. (1999) Going Wild: Hunting, Animal Rights, and the Contested Meaning of Nature. University of Massachusetts Press.

Dolman, P.M. and Waber, K. (2008) Ecosystem and competition impacts of introduced deer. Wildlife Research 35(3): 202-14

DPIW (2008) 2007 game seasons summary. Game Tracks 13: 18. Tasmanian Department of Primary Industries and Water.

DSE (2008) Atlas of Victorian Wildlife (electronic fauna database). Department of Sustainability & Environment, Melbourne.

DSE (2008b) Draft Hog Deer Management Strategy. Department of Sustainability and Environment, Melbourne. (Available at http://www.dse.vic.gov.au/DSE/nrenrt.nsf/LinkView/F34CF0B3CF6A60DCCA25737F000503FEB08C49EA4836D6D7CA25737F000541F3).

DSE (2008c) A Guide to Hunting Hog Deer in Victoria 2008. Department of Sustainability and Environment,

Melbourne. (Available at http://www.dse.vic.gov.au/DSE/nrenrt.nsf/LinkView/A48CBD7E7017B461CA256E4A000D8A207380F92E35E27D99CA2573750023D375).

Duncan, R., Ruscoe, W., Richardson, S. and Allen, R. (2006) Consequences of Deer Control for Kaweka Mountain Beech Forest Dynamics. Landcare Research Contract Report, Lincoln, New Zealand. September 2006. (Available at www.doc.govt.nz/upload/documents/conservation/threats-and-impacts/animal-pests/kaweka-deer-control.pdf).

DWLBC (2005) South Australian Deer Strategy. South Australian Department of Water, Land and Biodiversity Conservation.

Engeman, R.M., Stevens, A., Allen, J., Dunlap, J., Daniel, M., Teague, D. and Constantin, B. (2007) Feral swine management for conservation of an imperiled wetland habitat: Florida's vanishing seepage slopes. Biological Conservation 134(3) 440-446.

Fagerstone, K.A. and Clay, W.H. (1997) Control efforts to manage overabundant deer. Wildlife Society Bulletin 25(2): 413-17.

Fraser, K.W. (2000) Status and Conservation Role of Recreational Hunting on Conservation Land. Science for Conservation 140. Department of Conservation, Wellington, New Zealand. (Available at www.doc.govt.nz/upload/documents/science-and-technical/sfc140.pdf).

Hall, G. P., and Gill, K. P. (2005) Management of wild deer in Australia. The Journal of Wildlife Management 69, 837–844.

Hassall and Associates (1998) Economic Evaluation of the Role of Bounties in Vertebrate Pest Management, Prepared for the Bureau of Resource Sciences, April 1998. (Available at http://www.feral.org.au/feral_documents/00023.pdf).

IUCN (2000) Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species. Definition of Terms. The World Conservation Union. (Available at http://www.issg.org/database/welcome/content.asp).

Ker, P. (2008) Hunting park offer to farmers. Farm Weekly (Fairfax online). 22 November. (Available at http://fw.farmonline.com.au/news/nationalrural/agribusiness-and-general/general/hunting-park-offer-to-farmers/1367299.aspx).

Ker, P. (2008b) Farm 'shooting 'spree' under attack. The Age (Fairfax online). 28 November. (Available at http://www.theage.com.au/national/farm-shooting-spree-under-attack-20081127-6k2s.html).

Low, T. (2008) Family Cervidae: Deer. In S. van Dyck & R. Strahan (eds). The Mammals of Australia. New Holland Publishers, Sydney.

Masters, P. (2006) Feral Fallow Deer on Kangaroo Island: A Strategy for Future Management. Kangaroo Island Natural Resources Management Board. (Available at

McMillan, D.C. and Leitch, K. (2008) Conservation with a gun: understanding landholder attitudes to deer hunting in the Scottish Highlands. Human Ecology 36: 473-84.

Moriarty, A. (2004) The liberation, distribution, abundance and management of wild deer in Australia. Wildlife Research 31, 291-299.

Nogueira, S., Nogueira-Filho, S, Bassford, M. Silvius, K. and Fragoso, J. (2007) Feral pigs in Hawai'i: Using behavior and ecology to refine control techniques. Applied Animal Behaviour Science 108: 1–11.

Norris, A., Low, T., Gordon, I., Saunders, G., Lapidge, S., Lapidge, K., Peackock, T. and Pech, R. (2005) Review of the Management of Feral Animals and their Impact on Biodiversity in the Rangelands: A Resource to Aid NRM Planning. Pest Animal Control CRC, Canberra.

NSW DEC (2004) NSW Scientific Committee - Final Determination, Herbivory and Environmental Degradation Caused by Feral Deer - Key Threatening Process Declaration. Department of Environment and Con-

servation, NSW. (Available at http://www.nationalparks.nsw.gov.au/npws.nsf/Content/feral_deer_ktp).

NSW DEC (2005) Deer Management Plan for Royal National Park and Reserves in Sydney South Region. Department of Environment and Conservation and the Royal National Park Deer Working Group, NSW. September 2005. (Available at www.environment.nsw.gov.au/pestsweeds/RoyalDeerManagementPlan.htm).

Nugent, G. and Choquenot, D. (2004) Comparing cost-effectiveness of commercial harvesting, state-funded culling, and recreational deer hunting in New Zealand. Wildlife Society Bulletin 32: 481–492.

Nugent, G., Fraser, W. and Sweetapple, P. (2001) Top down or bottom up? Comparing the impacts of introduced arboreal possums and 'terrestrial' ruminants on native forests in New Zealand. Biological Conservation 99:65–79.

Orueta, J.F. and Aranda, Y. (1998) Methods to Control and Eradicate Non Native Species. Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), Council of Europe Publishing. Nature and Environment 118.

Peel, B., Bilney, R.J. and Bilney, R.J. (2005) Observations of the ecological impacts of Sambar Cervus unicolor in East Gipssland, Victoria, with reference to destruction of rainforest communities. Victorian Naturalist 22(4): 189-200

Ray, N. and Burgman, M. A. (2006) Subjective uncertainties in habitat suitability maps. Ecological Modelling 195, 172-186.

RBNC (2008) Deer management at River Bend Nature Centre. At http://www.rbnc.org/deermgmnt.htm.

Roberts, G. (2008) Feral farmers get on authorities' goat. The Australian. 4 December 2008. p. 8.

Rolls, E.C. (1969) They All Ran Wild: The Story of Pests on the Land in Australia. Angas and Robertson, Sydney.

SAC (2007) Final Recommendation on a nomination for listing: Reduction in biodiversity of native vegetation by Sambar (Cervus unicolor)(potentially threatening process). Nomination no. 756. Flora and Fauna Guarantee Act Scientific Advisory Committee. Department of Sustainability & Environment, Melbourne.

Sharp, T. and Saunders, G. (2004) DEE001 Ground shooting of wild deer. Standard Operating Procedure. NSW Department of Primary Industries and Department of Environment and Heritage Document. (Available at http://www.deh.gov.au/biodiversity/invasive/publications/humane-control/)

Spencer, P.B.S. and Hampton, J.O. (2005) Illegal translocation and genetic structure of feral pigs in Western Australia. Journal of Wildlife Management 69(1): 377-84.

Waller, D.M. and Alverson, W.S. (1997) The white-tailed deer: a keystone herbivore. Wildlife Society Bulletin 25(2): 217-26.

West, P. and Saunders, G. (2007) Pest Animal Survey: 2004-2006. A review of the distribution, impacts and control of invasive animals throughout NSW and the ACT. NSW Department of Primary Industries. (Available at http://www.invasiveanimals.com/publications/research-reports/index.html).

Wilson, B. (2008) Use of bounties for pest animal management. Policy Statement. Queensland Department of Primary Industries & Fisheries. (Available at www.dpi.qld.gov.au/documents/Biosecurity_EnvironmentalPests/IPA-UseOf-Bounties.pdf.)

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Abbreviations

ADA	Australian Deer Association
DEC	New South Wales Department of Environment and Conservation (now Department of Environment and Climate Change)
DSE	Victorian Department of Sustainability and Environment
DPIW	Tasmanian Department of Primary Industries & Water
DWLBC	South Australian Department of Water, Land and Biodiversity Conservation
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
FFG	Act Flora and Fauna Guarantee Act 1988 (Victoria)
ISC	Invasive Species Council
NGO	Non Governmental Organisation
NZ	New Zealand
SAC	Scientific Advisory Committee (Victoria)