Eyre Peninsula NRM Board

PEST SPECIES REGIONAL MANAGEMENT PLAN

*Dama dama* Fallow deer & *Cervus elaphus* Red deer

INTRODUCTION

Synonyms

Biology

Deer are ungulates (hoofed mammals) belonging to the order Artiodactyla (even-toed or cloven hoofed mammals). With the exception of two species not found in Australia, almost all deer species are placed within the family Cervidae. Six of the recognised 44 species of cervid deer worldwide are present in Australia. Within South Australia fallow deer *Dama dama* are the only species known to be abundant in the wild in parts of the state [1]. All six species have established feral populations throughout the more temperate parts of South Australia [2].

Habitat use and behaviour vary among the six species (Table 1). 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 [3]. They are not dependent on woodland as such, as they often inhabit forest edges to feed in adjacent grassland and agricultural areas [4], but if excluded from woodland, juvenile survival, fertility and growth rates is reduced [3]. In contrast, sambar and hog deer are highly dependent on dense cover associated with densely forested areas and adjacent heath [3].

Origin

Of the 18 deer species introduced into Australia and liberated into the wild [5], six species have naturalised to form viable wild populations [4, 6]. These six species were derived from diverse populations across Europe and Asia, and introduced to Australia at various times in the early-mid-, and late 19th century [4, 7]. The distinction between the red deer *Cervus elaphus scoticus* and the closely related wapiti *Cervus canadensis* from North America should be recognised. The red deer has naturalised in Australia following early introduction, but the wapiti was only introduced in the mid 1980s [8]. Within South Australia hybrids between red deer and wapiti may have been imported and subsequently escaped into the wild in the south east (G. MacKenzie Pers. Comm. 03/05/2011).

In 2004 research indicated an estimated 218 wild deer herds were naturalised in Australia [5]. Seven percent of these herds originated from acclimatisation society releases (on average 107 years old), 35% from deer farm escapes/releases (mean 9 years old) and 58% from translocations (i.e. deliberate releases, mean 6 years old). Of these herds only 11% (46) were in South Australia.

Of the estimated 200,000 wild deer in Australia in 2000, 85% were derived from ancestors of populations formed through acclimatisation society releases [5]. In the 1980s deer farms were popular in Australia, supplying venison and antler products to lucrative Asian markets. But many of these farms later became unprofitable and unwanted animals were either directly released to the wild or purchased by hunters and then released illegally [3]. In the last 20 years this proliferation of the escape or release of deer into the wild has reached levels where environmental values are threatened [5]. Comparison of 2004 survey results and previous surveys in 1976 and 1995, indicates the expansion of herd distribution and population increase [5].
Table 1: Source populations, time of introduction, general habitat requirements and behaviour of the six species of deer that have naturalised in Australia

<table>
<thead>
<tr>
<th>Species</th>
<th>Source Populations</th>
<th>When Introduced</th>
<th>Habitat</th>
<th>Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fallow deer</td>
<td>Fallow deer occur naturally in the Mediterranean region eastwards to southern Iran.</td>
<td>By 1850 [4]. 1832 [7].</td>
<td>Forest edge, feeding on edge and in clearings [4]. In Australia, forest country with dense understorey is a favoured retreat [9].</td>
<td>Gregarious. Predominantly a grazer. Diurnal but may feed nocturnally with disturbance. Feeds on short grasses, acacias, banksias, blackberry, tips of rushes and bracken. Attracted to improved pastures [4].</td>
</tr>
<tr>
<td>Red deer</td>
<td>Widely distributed over Eurasia [4], the Palaearctic region from northern Britain to Manchuria and from south of the Arctic Circle to the Himalayas and North Africa. Australian population is Cervus elaphus scoticus, sourced from Great Britain [4].</td>
<td>1865 [7]</td>
<td>Favoured by undulating grazing country interspersed with numerous water courses, to steeply wooded hills [4]. Preferred habitat is open, grassy glades in forest [9].</td>
<td>Red deer are mainly browsers feeding on woody trees and shrubs as well as grasses, sedges and forbs. They are social, living in herds dominated by a single female, with stags joining the groups in the breeding season [9]. Peak activity times are at dawn and dusk [9].</td>
</tr>
<tr>
<td>Rusa deer</td>
<td>Australian population derived from Cervus timoriensis rusa, from Borneo and Java and C. t. moluccensis from the Moluccas [4].</td>
<td>Moluccan Island 1912, Javan rusa 1907 [4]. First record 1865 [7]</td>
<td>Tropical species. Preferred habitat is grassy plains bordered by dense brush or woodlands to which they can retire during daylight hours [9]. Do not cope well with cold weather requiring adequate shelter and high energy feed to survive in cold conditions [9].</td>
<td>Gregarious. Preferred diet appears to be grasses, attracted to improved pastures [4]. They are semi-nocturnal [9].</td>
</tr>
<tr>
<td>Sambar</td>
<td>Australian population descended mainly from Cervus unicolor unicolor from Sri Lanka, but also introduced from India and Sumatra [4].</td>
<td>Mid 19th century into Victoria [4]. 1860 [7]</td>
<td>Preferred habitat is forested mountain country, but also inhabits open forest that includes suitable cover</td>
<td>A grazer and browser, they eat a wide variety of grasses, shrubs and tree foliage and prefer blackberry. Generally nocturnal</td>
</tr>
<tr>
<td>Chital</td>
<td>Australian population derived from Axis axis axis, from southern India [4].</td>
<td>Close to start of 19th century (1812) [4]. 1861 [7]. 1803 [6]</td>
<td>Tropical or sub-tropical species with a strong habitat preference for woodland, forests, and clearings near waterways [9]. The presence of permanent water is essential to chital and has a major influence on the extent of their range [9].</td>
<td>Strong herding instinct. They tend to live in large herds consisting of many females and their young, together with two or three stags. Feed early afternoon into night. Diet of native and improved pasture grasses and other vegetation.</td>
</tr>
<tr>
<td>Hog deer</td>
<td>Australian population is Axis porcinus porcinus from continental India and Sri Lanka.</td>
<td>Mid 19th century [4]. 1860 [7]</td>
<td>Restricted to coastal shrublands and teatree swamps, has not penetrated into forests or highlands [4].</td>
<td>Strongly territorial. Seldom in groups of more than two or three. Primarily a grazer on native grasses, sedges and improved pastures, but browsing contributes to diet. Feeds late afternoon until early morning [4].</td>
</tr>
</tbody>
</table>
Figure 1: The distribution in abundance, and bioclimatic predicted distribution (inset) in 2000 for A. fallow deer B. red deer C. sambar deer D. chital deer E. rusa deer and F. hog deer. Symbol shape = population source and colour = population size. For predicted habitat suitability (inset): dark green = high; light green/orange = medium; and yellow/blue = low. Source: [5].
Distribution

Of the six species that have naturalised, fallow deer are the most widely distributed (Figure 1A), but only the second-most abundant (Total population in Australia 55,500) [5]. Bioclimatic modelling indicates that fallow deer are well suited to southern Australia. Red deer have a similar distribution to fallow deer (Figure 1B), but have a smaller population (32,500) [5]. They have a similar bioclimatic distribution in southern Australia. Sambar deer are currently distributed in south east Australia, mostly in Victoria (Figure 1C), and are the most populous species in Australia (70,700) [5]. The bioclimatic model suggests this species is most suited to northern Australia, but only small parts of south east Australia appear favourable. Wild chital herds are sparsely distributed in relatively small herds along the eastern and southern coasts (Figure 1D), constituting a small proportion of total deer population (13,000) [5]. Modelling suggests they are suited to most Australian habitats. Rusa deer are also sparsely distributed in relatively small populations along the eastern and southern coasts (Figure 1E), also constituting a small proportion of total deer population (15,000) [5]. Modelling suggests that only small sections of coastal Australia provide suitable habitat for this species. The population of hog deer is concentrated around a herd in eastern Gippsland (Figure 1F), with several herds along the coast into South Australia and New South Wales. The population is the smallest of deer species in Australia (9,300) [5]. Like sambar deer this species appears to occur in less favourable environments at present, with modelling predicting the most favourable habitat in the northern half of Australia.

Feral populations of deer are found throughout the more temperate parts of South Australia (Figure 2). In South Australia the distribution and abundance of wild fallow deer have receded since the early 1950s due to agricultural development and recreational hunting [1]. All six species have been recorded in a recent survey in the lower south east of South Australia, however currently only fallow deer and red deer are in substantial numbers, especially in the Upper South East and Mt Lofty Ranges [1, 2]. The two species of deer known to be present on Eyre Peninsula are the red deer (C. elaphus) and the fallow deer (D. dama). They have been recorded widely across Eyre Peninsula (Figure 3). It is believed that the present populations of deer resulted from deer farm escapees. Several deer farms were at one time present on the peninsula but due to decreasing market demand and lower prices for deer products some of these are no longer in operation.

Five deer farms were registered as of October 2012 on Eyre Peninsula, down from eight registered in 2004.
RISK ASSESSMENT

Pest Risk

The increasing number of wild deer herds in Australia is impacting on social, conservation and agricultural values in some areas, with wild deer having the potential to establish significant populations [5]. Research in Australia is limited, but where undertaken there is clear evidence of damage through overgrazing, browsing, trampling, ring-barking, antler rubbing, dispersal of weeds, creation of trails, concentration of nutrients, exposure of soils to erosion/acceleration of erosion, and the subsequent degradation of water quality in creek and river systems [11, 12]. In addition, a significantly lower diversity and abundance of plant species have been noted at high deer density locations than in those of low deer densities [13]. Overseas, impacts as a consequence of overabundance have been shown to be significant [14], with deer shown to inflict major economic losses in forestry, agriculture, and transportation and contribute to the transmission of several animal and human diseases. Their impact on natural ecosystems is also dramatic but less quantified. By foraging selectively, deer affect the growth and survival of many herb, shrub, and tree species, modifying patterns of relative abundance and vegetation dynamics. Cascading effects on other species extend to insects, birds, and other mammals.

The extent of dietary overlap between wild deer and macropods requires more detailed research [9]. Rusa deer had a 13 % overlap in diet with the swamp wallaby Wallabia bicolor in summer and a 54% dietary overlap in winter in one study in NSW [15]. With an estimated 15% mean annual dietary overlap with the same species in a second study [13]. The Scientific Committee of the New South Wales National Parks and Wildlife Service has consequently made a preliminary determination supporting a proposal to list herbivory and environmental degradation caused by feral deer as a key threatening process impacting on vulnerable or endangered species, populations or ecological communities [16].

Males can be extremely aggressive during the rut (breeding season), presenting a threat to public safety for bushwalkers, campers and landholders alike. Deer can also impose costs on society, including damage to property and impact-related road traffic accidents [17, 18]. Economic impacts include damage to fences and pastures whilst reducing the productivity of livestock due to heavy competition for resources. Each species has specific habitat and diet requirements and, therefore, each species causes different impacts [3]. In woodlands, browsing and bark-stripping damage to mature trees is primarily associated with red deer, and fallow deer may cause damage to young and newly planted trees and fresh coppice. The less-social, resident species with restricted home ranges tend to inflict sustained continuous impact at constant levels, while the more social, mobile species inflict less-regular impact on parts of their larger range. There is no scientifically valid information on the impact of deer to agriculture and forestry in Australia [3]. Fallow, red, and (occasionally) other deer species are regularly observed grazing in standing crops. Grazing may be particularly heavy during autumn and spring when crops are becoming established or when crops are ripening prior to harvest, but the economic impact has not yet been quantified [3].

Being ungulates, deer can carry the same diseases that can infect domestic stock (e.g. bovine tuberculosis [19]). They would be a major concern if exotic diseases of concern should establish in Australia; e.g. they are a reservoir of bovine tuberculosis in New Zealand.

Deer in Australia typically produce single offspring, though twins in all species have been recorded [7]. Productivity in naturalized deer is high, with females reaching puberty as yearlings, and reproductive rates in females 2.5 years and over typically equal to or greater than 80% [3].

Given the dispersal ability of deer it is not possible to define an effective protection zone for key assets.

Feasibility of Control

Ground shooting either for recreational hunting or by paid, trained marksmen is the main form of control. Where shooting is not appropriate, for example in peri-urban areas, trapping methods are available.

Control options include

- **Spotlight shooting** – Shooting at night under a spotlight has been proved to be a safe and effective method. The method is strategic in that specific areas and species can be targeted for maximum effect.
- **Use of water points during summer** – Deer require water on a regular basis during the summer months. This provides an ideal opportunity for monitoring and control at these points when deer are regularly watering
- **Trapping** – Trapping on water troughs during summer may have reasonable results. The major drawback to this method is the requirement for adequate yards around the water trough which would be labour intensive and expensive to set up. They must be high enough that the deer cannot jump out and strong enough to resist being pushed through.
- **Use of Tracking collars (Judas deer)** – The use of ‘Judas deer’ carrying radio or GPS tracking collars has not been widely used in Australia but has been trialled with some success in New Zealand. Aerial shooting has been used in NSW to effectively mop up residual deer herds on private land after ground shooting, this could be very effective when combined with the use of Judas animals.
• Helicopter aerial shooting – Helicopter shooting has been used with success on feral goats and camels in SA. Aerial shooting of deer has been conducted successfully in the south east of the state where deer density has been high. The thickness of the native vegetation and low density of feral deer may make this management option less successful on most of Eyre Peninsula.

• Daytime stalking – Daytime stalking by professional shooters may be successful in some instances.

Deer can be difficult to monitor effectively due to their secretive and elusive nature. Current monitoring of feral deer on Eyre Peninsula is on an ad hoc basis. At present monitoring is limited to receiving reports on deer sightings, a small amount of motion sensor camera use and the presence of animal tracks/tree rubs. Annual deer fence inspections of farmed deer in the region also plays a role in monitoring for farm escapes. Options to determine density of feral deer include:

• Motion sensor cameras – Motion activated cameras with infrared can be used to capture photographs of feral deer both day and night. Motion sensor cameras can be placed in strategic locations to monitor activity and abundance and moved to different areas as required.

• Catch-per-unit-effort - Targeted hunters or landowners will be asked to record the time spent hunting feral deer and the number taken within the area of known distribution.

• Vehicle transects – Transects conducted either early morning or late evening or spotlighting at night recording any deer sighted.

• Reported sightings – Sightings from landholders and the public can be recorded as an informal monitoring method. This can provide details of numbers of deer sighted/shot, sex, species and location.

• Passive detection – surveys looking for tracks and rub trees within areas of known distribution. This could be extended outside of these areas to confirm presence or absence.

### Table 2: Regional Assessment

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Pest Risk</th>
<th>Feasibility of Control</th>
<th>Management Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fallow Deer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native vegetation</td>
<td>98 (High)</td>
<td>68 (Low)</td>
<td>Manage Pest Animal Populations</td>
</tr>
<tr>
<td>Pasture grazing</td>
<td>115 (High)</td>
<td>36 (Medium)</td>
<td>Protect Sites</td>
</tr>
<tr>
<td>Land Use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Deer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native vegetation</td>
<td>98 (High)</td>
<td>50 (Low)</td>
<td>Manage Pest Animal Populations</td>
</tr>
<tr>
<td>Pasture grazing</td>
<td>98 (High)</td>
<td>27 (High)</td>
<td>Contain Spread</td>
</tr>
</tbody>
</table>

### REGIONAL RESPONSE

### Special Considerations/Board Position

Feral deer have the ability to disperse over large distances (hundreds of kilometres) relatively quickly.

Feral deer can be a vector for exotic disease, with potentially significant economic and social costs where disease is introduced.

For exotic disease outbreaks (e.g. foot and mouth) in feral deer populations the board needs to liaise as a first point of call with Biosecurity SA to lead responses in South Australia, and with the Federal Department of Agriculture.

### Outcome

To protect, the environment, primary producers and the public from damage and hazards caused by feral deer.

### Objectives

To:

1. identify and significantly reduce feral deer populations within the region;
2. significantly reduce the impacts of feral deer on key assets;
3. minimise the potential risk to human health and stock posed by feral deer;
4. Raise community awareness about risk and ecological impacts potentially associated with feral deer
5. prevent the release or escape of domestic deer.

### Area/s to be protected

Key environmental assets
Actions
To:
Feral deer
1. develop codes of practice to support the implementation of control programs for feral deer;
2. encourage, facilitate or compel landholders to control feral deer on their property;
3. develop and implement a monitoring protocol to determine distribution and estimate population;
4. monitor any changes in range within South Australia of deer species not present in the NRM Board region to assess the potential for the species to move to the region;
5. prevent the establishment of new deer species (other than fallow and red deer) in the region;
6. establish protocols for systematic data collection and storage in a central spatial database (this will need to include a reporting mechanism at the district level for work undertaken by contractors); and
7. raise community awareness about the impact of feral deer.

Domestic deer
1. maintain accurate records of registered domestic deer properties;
2. liaise with relevant government agencies and stakeholders to obtain information on locations and size of domestic herds;
3. undertake biennial inspections of registered deer farm boundary fences to ensure compliance with deer industry fencing standards; and
4. establish protocols for systematic data collection and storage in a central spatial database (this will need to include a reporting mechanism at the district level for work undertaken by contractors).

Evaluation
Evaluation of success will be based on annual review of the:
- quality of deer farm boundary fences;
- the number of deer that have escaped or been released from registered farms;
- the number of deer released and not recaptured;
- analysis of monitoring data on the impacts of feral deer on key assets;
- the number of feral deer controlled by shooters or captured; and
- sightings or evidence of new feral deer species for the region.

These annual district based data sets will be reviewed across all districts at the NRM regional level every five years.

Declarations
For the whole of South Australia, excluding offshore islands, seven nominated members of the order Artiodactyla (even-toed ungulates) – Axis axis (Chital (axis) deer), Axis porcinus hog deer, Cervus canadensis wapiti, Cervus elaphus red deer, Cervus timoriensis Javan rusa deer, Cervus unicolor sambar, and Dama dama fallow deer – are declared pest species under Schedule 1 (CLASS 17 – Provisions: 179, 181(1), and 182(3)) of the Natural Resources Management Act 2004 (Table 3).

Table 3: Relevant sections of the South Australian Natural Resource Management Act 2004, Declared provisions for the whole of state for nominated members of the order Artiodactyla (even-toed ungulates): Axis axis chital (axis) deer, A. porcinus hog deer, Cervus canadensis wapiti, C. elaphus red deer, C. timoriensis Javan rusa deer, C. unicolor sambar, and Dama dama fallow deer.

<table>
<thead>
<tr>
<th>Section</th>
<th>How the section applies</th>
</tr>
</thead>
<tbody>
<tr>
<td>179</td>
<td>Cannot willfully or negligently release a declared animal into a control area</td>
</tr>
<tr>
<td>181 (1)</td>
<td>Land owner must comply with instructions to keep a declared animal in captivity</td>
</tr>
<tr>
<td>182 (3)</td>
<td>Land owner must take prescribed measures for the control of the animal on their land</td>
</tr>
<tr>
<td>Reg 26 (2)</td>
<td>A deer on land with the consent of the owner must be secured or confined and permanently identified.</td>
</tr>
<tr>
<td>(3)</td>
<td>A deer on land without the consent of the owner must be captured and removed or destroyed</td>
</tr>
<tr>
<td>Reg 28</td>
<td>A deer must not be destroyed or disposed of if it bears a visible ear tag and notification has been received from a deer keeper about an escape and less than 48 hours has elapsed since notification was received</td>
</tr>
</tbody>
</table>

References