

# Chapter 1

## Introduction

Non-native species are referred to by many names: exotic, alien, non-indigenous, or introduced. When they spread aggressively, they're called invasive.<sup>1</sup>

1.1 This chapter provides an overview of the current invasive species situation in Australia and describes their economic, environmental and social impacts.

### Overview

1.2 While invasive species are generally argued to be the second biggest threat to Australia's biodiversity after land clearing and other forms of habitat destruction, Dr Barry Traill, President of the Invasive Species Council, went so far as to say:

with land clearing hopefully now sorted out as a destructive problem, with controls in Queensland and New South Wales, invasive species are probably now the No. 1 threat to nature in Australia.<sup>2</sup>

1.3 The economic impact of invasive species is also high. The economic impact of weeds and 11 key vertebrate pest animals has been calculated at \$4 billion and \$720 million per annum respectively. These figures primarily represent production losses and control costs, as the cost of weeds to the environment and biodiversity is largely incalculable. This compares to an estimated combined annual cost of salinity, sodicity and soil acidity of \$2.4 billion.<sup>3</sup> A 1997 Australian Bureau of Statistics survey showed 47% of farmers reported weeds as a major problem, compared with about 15% for dryland salinity. However:

despite estimates that weeds are costing the economy 10-20 times as much as salinity, planned government programs on invasive plants amount to less than 10% of the resources dedicated to the salinity issue.<sup>4</sup>

This is demonstrated through the funding of \$1.4 billion for the recent National Action Plan for Salinity and Water.<sup>5</sup> More contemporary data on the cost of invasive species is given below.

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1 Cheryl Lyn Dybas, *Invasive species: the search for solutions*, BioScience, July 2004/ Vol. 54 No. 7, p. 617.

2 Dr Barry Traill, *Committee Hansard*, 14 April 2004, p. 41.

3 Bureau of Rural Sciences, *Submission 62a*, p. 11.

4 P Martin, *Killing us softly – Australia's green stalkers*, CRC for Australian Weed Management 2002, Canberra p. 10.

5 CSIRO, *Submission 34*, p. 4.

1.4 The threat to Australia's biodiversity and economy is from weeds, vertebrate and invertebrate pests, and plant and animal diseases, and it is contended that the threat is increasing:

Addressing the problem of these invasive alien species is urgent because the threat is growing daily and the economic and environmental impacts are severe.<sup>6</sup>

1.5 The physical isolation of Australia has favoured the evolution of unique species and ecosystems that occur nowhere else in the world. At the species level about:

- 82 percent of mammals;
- 45 percent of terrestrial birds;
- 85 percent of flowering plants;
- 89 percent of reptiles; and
- 93 percent of frogs are endemic to Australia.<sup>7</sup>

1.6 The evolutionary processes associated with being isolated has meant that:

[Native] [s]pecies are especially vulnerable to predators, pathogens, and parasites.

1.7 Australia has had an unfortunate history of incursions by plants and animals since colonisation. Mammals, birds, fish and plants have been imported, mainly for commercial reasons, but often simply for the purpose of making early settlers feel more 'at home'. We now know that many of these early species which were imported for seemingly innocent or harmless reasons have gone on to have significant adverse environmental impacts.

1.8 The rate of incursions has increased dramatically in more recent years, with the growth of international trade and travel leading to importation of thousands of invasive weeds, pest animals and diseases. The problem of invasive species has also been exacerbated by the ability of people to trade over the Internet.

1.9 Until recently many plants and animals were brought into Australia without being subject to rigorous pre-import risk assessment. Most of the plants and animals that have become invasive were brought in deliberately. Plants were brought in for pasture, horticulture and as ornamentals. Animals were brought in for sport shooting, as food sources or as pack animals. The Bureau of Rural Sciences noted in

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6 Jeffrey A. McNeely, *Strangers in our midst: the problem of invasive alien species*, Environment, Volume 46 Number 6, July-August 2004, p. 16.

7 Richard Sharp, *Federal Policy and Legislation to Control Invading Alien Species*, Australian Journal of Environmental Management, Volume 6, September 1999, p. 172.

8 Jeffrey A. McNeely, *Strangers in our midst: the problem of invasive alien species*, Environment, Volume 46 Number 6, July-August 2004, p. 17.

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its submission that based on the history of current vertebrate pests and weeds in Australia:

introduction of new vertebrate species and plants is likely to be deliberate, legal or illegal introduction rather than by accidental human-assisted dispersal. Hence for exotic plants and vertebrates it is highly desirable to have robust, scientifically-based risk assessment processes to distinguish species that pose a high threat of becoming future pests or weeds from those that pose a low threat, and a sound process to ensure that species identified as posing a high threat are not allowed to enter Australia.<sup>9</sup>

1.10 Unfortunately, the Committee heard evidence that current import risk assessment methods for plant and animal importation are neither robust nor highly effective in preventing the entry of future pest species. Loopholes in plant import legislation and the import risk assessment system for animals are detailed in Chapter 5.

1.11 CSIRO put the scale of the invasive species problem in context. It told the Committee that the ratio of species that become invasive is roughly 1 in 1000. Of one thousand species entering Australia, 10 may become naturalised and 1 of that 10 naturalised species will become a pest species. Obviously, prior identification of the 1 in 1000 that is likely to become an invasive species is a significant challenge for authorities charged with the protection of Australia's environment and agricultural sector.

1.12 As will be discussed, addressing the invasive species problem is not simply a border control issue, but also includes managing those species that are already here: in gardens, aquariums, farms, aviaries and the like, and that would pose a threat if they escape.

1.13 The Committee was also alerted to the challenge of 'sleeper' species which have the potential to become the next generation pest problem. Invasive species were identified as a major threat to Australia's biodiversity in both the 1996 and 2001 State of the Environment reports. The 2001 report noted that:

'sleeper' weeds (species that have established, but are yet to become a widespread problem) are now recognised to be of major concern, as are exotic organisms that might find their way in through Australia's quarantine barriers as a result of trade and other human activities.<sup>10</sup>

1.14 As a result of the introduction of pest species to Australia, ecosystems have become more homogenous and biodiversity has been affected. It is widely recognised that vast areas of the Australian landscape have been seriously altered

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9 Bureau of Rural Sciences, *Submission 62a*, p. 14.

10 Australian State of the Environment Committee 2001, *Australia State of the Environment 2001, Independent Report to the Commonwealth Minister for the Environment and Heritage*, CSIRO and the Department of Environment and Heritage, p. 78.

and degraded by invasive plants and animals. Human intervention has also seen native plants transferred within Australia, often with equally dramatic adverse effect on native ecosystems elsewhere.

1.15 On a global level, Jeffrey A. McNeely notes that:

This inadvertent ending of millions of years of biological isolation has created major ongoing environmental problems that affect developed and developing countries, with profound economic and ecological implications.<sup>11</sup>

1.16 Climate change, degradation caused by habitat destruction, fragmentation of native vegetation, disruption to conditions for the breeding of native animals and birds, and changes to the nutrient status of soil, have all enabled invasive plants and animals to spread.

## The current situation in Australia

### Weeds

1.17 Evidence provided by the CRC for Australian Weed Management (generally referred to as the Weeds CRC) states that in the last 200 years over 28,000 foreign plants have been introduced to Australia. Most of the species that have become invasive were from deliberate introductions. The Weeds CRC advised that:

- Between 1947 and 1985 460 pasture grasses and legume species were trialled in northern Australia. Sixty became weeds, 13 of which are now serious crop weeds. Only 4 proved useful without also causing weed problem.
- Between 1971 and 1995 two-thirds of the 300 plants that became established as weeds in the wild were introduced as ornamentals.
- Over 2500 species of introduced plants have established in the wild, and many threaten the integrity of valued places, such as Kakadu National Park.<sup>12</sup>

1.18 Many of the species that have become established in the wild may be sleeper weeds, as was *Mimosa pigra* (Mimosa). Mimosa was introduced to Darwin in the late 1800s. The plant was not considered a problem until 1952, when it was discovered growing outside Darwin. Following the wet year of 1974 it spread further and by 1981 much of the Adelaide River floodplain in the Northern territory

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11 Jeffrey A. McNeely, *Strangers in our midst: the problem of invasive alien species*, Environment, Volume 46 Number 6, July-August 2004, p. 27.

12 P Martin, *Killing us softly – Australia's green stalkers*, CRC for Australian Weed Management 2002, Canberra, p. 2.

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was covered with Mimosa, some areas with monospecific stands.<sup>13</sup> Currently, half a million dollars a year is spent to keep it out of Kakadu.<sup>14</sup>

### **Vertebrates**

1.19 The Vertebrate Pests Committee (VPC) has created a list of all exotic vertebrates (except fish) present in captivity or in the wild in Australia. The list includes:

- 218 exotic mammals;
- 246 birds;
- 148 reptiles; and
- 12 amphibian exotic species.<sup>15</sup>

1.20 In its submission the Bureau of Rural Sciences stated that over 80 species of exotic vertebrates (excluding marine species) have established wild populations in Australia. These species include:

- 25 exotic mammals;
- 20 birds;
- 4 reptiles;
- 1 amphibian; and
- 23 freshwater fish on mainland Australia;
- plus 1 mammal, 7 birds and 2 reptiles on offshore islands.<sup>16</sup>

1.21 The Bureau of Rural Sciences acknowledges that species that are already in Australia have passed through quarantine barriers, legitimately or otherwise, and relatively few of the listed species have had a risk assessment conducted to determine the threat they pose should they escape and establish wild populations. In its submission it stated that:

The cost and responsibility for conducting risk assessments of pest potential for exotic vertebrates already present in Australia but not yet established in the wild is an issue to be resolved.<sup>17</sup>

As will be discussed in Chapter 6, evidence indicated that there are weaknesses in Australia's biosecurity policy that should be addressed.

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13 Bureau of Rural Sciences, *Submission 62a*, p. 11.

14 P Martin, *Killing us softly – Australia's green stalkers*, CRC for Australian Weed Management 2002, p. 2.

15 Bureau of Rural Sciences, *Submission 62a*, p. 15.

16 *ibid*, p. 10.

17 *ibid*, p. 15.

## Marine

1.22 The major vectors for the introduction of marine pests in Australian waters is through ballast water and hull fouling, although they have also spread as a consequence of aquaculture and the aquarium trade.

1.23 In Australia, the majority of research into marine pest species is conducted by CSIRO Marine Research. Dr Nicholas Bax, Senior Research Scientist, CSIRO Marine Research told the Committee that 1593 invasive marine species have been identified worldwide. Of which:

- between 135 and 308 have invaded Australia;
- of those that have invaded, 53 to 73 are classified as having had economic and/or environmental consequences; and
- 36 more have been identified as on their way to Australia. They have been identified as causing damage overseas and have been identified as being in the ports of Australia's trading partners.<sup>18</sup>

1.24 Australia has 22,000 ship visits per year; half of which are from international sources. The Committee has heard that most new introductions will have no large-scale impact on the environment or marine industries, however, a small number will become significant marine pests with associated impacts and an unknown fraction will be sleepers.<sup>19</sup>

1.25 A web accessible database, the National Introduced Marine Pest Information System (NIMPIS), has been developed by the CSIRO to meet national needs for a central repository of information on known and potential introduced marine species. The project was jointly supported by the Department of the Environment and Heritage, with funding from the National Heritage Trust (NHT) Introduced Marine Pests Program, CSIRO and a consortium of State agencies. The database contains detailed information on over 80 known introduced species in Australia, and limited information concerning 35 species not currently known to be in Australia but that pose a potential threat. Users who are aware of introductions of marine or brackish water species not currently included in the database are requested to submit a report of their sighting.<sup>20</sup>

1.26 The NIMPIS database is one of a number of key initiatives aimed at providing tools to prevent further introductions of exotic marine species, facilitate rapid responses to new incursions, and assist in the management of existing introduced species in Australian waters. Reported sightings are automatically

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18 Dr Nicholas Bax, *Committee Hansard*, Adelaide 28 June 2004, p. 28.

19 CSIRO, *Submission 34*, p. 10.

20 Hewitt C.L., Martin R.B., Sliwa C., McEnnulty, F.R., Murphy, N.E., Jones T. & Cooper, S. 2002. (Eds). *National Introduced Marine Pest Information System*. At: <http://crimp.marine.csiro.au/nimpis>, Date of access: 6-Jul-2004.

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referred onto the Centre for Research on Introduced Marine Pests at CSIRO Marine Research.<sup>21</sup> Marine pests are discussed in detail in Chapter 6.

## **Economic Impact**

1.27 Invasive species represent a major cost to the Australian economy. As the management of invasive species is a shared responsibility of government, industry and the community each sector bears the costs of responding to the threat or managing the consequences of it. However, the primary responsibility for managing invasive species primarily rests with land holders and consequently management costs are largely borne by private citizens, particularly farmers, not government (except when government is also the landholder, such as reserves and parks). These costs take the form of direct management costs and also the increased cost of foods, loss of land value and reduced economic welfare.

1.28 The CRC for Australian Weed Management (Weeds CRC) and the Pest Animal Control CRC (Pest Animal CRC) have sought to quantify the cost of invasive species in recent reports entitled, respectively, *The economic impact of weeds in Australia* and *Counting the Cost: Impact of Invasive Animals in Australia, 2004*. These are discussed in the next sections.

### ***The cost of weeds***

1.29 The Weeds CRC report released in 2003 assessed the economic impact of weeds on agricultural land, national parks, other public land and indigenous land. The report assessed costs for the 2001-02 financial year. It estimated that the economic impact of weeds, across Australia, was approximately \$4 billion per annum and it acknowledged the fact that weeds have monetary and non-monetary costs and benefits:

If there were no weeds, incomes to agricultural producers and benefits to consumers of food would rise by \$3.927m in the mean case and \$112m of government expenditure would be released for productive investment elsewhere.<sup>22</sup>

1.30 The report identified that the impact of weeds could be measured as the:

- direct financial costs to control the weeds (herbicide etc);
- losses in production;
- changes in net money revenue; and

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21 Hewitt C.L., Martin R.B., Sliwa C., McEnnulty, F.R., Murphy, N.E., Jones T. & Cooper, S. 2002. (Eds). *National Introduced Marine Pest Information System*, At: <http://crimp.marine.csiro.au/nimpis>, Date of access: 6-Jul-2004.

22 J Sinden, R Jones, S Hester, D Odom, C Kalisch, R James and O Cacho, *The impact of weeds in Australia – Report to the CRC for Australian Weed Management*, CRC for Australian Weed Management 2003, p. 39.

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- and changes in welfare.<sup>23</sup>

1.31 The estimated cost of \$4 billion per annum is, in fact, conservative as it does not include the financial impacts on:

- biodiversity;
- landscape;
- tourism;
- water;
- labour costs of volunteers; and
- other asset and industry costs that could not be quantified.<sup>24</sup>

1.32 Some estimated costs of weeds to primary production are set out in the table below.

**Table 1.1 – Estimated costs of weeds to primary production**

Issue	Cost
National cost of weeds in annual winter grain regions	\$1.2 billion
Annual cost of wild oats in grain crops in 1987-88	\$42 million
Annual cost of serrated tussock in NSW pastures	\$40 million
Annual cost of serrated tussock in Victorian pastures	\$5.1 million (1997), estimate increasing to \$15 million by 2007
Cost of weeds to farmers in the southern cropping zone	\$70/ha per year (average);
Cost of attempts to eradicate <i>Kochia scoparia</i> in WA, where it was introduced for use with salinised soils	\$530,000 (1992-98)

1.33 While several submitters argued that weed management programs should be based on the 'public good', the CRC report notes that the allocation of monies to such programs is based on comparing costs and benefits and allocating to the project with the greatest rate of economic return. A downside of this approach is that a funding application based predominately on environmental grounds may not

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23 ibid, p.1.

24 P Martin, *Killing us softly – Australia's green stalkers*, CRC for Australian Weed Management 2002, Canberra p. 10.

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receive the same level of support as one that has impacts on agriculture. The Committee was told that non-economic factors, such as social and environmental impacts, warrant consideration in comparing costs and benefits.

1.34 Total expenditure by Commonwealth and state agencies (other than the National Parks and Wildlife Services), other government authorities, local government and other public land managers in 2001-02 was estimated as being at least \$80.775 million, with \$8.252 million spent by the Commonwealth on weed management and research.

1.35 The CRC report's findings of the high per hectare benefits, benefits to the agricultural sector and benefits relative to other environmental problems that could be achieved from improved weed management adds support to claims that weed programs should be a major recipient of research, management and control funds.<sup>25</sup>

### ***The cost of pest animals***

1.36 Pest animals have a triple bottom line effect. Dr Peacock, CEO, Pest Animal Control CRC, told the Committee that:

They affect our environment, our economy and our society. Often it is very difficult to quantify that cost. How do you value a threatened species or cost in another factor that makes life in the bush even harder than it should be? How do you measure the frustration of recreational anglers who cannot catch anything but carp? It is hard to measure but it is a big cost nevertheless.<sup>26</sup>

1.37 A report released by the Pest Animal CRC in mid 2004 estimated that the economic, environmental and social impact of 11 major introduced vertebrate pests of Australian agricultural industries and the environment was \$719.7 million per annum.<sup>27</sup> The report assessed those species that are included in the CRC's research priorities, impacts were assessed Australia-wide and a triple bottom line assessment was applied.

1.38 Economic impacts were able to be calculated for all 11 vertebrate pest animals:

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25 J Sinden, R Jones, S Hester, D Odom, C Kalisch, R James and O Cacho, *The impact of weeds in Australia – Report to the CRC for Australian Weed Management*, CRC for Australian Weed Management 2003, p. 39.

26 Dr Tony Peacock, *Committee Hansard*, Canberra, 26 November 2003, p. 8.

27 R McLeod, *Counting the Cost: Impact of Invasive Animals in Australia 2004*, CRC for Pest Animal Control, Canberra.

**Table 1.2 – Economic impact of vertebrate pests**

<b>Animal</b>	<b>Total Cost (\$m)</b>
Fox	\$227.5
Feral cats	\$146
Rabbit	\$113.1
Feral pigs	\$106.5
Dogs	\$66.3
Mouse	\$35.6
Carp	\$15.8
Feral goats	\$7.7
Cane Toads	\$0.5
Wild horses	\$0.5
Camels	\$0.2

1.39 Rabbits, foxes, feral pigs and feral cats were identified as inflicting the greatest cost impact on the Australian economy, with a total impact of \$553.1 million. The major component of the impact from rabbits and pigs was reduced agricultural production, principally for sheep and cattle industries. To address this issue, the Pest Animal CRC report noted that:

Given the heavy impact these pests impose on these industries, collaborative research projects should be sought with sheep and cattle producers, as they would be the major beneficiaries of such research.<sup>28</sup>

1.40 The environmental impact of the pest animals could only be quantified for foxes, feral cats and carp. Their impact was assessed as being \$190.0m, \$144.0m and \$11.8m respectively. Feral cats and foxes were identified as inflicting the greatest cost impact on native fauna, primarily as a consequence of bird deaths.

1.41 The major control costs were identified as including baiting, fencing, shooting and research associated with improving management of the invasive species. Production losses for sheep, cattle and cropping industries were predominately identified as being the result of invasive species predation on young stock, crop damage and competition for feed. The report identified that:

Feral pigs, rabbits, kangaroos and feral cats were estimated to account for 83% of losses and agricultural productivity loss accounts for about half of total costs estimated.<sup>29</sup>

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28 ibid.

29 ibid.

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1.42 In calculating the economic cost of the invasive species, expenditure on public sector research and management costs were assessed. The report noted that the social impacts of the pest animals were not able to be quantified.

1.43 Other species which were identified as having significant impacts, but for which costs were not calculated, were:

- pest birds;
- rodents;
- deer; and
- finfish.

The report noted that impact assessments on these species need to be conducted if the complete cost of vertebrate pests in Australia is to be determined.

### ***The cost of marine invasives***

1.44 While there is a lack of specific information on the economic impact of marine pests, the Bureau of Rural Sciences advised that:

the economic threat of marine pests is also substantial to the Australian mariculture industry which is worth in excess of \$600 million per year<sup>30</sup>

1.45 The Bureau of Rural Sciences noted that Tasmanian oyster and mussel growers are already experiencing heavy stock predation by the Northern Pacific Seastar.<sup>31</sup> The Committee heard evidence that Port Phillip Bay recorded a 40 per cent reduction in fish stock numbers over the past three years as a consequence of invasion by the Northern Pacific Seastar.<sup>32</sup>

1.46 Outbreaks of toxic dinoflagellate or other invasive microbial agents also pose a threat to aquaculture stock (mussels, oysters, scallops). If there is an outbreak it could lead to the closure of fisheries for human health reasons, such an event has the potential to be economically costly. The potential loss of Australia's 'clean' reputation could have a significant impact on mariculture if export markets are lost.

1.47 The extent of the economic impact of marine invasives is demonstrated through the campaign to eradicate the Black-striped Mussel that entered the marina in Darwin in 1999. The eradication campaign cost over \$2 million in materials alone. However, if left unchecked, it had posed a major threat to the local \$40 million per annum pearl industry. In assessing its response to the outbreak, Australia was able to learn from America's experience with the closely related zebra mussel that cost the United States \$100 million per annum to control in the Great

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30 Bureau of Rural Sciences, *Submission 62a*, p. 12.

31 *ibid.*

32 Mr Tim Allen, *Committee Hansard*, Adelaide, 28 June 2004, p. 40.

Lakes alone.<sup>33</sup> A case study on the Black-striped Mussel eradication campaign is provided in Chapter 4.

1.48 The cost of invasive marine species is not limited to mariculture industries. It also impacts upon shipping and ports, coastal amenity, human health, species and ecosystem health and diversity. Hassall and Associates has suggested that:

Marine pests have the potential to reduce this public amenity by reducing the chances of catching a fish, reducing the attractiveness of a diving trip, leading to beach closures or increasing the time spent by a boat owner in maintaining their vessel.<sup>34</sup>

1.49 The impacts listed in the Hassall report have flow-on economic impacts, such as:

- loss of revenue for dive operators and bait shops in tourist areas;
- increased costs associated with maintaining vessels; and
- costs associated with having to close marinas and waterways for treatment.

1.50 A key area that could be affected is tourism. If outbreaks occur in waters near tourist areas such as the Great Barrier Reef, and limit recreational use of the water, they have the potential to cause significant losses. This is demonstrated through the fact that:

The existence and option value of the Great Barrier Reef, at risk from human activities, has been estimated to be in the order of \$AUS45 million per annum.<sup>35</sup>

1.51 The Commonwealth Government has recognised the potential threat to tourism in the Great Barrier Reef that is posed by the Crown of Thorns Starfish. In the 2004-05 budget it provided \$0.9 million over three years to assist tourism operators to implement a control program.

### ***The cost of plant diseases***

1.52 Invasive plant diseases include pathogens and invertebrate pests, such as viruses, fungi and various insects. Plant pests pose a major threat to the Australian economy through their potential to impact on primary production. A comprehensive study of the cost of plant diseases to the Australian economy has not been prepared, however, information is available on the economic impact of individual plant

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33 CSIRO, *Submission 34*, p. 14.

34 Hassall and Associates Pty Ltd, *Introducing Marine Pests – Scoping the Socio-Economic Impact*, Sydney, 2003, p. 21.

35 *ibid*, p. 17.

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diseases. In its submission CSIRO noted that annually approximately 12% of losses to global crop production are caused by diseases.<sup>36</sup>

1.53 As with weeds and pest animals, plant pathogens have the potential to seriously reduce the productivity of crops once they become established in Australia. A known case is sorghum ergot, which costs industry \$4 million per annum to control.<sup>37</sup> One crop in Australia for which comprehensive data is available is wheat. In the 1980s annual crop losses of 14.5% of total production were attributed to wheat diseases; this amounted to \$300 million per annum.<sup>38</sup> This supports claims that the economic impact of plant diseases is significant.

1.54 In its submission Plant Health Australia (PHA) listed citrus canker (*Xanthomonas axonopodis* pathovar *citri*), a highly contagious bacterial disease of citrus, as having a potential negative impact on the industry if it were to become established in Australia. Citrus canker is spread by wind-borne rain, lawnmowers and landscaping equipment, animals, birds, movement of plants and fruit. PHA advised that citrus canker could also have an adverse impact on the six native species of *Citrus*, potentially resulting in the loss of biodiversity of the native species if it were to enter Australia.<sup>39</sup> Outbreaks can result in dieback, defoliation, blemished fruit, premature fruit drop and although not harmful to humans the crop cannot be sold.<sup>40</sup>

1.55 Outbreaks have occurred in Australia in 1912, 1991, 1993 and most recently in July 2004 in Emerald, Queensland. The most recent outbreak resulted in the Shires of Emerald, Peak Downs and Bauhinia being gazetted by Queensland as pest quarantine areas to further restrict the movement of citrus products. The cost of surveillance and eradication for the first six weeks of the outbreak was \$1.6 million. This activity will be followed by a further two years of surveillance which will cost significantly more. Though these costs are high they do not compare to the potential losses to the Queensland citrus industry, which is worth \$120 million per annum and the Australia-wide industry which is worth \$420 million.<sup>41</sup> The disease was eradicated from the infected property through removing and destroying host plants in the wider vicinity of the area.<sup>42</sup>

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36 CSIRO, *Submission 34*, p. 9.

37 *ibid.*

38 *ibid.*

39 Plant Health Australia, *Submission 9*, p. 2.

40 *ibid.*

41 AAP, *QLD: Another blow to Australia's disease-free safe haven*, 9 July 2004.

42 Department of Agriculture Fisheries and Forestry, *Citrus Canker Identified in Queensland*, Media Release, 6 July 2004.

## Environmental Impact

1.56 Apart from their economic impact, invasive species are a major threat to Australia's unique biodiversity:

In some cases, as with mimosa in the NT, it takes only one type of invader to cause total landscape change. Scientists refer to these invaders as 'transformer species' because they have the ability to transform entire ecosystems. Their legacy is a degraded, foreign environment, stripped of native plants and animals. Future generations may never realise what was lost.<sup>43</sup>

1.57 Habitat disturbance and destruction, and changed fire and water regimes, are often linked to the presence of invasive species. Grazing, predation and competition by introduced vertebrates are also recognised as impacts of invasive species.

1.58 The situation is not helped if ecosystems are already degraded:

A sick ecosystem is likely to allow new pests to establish themselves more easily and extensively and heighten their collective impact.<sup>44</sup>

Weeds such as serrated tussock and Chilean needle grass (*Nasella neesiana*) easily invade pasture lands through dispersal by wind, birds or human assistance.

1.59 The environmental impact of invasive species is part of a suite of impacts that can threaten the survival of native species. Impacts from invasive species include:

- reduced floral diversity by competing with native species for water and nutrients;
- shading out lower vegetation strata;
- altering fire regimes;
- reducing the productivity of pastoral land; and
- disrupting food webs.

1.60 Invasive plants have the capacity to spread across significant areas. Examples include:

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43 P Martin, *Killing us softly – Australia's green stalkers*, CRC for Australian Weed Management 2002, Canberra p. 6.

44 Hassall and Associates Pty Ltd, *Introducing Marine Pests – Scoping the Socio-Economic Impact*, Sydney, 2003, p. 18.

**Table 1.3 – Coverage of invasive plants<sup>45</sup>**

<b>Invader</b>	<b>Area</b>
Blackberry	8 million ha nationally
Prickly acacia	6.6 million ha in Qld in 2002 (potentially 50m ha nationally)
Lantana	4 million ha nationally
Rubber vine	700,000 ha, and now found across 20% of Qld
Mimosa pigra	80,000 ha in the Top End of NT

1.61 Jeffrey A. McNeely summed up the impact of invasive species when he wrote:

invasives may cause changes in ecological services by disturbing the operation of the hydrological cycle, including flood control and water supply, waste assimilation, recycling of nutrients, conservation and regeneration of soils, pollination of crops, and seed dispersal.<sup>46</sup>

1.62 It is very difficult to attribute a cost to such factors. The Hassall and Associates report noted that:

A significant factor limiting the capacity of researchers to determine the impact of these pests has been the absence of base-line environmental data and the consequential difficulty in determining the pre-existing environmental valuation of the resources. In many cases impacts are simply reported in a subjective manner as being "real and alarming"...Similarly, the impact on the environment is often noted as significant, relative to that on another sector, without real valuation.<sup>47</sup>

### ***Biodiversity impact***

1.63 The invasion of native ecosystems by invasive species is:

regarded as a major threat to biological diversity worldwide.<sup>48</sup>

1.64 Traits common amongst invasive species include:

- broad environmental tolerances (salinity, temperature, water quality);
- rapid colonisation;

45 P Martin, *Killing us softly – Australia's green stalkers*, CRC for Australian Weed Management 2002, Canberra p.6.

46 Jeffrey A. McNeely, *Strangers in our midst: the problem of invasive alien species*, Environment, Volume 46 Number 6, July-August 2004, p. 22.

47 Hassall and Associates Pty Ltd, *Introducing Marine Pests – Scoping the Socio-Economic Impact*, Sydney, 2003, p. 17.

48 Invasive Species Council, *Submission 33*, p. 1.

- fecundity;
- lack of specific dietary requirements;
- capacity to exploit an available niche; and
- capacity for broad dispersal.

1.65 Hybridisation of native and introduced species poses a threat to the survival of native species. The Committee heard from Mr John Stewart, Vice President, AgForce Cattle, AgForce Queensland, that:

with domestic dogs mating with dingoes we now have a much larger population of wild dogs than we have of pure dingoes. In fact pure dingoes tend to be dying out.<sup>49</sup>

1.66 Additional evidence of the hybridisation of native and introduced species was provided by Dr Black, Committee Member, Nature Conservation Society of South Australia. He told the Committee that:

the mallard has eliminated the pure New Zealand grey duck, and it is progressively invading genetically the black duck in Australia.<sup>50</sup>

1.67 Dr Peacock advised that foxes predate on small animals in the range from 300 grams – mouse size – to 5½ kilograms – small wallaby size. In discussing the decimation of small animals by foxes Dr Peacock said that:

As Tim Flannery said, half a century ago no-one even knew about these small mammals and in half a century from now it will be too late to do anything about them.<sup>51</sup>

1.68 The Committee received evidence that invasive species often flourish when introduced to new environments as generally they do not have natural predators to control their spread. An example of this is cane toads which have flourished since their introduction to Queensland in the 1930s. One reason that they have flourished is that they are poisonous in all stages of their life-cycle. Current estimates show cane toads are spreading in the tropics at about 27 kilometres a year. The Pest Animal CRC report noted that:

Populations of Northern Quoll, *D. haucatus*, have seriously declined in Queensland following colonisation by cane toads (Burnett 1997). These quoll populations have not recovered in the past 10 years, therefore cane toad impact on quolls is likely to be a long-term phenomena (Burnett 1997, in Glanznig, 2003).<sup>52</sup>

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49 Mr John Stewart, *Committee Hansard*, Brisbane, 14 April 2004, p. 70.

50 Dr Andrew Black, *Committee Hansard*, Adelaide 28 June 2004, p. 79.

51 Dr Tony Peacock, *Committee Hansard*, Canberra 18 June 2004, p. 12.

52 R McLeod, *Counting the Cost: Impact of Invasive Animals in Australia 2004*, Cooperative Research Centre for Pest Animal Control, Canberra, p. 47.

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1.69 Recent research undertaken in Kakadu National Park indicates that cane toads cause substantial declines in northern quoll populations. The Department of the Environment and Heritage acknowledged the threat that cane toads pose to native species survival. In its submission it stated that:

There is a significant risk that quoll species across northern Australia may become locally extinct in areas invaded by cane toads. As a precautionary measure, a representative sample of northern quolls have been moved to cane toad-free islands off Arnhem Land to safeguard the species.<sup>53</sup>

1.70 Evidence indicated that limited research is being conducted into the impacts of cane toads and possible control methods. Funding had been cut to a research program that had sought, through tracking the impact of cane toads on northern quolls and goannas in Kakadu National Park, to verify stories from indigenous communities in Cape York that cane toads led to the disappearance of the native animals. The research project had been commissioned by Parks Australia North and had been operating since 2001. The Committee expresses its regret that support for the project was withdrawn, at such a late stage, when:

To finish the radio-tracking, the project needed another four to five months and about \$16,000-\$20,000, roughly a tenth of what has already been spent.<sup>54</sup>

1.71 Cane toads have cut a swathe through native animals.

Australian native fauna that has been killed by cane toads include Goannas, Freshwater Crocodiles, Tiger Snakes, Red-bellied Black Snakes, Death Adders, Dingoes, and Northern Quolls.<sup>55</sup>

1.72 Evidence indicated that preference for funding is given to invasive species that cause significant economic impact over those that have non-economic impacts, such as environmental or cultural impacts. The preservation of biodiversity and the flow-on cultural impacts need to be accorded a commensurate level of recognition. The Indigenous Land Corporation submitted that:

weed management on a pastoral lease where the invasion is clearly affecting the economic capacity of that land is far more likely to be funded than where weed invasion is affecting Indigenous peoples capacity to hunt, gather food, undertake management of site and management [of the] country in accordance with cultural traditions. There needs to be a greater focus on invasive species that do not necessarily have a negative commercial impact.<sup>56</sup>

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53 Department of Environment and Heritage, *Submission 61*, p. 3.

54 B. Lane, *The Australian*, 23 August 2004, p. 5.

55 R McLeod, *Counting the Cost: Impact of Invasive Animals in Australia 2004*, Cooperative Research Centre for Pest Animal Control, Canberra, p. 47.

56 Indigenous Land Corporation, *Submission 38*, p. 5.

...Indigenous landholders are responsible for a significant part of the country, but are not major economic players commensurate with the extent of title held.<sup>57</sup>

1.73 The Bureau of Rural Sciences noted that weed species can reduce biodiversity and contribute to local extinctions of native plants and animals through competition. An example cited was blue trumpet vine (*Thunbergia grandiflora*) which spreads rapidly, smothering rainforest in the tropical lowlands of coastal north Queensland. It can invade about 0.6 of a hectare of rainforest per year, and can climb trees up to 40 metres tall.<sup>58</sup>

1.74 When pasture biomass is low, competition for food and water can occur between stock and invasive vertebrates. Invasive vertebrates can cause significant land degradation as they do not cease grazing if farmers de-stock pastures. Changes in the composition and cover of the vegetation caused by grazing vertebrate pests can influence populations of ants, termites and topsoil micro-arthropods. Changes in the vegetation may have long-term effects on the soil structure by increasing soil disturbance. This can have a flow on effect of reducing land values.

1.75 Invasive pest animals can have a variety of biodiversity impacts.

- Camels may deplete shelter and refuge for desert animals. Camel grazing can impact on native vegetation.<sup>59</sup>
- Rabbits and goats overgraze, resulting in increased soil erosion.
- Wild horses can increase soil erosion, destroy native plants along frequently used routes, foul water holes, collapse wildlife burrows, spread weeds through their hair and dung, and compete with native wildlife for food and shelter.<sup>60</sup>
- Foxes predate on mammals and birds. It has been estimated that they are responsible for the 9.5 million kilograms per year of live bird predation. Based on an average bird weight of 50g this accounts for 190 million fatalities per year.<sup>61</sup>
- Feral pigs threaten native species through feed competition. Native vegetation is also affected by damage from trampling, the spread of rootrot fungus (*Phytophthora cinnamomi*) and dieback disease.<sup>62</sup>

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57 Indigenous Land Corporation, *Submission 38*, p. 12.

58 Bureau of Rural Sciences, *Submission 62a*, p. 10.

59 R McLeod, *Counting the Cost: Impact of Invasive Animals in Australia 2004*, Cooperative Research Centre for Pest Animal Control, Canberra, p. 45.

60 *ibid*, p. 49.

61 *ibid*, p. 22.

62 *ibid*, p. 27.

- Carp increase water turbidity which releases sediment nutrients and destroys aquatic plants. They result in a reduction in the abundance of invertebrates and aquatic plants, which form the basis of native fish diets<sup>63</sup>.

1.76 The impact of wild dogs on biodiversity was highlighted by Mr John Stewart, Vice President, AgForce Cattle, AgForce Queensland, who explained that:

There is a significant impact on the survival of remnant populations of endangered fauna such as small macropods, and we have bilbies, bandicoots and smaller wallabies within the target range for wild dog food. In Central Queensland the last remaining population of northern hairy-nosed wombats has had to be fenced to protect it from the predations of wild dogs.<sup>64</sup>

1.77 The Invasive Species Council noted in its submission that despite the identified negative impacts:

there is virtually no momentum to address the invasive species threat to biodiversity. Currently, institutions, policies and funding are overwhelmingly concerned with protecting agricultural production values, and there is little public or private investment in environmental pests.<sup>65</sup>

1.78 It went on to advise that:

every year of neglect is a year when the long term costs blow out, usually with irreversible consequences on indigenous biodiversity.<sup>66</sup>

### ***Naturalisation of invasive species***

1.79 The already daunting task of managing invasive species is augmented by the fact that many people accept some introduced species as a normal part of the landscape, despite the harm they cause. This was demonstrated to the Committee during its site inspections in Brisbane where it saw the widespread use of varieties of *Duranta* for hedges, landscapes and colour features on public and private land. The Committee heard that many people who have planted *Duranta* in urban areas are not aware that it is widely dispersed through the spread of seeds by fruit bats and birds and is now naturalised from Cairns to northern New South Wales, outcompeting native vegetation.<sup>67</sup>

1.80 The challenge of managing invasive species is compounded by the fact that a number of invasive species have become naturalised and native animals have

63 ibid, p. 31.

64 Mr Stewart, *Committee Hansard*, Brisbane, 14 April 2004, p. 70.

65 Invasive Species Council, *Submission 33*, p. 2.

66 ibid.

67 Dr Rachel McFadyen, *Committee Hansard*, Brisbane, 14 April 2004.

learned to live with them. A case in point for this is cane toads. At the public hearing in Brisbane Mr Craig Walton, Senior Policy Officer, Ecology, Queensland Department of Natural Resources, Mines and Energy stated that:

there have also been a number of native species and a number of bird species that now feast on cane toads—they have now worked out how to roll them over on their back and eat their stomachs, and cane toads are now a prey species.<sup>68</sup>

1.81 Developing on this issue, Mr Peter Tucker, Committee Member, Nature Conservation Society of South Australia, explained the dependence of some native species on invasive species. Mr Tucker stated that:

We also have quite a conundrum in that ... where we have weeds, quite often native animals will use those weeds .... There is the nationally endangered bandicoot, and if we were to eliminate the blackberries another type of bandicoot would go extinct. It [invasive species management] is complex.<sup>69</sup>

1.82 It has been recognised that:

This mutualism presents an intractable conservation management dilemma.<sup>70</sup>

1.83 Evidence supports claims that invasive species can play a dual role. It has already been demonstrated that cane toads are a food source for some native species and the killer of others. The same situation is occurring with weed species. Weeds can harbour feral animals and diseases but also provide a food source and protection to native species. An example of this is blackberry (*Rubus fruticosus*) which provides protection for rabbits.<sup>71</sup> The other role it plays is harbour native species, such as bandicoots.

1.84 Many invasive pest animals have become integrated into the food chain. This has impacts on biodiversity when attempts are made to reduce their numbers. Highlighting this is the fact that:

Dingoes have been integrated into established predator-prey relationships and may play a constructive ecological role of regulating the population of certain native fauna. The controlling influence of wild dogs on marsupials and emus numbers is demonstrated by the difference in their prevalence across the two sides of the barrier fencing (Pople *et al.* 2000).<sup>72</sup>

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68 Mr Craig Walton, *Committee Hansard*, Brisbane, 14 April 2004.

69 Mr Peter Tucker, *Committee Hansard*, Adelaide, 28 June 2004, p. 76.

70 Jeffrey A. McNeely, *Strangers in our midst: the problem of invasive alien species*, Environment, Volume 46 Number 6, July-August 2004, p. 26.

71 Bureau of Rural Sciences, *Submission 62a*, p. 10.

72 R McLeod, *Counting the Cost: Impact of Invasive Animals in Australia 2004*, Cooperative Research Centre for Pest Animal Control, Canberra, p. 41.

1.85 There is also a case to argue that predation by wild dogs of other introduced species of predators such as foxes, feral cats and feral pigs counters their negative impact on native species. Mr John Stewart, Vice President, AgForce Cattle, AgForce Queensland explained this issue to the Committee.

For instance, some people will not bait for dogs and they do not bait for feral pigs because they want the dogs to keep the pig population down—that is, chase and get rid of the piglets. So, for that reason, they will not bait for feral pigs. Sometimes it needs to be explained to people. While people in the bush are well aware of feral pigs, wild dogs, foxes and so on, some people probably need to go through a greater education process about just what is happening to their overall profitability.<sup>73</sup>

1.86 As a consequence of the dual role of many introduced species the management of them needs to be carefully mapped to ensure that a consequence of management plans is not further loss of biodiversity. Mr Mark Ramsey, Executive Officer, Animal and Plant Control Commission, told the Committee that:

simply removing the feral species is not going to achieve a good outcome unless you know and plan what you want to achieve at the other end. So we are suggesting that people really need to start planning for the outcome they are trying to achieve, not just remove the weed.<sup>74</sup>

### ***Keystone species***

1.87 The Committee heard evidence that some of the small mammals and plants that have become extinct or are threatened by invasive species are keystone species. A keystone species is a species that is disproportionately important in the maintenance and balance of its community's integrity. They interact with a large number of other species in a community and because of those interactions, the removal of the species can cause widespread changes to the community structure. The reduction in keystone species has a significant impact as they are the cornerstone of the ecological community in which they reside.

1.88 Examples of keystone species are the small crabs on Christmas Island. Robber, red and blue crab populations were significantly reduced in areas of Christmas Island that were infested by yellow crazy ants in the 1990s. The crabs play a key role in the forest ecology by digging burrows, turning over the soil and fertilising the soil with their droppings. Once the crab numbers declined the structure of the forest changed. Populations of other ground and canopy dwelling animals, such as reptiles and other leaf litter fauna also decreased. Increased densities of crazy ants led to increased densities of scale insects, which led to increased light gaps in the canopy of the rainforest. The light gaps and reduction in crab numbers led to change in the ecology of the forest, resulting in an increase in seedlings and weeds growing on the forest floor. With the introduction of control

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73 Mr John Stewart, *Committee Hansard*, Brisbane, 14 April 2004, p. 76.

74 Mr Mark Ramsey, *Committee Hansard*, Adelaide, 28 June 2004, p. 12.

mechanisms for the yellow crazy ants crab numbers were able to increase and biodiversity is slowly being restored However, the longer terms impacts may not be evidenced for some time.<sup>75</sup>

### ***Increased fire risk***

1.89 A large number of pasture grasses were introduced to Australia from Africa in the last century because they grew larger and produced more feed for cattle than native grasses. Mr Tim Low, Councillor, Invasive Species Council, told the committee that:

If they are not eaten by cattle they dry out into straw and produce very hot bushfires—much hotter than Australia has been used to. These are having a devastating impact all over Northern Australia, changing vegetation structure, killing young trees and eating into inland rain forest. Putting a cost to that ecological damage is just unbelievable<sup>76</sup>

1.90 The Committee heard evidence from Mr Neville Crossman, President, Weed Management Society of South Australia, that feral olive trees burn faster and hotter than native trees, such as eucalypts. He advised that this occurs because they have a greater biomass, consistent canopy and higher oil content than natives. Concern was expressed regarding the bushfire risk posed by the large number of failed olive plantation investment schemes in areas of Australia that have a Mediterranean climate, especially those that are in close proximity to urban areas.<sup>77</sup>

1.91 The SA Government is seeking to address this risk. Mr Mark Ramsey, Executive Officer, Animal and Plant Control Commission, told the Committee that:

In South Australia, under the policies of the risk assessment process we have implemented, if an olive grove is not managed for two years, it can be proclaimed as a feral planting and removal can be enforced. Obviously we are always concerned about the fact that foxes and starlings spread olive seeds over large distances. When we are looking at new applications, we request that they consult their local boards and develop a management plan for those species. Providing a place for the birds to defecate before they fly off is at least a good start, so we ask the local boards to do something to manage the feral olives.<sup>78</sup>

1.92 The Committee heard that olive trees were brought to South Australia on the HMS *Buffalo* and this has resulted in a situation in South Australia of there being:

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75 Information in this paragraph is referenced from:  
[www.ea.gov.au/parks/christmas/fauna/crazy.html](http://www.ea.gov.au/parks/christmas/fauna/crazy.html).

76 Mr Tim Low, *Committee Hansard*, Brisbane, 14 April 2004, p. 43.

77 Mr Neville Crossman and Mr Noel Richards, *Committee Hansard*, Adelaide 28 June 2004, p. 53-4.

78 Mr Mark Ramsey, *Committee Hansard*, Adelaide, 28 June 2004, p. 12.

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both heritage listed olive trees and feral olives and we have an industry that is trying to develop.<sup>79</sup>

These different categories pose management challenges as blanket management plans cannot be applied.

## **Social impact**

1.93 The difficulty in quantifying the social impacts of invasive species was acknowledged by the Pest Animal CRC in its publication *Counting the Cost: Impact of Invasive Animals in Australia 2004*. It wrote that:

Social impact is perhaps the most difficult element of the 'triple bottom line' framework to define and quantify.<sup>80</sup>

1.94 The report sought to quantify the cost of 11 major vertebrate pests on Australian agricultural industries and the environment. The report was able to include annual cost values, including control and production loss estimates. However, it acknowledged that many gaps exist in knowledge of the social impacts of vertebrate pests and they were only discussed in qualitative terms in the report.<sup>81</sup>

1.95 Evidence received by the Committee indicated that the social impacts of invasive species are significant. However, it was widely acknowledged that there was difficulty in attributing an economic value to the social impacts for all areas that are affected by invasive species.

### ***A cross section of impacts***

1.96 It is recognised that many introduced species do not cause significant problems – it is worth recalling CSIRO's evidence cited above that only 1 in 1000 species imported into Australia end up being classified as invasive. For example, dogs and cats, tulips and roses, have arguably made a significant positive contribution to Australian social life. However, those that are invasive can have considerable social impact on the community.

1.97 Social impacts of invasive species are considerable and are not limited to rural areas. A cross section of impacts include:

- vehicle accidents involving pest animals;
- distress, fear and nuisance, eg. mice and pigeons;
- reduced rights of movement, for example in areas that are undergoing invasive species management activities;

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79 Mr Mark Ramsey, *Committee Hansard*, Adelaide, 28 June 2004, p. 12.

80 R McLeod, *Counting the Cost: Impact of Invasive Animals in Australia 2004*, Cooperative Research Centre for Pest Animal Control, Canberra, p. 7.

81 *ibid*, Executive Summary.

- loss of aesthetic values and amenity, such as with weeds, like *Hymenachne amplexicaulis*, that clog waterways; and
- impacts on lifestyle and health, such as the threat posed by red imported fire ants because of their aggressive nature, large numbers and tendency to sting a number of times.

1.98 Although the economic cost of the social impacts of invasive species is difficult to identify, the broad social impact of invasive species was widely acknowledged in submissions and other evidence the Committee received. The Bureau of Rural Sciences stated that:

Weed species, apart from impact on biodiversity, can also affect recreational use of areas. For example, many introduced plants can form dense infestations on or around coastline, such as bitou bush, and other water bodies limiting or preventing their use, such as willows (*Salix* spp.) which can make access along narrow rivers impossible. Many weeds grow densely and have prickles or spines such as lantana (*Lantana* spp.) and blackberry, and can limit or prevent access to areas.<sup>82</sup>

1.1 Weeds can reduce the appeal of natural landscapes. This can be seen in wetlands in the Northern Territory which, which were initially havens for wildlife, but have now become overrun by monospecific stands of *Hymenachne amplexicaulis*.<sup>83</sup>

1.99 Impacts of aquatic weeds include:

- blocking and polluting waterways;
- reducing employment opportunities;
- affecting drinking water; and
- reducing recreational enjoyment.

1.100 Dr Nicolas Bax, Senior Research Scientist, CSIRO Marine Research told the Committee about an outbreak of *caulerpa taxifolia* in West Lakes in Adelaide, South Australia and explained the impacts of the weed. He advised that *caulerpa taxifolia*:

is a green algae and it has caused a huge amount of trouble in the Mediterranean, where it spread to cover 10,000 hectares. It has now invaded southern California as well. It basically covers surfaces; it almost looks like an underwater golf course, I think, when it comes. It covers reefs, it covers seagrass and it is basically noxious to most species, so not many species eat it. It is seen as a major threat to nursery areas—for fish, for example—so the South Australian government went ahead and looked at various solutions to eradicate it from South Australia. It is spread by the aquarium industry, which is an interesting vector. Up until very recently it

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82 Bureau of Rural Sciences, *Submission 62a*, p. 10.

83 *ibid*, p. 11.

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was still available—you can still buy it on the Internet, for example—and up until very recently it was exported from Queensland.<sup>84</sup>

1.101 The cost of the eradication campaign was significant.

in South Australia they spent \$6 million to \$8 million eradicating from West Lakes through pumping freshwater into those lakes. So it does appear that eradication is possible, especially in areas where the environment is semi-closed...<sup>85</sup>

1.102 He went on to explain that:

One thing that may be of interest about caulerpa is that, whereas the national system and the cost sharing which has been set up by the states and the Commonwealth addresses introduced marine pests, because it cannot be demonstrated that caulerpa is introduced—and it appears that it comes from Queensland—it falls outside of the whole cost-sharing arrangement.<sup>86</sup>

### ***Learning from other countries***

1.103 Australia is able to learn about the social impacts of invasive species that have yet to become established in Australia, from countries that have experienced an outbreak of the species. This is what occurred when the red imported fire ant was discovered in Brisbane in February 2001. Australia looked to the United States experience with the red imported fire ant, where it had been allowed to spread beyond the point of eradication, and was able to conclude that inaction was not an option. In the United States the social impacts of fire ants included significant impact on public health due to their aggressive behaviour, their tendency to sting repeatedly, their ability to cause anaphylaxis, and safety risks for small children, the elderly and pets that may not be able to 'escape' an attack. Other social impacts included the loss of ability to use yards as places of relaxation and loss of amenity of other land, such as sporting fields.<sup>87</sup> A case study on the red imported fire ant incursion is provided in Chapter 5.

1.104 The social impact of invasive species is often a flow-on effect from the economic impact, especially if agriculture and industry are involved. Mr Tim Allen, National Coordinator, Marine and Coastal Community Network demonstrated this point through the example of the comb jellyfish in the Black Sea. He advised that:

It now constitutes up to 95 per cent of the biological mass of the Black Sea.  
It led to the collapse of the Black Sea's fishery worth \$250 million a year,

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84 Dr Nicholas Bax, *Committee Hansard*, Adelaide, 28 June 2004, p. 32.

85 *ibid*, p. 31.

86 *ibid*, p. 32.

87 Queensland Government, *Submission 43*, p. 30.

causing massive social dislocation and the complete collapse of that fishery.<sup>88</sup>

1.105 A correlation can be drawn between the comb jellyfish outbreak and the outbreak of the Northern Pacific Sea Star in Port Phillip Bay. The Northern Pacific Sea Star was first identified in Australia in Tasmanian waters in 1992. It is believed to have been present in Tasmanian waters, but misidentified, since approximately 1986. By 1995 it had spread to Port Phillip Bay and it has now extended beyond Port Phillip Bay to near Inverloch, 100 kilometres to the east. It is estimated that there are now 1200 tonnes of the Northern Pacific Sea Star in Port Phillip Bay compared to 2700 tonnes of fish. The Committee heard that the Northern Pacific Sea Star has the potential to spread east of Port Phillip Bay due to prevailing currents, however, it will only spread west with human assisted dispersal, for example through ballast water.<sup>89</sup>

1.106 The Department of the Environment and Heritage noted that there is evidence that the Northern Pacific Sea Star is affecting oyster production on some marine farms in southeast Tasmania.<sup>90</sup> It poses a threat to mariculture through its direct predation on native species, its ability to out-compete native species for food and its potential to occupy and dominate suitable habitats from Sydney to Perth. If it continues to spread across Australian waters and increase in prevalence it has the potential to cause significant social dislocation, resulting in job losses and reduced income, to areas that rely on fishing and aquaculture as key economic sources.

### ***Local impacts***

1.107 The social impacts of invasive species are generally localised. Mr Robert Pietsch, President AgForce Sheep and Wool and President Wool Producers, told the Committee that wild dogs are responsible for the slaughter of many lambs and sheep and are one of the factors that have made it no longer viable for people to run sheep in some areas of Queensland. He also explained that cattle farmers have problems with losses from wild dogs, a key source of losses being *Neospora caninum*, a disease which causes bovine abortion. Mr Pietsch told the Committee about the interrelation of the social and economic impacts. He told the Committee that:

there is an enormous impact socially in places like old wool towns where, because there are no longer shearing teams and all the rest of it, the economic loss to those communities is enormous.<sup>91</sup>

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88 Mr Tim Allen, *Committee Hansard*, Adelaide 28 June 2004, p. 39.

89 *ibid*, p. 40.

90 Department of Environment and Heritage, *Submission 61*, p. 3.

91 Mr Robert Pietsch, *Committee Hansard*, Canberra 18 June 2004, p. 51.

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1.108 Invasive species were identified by Dr Tony Peacock, CEO, Pest Animal CRC as being one of the aspects that make farming unappealing for people.<sup>92</sup> Dr Peacock showed the Committee footage of a mouse plague and advised that:

If you have had to shake them [mice] out of your children's beds at night and that sort of thing, it is another thing that makes farming unattractive for many people to participate in.<sup>93</sup>

1.109 The Committee heard that invasive fish species, such as carp, impact on anglers' recreational enjoyment. In some parts of Australia, fishing has been banned as a result of carp presence:

Lake Crescent (Tasmania), for example, which had 1,559 full season anglers who exclusively fished this area, was closed until the current brown trout season. Aside from directly affecting the well being of these fishermen, possible decreased expenditure by these people would have affected support industries. Each freshwater angler is estimated to spend around \$535 on the sport (Henry and Lyle 2000).<sup>94</sup>

1.110 Public amenity has been affected by invasive marine species. Impacts of invasive species have included:

- reducing the attractiveness of dive sites;
- causing beach closures;
- reducing the productivity of recreational fisheries; and
- increasing the maintenance requirements for recreational vessels.

1.111 Invasive species also have the potential to impact on the cultural identity of indigenous Australians. It has been recognised that:

The introduction of cane toads into traditional Aboriginal areas, such as Kakadu, may result in the decline of dingo, snake and crocodile numbers – threatening the nomadic hunter and gatherer lifestyle.<sup>95</sup>

1.112 The Indigenous Land Corporation submitted that:

the impact of weed species on cultural activities can be significant and must be included in the risk assessment of invasive species and the development of a Threat Abatement Plan and any other management strategy.<sup>96</sup>

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92 Dr Tony Peacock, *Committee Hansard*, Canberra 18 June 2004, p. 14.

93 *ibid*, p. 14.

94 R McLeod, *Counting the Cost: Impact of Invasive Animals in Australia 2004*, Cooperative Research Centre for Pest Animal Control, Canberra, p. 32.

95 *ibid*, p. 47.

96 Indigenous Land Corporation, *Submission 38*, p. 9.

### **Impacts on health – human and animal**

1.113 Invasive species can have significant impacts on human and animal health, which flows on to adversely affect social well being.

1.114 Invasive plants can have an impact on peoples' wellbeing. For example:

- the health of asthma and hay fever sufferers is linked to rye grass;
- it has been documented that *Parthenium* can cause severe respiratory problems and dermatitis, prolonged exposure can cause severe allergic reactions; and
- olives can be accountable for up to 40% of air-borne pollen at flowering time in areas where there is an invasive problem.<sup>97</sup>

1.115 The continued spread of certain invasive plants is increasing the adverse impacts that they have on peoples' health. Many invasive species that have become established can:

- sting people (stinging nettles);
- give people rashes (*Rhus*, *green cestrum*); or
- irritate skin with caustic sap (petty scurge).

1.116 Other weeds present a barrier of spikes, needles, thorns and prickles that can cause injury. Thornapple and castor oil seeds, arum, lilly, blackberry and nightshade, are toxic.

1.117 Twenty-three common weed species are a serious respiratory or toxic risk, especially to young children. However, amongst the twenty-three that pose significant respiratory or toxic risk only *Parthenium* has received federal funding for control.<sup>98</sup>

1.118 Landholders are well aware of weed species that harm stock and pet animals. Examples include:

- Paterson's curse;
- St John's wort; and
- silverleaf nightshade.<sup>99</sup>

1.119 As with humans, the thistles, spines and burrs on weeds such as mimosa, mesquite and acacias can often cause injury to stock and pet animals. This can have flow on economic effects.

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97 P Martin, *Killing us softly – Australia's green stalkers*, CRC for Australian Weed Management 2002, Canberra, p. 13.

98 ibid.

99 ibid.

1.120 Evidence indicated that some invasive species are potential reservoirs of diseases. Dr Kevin Doyle, Veterinary Director, Australian Veterinary Association, advised that feral pigs carry a number of diseases which are endemic in Australia; including a number of insect-borne viral diseases that cause encephalitis.<sup>100</sup> The role of feral pigs as carriers of disease has a public health dimension as some diseases of concern, such as Japanese encephalitis, are zoonoses.<sup>101</sup>

1.121 One of the most significant impacts of pest animals is that they can spread disease to humans, livestock and native animals. Examples include:

- Rabbits which host tapeworm and liver fluke and can also increase the prevalence of hytaids, paovirus, toxo plasmosis, distemper, brucellosis, coccidian and leptospirosis.<sup>102</sup>
- Feral pigs which can transmit leptospirosis, brucellosis, tuberculosis and other diseases. They are also reservoirs for exotic diseases such as foot and mouth disease and Japanese encephalitis.<sup>103</sup>
- Wild dogs have the potential to be vectors for rabies if it enters Australia.<sup>104</sup>
- Feral cats are vectors for toxoplasmosis and sarcosporidiosis, which can be transmitted to native animals, humans and domestic livestock. They also have the potential to be carriers of rabies.<sup>105</sup>
- Cane toads are poisonous to pets, especially to dogs which attempt to eat them.

### *The social benefits of invasive species*

1.122 The impacts of invasive species are not all negative. Camels, rabbits, foxes, carp and goats are a significant factor in the management costs for invasive species but also provide employment opportunities in rural and regional Australia.

- Export of feral camels to the Middle East is worth more than \$2 million per annum;<sup>106</sup>
- Export of fox pelts was estimated as being worth about \$8 million per annum in 1984.<sup>107</sup> More recent estimates are not available, although demand has reduced.

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100 Dr Kevin Doyle, *Committee Hansard*, Canberra 18 June 2004, p. 46.

101 Zoonoses are diseases that affect animals and humans.

102 *ibid*, p. 17.

103 *ibid*, p. 28.

104 *ibid*, Canberra, p. 41.

105 *ibid*, p. 53.

106 P Seidel, *Camel Catchers*, The Bulletin, 17 August 2004, p. 28.

- Commercial harvesting of carp was worth a gross total value of \$1.7 million in 2002.<sup>108</sup>
- Export of feral goats was worth a gross value of \$29 million in 1993.

1.123 While noting the positive contribution of pest animals to rural and regional Australia, the beneficial outcomes need to be discounted by the potential impact on biodiversity. The Pest Animal CRC's report noted that in most cases the benefits are relatively minor in comparison to the cost of pest impacts.<sup>109</sup>

1.124 In light of the disparity between the contribution and the cost of pest animals the Committee notes that compensation may be payable to people whose livelihoods are affected by the release of control methods.

1.125 A case that highlights this is the recent ruling that requires the Commonwealth Government and CSIRO to pay \$1.5 million in compensation to a small group of shooters and wholesalers who made their livelihoods from the wild rabbit industry. The grounds for the suit were that the Government and CSIRO were negligent in failing to prevent the release of the calicivirus from a testing station on an island in the Spencer Gulf of South Australia in 1995.<sup>110</sup>

### ***Challenges in addressing social impacts***

1.126 The extent to which invasive species are able to be effectively managed is dependent upon whether key stakeholders have been engaged and acknowledge problems and support programs to address them. It is essential that landowners be engaged as they bear the majority of costs associated with invasive species and their support is required if management activities seek to incorporate their land and neighbouring land.

1.127 Management of invasive species can be hindered by negative attitudes amongst some members of the community to some management activities. In relation to invasive plants, there may be objections to what are seen to be beautiful plants, such as duranta or willow trees. In relation to pest animals, objections are primarily focused on the method of reducing the pest animal population or objections to the killing of animals on humane grounds. This issue is very complex and has been acknowledged by researchers and authorities responsible for the management of invasive species. The Committee was told that, on South Australia's Kangaroo Island, the koala population is in danger of starving to death, simply

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107 ibid, p. 23.

108 ibid, p. 32.

109 ibid, p. 7.

110 Julie-Anne Davies, *The rabbit-proof defence*, The Bulletin, 24 August 2004, p. 31.

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because there is no palatable public policy to deal with the overpopulation problem.<sup>111</sup>

1.128 A backlash against proposed ariel baiting in the Kosciuszko National Park to control wild dogs highlights this issue. The Humane Society International advised that:

Under no circumstances does HIS support the use of 1080 baiting as a method of pest control. It is inhumane and indiscriminate in the species it kills.<sup>112</sup>

1.129 Four animals over which the management of the pest populations have been the recipient of heated debate are kangaroos, koalas, dingoes and wild horses. Reasons for objections to reducing their numbers include:

- an iconic status being attached to them;
- the animals being internationally recognised symbols of Australia and the attraction of international media attention on attempts to cull populations; and
- the animals being a source of eco tourism, such as wild horses on the NSW highlands, dingoes on Fraser Island and koalas on Kangaroo Island.

1.130 Dr Peacock told the Committee that invasive species are not the first issue for farmers. He said that:

The fact that it [invasive species management] is a second- or third-order level of magnitude means that it is an issue that goes between the cracks a little bit.<sup>113</sup>

1.131 If landowners do not see invasive species as a problem that warrants attention then the issue will not be effectively managed. To highlight this point, Dr Peacock told the Committee that:

the horticulture industry does virtually no vertebrate pest work and does not recognise it as an issue, but if you talk to a grape grower who is grape netting about what they are doing every night to keep vertebrate pests off their crops, it has a huge impact.<sup>114</sup>

1.132 Educating stakeholders about the issue is key to obtaining support for management programs. Mr Edward McAlister highlighted the role of education when he told the Committee about a project to return yellow-footed rock wallabies. He told the Committee that:

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<sup>111</sup> Mr Edward McAlister, *Committee Hansard*, Adelaide, 28 June 2004, p. 66.

<sup>112</sup> Canberra Times, *Kosciusko baiting could wipe out quolls: world body*, 27 August 2004, p. 7.

<sup>113</sup> Dr Tony Peacock, *Committee Hansard*, Canberra, 18 June 2004, p. 18.

<sup>114</sup> *ibid*, p. 18.

when we went up there first, the local people were a bit scathing about the idea of putting the wallabies back in the wild—more than scathing; they were a bit rude about the idea. However, once we got going, one of our young female vets went to the school and spoke to the children and the children became very enthusiastic. At Christmas time that year, they had the Wallaby Hop. The children all dressed up in wallaby outfits with tails and they did the Wallaby Hop. They went home to their parents and the parents were sucked in to getting involved. The pastoralists who did not want to do any baiting ended up being almost forced by moral pressure from the children. It started off with a 10-kilometre wide radius around the outside of the sanctuary. The result was that lambing percentages increased, so all of a sudden it has now been increased to a 30-kilometre wide radius. Once you can get the children on board, you can work through the children to get to the parents.<sup>115</sup>

1.133 The flow on from this was that:

The other thing that happened is that when they got enthusiastic they formed a biodiversity group up there in the Flinders Ranges. They got money from the NHT to eradicate weeds and to keep on eradicating foxes and rabbits, particularly, as well as dogs and cats.<sup>116</sup>

1.134 Another program that demonstrates the benefits of education campaigns is Weed Buster Week. This is a national education and awareness campaign that started in Queensland. A review of Weed Buster Week in 2003:

showed that for every dollar invested in education initiatives pertaining to weed control there is \$43.80 worth of benefits generated by weed control activities throughout the state.<sup>117</sup>

The value of engaging the community in management projects is discussed in Chapter 8.

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115 Mr Ed McAlister, *Committee Hansard*, Adelaide, 28 June 2004, p. 64.

116 *ibid.*

117 Queensland Government, *Submission 43*, p. 15.