

# A review of Pest Animals and Plants in Australia

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## Foreword - Tim Low, Invasive Species Council

Climate change and habitat loss attract so much attention today that many people don't recognise the extent to which invasive species are threatening our wildlife. Of Australia's extinctions since 1960, 76% were caused by invasive species. That percentage rises to 86% if we consider animal extinctions on their own. These figures come from a recent report I coauthored with Carol Booth, *Gone: Australian animals extinct since 1960*, published by the Invasive Species Council. They imply that Australia's next extinctions will more likely come about from invasive species, providing a reason for a strong focus on these. I commend HOPE Inc. for producing this report, which surveys the species and the problems they cause, helping keep invasive species in the public eye.

## Introduction

Australia has a long history of non-native species introductions, which includes over 27,000 plant species and 650 vertebrate species (Groves et al. 2005, Whisson et al., 2020), many of which have established wild populations across mainland Australia and become problems. The first vertebrate species to be introduced, the dingo (*Canus familiaris*), arrived from South East Asia between 3500 and 10,000 years ago (Baker and Gynther 2023). The first plant species to establish wild populations in Australia may have been the Tamarind (*Tamarindus indica*), introduced to the Northern Territory coast in the 1700s by Macassan fishermen, which is now regarded as an environmental weed in northern Queensland (Whisson et al. 2020).

Many pest species were introduced during the settlement of Europeans in Australia in the 1700s. Vertebrates such as pigs, rabbits, goats, deer, horses, donkeys and camels were brought over for farming and animal products, transport, physical labour, work and hunting. Other species were introduced for ornamental use, biological control of other species, for example the Cane toad (*Rhinella marina*), aesthetic value and some were released by accident. Many plant species, such as prickly pear cacti (*Opuntia spp.*), European Privet (*Ligustrum vulgare*) and European blackberry (*Rubus fruticosus agg.*) were brought over for aesthetic or agricultural use, but have now become huge problems due to their rapid multiplication rate.

Of the 650 vertebrate animal species introduced to Australia, 81 species have established wild populations, including 25 mammal species, 20 bird species and 30 freshwater fish species, with more than 30 of these considered pests. Pest plants are a larger category, with almost 3,000 non-native species establishing populations in the wild (Dodd et al. 2015).

## The impact of pest plants and animals

The impact of pest species across Australia is massive and far-reaching and an estimated \$400 million is spent on the management of the main plant and animal pest species every year (Hart and Bomford, 2006). Pest species have caused problems across the mainland including outcompeting native species for resources, threatening biodiversity, spreading and introducing diseases, disrupting existing ecosystems and affecting agriculture and livestock farming (Whisson et al. 2020).

### The impact on Australia's native species

Australia is known for its biodiversity and large number of endemic species; for example, 87% of Australia's 316 terrestrial mammal species are endemic (Woinarski et al. 2015), as well as 93% of all Australian reptiles and 94% of amphibians. Since the settlement of Europeans and introduction of hundreds of pest species, 27 native mammal species, 23 bird species and 4 frog species have become extinct in Australia and according to a 2023 report, pest species are the leading cause of native Australian animal extinctions since the 1960s (Low and Booth, 2023). The agents of extinction have been foxes (*Vulpes vulpes crucigera*), feral cats (*Felis catus*), black rats (*Rattus rattus*), brown trout (*Salmo trutta*), Asian wolf snakes (*Lycodon capucinus*) and two pathogens, amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) and a trypanosome (*Trypanoso lewisi*).

Many marsupials and native rodents cannot co-exist with foxes and cats, surviving only on predator-free islands and in mainland fenced reserves. At the Arid Recovery reserve in South Australia, efforts are underway to train bilbies and bettongs to become predator-wardy, to see if coexistence can become possible, to reduce the decline of native species.



### Section 1: Pest Animals



Throughout the 1700s, Europeans brought many pest species into Australia for transport, work, hunting, fishing, food and animal products, aesthetic value and biological control. Many of these species subsequently escaped captivity, such as the grey squirrel (*Sciurus carolinensis*), or were deliberately released into the wild, such as the dromedary camel (*Camelus dromedarius*), deer (*Cervus spp.*) and horse (*Equus caballus*) (Whisson et al. 2020). One of the most damaging pest species, the European rabbit (*Oryctolagus cuniculus*) was introduced in 1859 with

the intention of rabbits being hunted for sport.

Pest animal species currently cause huge problems, threatening biodiversity through their predation on and competition with native species, and by transmitting disease. They degrade habitats and ecosystems by grazing and trampling on land, contributing to erosion and by spreading weeds. In addition to this, there is an increasing understanding that co-occurring pest species can exacerbate impacts. For example, European rabbits provide a food source to European red foxes and feral cats which increases predator populations and leads to hyper-predation of native species (Courchamp et al. 2000).

Annually, it is estimated that pest animal species cause losses of \$743.5 million, which includes both agricultural losses and expenditure on management, administration and research (Agriculture Victoria, 2024). A recent survey found that 89% of land managers reported problems caused by feral animals, the main pests being wild dogs, foxes, rabbits, rats and mice (ABARES, 2023)

European rabbits are regarded as one of the most damaging pest species in Australia because they consume so much vegetation and prevent regeneration. They are estimated to impact over 300 threatened species through their destruction of habitats which affects both plant and animal populations. Rabbits have high reproductive rates so control is difficult and they are able to outbreed most measures put in place to control their numbers (DAFF, 2004).

The introduction of red foxes and feral cats has also led to significant shifts within Australian ecosystems (Glen and Dickman, 2005) and resulted in the loss of many of Australia's endemic land animals such as ground-dwelling birds and small mammals. Currently, red foxes threaten almost 100 endangered species and feral cats have been a major factor in the extinction of over 30 native mammal species. Currently feral cats threaten over 120 endangered species, including the numbat (*Myrmecobius fasciatus*), bilby (*Macrotis spp.*), bettong (*Bettongia spp.*) and bandicoot (*Peramelidae spp.*) (DAFF, 2004).

Another significant pest species is the Cane toad (*Rhinella marina*) which was introduced to Australia in 1935 as an attempt to control pests in sugarcane crops. Cane toads have now become a significant pest species, spreading across Northern Australia and threatening native wildlife. They threaten quolls, goannas and snakes that are poisoned when they prey on toads and ingest their toxins (Whisson et al. 2020).

The dingo (*Canus familiaris*) which was introduced between 3,500 and 10,000 years ago, and perhaps more than once, has been held responsible for the extinction from mainland Australia of the Thylacine (*Thylacinus cynocephalus*), Tasmanian Devil (*Sarcophilus harrisii*) and Tasmanian Native-hen (*Tribonyx mortierii*) (Fillios et al. 2012). However, dingoes can provide benefits as a top-order predator, suppressing populations of herbivores such as kangaroos and feral goats and (in some habitats) feral cats and red foxes (Glen et al. 2007).

Another early animal introduction was the Pacific Rat (*Rattus exulans*), a species native to Flores Island in Indonesia that was introduced to Norfolk Island around 900 years ago. The introduction of this species resulted in the demise of the Lord Howe Island Gecko (*Christinus guentheri*) and skink (*Oligosoma lichenigera*) (Whisson et al., 2020) which inhabited offshore isles such as the Norfolk and Lord Howe Islands. The Pacific Rat also probably contributed to the extinction of a flightless rail, snipe and some seabirds.

Other invasive animals, not considered here, include fish, marine invertebrates travelling with ships, insects, mites, spiders, millipedes, snails and worms.

## Section 2: Pest Plants



An estimated 27,000 plant species have been introduced to mainland Australia (Whisson et al. 2020). In the 1700s, most plants were introduced for ornamental horticulture with approximately 94% of all exotic plants introduced now found in home gardens (Groves et al. 2005). Others were introduced for food, pasture or forestry. In Victoria in the 1850s, Ferdinand von Mueller, government botanist and director of the Royal Botanic Gardens, Melbourne, was responsible for distributing over 7,000 living plants and 22,000 packets of seed across the state (Tout-Smith, 2003).

Today, pest plants are a huge problem, costing farmers \$4,344 million in an average year (Hafi et al. 2023), and causing many problems for biodiversity including competing with native plants for space, nutrients, moisture, and sunlight, altering hydrological cycles and fire regimes, and transforming ecosystems through changes to vegetation structure and plant species composition (Sinden et al. 2004). Many plant varieties which were native to European countries also grow abundantly in the warmer Australian climate so are able to spread rapidly and often benefit from a lack of their natural enemies.

Pest plant species also threaten native species by introducing new diseases, fungi and pathogens, the most significant being myrtle rust (*Austropuccinia psidii*) and the root-rot fungus (*Phytophthora cinnamomi*). At least 417 native plant species have been documented as susceptible to myrtle rust, including scrub turpentine (*Rhodamnia rubescens*) and native guava (*Rhodomyrtus psidioides*) which are both listed as critically endangered. In many areas, guava provides ecosystem stability and it has been associated with over 100 insect pollinators (Fensham et al. 2020). The root-rot fungus (*Phytophthora cinnamomi*) also affects hundreds of thousands of hectares of native vegetation in several states, killing a wide range of native plants including banksias and grass trees (DAFF, 2004).

European Privet (*Ligustrum vulgare*) is one example of a serious environmental weed in South Eastern Australia. Infestations of privet reduce biodiversity, threatening endangered plant and animal species. Privet invades grassy woodlands, orchards and pastures in Australia and dense masses of privet prevent other vegetation surviving or establishing (DPI, 2024).

The European blackberry (*Rubus fruticosus agg.*) is listed as one of the top ten pest species impacting endangered species in Australia (Kearney et al. 2019) and has been listed as a Weed of National Significance due to its rapid spread along the east and south-west coasts. It also increases the risk of fires in the areas it populates due to its dry leaves and dense structure.

### **What is being done about pest species**

In 1879, due to the rapid spread of European rabbits across Australia, the Rabbit Suppression Act was created. Landowners and government-organised groups were encouraged to destroy burrows and rabbit populations through trapping, netting, shooting and poisoning. Councils and other bodies were required to destroy rabbits on land they managed or owned and releasing a rabbit into the wild became an offence with a penalty of £100, a huge amount of money for the time (Gov of South Australia, 2023). Feral cats and foxes were also hunted for their pelts and Australia became one of the world's largest exporters of cat and fox pelts, which generated significant export income (Hart and Bomford, 2006). Since the decline in world fur trade however, this practice no longer occurs.

Since the Rabbit Suppression Act in 1879, many other initiatives have been created including the Environment Protection and Biodiversity Conservation Act 1999 and Australian Pest Animal Strategy 2017-2027, which defines pests as a species which "causes more damage than benefits to human valued resources and social wellbeing".

In recent years, a more holistic, ecosystem-level approach that recognises pest species as part of a complex network of species and acknowledges the role of stakeholders has been taken to address the issue (Whisson et al., 2020). For example, the development of the National Pest Strategies for Animals and Weeds in 2007 marked a major improvement in pest management in Australia. This approach highlighted the need for a focus on nationwide biosecurity and provided guidelines on how to address established pest species populations. Currently, the majority of Australia's native fauna is protected by legislation and land owners have a legal responsibility to control established pest animals under section 20 of the CaLP Act (Agriculture Victoria, 2024).

Pest control programmes operate across Australia and methods include baiting, trapping, shooting, poisoning and culling, with bounties sometimes being used as incentives, although research indicates these to be ineffective (DAFF, 2004). Poisons are used to control feral pigs, rabbits and foxes, but this method can risk harming non-target species. Shooting can reduce horses, donkeys, camels, goats and deer, and in vast, remote areas, trained shooters operate from helicopters. This method is considered to be an effective and humane way to control many pest species (DAFF, 2004).

Recreational hunting rarely reduces pest numbers because the rates of harvest are usually below the reproductive rates of the animals, especially when the goal is meat for the freezer or deer antlers for mounting. Some hunters have worsened pest problems by releasing deer and pigs in new locations for future hunting opportunities. Commercial hunters are more likely to provide a benefit when they harvest feral animals in large numbers for hides or meat.

Regarding pest plant species, landholders spend more than \$3,100 000m controlling them each year (Hafi et al. 2023). Control methods include herbicides, manual removal and ploughing to bury herbicide-resistant plant species in the soil to prevent growth. However, using pesticides can pollute nearby water sources and indirectly kill native insects and other invertebrates (DAFF, 2004).

Biological control is another option for pest plant control, a famous example being the Cactus moth (*Cactoblastis cactorum*) used to control the spread of the prickly pear cacti in the 1920s, considered one of the world's best examples of biological weed control (DAFF, 2004). Biological control has also been used to reduce numbers of rabbits, and a virus may prove effective against carp (*Cyprinus carpio*).

## Conclusion

Overall, pest plant and animal species continue to be a significant threat to Australia's native species, ecosystems, biodiversity, farming and agriculture and cause huge economic costs annually for farmers, stakeholders, independent organisations and the government. The long-term environmental and social impacts, as well as the impact on future ecosystems is more difficult to assess, but should not be underestimated. Due to the complexity of the issue and distribution of pest species across Australia, it will be impossible to eradicate all pest species, therefore preventing additional pest species entering Australia through the use of good biosecurity, and effectively managing pest species, should be the main priorities going forward.

It is also vital that management techniques are effective, economically viable, sustainable and provide long-term benefits. These management techniques will need to be supported by further research, funding and long-term commitment to reduce the impact of pest species across Australia.

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