

Eyre Peninsula Landscape Board

PEST SPECIES REGIONAL MANAGEMENT PLAN

Dama dama Fallow deer & *Cervus elaphus* Red deer

Also: *Axis axis* Chital, *Axis porcinus* Hog deer,
Cervus timoriensis Rusa deer,
Cervus unicolor Sambar and *Cervus axis* Chital deer

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



INTRODUCTION

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. 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 tend to be found in areas with 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 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).

Of the estimated 200,000 wild deer in Australia in 2000, 85% were derived from ancestors of populations formed through acclimatisation society releases, over 100 years ago [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 become 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].

Table 1: Source populations, time of introduction, general habitat requirements and behaviour of the six species of deer that have naturalised in Australia.

Species	Source Populations	When Introduced	Habitat	Behaviour
Fallow deer	Fallow deer occur naturally in the Mediterranean region eastwards to southern Iran. In Australia, sourced from England directly and via Tasmania [4]. Subspecies <i>Dama dama dama</i> originally from the Mediterranean region of southern Europe [4].	By 1850 [4]. 1832 [7]	Forest edge, feeding on edge and in clearings [4]. In Australia, forest country with dense understorey is a favoured retreat [9].	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].
Red deer	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 <i>Cervus elaphus scoticus</i> , sourced from Great Britain [4].	1865 [7]	Favoured by undulating grazing country interspersed with numerous water courses, to steeply wooded hills [4]. Preferred habitat is open, grassy glades in forest [9].	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].
Rusa deer	Australian population derived from <i>Cervus timoriensis russa</i> , from Borneo and Java and <i>C. t. moluccensis</i> from the Moluccas [4].	Moluccan Island 1912, Javan rusa 1907 [4]. First record 1865 [7]	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].	Gregarious. Preferred diet appears to be grasses, attracted to improved pastures [4]. They are semi-nocturnal [9].
Sambar	Australian population descended mainly from <i>Cervus unicolor unicolor</i> from Sri Lanka, but also introduced from India and Sumatra [4].	Mid 19 th century into Victoria [4]. 1860 [7]	Preferred habitat is forested mountain country, but also inhabits open forest that includes suitable cover	A grazer and browser, they eat a wide variety of grasses, shrubs and tree foliage and prefer blackberry. Generally nocturnal
Chital	Australian population derived from <i>Axis axis axis</i> , from southern India [4].	Close to start of 19 th century (1812) [4]. 1861 [7]. 1803 [6]	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].	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.
Hog deer	Australian population is <i>Axis porcinus porcinus</i> from continental India and Sri Lanka.	Mid 19 th century [4]. 1860 [7]	Restricted to coastal shrublands and teatree swamps, has not penetrated into forests or highlands [4].	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].

Distribution

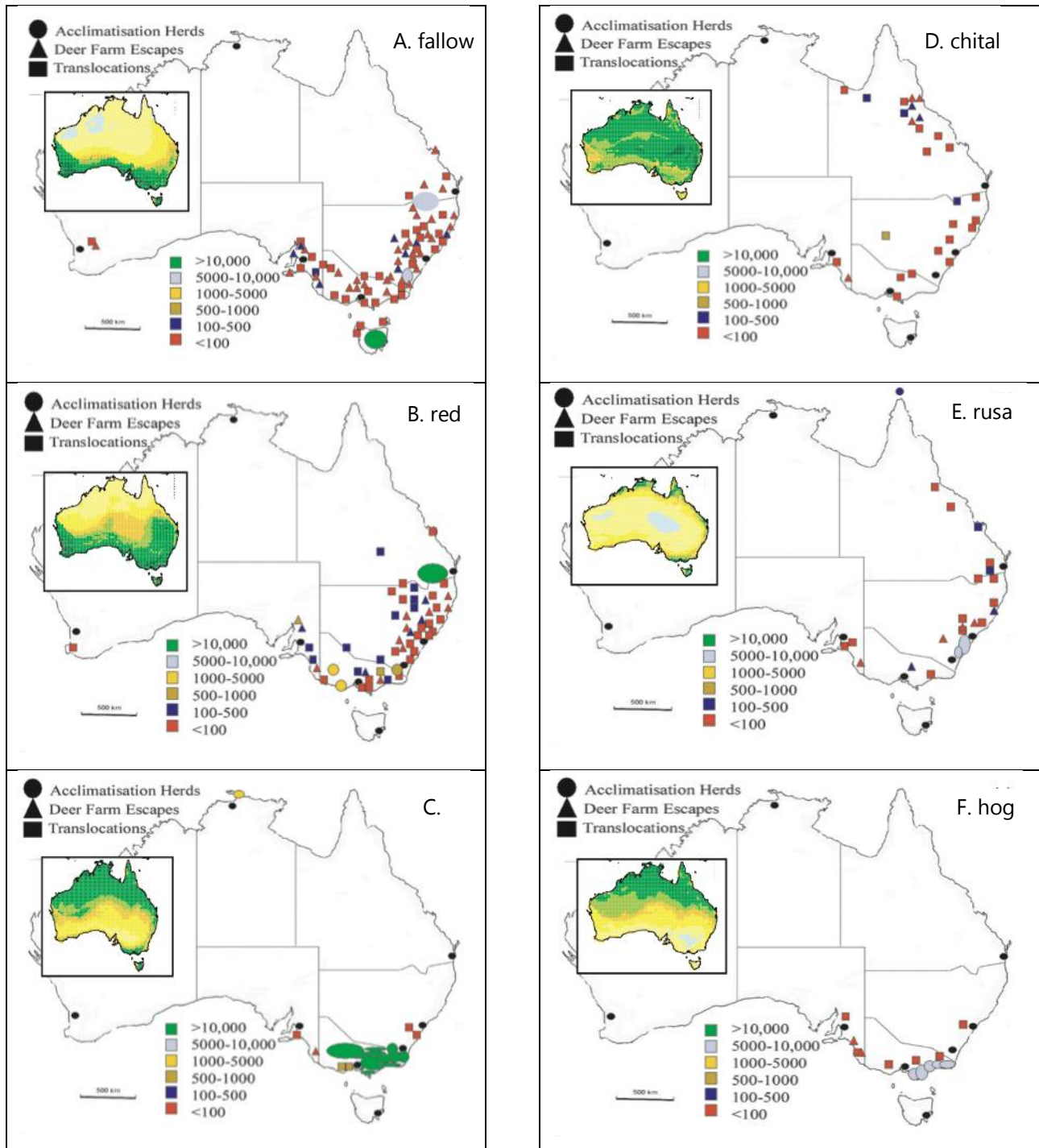


Figure 1: The distribution in abundance, and bioclimatic predicted distribution (inset) in 2000 for A. fallow deer B. red deer C. sambar deer D. chital deer E. rusa deer and F. hog deer. Symbol shape = population source and colour = population size. For predicted habitat suitability (inset): dark green = high; light green/orange = medium; and yellow/blue= low. Source: [5].

In Australia, 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 populations 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.

The three species of deer known to be present on Eyre Peninsula are the red deer (*C. elaphus*), the fallow deer (*D. dama*) and chittel deer (*C. axis*). 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 2021 on Eyre Peninsula, down from eight registered in 2004.

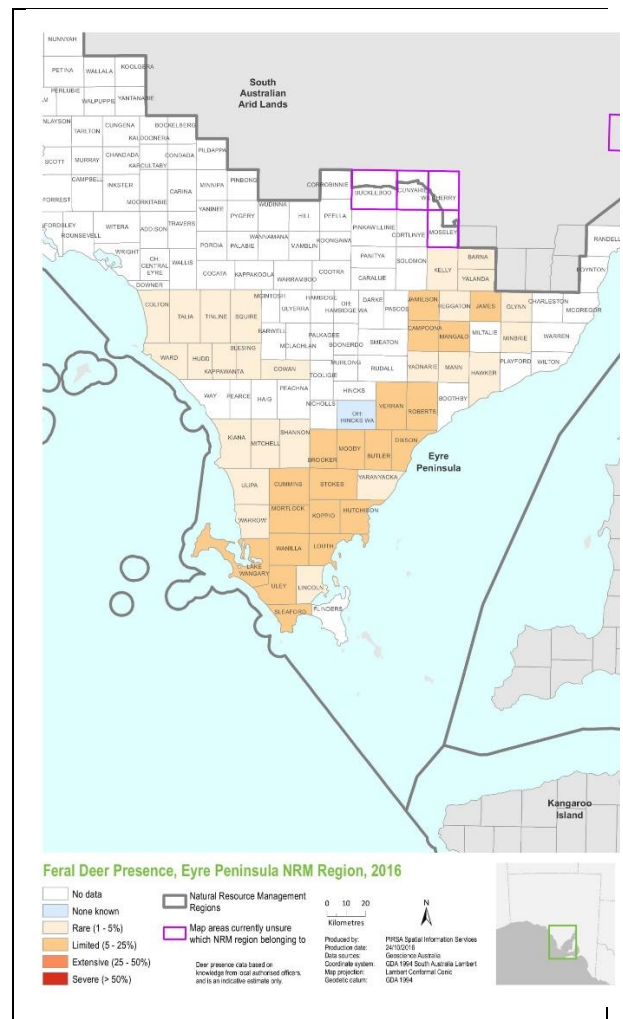


Figure 2: Occurrence, abundance and distribution of wild deer in South Australia in 2016 [20].

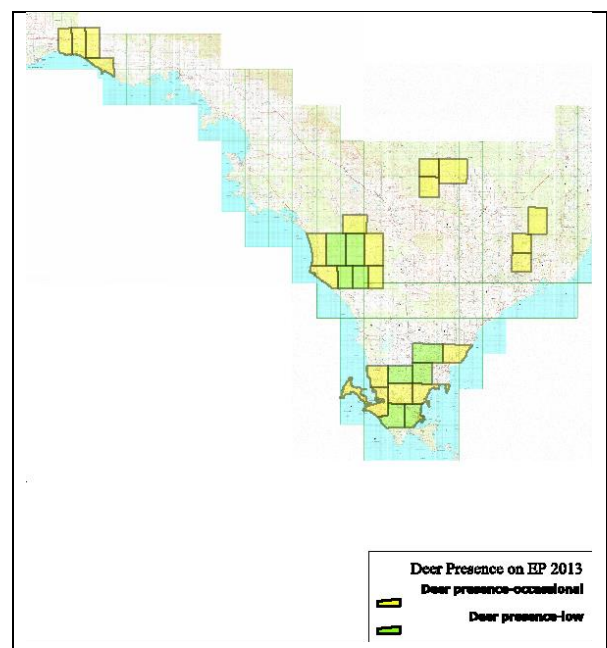


Figure 3: Deer presence on Eyre Peninsula 2013

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].

Internationally, impacts as a consequence of deer 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.

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, decreased diversity and abundance of plant species have been noted at locations of high deer density compared with locations of low deer densities [13].

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]. A phone survey of 48 Victorian farmers found the average estimation of deer damage was around \$4600 for each property [21]. 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 [19]. In New Zealand feral deer transmit and spread bovine tuberculosis. Feral Deer would be a major concern of transmitting diseases across the country if an exotic disease of concern should establish in Australia.

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 although thermal assisted aerial shooting may assist.
- 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.
- Thermal assisted aerial surveying

Status

Within the EP Landscape Board region a risk management assessment (Table 2) shows that deer warrant a management action of manage pest animal populations in native vegetation and crop/pasture land uses.

Table 2: Regional Assessment

Land Use	Pest Risk	Feasibility of Control	Management Action
Native vegetation	Very High	Negligible	Manage Pest Animal Populations
Crop/Pasture	Very High	Negligible	Manage Pest Animal Populations

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 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 PIRSA Biosecurity Division 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. reduce feral deer populations within the region with the ultimate aim of eradication within the region;
2. reduce the environmental impacts of feral deer;
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; and
5. prevent the release or escape of domestic deer.

Area/s to be protected

All areas

Actions

In relation to feral deer

Land managers to:

1. undertake control programs on their property, preferably in coordination with surrounding landholders;
2. report sightings of feral deer.

Landscape Board staff to:

3. Develop localised annual action plans to achieve the objectives and actions of this management plan.
4. support the development of a state-wide document consisting of guidelines with high level government approval that can support the implementation of control programs for feral deer;
5. destroy all feral populations by encouraging, facilitating or compelling landholders to control all feral deer on their property;
6. implement a monitoring protocol to determine distribution and estimate population on Eyre Peninsula. Promote the use of the DeerScan App to assist land managers monitor deer;

7. monitor any changes in range within South Australia of deer species not present in the Board region to assess the potential for the species to move to the region;
8. prevent the establishment of new deer species in the region;
9. undertake systematic data collection (numbers, location and species of deer controlled/sighted) 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
10. raise community awareness about the impact of feral deer and the importance of reporting sightings.

In relation to domestic deer

Land managers to:

1. Maintain compliance with requirements relating to ear tags and fencing standards;
2. Report any escapes of domestic deer.

Landscape Board staff to:

3. maintain accurate records of registered domestic deer properties;
4. Support deer farmers to maintain tagging and fencing standard requirements through education and capacity building;
5. consult with PIRSA, DEW and Crown Solicitor to develop compliance requirements and an instruction list of steps for Authorised Officers conducting inspections to follow;
6. liaise with relevant government agencies and stakeholders to obtain information on locations and size of domestic herds;
7. undertake annual inspections of registered deer farms to ensure compliance with deer industry fencing standards and ear tag requirements;
8. undertake incremental enforcement actions for non-compliance with deer industry fencing standards and ear tag requirements (if required);
9. establish protocols for systematic data collection and storage in a central spatial database.

Evaluation

Evaluation of success will be based on:

- annual analysis in July of monitoring data to evaluate the success of the pest plan actions (including the update of spatial layers);
- quality of deer farm boundary fences;

- the number and location of feral deer controlled by shooters or captured and the number and location of feral deer reported/sighted;
- sightings or evidence of new feral deer species for the region; and
- review of this pest management plan every five years.

Declarations

There are two separate classes for deer, Class 15 for feral deer, and class 16 for domestic deer. Under section 185(1)(a)(i) of the Landscape South Australia Act 2019, the Minister for Environment and Water has declared that provisions 189, 191(1), and 192(3) apply to domestic deer for the whole of the State (excluding any areas specified in other classes); provisions 186(1)(3), 187(1), 188 (1), 189, 192(1) apply to feral deer for the whole of the State (excluding any areas specified in other classes); and provisions 186(1)(3), 187(1), 188, 189, 190, 191(1), 192(1) apply to deer on all offshore islands including Kangaroo Island (Table 3).

These provisions apply to 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.

Table 3: Relevant sections of the *Landscape South Australia Act 2019*. 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.

Section	How the section applies
Provision for whole of State	
Feral Deer (Class 15)	
186 (1)	Must not allow entry of feral deer
183 (3)	Must not move feral deer
187 (1)	Must not keep feral deer
188 (1)	Must not sell feral deer
189	Must not release deer
192 (1)	Landholders to destroy all feral deer on their properties
Domestic Deer (Class 16)	
189	Must not release domestic deer
191 (1)	Deer keepers must comply with instructions of authorised officers
192 (3)	Landowners to control domestic deer on their properties, as per fencing and tagging standards set in the Chief Executive Gazette Notice (published in the Government Gazette on 20 August 2020 under section 192(3)(a) of the Landscape South Australia Act 2019 and in accordance with regulation (1) of the General Regulations).

More information

Contact your local Eyre Peninsula Landscape Board office

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