RISK ASSESSMENT FOR AUSTRALIA – Fallow Deer (*Dama dama*) (Linnaeus, 1758)

Class - Mammalia, Order - Artiodactyla, Family - Cervidae (Goldfuss, 1820), Genus - *Dama* (Frisch, 1775); (Wilson and Reeder 1993, ITIS Integrated Taxonomic Information System 2007, Catalogue of Life 2008)

Score Sheet

| SPECIES: Fallow Deer (*Dama dama*) | Species Description – Head and body length 1,300-1,750 mm, tail length 150-240 mm, shoulder height 800-1,050 mm, and weight 40-200 kg. Colour may be rich brown, reddish brown, pale fawn, grey-brown to almost black, with numerous white spots. The under parts are white; the buttocks are white and are margined with black. Only males have antlers: their peculiar shape is the basis for placing this deer in a genus distinct from *Cervus*. The antlers are flattened and palmate with numerous points. The males develop a single unbranched horn the second year, and each succeeding year the horns are larger and have more points, until the fifth or sixth year. The front outer curve of the antlers is 635-940 mm, and the tip-to-tip measurement is 305-762 mm. Fawns are usually slightly darker in colour than adults and spotted with white (Chapman and Chapman 1975, Bentley 1978, Chapman and Chapman 1980, Feldhamer et al 1988, Corbet and Harris 1991, Nowak 1999, Long 2003).

| Synonyms: Cervus dama | General information – Social behaviour varies; in some areas Fallow Deer do not appear gregarious, but in other areas herds of as many as 30 individuals are commonly seen throughout the year. There does not seem to be a dominance hierarchy, but a doe is usually the group leader. Adult males are usually solitary but may join in bachelor groups of fewer than 6 individuals during the summer (Feldhamer et al 1988, Corbet and Harris 1991, Nowak 1999).

| Opinion remains divided regarding whether *Dama* should be considered a distinct genus, or included within *Cervus* (Nowak 1999). | Longevity – Maximum recorded longevity in captivity 21.1 years. It has been estimated that in the wild, these animals can live up to 25 years, however this is doubtful (HAGR Human Ageing Genomic Resources 2006).

| Date of Assessment: 04/08/2008 | Status –

1. Red List Category – Lower Risk Least Concern
   Rationale: A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable (Deer Specialist Group 1996).

2. CITES listed Protection Status – CITES Appendix I
   Rationale: Not listed, except for the subspecies *Dama dama mesopotamica*, which is included on CITES Appendix I. Appendix I lists species that are the most endangered among CITES-listed animals and plants (CITES 2007). This subspecies was once considered to be extinct, but in the 1950s a small population probably containing fewer than 50 individuals was found along several rivers in western Iran, near the border with Iraq. However, by 1988 the last wild population had all but disappeared. Individuals taken from the wild form the basis for a semi-captive herd of 140 deer in northwestern Iran (Nowak 1999).

Bird and Mammal Model Used: (Bomford 2008) using PC CLIMATE (Brown et al 2006, Bureau of Rural Sciences 2006)

The Risk Assessment Model

Models for assessing the risk that exotic vertebrates could establish in Australia have been developed for mammals, birds (Bomford 2003, 2006, 2008), reptiles and amphibians (Bomford et al 2005, Bomford 2006, 2008). Developed by Dr Mary Bomford of the Bureau of Rural Sciences (BRS), the model uses criteria that have been demonstrated to have significant correlation between a risk factor and the establishment of populations of exotic species and the pest potential of those species that do
establish. For example, a risk factor for establishment is similarity in climate (temperature and rainfall) within the species' distribution overseas and Australia. For pest potential, the species' overseas pest status is a risk factor. The model was originally published in 'Risk Assessment for the Import and Keeping of Exotic Vertebrates in Australia' (Bomford 2003) available online http://www.daff.gov.au/brs/land/feral-animals/management/risk. This model used the Apple Mac application CLIMATE (Pheloung 1996) for climate matching.

The risk assessment model was revised and recalibrated 'Risk Assessment for the Establishment of Exotic Vertebrates in Australia: Recalibrated and Refinement of Models' (Bomford 2006) and the climate application changed to PC CLIMATE software (Bureau of Rural Sciences 2006), available online at http://affashop.gov.au/product.asp?prodid=13506. The most recent publication (Bomford 2008) includes updated instructions for using the exotic vertebrate risk assessment models and an additional model for freshwater fish. A bird and mammal model for New Zealand has also been included.

**Which models are being used for the assessments:**

Birds and mammals have been assessed using the Australian Bird and Mammal Model (Bomford 2008), pp 16-28, including both versions of stage B, models 1 (4 factors) and 2 (7 factors). All reptiles and amphibians were assessed using three models; the Australian Bird and Mammal Model (Bomford 2008), including Model A, using 3 factors from stage B (pp 54-55), and Model B, using 7 factors from stage B (pp 20), and the Australian Reptile and Amphibian Model (Bomford 2008), p 51-53. The rational for using additional models for reptiles and amphibians is to compare establishment risk ranks of the three models for a precautionary approach. If the models produce different outcomes for the establishment potential of any reptile or amphibian, the highest ranked outcome should be used (Bomford 2008).

**Climate Matching Using PC CLIMATE**

Sixteen climate parameters (variables) of temperature and rainfall are used to estimate the extent of similarity between data from meteorological stations located in the species' world distribution and in Australia. Worldwide, data (source: worlddata_all.txt CLIMATE database) from approximately 8000 locations are available for analysis. The number of locations used in an analysis will vary according to the size of the species' distribution. Data from approximately 762 Australian locations is used for analysis.

To represent the climate match visually, the map of Australia has been divided into 2875 grid squares, each measured in 0.5 degrees in both longitude and latitude.

CLIMATE calculates a match for each Australian grid by comparing it with all of the meteorological stations within the species' distribution (excluding any populations in Australia) and allocating a score ranging from ten for the highest level match to zero for the poorest match. These levels of climate match are used in the risk assessment for questions B1 (scores are summed to give a cumulative score), C6, and C8. For a grid square on the Australian map to score highly, it must match closely all 16 climatic variables of at least one meteorological station in the species' distribution for each level of climate match. [The score for each grid is based on the minimum Euclidian distance in the 16-dimensional variable space between it and all stations in the species’ distribution. Each variable is normalized by dividing it by its worldwide standard deviation.]

**LITERATURE SEARCH TYPE AND DATE:** NCBI, CAB Direct, MEDLINE, Science Direct, Web of Knowledge (Zoological Records, Biological Abstracts), SCIRUS, Google Search and Google Scholar 19/02/2008
### STAGE A: RISKS POSED BY CAPTIVE OR RELEASED INDIVIDUALS

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<th>FACTOR</th>
<th>SCORE</th>
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<td>A1. Risk to people from individual escapees (0–2)</td>
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- **Assess the risk that individuals of the species could harm people.** (NB, this question only relates to aggressive behaviour shown by escaped or released individual animals. Question C11 addresses the risk of harm from aggressive behaviour if the species establishes a wild population.)
- **Aggressive behaviour, size, plus the possession of organs capable of inflicting harm, such as sharp teeth, claws, spines, a sharp bill, or toxin-delivering apparatus may enable individual animals to harm people. Any known history of the species attacking, injuring or killing people should also be taken into account. Assume the individual is not protecting nest or young. Choose one:**

  1. Animal that can make unprovoked attacks causing moderate injury (requiring medical attention) or severe discomfort but is highly unlikely (few if any records) to cause serious injury (requiring hospitalisation) if unprovoked

- **Fallow Deer** as a species are extremely timid and nervous. They display a bouncy gait when alarmed. However, Fallow bucks can be aggressive and can be dangerous when rutting (de Vos 1982, Jesser 2005); one of the characteristics of the rut is that mature bucks, which are usually secretive and wary, become bold and lose much of their fear of people (Chapman and Chapman 1975).

| A2. Risk to public safety from individual captive animals (0–2) | 0 |

- **Assess the risk that irresponsible use of products obtained from captive individuals of the species (such as toxins) pose a public safety risk (excluding the safety of anyone entering the animals' cage/enclosure or otherwise coming within reach of the captive animals)**

- **Nil or low risk (highly unlikely or not possible).**

**STAGE A. PUBLIC SAFETY RISK SCORE**

**SUM A1 TO A2 (0–4)**

| 1 |

### STAGE B: PROBABILITY ESCAPED OR RELEASED INDIVIDUALS WILL ESTABLISH FREE-LIVING POPULATION

**Model 1: Four-factor model for birds and mammals (BOMFORD 2008)**

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<td>B1. Degree of climate match between species overseas range and Australia (1–6)</td>
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- **Climate Match Score = 2451 Very high climate match with Australia** [See above information on climate matching.]

  - Climate data from 2693 locations (see species worldwide distribution map) were used to calculate the CMS; natural distribution Mediterranean region of southern Europe, Asia Minor and Palestine to Iran, and probably in northern Africa, with introduced populations worldwide (Long 2003) (see B2 and B3 for details).

| B2. Exotic population established overseas (0–4) | 4 |

- **Exotic population established on an island larger than 50 000 km² or anywhere on a continent**

  - The natural distribution is now difficult to define because of introductions and re-introductions. Its present worldwide distribution is due almost entirely to the activity of humans, with most introductions occurring in the 19th and 20th century. In Europe Fallow Deer have been introduced over a longer period from the 11th to 20th centuries (de Vos et al 1956, Chapman and Chapman 1975, 1980, Long 2003).

  - Free-living herds have been established by people in the United States, Canada, the West Indies, South America, South Africa, Madagascar, New Zealand, Fiji, and Australia. Many Fallow Deer are also maintained in captivity for exhibition or for commercial production of meat and antler velvet (Nowak 1999).

  - **Africa:**

    - Northern Africa: Fallow deer were present in Northern Africa, in parts of Algeria, Tunisia and Libya, until
the late 20th century. The origin of these animals is unknown – it is uncertain whether they were native to this region or introduced, although it is suspected that Northern Africa was a part of the species’ natural range. Fallow Deer may have been introduced by the Phoenicians as early as 7 BC. It is uncertain whether any Fallow Deer survive here today. Fallow Deer may have been introduced to Egypt during the 16th century (de Vos et al 1956, Chapman and Chapman 1975, 1980, Long 2003).

**South Africa:** Fallow Deer are found in the wild in Cape Province, the Orange Free State, and the Transvaal. In Natal province, Fallow deer are present only in fenced enclosures. Fallow Deer were first introduced to South Africa, when some were released on an estate in Capetown in 1887, and again in 1869. Numerous deer were released onto estates during the 1900s. Although Fallow Deer herds often occur on estates or farms in South Africa, these animals are considered to be wild/feral because they are free ranging, on large areas on native (as opposed to cultivated) land, up to 850 km² (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Fallow Deer also established on Robben Island, when 3 were taken there in 1963. By 1977, the population had increased to about 40 (Lever 1985, Long 2003).

**Madagascar** – Fallow Deer were successfully introduced in 1932, but they appear to have become extinct on the island some time prior to 1974 (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

**Europe:** Since the Middle Ages, Fallow Deer have occurred in almost every country in Europe. Originally the species was only present in Mediterranean countries, but animals were transported by the Phoenicians to newly founded colonies, for religious purposes; the Romans likewise released Fallow Deer as the holy deer of the goddess Diana (de Vos et al 1956, Long 2003, Blake 2007).

Fallow deer are now widespread in Europe, occurring in at least two-thirds of countries (Chapman and Chapman 1975). There have been Fallow Deer introductions in the following European countries:


- **Bulgaria** – The first introductions occurred in 1908-1911, but Fallow Deer probably already existed here from the Middle Ages or earlier. Wild populations of Fallow Deer are now widely dispersed in Bulgaria (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

- **Cyprus** – introduction attempts were being made in 1980-82 to re-establish the species on Cyprus, where it had been extinct since medieval times (Long 2003).

- **Czechoslovakia** (now Czech Republic and Slovakia) – Fallow Deer were not released in the wild until last century. Introduced in the Pavlov Hills, South Moravia, and became established, now widely distributed in the wild (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

- **Denmark** – Fallow Deer are mentioned in the Danish literature as early as 1231, having been introduced by Danish kings for hunting. They now occur in many deer parks as well as in the wild, and are present on the Jutland Peninsula and on four of the major islands (Langeland, Holland, Funen and Zealand), and four other very small islands (de Vos et al 1956, Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

- **Finland** – some uncertainty exists as to whether Fallow Deer occur in Finland in the wild. A free-ranging herd exists near Helsinki, which may have been obtained from central Europe in 1938. They numbered about 50 in 1938 (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).
France – Fallow Deer occur in a number of areas in France. Individuals were introduced near Orival, Somme, in the 1860s. They multiplied and spread towards Rouen, and now occur east of Longueval. A small number occur in the Samoussy Forest near Laon, north-east of Paris in the Department of Aisne, as a result of escape, but their present status is not known (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Germany – recorded there since the Middle Ages, Fallow Deer have been introduced in selected forest areas and have a fairly limited distribution. The first attempted releases for establishment occurred in 1577 when 30 deer were liberated near Salaburg, followed by many others in the early 17th and 18th centuries. Although Fallow Deer have been widely distributed in western Germany since the 16th century, they were found mainly in parks and not until much later did animals escape and become established in the wild. Subsequently, Fallow Deer were released deliberately in various places. In eastern Germany, they now occur mainly in the central and northern regions (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Greece – the species is not established in the wild in Greece today. Originally native to Mediterranean Europe, the Fallow Deer was probably re-introduced in Greece by the Knights of the Order of St John of Jerusalem in the 14th century. These populations were exterminated during the Turkish rule in 1522-1912, but re-introduction by the Italians took place between 1912-1945 (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Fallow Deer occur on the island of Rhodes in the Aegean Sea, but there is some debate as to whether they were introduced or are indigenous to the island (Lever 1985, Long 2003). The Island of Rhodes is thought to possess the last remnant of the most ancient line of Fallow Deer populations (Masseti 2007).

Hungary – wild Fallow Deer occur in only a few areas of Hungary. East of Budapest, there are some 600 Fallow Deer on an unfenced hunting reserve, where they were introduced in the late 19th century. In other areas they occur near Gyula between the River Koros and the Romanian border, around Taktakenex and Takaharkany, between Budapest and Komaron west of the Danube (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Netherlands – were released near the Hague early in the 17th century, but were all killed 20 years later; in 1647 they were introduced near Rheden, but were shot out by the end of the 18th century. In 1912, Fallow Deer were released into the forest at Hetloo and still exist in this area, they also spread further to a few kilometres north-west of Elspeet. Today, Fallow Deer escapees are usually shot before a feral population is established (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Norway – initial introduction uncertain, but it was probably as early as the 17th century. In the early 20th century, several liberations were made (3 Fallow Deer were released on Rauo Island in Oslo Fjord, and 50 were there in 1911, however they subsequently died out. Fallow Deer were released at Hurdalen in 1903, but these did not establish. The only free-ranging population occurs on Hanko, originating from 7 deer introduced in 1901-1902 and increased to 300 by 1936. Attempts to establish Fallow Deer elsewhere in the south and west of Norway probably failed because of the deep snow (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Poland – probably introduced in the 17th century, Fallow Deer are now established in many areas, particularly in the western half of the country. More recently, introductions have been made in some central and eastern districts (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Romania – the species was acclimatised in the middle of the 19th century. Wild populations are widely distributed, established in at least 16 areas, with a total population of about 3,800 in 1975 (Chapman...
Establishment has been successful in some areas, especially Moldova and the Ukraine where Fallow Deer are established locally. Some were introduced to the Caucasus in 1888, but were all killed in 1919-20. Introductions occurred in the Białowieża Forest in western Russia (on the Polish-Russian border) around 1890 and were partially successful, but none have been seen there since 1930 (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).


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Sweden – introduced in the 16th century, but the exact date is uncertain. Fallow Deer are occasionally found in the wild in Skane, Halland, Smaland, Vastergotland, Dalsland, Ostergotland, Sodermanland, Narke, Vastmanland, and Uppland (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Switzerland – occasionally individual Fallow Deer escape from deer parks, or immigrate from surrounding countries and are observed or shot, but the species is not considered to be permanently established anywhere in Switzerland (Long 2003).

United Kingdom – A large form of Fallow Deer (D. d. clactoniana) was living in Britain during the Hoxnian period, 250,000 years ago. This form became extinct during the last glaciation (Wurm) surviving only further south in Europe (Chapman and Chapman 1975, 1980, Corbet and Harris 1991).

Fallow Deer were almost certainly re-introduced by the Normans to Britain in the 11th century, and to Ireland in the 13th century, when they were released in forests and parks as highly prized quarry for hunting. By the 14th century there were many hundreds of parks where Fallow Deer were hunted. All the free-living deer in the British Isles today are descended from medieval introductions, or were escapees from deer parks, especially in the 20th century during WWII (Chapman and Chapman 1975, 1980, Lever 1985, Corbet and Harris 1991, Long 2003).

Only in England have Fallow Deer dispersed throughout the whole country. In Wales and Scotland, the populations are more widely scattered. In Ireland, Fallow Deer occur in several localities in the north-eastern half of the country (Chapman and Chapman 1975, 1980).

However, the status of Fallow Deer as an introduced or indigenous animal in the UK still carries some doubts. There is some evidence that it may be indigenous in the New Forest in Hampshire and Epping Forest in Essex (Chapman and Chapman 1969, Long 2003).


North America:

Canada – Fallow Deer have been introduced to James Island, British Columbia, where the species has been flourishing since release in 1895. Release also occurred to Saltspring, Pender and Vancouver Islands, where the deer became established for some time (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).
United States – Fallow Deer have been released in several areas of the United States since the 1870s and have become established in some. They appear to be still established in localities in Alabama, California, Colorado, Georgia, Kentucky, Massachusetts, Nebraska, New Mexico, Texas, and are established on estates in other states (de Vos et al 1956, Chapman and Chapman 1975, 1980, Lever 1985, Long 2003). Fallow Deer were also introduced to the island of Martha’s Vineyard, Massachusetts (de Vos et al 1956, Chapman and Chapman 1975).

South America:

Argentina – Fallow Deer were introduced to Argentina in the 1920s and released into Buenos Aires, Santa Fe and Rio Negro provinces, other importations have occurred to other parts of the country. They have also established in Neuquén province. Fallow Deer are abundant on Isla Victoria and also occur as a small population on the north-eastern shore of Nahuel Huapi Lake (de Vos et al 1956, Chapman and Chapman 1975, 1980, Lever 1985, Veblen et al 1989, Long 2003, Novillo and Ojeda 2008).


Peru – Fallow Deer were released at Cajamarca province in 1948, and apparently earlier in the 1920s on the Hacienda Casa Grande in the northern part of Peru. They have not multiplied greatly at Casa Grande, possibly due to predation by Pumas (Felis concolor), and persistent poaching at Cajamarca, only 20-25 remained in the 1970s. These were later relocated to the Chiamaco river basin, where they later became established (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Uruguay – During the 1930s some Fallow Deer were kept in an enclosure in the Department of Colonia. The enclosure no longer exists, but Fallow Deer have been reported in the vicinity (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

West Indies:

Lesser Antilles – In the Leeward Islands, Lesser Antilles, 2 islands have free-ranging populations of Fallow Deer. They were introduced on Barbuda during the 18th century. It was presumed for many years that there were no Fallow Deer there, but more recent photos and specimens indicate they are still present. Fallow Deer are also present on Guana (Iguana), off Antigua. It was initially thought these were White-tailed Deer (Odocoileus virginianus), but were correctly identified as Fallow Deer in 1978 (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Pacific Ocean Islands:

Fiji – Fallow Deer were imported in 1880 to the island of Wakaya, Fiji. By 1929 1000 were present but by 1977, numbers decreased to about 400 individuals (Chapman and Chapman 1975, 1980, Long 2003).

New Zealand – Fallow Deer were first imported to New Zealand in 1864. There were subsequently 25 known introductions involving at least 60 Fallow Deer. All introductions of Fallow Deer were partially successful, except for those on Kapiti Island. However, Fallow Deer have not generally spread in New Zealand, although they are common in some areas. Scattered populations still occur across both the North and South islands, with the largest herds probably in the Wanganui, Westland and Wakatipu areas (de Vos et al 1956, Chapman and Chapman 1975, 1980, Veblen and Stewart 1982, Fraser et al 2000, Long 2003, King 2005).
Australasia:

Papua New Guinea – Fallow Deer may have been introduced to the Madang area along with other deer species in the 1920s, but are not known to be now established anywhere. It is possible that deer had been misidentified and may have in fact been Rusa Deer (*Cervus timorensis*), that are widely established in Papua New Guinea (Chapman and Chapman 1975, 1980, Lever 1985, Long 2003).

Australia – Scattered populations of Fallow Deer are present in Australia from south-east South Australia to Stanthorpe in Queensland, and in Tasmania, where they are well established with a total number of around 8,000-10,000. Fallow Deer were first introduced to Tasmania in 1829, and to the mainland around 1844. From these dates until about 1924 there were several more introductions in different parts of the country, including: Albury, Delaware, Burgowanah, and Jindera, New South Wales; Phillip Island (died out in the 1920s after surviving for 60 years), Narbethong-Healesville, Kinglake, Yanra Glen, the Grampians, Blackwood and Brisbane ranges, Victoria; Warwick, Stanthorpe, and Maryvale Station Queensland; Pewsey Vale and Adelaide Hills, South Australia; Cape Leeuwin, Gingin, Gidgegannup, and Pinjarra, Western Australia. Fallow Deer were released at Port Essington, Northern Territory, in 1912, but failed to become established. Small populations still survive in the vicinity of original points of liberation in all States except Western Australia; a large population is established in Tasmania (de Vos et al 1956, Chapman and Chapman 1975, Bentley 1978, 1980, Lever 1985, Strahan 1995, Long 2003, Moriarty 2004, Jesser 2005).

B3. Overseas range size (0–2)

< 1 = 0; 1 – 70 = 1; >70 = 2

Overseas range between 1-70 million km², estimated at 15.54 million km². Includes current and past 1000 years, natural and introduced range.

The natural distribution is now difficult to define because of introductions and re-introductions. Its present worldwide distribution is due almost entirely to the activity of humans, with most introductions occurring in the 19th and 20th century. In Europe Fallow Deer have been introduced over a longer period from the 11th to 20th centuries. During the last interglacial period the Fallow Deer was widespread in Europe, from England to Russia. During the following Wurm glacial period (lasting 60,000 years) its range diminished and Fallow Deer only existed in a few places at the end (about 10,000 years ago) of the period. Unlike other deer species, Fallow Deer did not re-colonise Europe after the last Ice Age and it is now thought that the present distribution is most likely largely human-made (Nowak 1999, Long 2003).

The species originally occurred in the Mediterranean region of southern Europe, Asia Minor and Palestine to Iran, and probably in northern Africa. Reports that the species also lived in Ethiopia until about 1000 years ago are based only on two questionable representations. The populations in Asia, to the east and south of Turkey, and in Africa, sometimes have been referred to as a separate species, *Dama mesopotamica*. However, this species is now extinct in Africa and Asia, except for a few survivors in western Iran (de Vos et al 1956, Feldhamer et al 1988, Saltz 1996, Nowak 1999, Long 2003).

Continental Asia Minor is considered as the only geographical range where the Fallow Deer has persisted as a native form. The Island of Rhodes is thought to possess the last remnant of the most ancient Fallow Deer populations (Masseti 2007).

While the Fallow Deer was spreading into new areas, it was disappearing from its original range because of both excessive hunting and climatic changes. The genus *Dama* apparently disappeared from Africa in the 19th century, from the mainland of Greece in the early 1900s, and from Sardinia in the 1950s. At the same time, it became very rare in the Asian parts of its range (Nowak 1999).

Introduced populations occur worldwide (Long 2003) (see B2 for details).
### B4. Taxonomic Class (0–1)

1  

**Mammal** (Catalogue of Life 2008).

### B. Establishment Risk Score

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**Model 2: Seven-factor model for birds and mammals (BOMFORD 2008)**

### B5. Diet (0–1)

1  

**Generalist with a broad diet of many food types**

Diet mainly includes grass, forbs, and sedges. Fallow Deer will also browse leaves and bark of shrubs and trees, young shoots, beech mast, chestnuts, acorns, roots, vegetables, flowers and cultivated crops, dried leaves, bark of trees and bushes, mosses, fungi and lichens (Nugent 1990, Putman 1993, Borkowski and Obidzinski 2003, Long 2003).

### B6. Lives in disturbed habitat (0–1)

1  

**Can live in disturbed habitats**

Fallow Deer occupy a great variety of habitats, but generally some forest is required for shelter (Corbet and Harris 1991, Nowak 1999). Habitat utilised is often a combination of vegetation types, and includes open woodlands with undergrowth, adjacent grasslands, parklands, plains, light hilly country with dense grassy cover and sparse woods or brushy areas (Feldhamer et al 1988, Long 2003). They frequently forage in agricultural or other open land outside of woodlands; populations can thus equally well be supported in smaller woodlands or scattered copses in agricultural land (Corbet and Harris 1991, Thirgood 1995).

### B7. Non-migratory behaviour (0–1)

1  

**Non-migratory or facultative migrant in its native range**

The species is not noted for any migratory behaviour in Walker’s Mammals of the World (Nowak 1999). Home range size varies depending on availability of food and other factors such as shelter, degree of disturbance, climate factors, and density of animals (Feldhamer et al 1988, Nowak 1999), may be 0.5-1 km² (Long 2003). Home range size averages 0.66-1.89 km² in New Zealand (Nugent 1994). The range in winter increase in size by about 50% (Corbet and Harris 1991).

Males occupy two seasonal home ranges, which may or may not overlap; one during the rut and one when they are in bachelor groups (Feldhamer et al 1988). In the mating season, at least in some areas, many of the older, more powerful males establish small territories centred about 100 m apart (King 2005).

### B. Establishment Risk Score

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### STAGE C: Probability an Established Species Will Become a Pest

#### C1. Taxonomic group (0–4)

4  

**Mammal** in one of the orders that have been demonstrated to have detrimental effects on prey abundance and/or habitat degradation; AND  

**Mammal** in one of the families that are particularly prone to cause agricultural damage  

Order Artiodactyla, Family Cervidae (Catalogue of Life 2008).

#### C2. Overseas range size including current and past 1000 years, natural and introduced range (0–2)

1  

**Overseas range 10-30 million km². Estimated at 15.54 million km².**

Overseas distribution Mediterranean region of southern Europe, Asia Minor and Palestine to Iran, and probably in northern Africa, with introduced populations worldwide (Long 2003) (see B2 and B3 for...
Fallow Deer (*Dama dama*) risk assessment for Australia. Amanda Page, Win Kirkpatrick and Marion Massam, August 2008, Department of Agriculture and Food, Western Australia.

| C3. Diet and feeding (0–3) | 3 | Mammal that is primarily a grazer or browser  
Fallow Deer are predominantly grazers, but they also commonly browse trees and shrubs (Corbet and Harris 1991, Putman 1993, Nowak 1999, Piasentier et al 2007) (see B5 for details). |
|---------------------------|---|---|
| C4. Competition with native fauna for tree hollows (0–2) | 0 | Does not use tree hollows  
Does not use tree hollows (Nowak 1999). |
| C5. Overseas environmental pest status (0–3) | 3 | Major environmental pest in any country or region  
**Browsing damage**  
In New Zealand, Fallow Deer are able to build up large numbers and cause severe damage to the vegetation, but they do not occupy high altitude forest and alpine grassland where the erosion risk from deer activity is severe (Long 2003). Fallow Deer have caused severe modification to indigenous vegetation in some areas. In a few places densities are so high in native forests that they prevent the regeneration of their most preferred tree species (King 2005). A study of their impact on the Wakatipu Forest in New Zealand over a period of two decades found little evidence that browsing by Fallow Deer caused large changes in the structure and composition of the forest. The limited changes in composition of the forest that was detected could have been due to natural successional processes, or to the legacy of high Fallow Deer densities prior to establishment of the study site, as much as to contemporary effects of browsing on the remaining palatable species (Husheer and Frampton 2005).  
In woodland, Fallow Deer may damage young plantings or prevent regeneration of coppice and bark-stripping of mature trees, both coniferous and deciduous, may also be a problem. Severe damage to ground flora has been reported in some places, such as to the Oxslip (*Primula elatior*) in Hayley Wood, Cambridgeshire (Corbet and Harris 1991).  
In some National Nature Reserves in the Czech Republic, browsing damage to broadleaves by ungulate game species, including Fallow Deer, remains a significant limiting factor for the evolution of the forest ecosystems. In several studied reserves, browsing reached levels where protection efforts to maintain these landscape areas were being jeopardised (Cermak and Mrkva 2003).  
By browsing on tree seedlings, shrubs and climbers, deer tend to reduce stem densities, limit height growth and reduce foliage density, creating a more open understorey. Light penetration to the ground can increase, providing more plant cover close to the ground. Deer tend to reduce the diversity of seedlings, and that effect is greater at higher densities of deer. The effects of deer on the amount and composition of regeneration appear to depend on site characteristics, including the light regime and composition of the ground vegetation (Gill and Beardall 2001). High grazing by deer suppresses regeneration, by severely reducing seedling density and by delaying growth of seedlings that do survive (Gill 2000).  
Major impacts of deer on the ground flora of lowland woods in Britain have become common, often with a shift to grass-dominated vegetation. Recent studies have shown that the ground flora is being heavily affected by increased levels of grazing within British broadleaved woodland, particularly as a consequence of rising deer populations. Fallow Deer in Haley Wood have been observed to eat the flower stalks of *Primula elatior*, and to take the flowers of this and *P. vulgaris* throughout East Anglia. Some woodland herbs are long-lived, so reduced seed production because of deer grazing may not be significant. However, for other plants, reductions in successful flower and seed production could have long-term effects on the survival of herbs in a wood (Kirby 2001).  
The impact of ungulate browsing was observed by comparing 20 pairs of fenced and unfenced plots... |
over a 10 year period in the Netherlands. A reduction in herbivores resulted in a strong increase of shrub and tree sapling numbers. However, height growth of the most palatable broadleaved tree species was still strongly impeded. It was argued that the most browse-sensitive woody species such as Pedunculate and Sessile Oak (*Quercus robur* and *Q. petraea*) will successfully regenerate only if temporal and spatial variation in browsing pressure is allowed to occur (Kuiters and Slim 2002).

**Trampling damage**

Some common woodland plants are damaged by trampling, so that their abundance is reduced along deer paths or in areas where deer congregate. Hoof-scraping may destroy bulbs, or bring them closer to the soil surface where they are more vulnerable to attack by animals such as slugs (Kirby 2001).

In one study in South America, there was a dramatic difference between understoreys with and without deer, as in the *Nothofagus-Austrocedrus* forests in Northern Patagonia with the scarcity of the subcanopy tree *Aristotelia chilensis* in the deer-affected area. Deer have drastically reduced the abundance of both *Austrocedrus* and *Aristotelia*, and seedlings and saplings were rare (Veblen et al 1989).

**Thrashing damage**

Male Fallow Deer may also inflict considerable damage on individual trees by thrashing them with their antlers, both in aggressive display during the rut and in cleaning velvet from newly grown antlers in late summer (Corbet and Harris 1991).

**Damage to fauna (competition, habitat destruction etc.)**

Where Fallow Deer have been introduced on Little St Simon’s Island, Georgia, in the United States, the native White-tailed Deer (*Odocoileus virginianus*) has disappeared (Long 2003). The Fallow Deer was also introduced to Martha’s Vineyard island, Massachusetts, where it apparently competed for food with the White-tailed Deer (de Vos et al 1956).

Deer grazing and browsing may impact fauna indirectly. The majority of herbivorous insects feed almost entirely on one or a very limited number of plant species. As a result, their diversity is likely to be directly related to the richness of the plant community (Gill 2000, Stewart 2001). Deer also directly compete with herbivorous invertebrates for plant food (Stewart 2001).

The effects of deer in woodlands are known to result in habitat changes which can be detrimental to songbirds. The principal mechanism by which deer may affect habitat quality is through the reduction of low woody vegetation by browsing, which forms a key element to the preferred habitat of several species of birds – this may be associated with loss of nest sites, increased exposure to predators, and reduction of food (Gill and Fuller 2007).

In Argentina, Fallow Deer populations cause habitat modification, affect tree composition, structure and regeneration, and compete with and displace native deer species (Novillo and Ojeda 2008).

**Other damage**

Deer also alter the pattern of nutrient cycles through consumption of material in some areas and dunging in others. Positive effects of deer on seed spread include the distribution of seeds that have passed through the gut, of seeds on the coat or in earth on the hooves. (Kirby 2001).

**Environmental benefits**

Invertebrate groups that benefit from deer include dung beetles, external and internal parasites, and species dependent on carrion. Three species of Dung Beetle (*Aphodius* spp.) with a limited range are known to occur in woodlands and use deer faecal pellets. There are also 13 rare species of carrion...
Ground dwelling or nesting birds may be threatened by trampling of eggs and/or nests by Fallow Deer and plants may be threatened by trampling or grazing by deer. Susceptible Australian native species or natural communities that could be threatened include, but are not limited to:


**Invertebrates:** **Critically endangered** – Golden Sun Moth (*Synemon plana*); **Endangered** – Gove Crow Butterfly (*Euploea al catchoe*), a moth (*Phyllodes imperialis*); **Vulnerable** — Bathurst Copper Butterfly (*Paralucia spinifera*).


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Fallow Deer (*Dama dama*) risk assessment for Australia. Amanda Page, Win Kirkpatrick and Marion Massam, August 2008, Department of Agriculture and Food, Western Australia.


**Communities:** Iron-grass Natural Temperate Grassland of South Australia (critically endangered), Eastern Stirling Range Montane Heath and Thicket (endangered), Natural Temperate Grassland of the Fallow Deer (*Dama dama*) risk assessment for Australia. Amanda Page, Win Kirkpatrick and Marion Massam, August 2008, Department of Agriculture and Food, Western Australia. 13
C7. Overseas primary production pest status (0–3)

<table>
<thead>
<tr>
<th>Has the species been reported to damage crops or other primary production in any country or region of the world?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Tablelands of NSW and the Australian Capital Territory (endangered).</td>
</tr>
</tbody>
</table>

AND The species has more than 100 grid squares within the highest four climate match classes that overlap the distribution of any susceptible native species or ecological communities.

**Mammals:** Rufous Bettong (*Aepyprymnus rufescens*), Central Hare-wallaby (*Lagorchestes asomatus*), Spectacled Hare-wallaby (*L. conspicillatus*) (Strahan 1995).

<table>
<thead>
<tr>
<th>Overseas primary production pest status (0–3)</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Europe, Fallow Deer occasionally eat turnips, beet and other crops, and may cause considerable damage. Damage to forests and farm crops in Britain is sometimes severe. In England the most common damage is grazing of early spring grass and corn crops that suffer considerable damage. Fallow Deer will eat the fruit from trees and retard plant growth by feeding on the leaves and shoots (Long 2003).</td>
<td></td>
</tr>
<tr>
<td>Fallow Deer are probably the most widely implicated species that damage agricultural crops and forestry in lowland Britain. It has great potential to cause damage to farm woodlands and commercial plantations as is their potential to damage cereal agriculture. The actual economic significance of this damage has not been accurately determined. Most of the agricultural damage reported is to cereals from eastern England. Fallow Deer are regularly observed grazing arable crops in the lowlands. They most frequently damage cereal crops, and can feed directly on ripening corn ears. They may also cause damage to other ripening crops by crushing stems in bedding sites or by rolling in the crop. Fallow Deer can cause damage to fruit orchards, mainly by browsing vegetative growth rather than causing damage to tree bark/stems or fruits. Young trees appear to be more at risk than older specimens, and certain fruit trees appear more susceptible than others (Putman and Moore 1998).</td>
<td></td>
</tr>
<tr>
<td>Deer cause damage to farm woodlands by bark-stripping. Stripping damage tends to be irregular and of varying intensity. Damage is primarily restricted to the winter period when food is short. Bark stripping rarely results in the death of a tree, however it may cause stunted growth, and extensive wounding may facilitate secondary fungal infection. Male deer also cause damage to both broadleaved and coniferous trees with their antlers by scoring the trunk of relatively mature trees with the antler tines and during territorial displays in the breeding season (Putman and Moore 1998).</td>
<td></td>
</tr>
<tr>
<td>It is probably only in areas of high density that Fallow Deer can become pests of forestry and agriculture. In woodland they damage young plantings or prevent regeneration of coppice. In agricultural areas they feed in farmland and may constitute a problem by competing for feed with stock (Long 2003). In areas of high population density most wild populations are controlled by shooting. Culling at appropriate levels means that the population can be managed not only for control, but also for annual harvest of a profitable crop of venison. Production of venison has also led to the development of commercial Fallow Deer farms in the UK and elsewhere. In addition to the venison there are also markets for the skins and antlers (Corbet and Harris 1991).</td>
<td></td>
</tr>
<tr>
<td>Coppicing is a form of silvicultural management that is used for woodland conservation management in the UK, and elsewhere in Europe. Deer browsing currently poses the greatest threat to the successful re-growth of the coppice in England. The most obvious effect of deer browsing is the change in vegetation structure, which might also affect animal biodiversity. It is predicted that Deer browsing is likely to reach unprecedented levels in the future unless active measures are taken to reduce damage to individual coppice from deer populations, and that some form of deer management is required to prevent excessive reduction of the shrub layer and ground vegetation (Joys et al 2004). In the south of England, browsing of Fallow Deer damage was highest on Sweet Chestnut (<em>Castanea sativa</em>), Ash (<em>Fraxinus excelsior</em>) and Lime (<em>Tilia cordata</em>) (Kay 1993).</td>
<td></td>
</tr>
</tbody>
</table>
In New Zealand, Fallow Deer cause some damage to watershed protection forests and pasture lands (Long 2003). Wild Fallow Deer sometimes impede efforts to reduce the regional incidence of Bovine Tuberculosis, but they have a limited distribution and most populations are not involved in this issue (King 2005).

Fallow Deer are farmed extensively for venison and velvet (Long 2003).

**Australia:**

In south-east Queensland, Australia, damage to forestry seedlings, agricultural crops, commercial flower crops and orchards has been observed. Fallow Deer are direct grazing competitors with cattle. Competition with livestock, combined with the need for expensive deer exclusion fencing means that it can be costly for a primary producer to manage deer. There is also risk of wild deer transmitting diseases or parasites to domestic stock (Jesser 2005).

Wild deer also have the potential to compete with native animals. A study of the dietary overlap between Fallow Deer and Forester Kangaroos (Macropus giganteus) in Tasmania found that there was a significant overlap in mid winter, when food shortages were at their greatest, and that the deer had much wider feeding range than Forester kangaroos (Duncan 1987) as cited in (Moriarty Unpublished).

<table>
<thead>
<tr>
<th>C8. Climate match to susceptible primary production (0–5)</th>
<th>5</th>
<th>Score = 483 (Bomford 2003, 2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess Potential Commodity Impact Scores for each primary production commodity listed in Table 9, based on species' attributes (diet, behaviour, ecology), excluding risk of spreading disease which is addressed in Question C9.</td>
<td></td>
<td>See Commodity Scores Table – the species has attributes making it capable of damaging sheep, cattle, timber, cereal grain, oilseed, grain legume, other fruit, vegetable, nut, other livestock, and other horticultural industries.</td>
</tr>
</tbody>
</table>

| C9. Spread disease (1–2) | 2 | All birds and mammals (likely or unknown effect on native species and on livestock and other domestic animals). |

<table>
<thead>
<tr>
<th>C10. Harm to property (0–3)</th>
<th>1</th>
<th>$1.00-10 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>The annual number of vehicle collisions with ungulates (including Fallow Deer) in Europe is estimated to cause material damage amounting to US$1 billion (Groot Bruinderink and Hazebroek 1996). In Europe, the rate of collisions between vehicles and deer in general is 74,000 a year, and the cost to motorists is massive (Blake 2007). Fallow Deer could potentially cause damage to home gardens by trampling or feeding on garden beds.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C11. Harm to people (0–5)</th>
<th>3</th>
<th>Moderate risk – injuries or harm moderate but unlikely to be fatal and few people at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess the risk that, if a wild population established, the species could cause harm to or annoy people. Aggressive behaviour, plus the possession of organs capable of inflicting harm, such as sharp teeth, tusks, claws, spines, a sharp bill, horns, antlers or toxin-delivering organs may enable animals to harm people. Any known history of the species attacking, injuring or killing people should also be taken into account (see Stage A, Score A7).</td>
<td></td>
<td>Although a shy and timid species, males Fallow Deer are aggressive and can be dangerous during the rut (Jesser 2005); one of the characteristics of the rut is that mature bucks, which are usually secretive and wary, become bold and lose much of their fear of people (Chapman and Chapman 1975). Deer-vehicle collisions, including collisions with Fallow Deer, have become a serious road-safety problem in Europe (Blake 2007). The annual number of collisions with ungulates in Europe (excluding Russia) is estimated at 507 000, which results in 300 people killed and 30 000 injured. In France, the mean annual number of people killed in collisions between cars and ungulates is approximately 50, and about 2 500 people suffer injury; in Sweden, 10-20 people are killed each year and about 750-1000 injured (Groot Bruinderink and Hazebroek 1996). Zoonoses: Free-ranging Deer are thought to be relatively free of major diseases (Corbet and Harris 1991).</td>
</tr>
</tbody>
</table>
There are reports of Fallow Deer carrying Q-Fever (*Coxiella burnetii*) antibodies (Hubalek et al 1993). Symptoms of this disease in humans can include chills, fever, sweating, headache, and endocarditis; the overall mortality is low, probably 1% or less in untreated cases (Stevenson and Hughes 1988).

Fallow Deer may act as hosts for disease carrying ticks, such as Lyme Disease - transmission of spirochaete through tick bite; symptoms include malaise, fatigue, chills, pyrexia, headache, episodic polyarthritis, cardiac and neurological abnormalities; If diagnosed in the early stages, Lyme Disease can be cured with antibiotics but without treatment, complications involving joints, the heart, and the nervous system can occur (Stevenson and Hughes 1988, Duffy et al 1994).

Wild Deer may also be a source of Leptospirosis, a bacterial disease caused by spirochaetes of the genus *Leptospira*. It is among the world's most common zoonoses, but a relatively rare bacterial infection in humans. It can be transmitted to humans by water contaminated by animal urine having contact with breaks in the skin, eyes or with the mucous membranes. Infection from these zoonotic diseases is more likely in hunters and agricultural workers. However, the potential for disease transmission becomes an increasing public health issue as wild deer intrude more into outer urban areas. In closely settled areas, the disease is likely to be transferred from deer to humans through domestic animals such as dogs (Jesser 2005).

<table>
<thead>
<tr>
<th>C. PEST RISK SCORE</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGE A. PUBLIC SAFETY RISK RANK – RISK TO PUBLIC SAFETY POSED BY CAPTIVE OR RELEASED INDIVIDUALS</td>
<td>1 MODERATELY DANGEROUS</td>
</tr>
<tr>
<td>0 = Not dangerous; 1 = Moderately dangerous; ≥ 2 = Highly dangerous</td>
<td></td>
</tr>
<tr>
<td>STAGE B. ESTABLISHMENT RISK RANK – RISK OF ESTABLISHING A WILD POPULATION</td>
<td>11 EXTREME ESTABLISHMENT RISK</td>
</tr>
<tr>
<td>MODEL 1: FOUR-FACTOR MODEL FOR BIRDS AND MAMMALS (BOMFORD 2008)</td>
<td></td>
</tr>
<tr>
<td>≤ 5 = low establishment risk; 6–8 = moderate establishment risk; 9–10 = serious establishment risk; ≥11–13 = extreme establishment risk</td>
<td></td>
</tr>
<tr>
<td>STAGE B. ESTABLISHMENT RISK RANK – RISK OF ESTABLISHING A WILD POPULATION</td>
<td>14 EXTREME ESTABLISHMENT RISK</td>
</tr>
<tr>
<td>MODEL 2: SEVEN-FACTOR MODEL FOR BIRDS AND MAMMALS (BOMFORD 2008)</td>
<td></td>
</tr>
<tr>
<td>≤ 6 = low establishment risk; 7–11 = moderate establishment risk; 12–13 = serious establishment risk; ≥14 = extreme establishment risk</td>
<td></td>
</tr>
</tbody>
</table>
### Stage C. Pest Risk Rank - Risk of Becoming a Pest Following Establishment

<table>
<thead>
<tr>
<th>&lt; 9 = low pest risk; 9-14 = moderate pest risk; 15-19 = serious pest risk; &gt; 19 = extreme pest risk</th>
<th>29</th>
<th>Extreme Pest Risk</th>
</tr>
</thead>
</table>

### Verterbrate Pests Committee Threat Category

<table>
<thead>
<tr>
<th>Median number of references per mammal, for all mammals assessed by (Massam et al 2010) (n=17)</th>
<th>37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of references for this species (\text{median number for references for Public Safety Risk, Establishment Risk and Overseas Environmental and Agricultural Adverse Impacts})</td>
<td>47 – more than the median number of mammal references were used for this assessment, indicating a decreased level of uncertainty.</td>
</tr>
</tbody>
</table>
WORLDWIDE DISTRIBUTION – Fallow Deer (*Dama dama*), includes current and past 1000 years; including natural populations (black) and introduced populations (red).

Each black or red dot is a location where meteorological data was sourced for the climate analysis (see B1), faint grey dots are locations available for CLIMATE analysis but are not within the species’ distribution therefore not used.

[Note: The Australian distribution indicated, was not included in the climate analysis for this assessment. However, to assist predictions of further spread within Australia, an analysis with Australian distribution has also been included on page 9 for comparison.]
Map 1. Climate match between the world distribution of Fallow Deer (*Dama dama*) and Australia for five match classes.

<table>
<thead>
<tr>
<th>Colour on Map</th>
<th>Level of Match from Highest (10) to Lowest (6)</th>
<th>No. Grid Squares on Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>10 HIGH MATCH</td>
<td>1</td>
</tr>
<tr>
<td>Pink</td>
<td>9 HIGH MATCH</td>
<td>110</td>
</tr>
<tr>
<td>Dark Green</td>
<td>8 MOD MATCH</td>
<td>762</td>
</tr>
<tr>
<td>Mid Green</td>
<td>7 MOD MATCH</td>
<td>1176</td>
</tr>
<tr>
<td>Lime Green</td>
<td>6 LOW MATCH</td>
<td>402</td>
</tr>
</tbody>
</table>

CMS = 2451

Map 2. Climate match between the world distribution (including Australian distribution) of Fallow Deer (*Dama dama*) and Australia for five match classes.

<table>
<thead>
<tr>
<th>Colour on Map</th>
<th>Level of Match from Highest (10) to Lowest (6)</th>
<th>No. Grid Squares on Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>10 HIGH MATCH</td>
<td>9</td>
</tr>
<tr>
<td>Pink</td>
<td>9 HIGH MATCH</td>
<td>205</td>
</tr>
<tr>
<td>Dark Green</td>
<td>8 MOD MATCH</td>
<td>710</td>
</tr>
<tr>
<td>Mid Green</td>
<td>7 MOD MATCH</td>
<td>1132</td>
</tr>
<tr>
<td>Lime Green</td>
<td>6 LOW MATCH</td>
<td>396</td>
</tr>
</tbody>
</table>

CMS = 2452
### Fallow Deer (Dama dama) Susceptible Australian Primary Production – Calculating Total Commodity Damage Score

The commodity value index scores in this table are derived from Australian Bureau of Statistics 1999 – 2000 data. The values will require updating if significant change has occurred in the value of the commodity (Bomford 2006).

<table>
<thead>
<tr>
<th>Industry</th>
<th>Commodity Value Index 1 (CVI based on 2005-06 data)</th>
<th>Potential Commodity Impact Score (PCIS 0-3)</th>
<th>Climate Match to Commodity Score (CMCS 0–5)</th>
<th>Commodity Damage Score (CDS columns 2 X 3 X 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle (includes dairy and beef consumption of stock)</td>
<td>11</td>
<td>2</td>
<td>5</td>
<td>110</td>
</tr>
<tr>
<td>Cereal grain (includes wheat, barley sorghum etc)</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>120</td>
</tr>
<tr>
<td>Sheep (includes wool and sheep meat)</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>Fruit (includes wine grapes)</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Vegetables</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Poultry and eggs</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Aquaculture (includes coastal mariculture)</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oilseeds (includes canola, sunflower etc)</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Grain legumes (includes soybeans)</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cotton</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other crops and horticulture (includes nuts tobacco and flowers etc)</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Pigs</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other livestock (includes goats, deer, camels, rabbits)</td>
<td>0.5</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Bees (included honey, beeswax and pollination)</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Commodity Damage Score (TCDS)</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>483</strong></td>
</tr>
</tbody>
</table>

Table 9  
[Table 9 Rational Potential Commodity Impact Score (0-3)]

Assess Potential Commodity Impact Scores for each primary production commodity listed in Table 9, based on species' attributes (diet, behaviour, ecology), excluding risk of spreading disease which is addressed in Question C9, and pest status worldwide as:

0. Nil (species does not have attributes making it capable of damaging this commodity)

1. Low (species has attributes making it capable of damaging this or similar commodities and has had the opportunity but no reports or other evidence that it has caused damage in any country or region)

2. Moderate–serious (reports of damage to this or similar commodities exist but damage levels have never been high in any country or region and no major control programs against the species have ever been conducted OR the species has attributes making it capable of damaging this or similar commodities but has not had the opportunity)

3. Extreme (damage occurs at high levels to this or similar commodities and/or major control programs have been conducted against the species in any country or region and the listed commodity would be vulnerable to the type of harm this species can cause).

**Climate Match to Commodity Score (0–5)**

- None of the commodity is produced in areas where the species has a climate match within the highest eight climate match classes (ie classes 10, 9, 8, 7, 6, 5, 4 and 3) = 0
- Less than 10% of the commodity is produced in areas where the species has a climate match within the highest eight climate match classes = 1
  - Less than 10% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes (ie classes 10, 9, 8, 7, 6 and 5) = 1
  - Less than 50% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes AND less than 10% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes (ie classes 10, 9 and 8) = 2
  - Less than 50% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes BUT more than 10% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes = 3
  - OR More than 50% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes BUT less than 20% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes = 4
  - More than 50% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes OR overseas range unknown and climate match to Australia unknown = 5.]
Map 3. Climate match between the world distribution of Fallow Deer (*Dama dama*) and Australia for eight match classes.

<table>
<thead>
<tr>
<th>Colour on Map</th>
<th>Level of Match from Highest (10) to Lowest (3)</th>
<th>No. Grid Squares on Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
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</tr>
<tr>
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<td>Dark Green</td>
<td>8 HIGH MATCH</td>
<td>762</td>
</tr>
<tr>
<td>Mid Green</td>
<td>7 MOD MATCH</td>
<td>1176</td>
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<tr>
<td>Lime Green</td>
<td>6 MOD MATCH</td>
<td>402</td>
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<td>Yellow</td>
<td>5 MOD MATCH</td>
<td>287</td>
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<tr>
<td>Blue</td>
<td>4 LOW MATCH</td>
<td>44</td>
</tr>
<tr>
<td>Light blue</td>
<td>3 LOW MATCH</td>
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</table>
References


Duncan AMR (1987). A dietary study of two sympatric herbivores: Fallow deer (Dama dama) and Forester Kangaroos (Macropus giganteus tasmaniensis). University of Tasmania, Hobart.


Fallow Deer (Dama dama) risk assessment for Australia. Amanda Page, Win Kirkpatrick and Marion Massam, August 2008, Department of Agriculture and Food, Western Australia.
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**Fallow Deer (*Dama dama*)** risk assessment for Australia. Amanda Page, Win Kirkpatrick and Marion Massam, August 2008, Department of Agriculture and Food, Western Australia.
Vertebrate Pests Committee Threat Categories (Natural Resource Management Standing Committee 2004)

A species’ VPC Threat Category is determined from the various combinations of its three risk ranks; (A) Public safety risk rank, (B) Establishment risk rank, (C) Pest risk rank.

<table>
<thead>
<tr>
<th>A. Public Safety Risk Rank</th>
<th>C. Pest Risk Rank¹</th>
<th>B. Establishment Risk Rank¹</th>
<th>Threat Category</th>
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¹ ‘Establishment Risk’ is referred to as the ‘Establishment Likelihood’ and ‘Pest Risk’ is referred to as the ‘Establishment Consequences’ by the Natural Resource Management Standing Committee (2004).