Invasive Animals Cooperative Research Centre

# Assessing the social impact of invasive animals in Australia



**Gerard Fitzgerald and Roger Wilkinson** 









**Invasive Animals CRC** 

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Gerard Fitzgerald and Roger Wilkinson (2009)

A report produced for the Invasive Animals Cooperative Research Centre



Australian Government







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#### Assessing the social impact of invasive animals in Australia

Report prepared for Invasive Animals Cooperative Research Centre Project 12.D.6: Measuring the social, environmental and economic impacts of vertebrate pests.

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# Summary

This report summarises the social research done for the Invasive Animals Cooperative Research Centre project: 'Measuring the social, environmental and economic impacts of vertebrate pests'. The project aimed to:

- identify gaps in an earlier estimate of the social cost of invasive animals to Australia (*Counting the Cost,* by Ross McLeod 2004)
- develop an improved framework for assessing social costs or impacts
- conduct a case study of the social impacts of invasive animals in one district.

The case study of the Upper Hunter Valley in New South Wales set out to identify, understand, and possibly quantify the social impacts of invasive animals in an area with a typical range of land uses. We found that in the Upper Hunter region, wild dogs, foxes, feral pigs and rabbits, and to a lesser extent, feral goats and carp are seen as the main pest animals. In practice, only wild dogs, foxes and feral pigs currently seem to be causing concern for local landowners and resource managers.

For the most part, the effects of pest animals in the Upper Hunter region are economic and environmental. Such effects include stock and pasture loss, biodiversity loss and vehicle accidents involving invasive animals. Most of the social impacts of pest animals in this region therefore seem to flow out of the economic and environmental impacts. However, some direct social impacts do occur. Examples include psychological distress to farmers caused by fox predation on their stock, fear of wild dog attacks and trauma from vehicle accidents. The increasing diversity of rural land use and rural residents may also cause intracommunity conflicts. Some cited benefits of invasive animals include opportunities for hunting, fishing and trading. At a national level, it is also likely that the main social impacts of invasive animals are not direct impacts, but rather flow out of the economic impacts and, to a lesser extent, the environmental impacts. We recommend a different approach for the estimation of the social impacts of invasive animals nationally, requiring systematic collection of primary data from across the entire Australian community.

# 1. Introduction

In 2004, the then Pest Animal Control Cooperative Research Centre commissioned a review of the impacts of invasive or pest animals on Australia's environment, economy and society (McLeod 2004). This review, *Counting the Cost*, drew on the available literature and consultation with key agencies and researchers to summarise the impacts of 11 major feral pest animals:

- mice
- rabbits
- foxes
- pigs
- carp
- goats
- dogs or dingoes
- camels
- cane toads
- cats
- horses.

Most of the effort was put into identifying and quantifying the environmental (bio-physical) impacts and the economic cost of these species. The social costs or impacts were not covered comprehensively. McLeod noted that in accounting for the social impacts of pests, he encountered significant gaps in knowledge as well as conceptual and methodological problems.

In 2005, the new Invasive Animals Cooperative Research Centre (IA CRC) convened a workshop in Canberra to discuss the findings of McLeod's report. One of the tasks of the workshop participants was to consider the question of the social impacts of pest animals, and the poor coverage of these impacts in the report. Among other outcomes, the workshop participants recognised that more needed to be done to identify and quantify the social impacts and costs. The IA CRC subsequently initiated a research project entitled 'Measuring the social, environmental, and economic costs of invasive animals', within its Detection and Prevention Program.

The component of the project dealing with measuring the social costs of invasive animals had six phases:

- 1. Briefly review McLeod's *Counting the Cost* report from a social perspective.
- 2. Conduct social impact scoping investigations.
- 3. Hold a social impact research expert workshop.
- 4. Conduct a social impacts case study.
- 5. Extrapolate the case study research to other species and areas.
- 6. Prepare a report on the findings.

This document is the final report of the social research. It summarises the findings of two substantive progress reports (Fitzgerald and Wilkinson 2007, Fitzgerald and Wilkinson 2008), draws conclusions and makes recommendations for further research.

# 2. A brief review of *Counting the Cost* from a social perspective

The McLeod (2004) study drew largely on previous studies, supplemented by discussions with experts in the field. Limited resources were available for the study and it was not intended to be exhaustive. McLeod himself recognised that the social costs aspect was not well covered. He noted difficulties in dealing with the social impacts, and identified two types of problems:

- a lack of agreed framework and methods for measuring 'social performance'
- a lack of data or knowledge about the social impacts of vertebrate pests.

## **2.1** The framework for assessing the social impacts

With respect to McLeod's difficulties with a lack of framework for social impact assessment (SIA), his own approach may be part of the problem. Two aspects of the approach are problematic from a social science perspective: assumptions about how to count social impacts, and the choice of framework.

## 2.1.1 The assumption that social impacts can be counted

The first problem is the focus on estimating the 'financial and economic performance' of pests (McLeod 2004 p1). This focus suggests an assumption that all impacts can be potentially rendered as a quantifiable financial cost or benefit. Many social scientists reject this assumption, for reasons that are both ontological (related to the nature of the phenomena being examined or what can be known) and epistemological (related to how something is known and the methods used to know/measure it). Many social scientists are willing to accept that some aspects of human social life can be measured or quantified, but not necessarily that they can be converted to financial values, at least without gross simplification. In short, not everything that counts can be counted in a meaningful way, and where something can be counted it cannot necessarily be converted to one agreed standard measure such as dollar values. Fortunately, SIA has been developed to provide a rigorous way of assessing social impacts.

#### 2.1.2 Conceptual framework

The second issue with McLeod's approach is the use of 'triple-bottom-line reporting' as the basis for social impact analysis. McLeod operationalised this by reference to assessment of 'social performance'.

Essentially, social performance accounting is about assessing the performance of companies, organisations and so on — which have control over their own activities — against some agreed standard or set of priorities. We contend that, while social performance accounting may be suitable for measuring the performance of pest management organisations and pest management or control programs against some agreed standard, it is not suitable for indicating the impacts of pest animals on people, communities and society. In short, it is difficult to see how a pest animal species can be held accountable for its social performance, and how its behaviour or actions can be modified to meet some performance standard.

A different kind of framework for assessing the social impacts of pests is therefore needed. We have used such a framework (explained in Section 3) to guide our field research in this project.

# 2.2 Gaps

## 2.2.1 Gaps in the coverage of social impacts

Based on a recent literature review by Fitzgerald et al (2007), it would appear that, to date, there has been little systematic research into the social impacts of invasive animals. McLeod's conclusion that 'many gaps exist in our knowledge of the major ... social impacts' would seem reasonable.

Where McLeod was able to note the social impacts of various species, his observations were largely confined to impacts of particular species on:

- employment and income opportunity
- human health and safety, including road accidents
- indigenous people's ways of life.

In McLeod's report, the biophysical (environmental) impacts of pest animals were not seen as having consequences for people, families, communities, institutions or society. Also, the direct and indirect impacts of pest animals on the economic and material wellbeing of people, families, communities and society were rendered as 'economic' costs, without attendant social effects.

The following groups of impacts were identified as gaps in McLeod's coverage by participants at the Canberra workshop in 2005 (without reference to any particular SIA framework or schema):

- impacts on individuals (eg human physical and mental health and wellbeing, sense of empowerment and identity)
- impacts on families and households (eg quality of life, leisure time, social acceptance, financial security, lifestyle)
- impacts on communities (eg community cohesion, neighbour conflict, social deprivation, community diversity, distribution of costs and benefits)
- impacts at the regional/landscape level (eg tourism, recreational opportunities, conflicts around management of multiple issues, public safety, urban and rural tensions)
- impacts on the nation (eg cultural heritage, national identity and pride, trust in institutions, impact on indigenous cultures).

The social effects of efforts to control the pest animals may also need to be considered.

#### 2.2.2 Gaps in the geographical and species coverage

Hart (2002) noted that about 80 introduced animal species have established significant wild populations on mainland Australia, and many have become pests to a greater or lesser extent. Hart rated a number of these as serious pests. The McLeod study focused on the priority pest animals of the IA CRC, including most of those noted by Hart, but did not attempt to be exhaustive in pest species coverage. Likewise, McLeod did not attempt to provide a state-by-state analysis of the impacts of each species.

McLeod covered 11 introduced species and one indigenous species: fox, feral cats, rabbit, feral pigs, dogs and dingoes, mouse, feral goats, cane toads, wild horses, camels, carp and kangaroo. The report also made mention of the potential impact of stoats. Other than a range of economic impact assessment studies, the *Counting the Cost* report contained no references to systematic social research on the impacts of any of the 12 animals. This is hardly surprising since, despite a recent literature review (Fitzgerald et al 2007), we have not been able to

identify any purposive systematic national, state, regional or local studies of the social impacts of any pest animal in Australia.

Despite this major handicap, McLeod's limited assessment of the social impacts of the various species drew on some specialist reports on carp, cane toads and kangaroos. The report did not cover some species that, from the review of the literature on attitudes to invasive animals (Fitzgerald et al 2007) and from discussions at several workshops held by the IA CRC, are considered problematic by some sections of the Australian public. These include European starlings, Indian mynah (or common mynah), deer, possums and flying foxes.

# 2.3 Information used

McLeod relied on secondary data for the *Counting the Cost* study, although a limited number of studies and sources of data were identified and used (see above). Importantly, the study did not identify existing social research on public attitudes and perceptions, such as the studies that have recently been reviewed by Fitzgerald et al (2007). These pieces of research included an examination of people's experiences and perceptions of various impacts, the results of which could be used to scope the perceived social or human impacts (Table 1). Some of the studies listed in Table 1 were published after *Counting the Cost* was produced.

Author/s	Species and area
The Roy Morgan Research Centre (1995)	rabbits in Australia and New Zealand
Johnston and Marks (1997)	a range of species in Victoria
Miller (1999, 2000, 2001, 2003)	wildlife generally in Victoria
O'Keeffe and Walton (2001)	a range of species in built-up areas of Queensland
Doak (2002)	a range of species in New South Wales
Oliver and Walton (2004)	a range of species in Queensland
Ballard (2005)	wild horses, flying foxes and kangaroos in areas of New South Wales
Finch and Baxter (2005)	wild deer and other species in Queensland
Fisher et al (2006)	foxes in Tasmania
FitzGibbon and Jones (2006)	a range of species in suburban bushland in Brisbane, Queensland
Russell (2006)	wild dogs in a valley in the southern tablelands of New South Wales
Franklin (2007)	a range of species in Australia
Sheppard and Urquhart (1991)	a range of species in New Zealand
Fitzgerald et al (1996a)	rabbits in New Zealand
Fitzgerald et al (1996b)	possums in New Zealand
Wilkinson and Fitzgerald (1998)	rabbits in New Zealand
Parliamentary Commissioner for the Environment (2000)	possums in New Zealand
Fraser (2001)	wild deer and other species in New Zealand
Fitzgerald et al (2002, 2005)	stoats in New Zealand
Wilkinson and Fitzgerald (2006)	possums in New Zealand

Table 1.	Australian	and	New	Zealand	research	on	perceptions	of, an	id a	ttitudes	to,
the impa	acts of pest	anim	als								

Despite the shortcomings of *Counting the Cost*, improving on its coverage of the social impacts of invasive animals in Australia is not easy, as we shall explain in the following section.

# 3. A framework for assessing the social impacts of invasive animals

The first major step in building a more comprehensive assessment of the social impact of invasive animals in Australia is to conduct a case study of a particular area. If sufficient highquality data are obtained in the case study area, it ought to be possible to extrapolate a national estimate of the social impacts of invasive animals. Before conducting the case study, a framework for understanding and attributing the impacts is required.

# **3.1 Social impact assessment and invasive animals**

The applied field of Social Impact Assessment (SIA) had its genesis in the regulatory assessment of the environmental impacts of development projects. For this reason, SIA is generally considered to be a process for researching, analysing and managing the intended and unintended consequences for human beings of planned interventions (Vanclay 2002, Taylor et al 2004). A planned intervention may be a project, program, plan, strategy or policy that is designed to bring about certain desired changes in a particular biophysical and social context. The goal of SIA as applied to such interventions is to anticipate and eliminate undesired consequences in advance of them occurring. Most writing in SIA tends to be about such anticipatory (ie *ex ante*) assessment.

However, this study is not about understanding the effects of a proposed or actual planned project, program or policy (such as a pest control program). Rather, we are interested in understanding the present-day consequences for people of the unplanned release by settlers of non-native animals into the Australian environment, particularly as they come on top of people's alteration to and use of the biophysical environment for particular purposes (eg pastoral farming). This study was therefore an ex post assessment, such as has been carried out on the effects of climatic or natural events (eg drought), disasters, or changes in the human or biophysical environment. The 'invasion' of an area by unwanted accidentally or deliberately released animals (eg foxes and rabbits) can be considered an unplanned event from the environmental standpoint, precipitating biophysical changes that have long-term unanticipated effects on people and communities.

Not only are the social interventions caused by invasive animals unplanned, they are also chronic, complex and cumulative. There is no single unplanned event; instead there are many invasion events spread out over time and space. Invasive animals may spread from one area to another. There are interactions between different species of invasive animal in an affected area. Many areas suffer from multiple invasive species. Conventional frameworks for undertaking SIA are unsuitable in these circumstances, and a search for a more suitable framework is required. Fortunately, such a framework exists.

# 3.2 Social change and social impacts

Vanclay (2002) suggested that SIA seeks to identify, consider and evaluate changes to various aspects of people's lives, including their way of life, culture, community, biophysical environment, economic systems, and mental, physical, social and psychological wellbeing. The concept of 'social' here is thus a broad one, encompassing many aspects of human life at the individual and collective level, including households and families, groups, communities and society.

Van Schooten et al (2003) also drew a distinction between changes in aspects of people's lives and social impacts, and suggested that a change only becomes an impact when it is 'socially significant'; that is, when something that is considered important or valuable is affected. Using this notion of an impact, it follows that animal pests will be seen as impacting on people when the changes (or change processes) that are induced by the animals:

- significantly add to or diminish the quality of people's lives
- significantly add to or diminish the quality or supply to people of important goods and services that are obtained from the environment, or
- significantly enhance or reduce the life-supporting capacity of valued ecosystems.

For example, in the Australian context, foxes preying on feral rabbits would seem to have little human (including economic) impact, whereas foxes preying on lambs can compromise human livelihoods and cause flow-on social changes that impact on others.

The word 'pest', when attached to an Australian animal, indicates that most people (or at least the most influential people in Australian society) see the animal as diminishing the things that people hold to be important. 'Pestiness' is socially constructed, so that not everyone may see a particular animal as a pest (or even invasive), and some people may even see an animal as both a pest and a resource.

## 3.3 The human–environment relationship

For an assessment of the effects of animal pests to be focused, we need to be explicit about the connection between the human world and the biophysical world, and the pathways by which changes in one bring about changes in the other. Figure 1 outlines a framework that does just that: Slootweg et al's (2003) logical procedure (or framework) for identifying the biophysical and human impacts of biophysical changes. Significantly, it makes a clear distinction between changes and impacts.



#### Figure 1. Framework for determining impacts of biophysical changes

Source: adapted from Slootweg et al (2003 p64).

According to Slootweg et al (2003 p63–66), physical interventions or activities (A in Figure 1) create changes in the characteristics of the natural resources in the biophysical setting (B). These biophysical changes can be measured and quantified using the tools of biophysical science. Any biophysical changes that result directly from an intervention are 'first-order' changes. These may in turn cause 'second-order' or even higher-order biophysical changes (C).

Changes in the physical and biological properties of natural resources will change the functions of the natural environment (E); that is, the goods and services provided by nature. These changes are called 'biophysical impacts'. There may be many such impacts, and what Slootweg et al (2003) called a 'Landscape filter' (D) is applied to narrow down the range of potential impacts. The landscape filter includes aspects such as knowledge of biophysical process and defining the boundary of the study area to exclude external impacts.

Biophysical impacts are then expressed as changes in the products and services provided by the environment. These changes then impact on the values of these functions (of the natural environment) for human society (F). Changes in the functions of nature lead to changes in the values assigned to nature. Human impacts of an intervention that occur as a consequence of biophysical changes and impacts are 'indirect'. There may also be direct human impacts that result directly from the intervention.

Slootweg et al (2003 p68) then presented a revised model to make clearer the distinction between direct, indirect and second-order impacts while integrating the biophysical and social settings (Figure 2). Direct human impacts result directly from social change processes, while indirect human impacts result from biophysical impacts (which result in turn from biophysical changes). Second-order social impacts result from other social impacts, whilst second-order biophysical impacts result from other biophysical impacts.



Pathways to derive biophysical and human impacts

#### Figure 2. Pathways to derive biophysical and human impacts

Source: Slootweg et al (2003 p68).

Slootweg et al's (2003) attempt to provide a method to map the pathways of biophysical and human interactions implies that all impacts ultimately have human consequences. Indeed, our interest in the biophysical world must (and can only) be self serving since we can only see the world though human eyes. This 'self-serving' interest or concern can range from wanting to sustain our livelihoods by protecting the productive value of the land through to wanting to enhance or protect, for future human generations, the ecological value of species with which we have little direct interaction. That all impacts are ultimately human or social is reinforced by our increasing recognition that human activity or 'intervention' in the biophysical environment can have serious consequences (and costs) for ourselves and our society. Likewise, changes in the social world (eg in quality-of-life expectations) may lead to changes in the biophysical environment, the consequences of which tend to feed back as impacts on ourselves.

# 3.4 Change pathways

In addition to understanding the relationship (cause and effect) links between the biophysical world and the human or social world, assessment of the pathways of change and impact through which invasive animals cause human impacts presents a number of methodological challenges. These challenges include questions of how to attribute impacts to causes in dynamic situations, and how to deal with cumulative impacts.

Both situations (multiple sources of change, and cumulative impacts) present problems for those wanting to attribute particular changes and costs to particular species (eg foxes versus rabbits). Only once problems of attribution and cumulative effects have been alleviated can the chain of impacts be followed.

## 3.4.1 Attributing impacts to particular causes

Separating out the social impacts of invasive animals from the impacts arising from other biophysical and social changes can be problematic in dynamic situations and systems (the 'attribution problem'). For example, the productivity of a farm expressed as income can be simultaneously affected by, among other things, climate, the farm inputs and their cost (eg timely use of water and labour, quality of the base stock, application of fertilisers), pest numbers, and the state of farm and district infrastructure. The sustainability of farming can be influenced by these factors, as well as, for example, by the regulatory environment, the state of the local community and land ownership arrangements. The larger the geographical unit of analysis, and the longer the timeframe, the greater chance there is of multiple or cumulative sources of change leading to human impacts, and the more difficult it becomes to attribute particular amounts of impact to particular causes.

## 3.4.2 Dealing with cumulative change and impact

Cumulative impacts are those that result from interactions of many incremental activities, each of which may have varying (positive and negative) effects on their own but become more significant or more complex when aggregated or when they coincide or synergise (Hunsaker 1998). In the case of invasive animals, the impacts may arise from the:

 overlapping in space of individual invasive species whose effects can be additive, subtractive or qualitatively different (eg predator-prey relationships such as foxes preying on rabbits)

- overlapping of the damaging actions (and benefits) of invasive species with those arising from social or economic changes elsewhere, such as changes in market conditions or new regulations
- overlapping of either of these situations with single or multiple interventions aimed at reducing individual animal populations or minimising their social and economic impacts.

Such effects may appear quickly or after considerable delay. They may be additive, subtractive, or synergistic. Or, they may appear in different human domains or at different levels of social organisation. To use the ripple analogy, a series of overlapping waves of impacts can amplify effects that might otherwise be minor if caused by a single effect (animal, source of social change, or intervention).

Simultaneous or sequential interventions to reduce invasive animal populations or reduce their individual impacts may also unintentionally cancel out desired positive social effects, or result in significant unintended outcomes. Unanticipated effects can become more likely when there are many potential types of overlapping interventions.

## 3.4.3 Dealing with 'orders' of social impacts

The notion of cumulative impacts is related to that of the 'chain of effects'. In theory it is possible, either through a mechanistic or systems analysis, to describe the chain of effects, including social effects, that result from biophysical changes resulting from the 'invasion' of an undesired animal, (or by the implementation of an intervention). Impact assessors refer to these as 'orders' of effects (eg first order, second order, third order, etc) or as 'direct', 'indirect' and 'induced' effects (Taylor et al 2004, Porter 1995). At each new level in the tree of cause and effect the number of possible effects and impact domains (and therefore the complexity) increases dramatically. Impact assessors therefore have to make pragmatic decisions about how far to extend their analysis before the effects become trivial or the outcomes become clearly not attributable to the invasion of an animal (or the implementation of the intervention).

# 4. Case study methodology

# 4.1 Scope

We chose to conduct a geographically based case study because it would allow for an investigation of the impacts of each of the main invasive species at different 'social levels'. Key considerations in the selection of a case study area were:

- presence of the IA CRC's priority invasive species (foxes, feral cats, feral rabbits, feral pigs, wild dogs, mice and carp)
- representativeness of the area in terms of the range of land uses, settlement type, land tenure and stakeholders
- ability to identify scale and order impacts
- ability to bound and partition the area administratively (eg local government boundaries)
- possible cooperation of local government and administrative bodies
- avoidance of major impacts arising from other causes (eg drought)
- fieldwork costs.

Before commencing field work for the case study, we conducted a deliberative exercise with Australian social scientists. Participants were drawn from among people working in the natural resources management, rural sociology and impact assessment fields. The purpose of the deliberation exercise was to:

- review the preliminary scoping work to set the scope of the case study
- map the linkages between biophysical, social and economic effects
- settle on an appropriate conceptual framework for counting the range of social costs of invasive animals
- set the parameters for the case study.

The exercise was conducted using e-mail, in a modified Delphi process. We produced a scoping document, circulated it to participants along with a list of questions we wished them to answer, and used their responses to revise the scoping document.

On the basis of our criteria, the Hunter Valley region in New South Wales was selected as the general area for the study. Furthermore, based on advice from representatives of pest stakeholder groups in the Hunter Valley and fellow social scientists, the Upper Hunter was selected as the local area for the study, in particular the area administered by the Hunter Rural Lands Protection Board (RLPB).

# 4.2 Method

The case study investigation was conducted in two phases:

1. Assembly of background information on the Hunter Valley and fieldwork planning, including: pest incidence data (where available), identification of stakeholder groups through desktop research, preliminary discussions with selected stakeholders, and fieldwork planning (October–November 2007).

 Fieldwork in the Hunter Valley, including: independent and guided site visits, semi-structured face-to-face and telephone interviews with key local informants, attendance at a landholders' pest management forum, and gathering of secondary data. This fieldwork was carried out in two stages: 4–11 December 2007 (Fitzgerald and Wilkinson) and 10–20 February 2008 (Fitzgerald), with follow-up data collection and discussions following each visit.

The interview informants included key people and representatives from the following interests:

- pastoral farming community
- horticulture and viticulture industries
- agricultural and rural service and support organisations
- public and private sector pest and wildlife management
- recreational fishing and hunting
- public reserves and recreation management
- catchment management
- forest management
- vehicle insurance and repair
- local government
- rural communities.

Notes were taken of all interviews, and later transcribed and key worded for analysis using the AskSam software.

We sought and received the cooperation of the Hunter RLPB, the main body responsible for terrestrial pest management in the Upper Hunter. This board is also the main source of information about pest animal incidence, pest control and stock numbers in the district. The officers and directors of the Hunter RLPB facilitated contact with local landowners and farmers, especially the various local community pest committees.

# 5. The Upper Hunter case study area

# 5.1 The Hunter region

The Hunter region is located on the east coast of Australia in the state of New South Wales (between 31.5 and 33 degrees south and 150 and 152 degrees east), and takes in the districts surrounding the catchment of the Hunter River. The Hunter River, with a catchment area of 22,400 square kilometres, bisects much of the region. It rises mainly in the Barrington Tops area to the north then flows generally southwest, then south-eastwards towards the coast at Newcastle (Figure 3).



Figure 3. Map of the Hunter region in New South Wales

# 5.2 The Upper Hunter

## 5.2.1 Local government

The Upper Hunter subregion is made up of the predominantly rural Upper Hunter, Muswellbrook and Singleton Shires, with a total area of 56,353 square kilometres and a population of 50,152. Each of the main towns in the Upper Hunter (Scone, Muswellbrook, and Singleton) were established as farm servicing towns in the 1830s, are located on the banks of the Hunter River, and are linked by the New England Highway.

Upper Hunter Shire has a total area of 8060 square kilometres, much of which is national park and nature reserves. Most of the remaining rural area is used for beef and sheep grazing, dairying, horse studs and general farming. The 2006 population was 12,976. The main town and service centre is Scone (population approximately 5100), with smaller settlements at Aberdeen, Merriwa and Murrurundi. Between 1996 and 2006, the resident population declined slightly (by 166 persons).

Muswellbrook Shire occupies 3400 square kilometres and in 2006 had a population of 15,236. The main service and administrative centre is Muswellbrook, with about 10,700 residents. There are smaller but well-established service centres and settlements at Denman and Sandy Hollow. Most of the rural area is used for cattle grazing, dairy farming, coal mining, horse studs and viticulture. The resident population of Muswellbrook Shire declined slightly between 1996 and 2006 (by 139 people).

Singleton Shire occupies 4893 square kilometres and in 2006 had a population of 21,940. The main service and administrative centre is Singleton, with a population of approximately 13,500. Along with grazing, horse studs, dairying, general farming and viticulture land uses, Singleton Shire has a large proportion of area in national parks and state (production) forests, significant industrial land use (especially open-cut coal mining and thermal power generation) and a military training area. Between 1996 and 2006, the resident population increased by 9.5% (or 1912 people), largely due to the continued expansion of coal mining.

## 5.2.2 Socio-economic characteristics

Collectively and individually, the local government areas of the Upper Hunter have a very high proportion of older residents (ranging from 17% to 22%), and between 1996 and 2006 this section of the population grew despite there being little overall population growth. Population aging is most evident in Upper Hunter Shire, where those aged 50 and over make up 28% of the population. It appears to be associated with an ongoing out-migration of young adults for educational, employment and lifestyle opportunities in the main cities.

The Upper Hunter population is predominantly of European (especially Anglo-Saxon) origin. Only 1707 residents identified themselves as indigenous Australian in 2006 (ie 3.4% of the total population); 683 more than in 1996.

The Upper Hunter subregion has a diversity of land uses, including residential settlements, coal mines, major electricity generation plants, water supply catchment areas and reservoirs, industrial estates, production forests, a military training area, national parks and reserves, and significant areas in agricultural and horticultural production. While having a diversity of land uses, the district economy is centred on coal mining and agriculture. For example, out of a total Upper Hunter workforce of 23,234 people, 3593 (or 15.5%) work in the mining sector (almost all in coal mining), and 2386 (10.3%) work in agriculture, forestry or fishing.

## 5.2.3 Agriculture

Dairy farming, horse breeding and vegetable production tend to be concentrated on the alluvial flats. Away from these areas, wine grape, cereal crop, olive, beef cattle and sheep production predominate. The available Hunter RLPB data indicates that there are approximately 1500 landholders with ten hectares of land or more who keep stock; mainly beef cattle, sheep, horses and dairy cattle.

In 2001, the Australian Bureau of Statistics identified 532 farm holdings within the former Scone, Murrurundi and Merriwa Local Government Areas (an area larger than the present Shire of Upper Hunter). The total area of those holdings was 818,270 hectares, indicating an average farm size of 1040 hectares. In Singleton Shire in 2001, there were around 600 agricultural

producers, with an average holding size of 356 hectares. In 2001, the economic value of agricultural production in Singleton Shire was \$34 million.

#### Sheep and beef farming

The census data indicate that approximately 1280 people were employed in beef and sheep farming in the Upper Hunter in 2006. This number accounts for approximately 6% of all employment. Over half of this employment was in Upper Hunter Shire.

#### Cropping

According to local informants, most of the cropping is done on the darker soils in the western part of the Upper Hunter District, especially around Merriwa. Broadacre grain crops and some horticultural crops are produced. Lucerne hay is also produced as a commercial crop on the river flats. For many years, 'Hunter River' was virtually the only lucerne variety grown commercially in Australia. Data on the crop areas and levels of production for the Upper Hunter were not available at the time of the study. The census data indicates that in 2006, across the three shires of the Upper Hunter, 142 people were primarily employed in crop production in the Upper Hunter. Cropping tends to be mainly done as part of a mixed farming regime.

#### Viticulture

The Hunter Valley is an important wine region in Australia, but the viticulture industry is concentrated in the Lower Hunter. Much of the Hunter's tourism is wine based. The number of vineyards in the Upper Hunter is not clear. The 2006 census data for the three shires of the Upper Hunter indicates that 128 people were employed in grape growing, while 238 were employed in wine and other alcoholic beverage manufacturing. About 90% of the jobs in the local wine industry are in Muswellbrook and Singleton Shires.

#### Equine industry

The Upper Hunter subregion is an important centre for the thoroughbred and stock horse industry in Australia, especially Upper Hunter Shire. The importance of the equine industry is reflected in the employment data from the 2006 census. For instance, 607 people were employed in horse farming, 60% in Upper Hunter Shire, 34% in Muswellbrook Shire and 6% in Singleton Shire.

#### 5.2.4 Mining and power generation

The Hunter Valley has a long history of coal mining, although today most coal is produced by large open-cut mines located on former farmland, mostly around the alluvial flats of Singleton and Muswellbrook. The coal mines and their waste stockpiles are a noticeable feature of the Upper Hunter landscape. There are 25 coal mines in the Hunter Valley, the majority of which are open-cut mines, with Xstrata and Coal and Allied being the biggest operators. Eighteen of the coal mines are located in Singleton Shire. When mining companies acquire land for mining, they tend to buy out adjoining farms as a buffer, which the companies continue to run as farms.

Census data on place of work shows that in 2006, there were approximately 5360 persons employed in the mining industry in the Upper Hunter (mostly in Singleton Shire), and 700 were employed in the electricity supply industry. In these sectors, the Upper Hunter is a net supplier of jobs to the wider region. For instance, in 2006 some 600 Upper Hunter residents

were employed in the mining sector, while approximately 440 were employed in fossil fuel electricity generation.

### 5.2.5 National parks, reserves and state forests

The Upper Hunter subregion contains significant areas of conservation land, such as the Wollemi, Yengo, and Goulburn River National Parks to the southwest, and the Mt Royal and Barrington Tops National Parks in the northeast. Some 60,000 hectares (or about 8%) of Upper Hunter Shire are in national parks and nature reserves managed by the New South Wales National Parks and Wildlife Service.

#### 5.2.6 Outdoor recreation

Outdoor recreational and leisure opportunities and facilities within the region include:

- national parks and reserves, which are used for activities such as bushwalking and observing nature — hunting is not permitted in these areas
- state forests, which are used for bushwalking, and in some instances, recreational hunting — declared hunting species include wild deer; feral pest animals including pigs, goats, foxes, cats, hares, rabbits, wild dogs (but not dingoes); and various game birds
- private land, some of which is used for hunting under New South Wales law, landowners are free to hunt on their own property
- Lake Glenbawn, Lake St Clair and Lake Liddell recreation areas used mainly for recreational angling, water sports, and camping and picnicking
- Hunter River used for fishing and water sports, both above and below Lake Glenbawn
- vineyards of the Upper Hunter many of which provide for wine tourism (wine tasting and dining) and occasional events such as concerts.

In former years, most of the alluvial flats and riparian (riverbank) areas in the Upper Hunter were reportedly involved with dairy and other farming. With the increasing acquisition of these areas by coal mining companies and horse studs, access to the streams and rivers that flow through their properties has reportedly decreased.

Hunting on public land, and on private land not owned by the hunter, requires a permit. According to the New South Wales Game Council, in 2008 there were approximately 156 General and Restricted hunting licence holders in the rural Hunter Valley, of which 53 were in the Upper Hunter subregion. For state forests in the Upper Hunter Valley where hunting is permitted, the following feral animals were officially recorded as having been taken in 2007–08: five cats, three deer, six dogs, 22 foxes, 25 goats, 20 hares and rabbits, and 12 pigs. The Game Council was not able to supply hunting-return data for licence-based hunting on private land.

## 5.2.7 Pest management

In New South Wales, public and private landholders have an obligation under the *Rural Lands Protection Act 1998* to eradicate pest animals on land they own, occupy or manage. The RLPBs are the main pest-management agencies, providing landowners with advice and assistance in eradicating the declared pest species, and employing specialist staff for this purpose. RLPBs also work with private and government stakeholders to develop vertebrate pest management plans and cooperative management programs (eg with state forest and national parks managers).

Current declared pest species in New South Wales include rabbits, feral pigs, wild dogs and various locust species. Foxes and mice are currently classed as nuisance animals and there is no obligation for a landholder to control them, though RLPBs provide advice and assistance in their control as required.

The Hunter RLPB is responsible for most of the Upper Hunter region. The organisation is headquartered in Scone and has a staff of 12, including three rangers; two of these rangers deal with pest animals. The current boundaries of the Hunter RLPB are indicated on Figure 4 in relation to the shires of the Upper Hunter region.



# Figure 4. Hunter RLPB (pale grey) boundaries in relation to Upper Hunter region (whole shaded area)

# 5.3 Local trends

## 5.3.1 Changes in farming and land use

Historically, sheep farming occurred on farms away from the main alluvial flats and in the side valleys, especially on drier land east and northeast of the New England Highway. In the past 15 years or so, farmers have reportedly moved out of sheep farming in favour of cattle grazing.

Apart from decreases in stock carrying to cope with sustained drought, farmers and others attribute the long-term reduction in sheep farming in favour of beef farming in the Upper Hunter to:

- threat to stock from wild dogs or dingoes, and high costs of maintaining control (eg fences), especially in areas near national parks and forest land
- persistent low wool prices
- labour requirements and cost
- occasional animal health problems (flystrike, worms in wetter seasons)
- generational change, combined with the glamour of beef production
- increased urban and corporate ownership of what were once family farms
- increased diversity of landholders, particularly town people with a focus on lifestyle and conservation rather than production
- loss of productive land to coal mining.

Hunter RLPB stock data for the district confirms that sheep numbers have been reducing since the 1980s. Figure 5 shows the trend in sheep and cattle numbers for Division A in the northeast of the Hunter RLPB district, the only one for which continuous data are available and one of two divisions where most of the grazing occurs. The high number of sheep in the late 1990s may be associated with wool prices, which peaked in 1989 then collapsed suddenly with the dismantling of the Wool Reserve Price Scheme and remained low during the early 1990s.



#### Figure 5. Approximate stock numbers 1987–2007 for Division A, Hunter RLPB

The Hunter RLPB data also indicate that the district's dairy herd has reduced since 1997. Based on interviews with agriculturalists and advisors, the fall in the number of dairy cows has been an outcome of dairy industry deregulation, along with conversion of river flat land to horse farming. This observation is reflected in the 50% increase in the number of horses in the Upper Hunter since the late 1990s. By 2007, the number of horses almost equalled the number of dairy cattle. About half of the horses are on properties in Division A in the northeast of the RLPB district, especially on the river flats, although much of the recent growth in horse numbers has occurred in the southeastern areas.

## **5.3.2 Perceived challenges for farming in Upper Hunter**

In order to put pest animal problems in context, the study informants were asked what they felt were the main challenges facing the agricultural sector in the Upper Hunter. The main challenges identified were:

- ongoing drought throughout the 2000s
- low prices and an attendant cost/price squeeze
- increasing regulatory costs and constraints
- noxious weeds and regrowth of cleared vegetation, which are believed to be expanding due to the lower numbers of sheep and reduced weed control efforts
- 'interference' in farming by urban-based interests, such as animal welfarists and environmentalists
- adapting to the changing nature of the rural population, with increases in smallholders and hobby farms, and with them, greater diversity of values and attitudes towards farming and community — and attendant conflicts
- maintaining community- and landowner-based pest control efforts, especially for wild dogs in the face of changing land use, land ownership, and farm income pressures.

Pest animal problems are therefore but one of a number of challenges facing landowners and managers in the Upper Hunter. The impacts of pest animals on local households and communities can therefore be expected to be variable and inseparable from other factors shaping local social circumstances and wellbeing. 6. Invasive animals of the Upper Hunter and their social impacts

# 6.1 The main problem animals

Key informants in each sector were asked to indicate what they thought were the main pest animals in the Upper Hunter, and to rank them in terms of their importance. The perception of animals as pests or threats, and their relative ranking, varied according to the particular interests of the informant (eg pastoral farmers compared with horticulturalists) and the geographical location. The various pest species fell into three groups:

- 1. The 'A list', consisting of the animals listed by most of our study informants and which the informants discussed the most. This list includes, in priority order, wild dogs, foxes, feral pigs and rabbits.
- 2. The 'B list', consisting of animals listed by several of our informants and subject to some discussion. This list includes feral goats, carp and deer.
- 3. The 'C list', being animals that were listed by only one or two informants, perhaps with particular sectoral interests, or which were limited to particular locations or activities. Animals on this list include feral cats, kangaroos, wallabies, wild horses, flying foxes, wombats, unspecified snakes, and various birds (mynahs, wedgetailed eagles, leatherbacks, cockatoos).

The distribution and incidence of each of the major invasive animals of the Upper Hunter region is described below, along with the social issues and impacts arising from the animal. All the A and B list animals are included; Table 2 summarises the key issues and social consequences (actual or potential) observed with these animals. Wild horses and feral cats from the C list are also discussed below.

Pest animal	Main issues or benefits	Main social outcomes
Wild dogs or dingoes	Prey on sheep and other farm animals. Induce fear and uncertainty among stock managers. Undermine sustainability of sheep farming. Responsibility for and cost of control are a source of social conflict.	Reduced farm income. Financial stress. Additional farm work and expenditure. Psychological distress. Loss of community cohesion. Land use change.
Foxes	Prey on sheep and poultry. Undermine sustainability of sheep farming. Prey on indigenous animals (biodiversity loss). Cause road accidents.	Reduced farm income. Financial stress. Psychological distress. Reduced quality of the living environment. Physical injury to motorists. Higher motoring costs.
Feral pigs	Physically damage pasture, crops and farm infrastructure. Possible vector for animal diseases. Game animal for recreational hunters that can be traded.	Additional farm work and expenditure. Reduced farm income. Improved local recreational amenity. Additional income for hunters.

Pest animal	Main issues or benefits	Main social outcomes
Rabbits	Consume pasture intended for farm grazing stock. Physically damage the land. Provide recreational hunting opportunity.	Reduced farm income. Additional work for land managers. Reduced quality of the living environment. Improved local recreational amenity.
Feral goats	Consume feed of farm grazing stock. Consume desired forest vegetation. Consume unwanted regrowth and weeds. When captured, generate income. Provide recreational hunting opportunity.	Reduced farm income. Reduced forest production. Reduced cost of weed control. Increased farm/landholder income. Improved local recreational amenity.
Carp	Displace native fish and desired recreational fishing species in lakes and rivers. Cause biodiversity loss.	Reduced local recreational amenity and enjoyment for anglers. Cultural loss.

# 6.2 Wild dogs

Informants in our study referred variously to 'wild dogs' and 'dingoes'. These terms appeared to be used interchangeably. Wild dogs are widely regarded as the Number One pest animal in the Upper Hunter. As a leading farmer noted, 'there is general community agreement that wild dogs are a problem — especially dingo crossbreeds'. In this respect, about 75% of the Hunter RLPB's pest control expenditure and most of one ranger's effort goes on wild dog control. Ostensibly, the main issue with wild dogs is that they predate on, harass and injure livestock, especially sheep, and therefore have a negative economic impact on livestock farmers and associated rural industries and services.

## 6.2.1 Distribution and incidence

According to West and Saunders (2007 p52), who conducted several surveys of New South Wales land and pest managers' perceptions of pest animal occurrence, dingoes and wild dogs occur in the pastoral zone of the 'northern tablelands', which includes the Upper Hunter. In the Upper Hunter, they occur in medium to high densities in most areas away from the alluvial flats and can be found particularly on the western side of the Barrington Tops and Mt Royal National Parks and forests, and on some of the mining lands between Singleton and Muswellbrook. This country is where most of the cattle and sheep grazing occurs. West and Saunders (2007) also noted that large increases in wild dog numbers were reported in the Hunter region between 2002 and 2004.

According to local environment and pest managers, wild dogs and dingoes tend to occur in and around the forest areas and national parks between the Great Dividing Range and the coast. Wild dogs reportedly occur in greater numbers in the 'least-used country, such as the Singleton Army Base, on the coal mines land and the national parks', and are less commonly encountered in the most intensively used areas where human presence is greatest. Farming informants confirmed this observation, noting that historically dogs came down into pastoral areas from the national parks, and that 'the worse affected farms were adjacent to national parks'.

Among our study informants, there was a perception that the wild dog problem is increasing in the Upper Hunter. Various reasons were given, including that:

- There has been an increase in the area set aside as national parks and reserves

   the primary refuges for dingoes and wild dogs and they are not being well controlled. However, this comment is contentious. For example, in 2007 the National Parks and Wildlife Service reportedly laid some 1100 poisoned dog baits in Upper Hunter national parks and reserves, killing an estimated 100 wild dogs and dingoes.
- Wild dog problems, along with animal health challenges and prices, have brought about a reduction in sheep farming (especially in the most vulnerable areas) in favour of beef cattle grazing.
- It appears that cattle farmers are less concerned than sheep farmers about wild dogs because dogs are not seen as a direct threat to their stock. Consequently, there are now fewer landholders actively involved in wild dog control.
- There are increasing proportions of escaped domestic and hunting dogs among and interbreeding with the wild dog population. These dogs are reportedly more likely to form packs and kill multiple animals, rather than pick off individual sheep for food (as dingoes generally appear to do). In addition, increased lifestyle farming had brought domestic dogs into the countryside, where they can then harass livestock.

In the 12 months to February 2008, 143 wild dog sightings, with 45 trapped or shot, were recorded in the northern part of the Hunter RLPB area.

#### 6.2.2 Issues and impacts

In the 12 months to February 2007, the Hunter RLPB recorded that wild dogs and dingos were responsible for the deaths of 342 sheep, two cows, two goats and a \$20,000 foal. Based on Hunter RLPB reports, we estimate that there may have been up to 840 sheep lost to wild dogs in 2007. These losses would have been quite concentrated since 99% of the sheep are located on properties in the two northern Hunter RLPB divisions. As noted in the stock loss reports, wild dogs do attack cows, and some of our survey informants noted they had seen evidence of dog attacks on calves. The following is an example of one landholder's experiences of stock loss: 'We put 1050 sheep out on one of our properties before Christmas, but only 600 were recovered through mustering, which had to be delayed until February due to the equine flu quarantine. Of these, some showed signs of dog attack.'

#### Financial impact

The main impact of stock losses is financial, and this loss can be significant when a farm is organised and structured for sheep. Using the estimated figure of 840 sheep (as above) lost in 2007, the overall direct financial loss in the district might be in the order of \$40,000 to \$80,000. The loss of farm income due to wild dogs flows through into the rest of the community and beyond in the form of reduced spending.

There are also likely to be social consequences of loss of farm income due to wild dogs, including a reduction in the material quality of life for the farming household, and constraints to farm and business development. Based on the reported land use change and reduction in stock numbers, wild dogs seem to have helped reduce the sustainability of sheep farming in parts of the Upper Hunter.

#### Physical threat to humans

The Hunter RLPB noted three dog attacks on people in the year ending December 2007 (although the nature of these is not clear). Several interviewees mentioned being anxious about going into remote parts of their properties when dogs are known to be in the vicinity.

#### Additional work

In the immediate aftermath of a dog attack, there is additional work in protecting the remaining stock and the distasteful task of disposing of injured and killed stock. This also has a psychological impact. One farmer estimated that it takes about a month to successfully trap a dog. An experienced pest manager estimated that typically one to two days work annually was required for dog control on a local farm.

#### Disruption to farm plans and options

Having wild dogs or dingoes in the district can limit farmers' options and can make it difficult to optimise farm management and production.

#### Psychological impacts

There can be significant emotional upset and frustration associated with a wild dog or dingo attack on farm stock. Farmers spoke of 'the emotional upset of seeing animals hurt', 'gut wrenching' attacks and 'strong feelings of revenge and contest'. The 'contest' referred to is between the farmer determined to protect their stock by eliminating or controlling wild dogs, and the instincts of the dog. This sense of contest, along with the strong sense of responsibility for the welfare of the stock, seems to be sufficiently intense among sheep farmers that many are prepared to invest more time and money in wild dog control than the pure financial losses might seem to warrant. The effort invested suggests that the psychological impact on farmers of wild dog attacks is quite profound.

There is also a sense of psychological insecurity and uncertainty that farmers live with on a daily basis when wild dogs are present in the environment: 'One is always anticipating the possibility of wild dog attack. Whenever one goes into a sheep paddock one thinks "am I going to find a dead sheep here?".'

Farmers also experience a degree of anxiety and uncertainty over their rights with respect to reducing the risks from wild dogs and other pest animals. These feelings arise from a perception of being increasingly constrained by the urban animal welfare lobby, the National Parks and Wildlife Service and the increasing number of non-farming and hobby or lifestyle farmers who are thought not to appreciate the realities of 'real' farmers. This uncertainty over rights is closely related to changing interests in and uses of rural land.

#### Consequential changes in farming and land use

In the Upper Hunter, the reduction in sheep numbers (partly due to wild dogs) has reportedly meant a reduction in the number of people working on the land and an associated loss of pest control capability and capacity. The reduction in sheep numbers on local farms has reportedly led to an increase in weed and scrub regrowth, which in turn is requiring increased control work.

#### Community conflict and disharmony

Community conflict is a consequence of wild dogs and efforts to control them. The conflicts seem to be around:

- the reported non-involvement of non-sheep-owning landholders and farmers in community-based wild dog control efforts — some interpret the lack of community focus in pest control as indicating a breakdown of the sense of community and traditional interdependence in rural areas
- the effect on neighbours of a perceived lack of dog control by some large landholders and managers such as National Parks and Wildlife Service, state forests, coal-mining companies and the army (even though many of them do dog control work)
- the management of domestic non-working dogs, including during wild dog 1080 baiting programs
- conflicts of values regarding wild dogs and other farmed and feral animals, and the right of farmers and local authorities to control them.

Sustained or unresolved conflict between rural residents and landholders may result in feuds, poor relations within a community, and a reduction in community cohesion and sense of belonging (social capital). Such changes can ultimately reduce family and personal wellbeing.

# 6.3 Foxes

#### 6.3.1 Distribution and incidence

According to West and Saunders (2007), foxes are present throughout the Hunter Region including the Upper Hunter study area. The Upper Hunter was rated as having relatively high levels of fox occurrence, including areas close to the main towns. A professional pest manager who works throughout the district made the following appraisal:

Foxes are in greater density than wild dogs. They are twice as likely to be picked up in a trapping program than dogs. But they do not bother the farmers so much ... Their density varies by area and lambing season. They have less economic impact than dogs, but are more widespread (and almost naturalised).

#### 6.3.2 Issues and impacts

Foxes rated as one of the main animal pests in the Upper Hunter. Among farmers and other producers they are regarded as an important pest because they:

- predate on lambs, poultry and possibly other stock (such as newborn and weaker calves)
- predate on native fauna such as small marsupials, birds and invertebrates
- eat wild berries and fruit and thus contribute to the spread of weeds, especially blackberry
- chew on and damage irrigation lines in vineyards in search of water, and consume the grapes.

The main effects of foxes in the Upper Hunter are economic, psychological and environmental.

#### Stock loss

A number of study informants commented on the extent of foxes preying on lambs:

Without fox control the stock loss would be 30% of lambs, but since there are not a lot of breeding ewes around here now, it isn't so much of a local issue. When we are lambing we put the ewes and lambs in sheds to protect them from foxes and hawks.

We estimate that, if foxes were not controlled, the potential annual lamb losses would be in the order of 3300 to 5500, equating to a loss of between \$150,000 and \$275,000 to local farmers. However, since fox control using 1080 bait occurs regularly, the actual lamb losses are likely to be considerably less. In addition to the financial loss, the loss of lambs can cause health problems for milking ewes that lose their lambs, and more generally can disrupt the overall farming system and plan.

Several informants noted that predation by foxes on poultry impacted on farming households and especially poultry farmers and rural life stylers, many of whom keep chickens, ducks and geese.

Due to the major reduction in sheep numbers that has occurred over the past 10–15 years in the Upper Hunter, there is some suggestion that foxes may be switching prey. Incidents noted by informants included foxes chewing on the tongues of calves, and attacks on newborn calves, weaker heifers and cows.

#### Vineyard damage

Several informants noted that foxes eat grapes and are known to interfere with vineyard irrigation systems in search of water during dry periods. However, no data were available.

#### Biodiversity loss

Several private landholders and public land mangers referred to the negative impact of fox on native biodiversity. However, no data were available.

#### Hunting

Fox control using 1080 poisoned baits represents a direct cost to the landholder and ratepayer. However, as one farmer reported, 'the cost of fox baiting is relatively low: one paddock costs about \$100 for bait and labour, and it pays for itself if it saves two lambs'. Some landholders use recreational hunting as a form of fox control. This hunting is typically done by younger local people, including members of farming families, who go 'spotlighting' for fox, rabbits and hares.

#### Road accidents

Data provided by the insurance firm IAG indicates that it gets 3–4 claims per year in the Hunter region for motor vehicle damage caused by collisions with foxes, at an approximate cost of \$4700 each. This does not take into account the psychological upset and inconvenience to the driver and vehicle owner. No other data were available.

# 6.4 Feral pigs

## 6.4.1 Distribution and incidence

Feral pigs reportedly occur in varying densities throughout the Upper Hunter and Muswellbrook Shires, except on the Hunter River flats. Within this broad area, West and Saunders (2007) have recorded that pigs occur in high and medium densities in parts of the region's national parks. In Singleton Shire, feral pigs occur in medium density on the Singleton Army Base and adjacent coal-mining areas, and in lower densities to the north of Singleton around the Ravensworth State Forest. According to several of our study informants, in the Upper Hunter feral pigs are generally isolated in the very top ends of side valleys, which tend to be lower-grade farming areas, and that very few pigs occur on the valley floor. Nevertheless, we received one report of a Hunter RLPB ranger in 2007 having to shoot a feral pig that was venturing close to a new subdivision in Muswellbrook.

According to Hunter RLPB records, in the late 1990s and early 2000s the Upper Hunter area had a substantial farmed pig herd of over 10,000 animals and in 2002 it reached 21,000 pigs. However, by 2007 there were only about 350 pigs on local properties. It is quite possible, therefore, that some farmed pigs may have escaped or been released into forests in the years following 2003.

West and Saunders (2007) noted that the Upper Hunter is perceived as having had a moderate increase in feral pig numbers in recent years. In our study, several multigenerational family farmers from different parts of the Hunter RLPB district felt that feral pigs are relatively 'recent' arrivals on their land: 'Pigs weren't here 30 years ago. We think they were deliberately transferred by hunters. We have pigs all through this country now.' Specific instances of feral pig incursions included a 4500 acre farm adjacent to a national park on which an estimated 200 pigs are killed by hunters each year, and another on a large sheep property where some 30 feral pigs were shot in 2006.

## 6.4.2 Issues and impacts

In the Upper Hunter, feral pigs are generally regarded as the second most problematic pest animal because they:

- are believed to carry, or have the potential to carry, exotic diseases that present a threat to cattle, other animals and possibly humans
- physically damage pasture, crops, and farm and forest tracks and roads such physical damage causes weed regrowth, loss in farm and forest production, land degradation, additional work and expenditure for the farmer, and physical danger to track users.

Other pig problems reported by landowners and managers include:

- fouling of waterways, thus reducing water quality for stock and downstream users
- attacks on and deaths of working dogs
- predation of new lambs
- mingling with and unsettling or panicking sheep flocks
- destruction of farm fences.

These impacts are consistent with those reported by West and Saunders (2007). No local data were available on recorded incidences of these problems or their consequences.

In the Upper Hunter, feral pigs are also a recreational hunting and commercial resource. In many instances, farmers use recreational hunters to help control feral pigs. Such hunting is reportedly done on private and public land by young and adventurous local men who use dogs to corner the pigs, before dispatching them using knives (pig sticking) and firearms. In some cases, hunters sell the pig carcasses to 'wild boar' meat exporters, thus generating income for themselves and the nation. In the Upper Hunter, this trade has been facilitated by the establishment of a chiller (cool store) at Murrurundi, where key-holding hunters can deposit their kills for collection by a buyer who pays approximately \$1 per kilogram (or \$60–\$80 per carcass). However, our informants also noted several down sides to pig hunting; namely that the loss of pig dogs into the forest seems to be contributing to the wild dog problem, and that some hunters have reportedly released pigs into the wild to ensure they have a good supply of game.

# 6.5 Feral rabbits

## 6.5.1 Distribution and incidence

According to West and Saunders (2007), rabbits occur in low to medium density in the Upper Hunter district. Local pest management specialists commented that rabbits mainly occur on the alluvial flats and the foothills, but generally as isolated populations associated with particular warren systems. They are reported to be more common (and increasing) on the 'red soil' country used for pastoral farming — generally to the east and north of the New England Highway — and not so common on the 'black soil' basalt country where cropping occurs. They also occur on the mining company lands, where they have access to freshly repastured land.

Most of our study informants considered rabbits to be one of the main pest animals of the Upper Hunter, although they commonly believed that rabbits were under control and were not a significant problem at present. Various informants expressed concern about a possible reemergence of a rabbit problem, and thought that Rabbit Calicivirus Disease, released in the 1990s, may have 'lost its punch'.

## 6.5.2 Issues and impacts

The main impacts of rabbits in the northern tablelands of New South Wales (into which the Upper Hunter District falls) are reported to be soil erosion and land degradation, competition for pasture, suppression of native vegetation regeneration and competition with native wildlife for food (West and Saunders 2007).

However, informants in our study spoke little about these impacts, instead describing the problems rabbits cause for the establishment of pasture on rehabilitated mining land, problems caused by rabbits (and hares) grazing on younger grape vines, and the fact that those purchasing land on the river flats for horse breeding were careful to avoid land with rabbit holes and signs of rabbits due to the potential for injury to horses.

Rabbits therefore mostly impact on agricultural production and incomes, with the cumulative effects of many rabbits causing significantly increased land management costs.

Some benefits from rabbits were noted during the study, particularly recreational opportunities for local hunt clubs and recreational shooters and some (unquantified) income from the sale of rabbit skins.

# 6.6 Feral goats

## 6.6.1 Distribution and incidence

West and Saunders (2007) indicated that feral goats are absent in most of the Upper Hunter study area, although they occur in low to medium density in the northeast and northwest of the district, in and around some of the reserves and state forests. Our study informants confirmed this observation, adding that they considered feral goats to be a medium-level pest.

#### 6.6.2 Issues and impacts

Feral goats were considered a pest animal because:

- they eat pasture intended for productive farm animals in some areas, and therefore have a negative impact on farm production and farm incomes — however, feral goats eat mostly roughage, so direct competition between goats and sheep only really occurs in rougher marginal areas where pasture is limited or on the very best pasture where roughage is limited
- as an unmanaged animal sharing the same space as farm animals, they present a potential animal health threat
- in production forests, they consume regrowth of desired tree species, causing a reduction in timber production
- in protected areas (national parks), they consume rare native plants, thus reducing indigenous biodiversity.

At the same time, feral goats are also regarded as an asset and a resource by some farmers and to a lesser extent by forest managers. The benefits noted were that feral goats:

- act as a weed biocontrol in the forests and on the rougher pastoral areas
- can be captured or fenced in because they tend to be territorial, then sold as live animals at between \$30 and \$50 per head, thus generating farm income
- are a target species for recreational hunters however, hunting of goats has been reducing due to their increasing value as live animals.

In the Upper Hunter, therefore, feral goats are both a pest animal and an asset, depending on the particular land management situation in which they occur. However, no quantitative data on the costs and benefits were obtained.

## 6.7 European carp

The main recreational fisheries of the Upper Hunter are Lake Glenbawn, Lake St Clair and the Hunter River. Lake Glenbawn, a 2500 hectare artificial lake on the Hunter River, is well developed for recreation, especially angling. It can reportedly attract up to 4000 fishers on longer holiday weekends. These fishers come from all over New South Wales and southern Queensland. On an average weekend, it is reported that there are about 50 boats with anglers on the lake, and on weekdays up to ten boats. Of the 20,000 or so fishing licences issued each year in the district, 80% are reportedly for lake fishers who are most interested in catching native fish from boats.

Both Glenbawn and St Clair are sites for major fishing tournaments that can attract several hundred anglers. Recreational fishing makes an important, though unquantified, contribution to the local economy.

## 6.7.1 Distribution and incidence

West and Saunders (2007) suggested that carp occur in medium densities in the Hunter River. In our fieldwork, local environmental and catchment management specialists reported that carp have been found in most of the river tributaries, streams and water holes in the Upper Hunter. Experienced fishers also report that 'carp' are common in the major local recreational fisheries. Lake Liddell was reported to contain mainly carp.

However, the extent to which European carp are present in Lake Glenbawn and Lake St Clair is unclear. This is because informants for our study, including very experienced anglers, referred to various kinds of carp. It was difficult, therefore, to identify clearly the extent to which local fishers encountered European carp in the waterways of the Upper Hunter, especially Lake Glenbawn.

## 6.7.2 Issues and impacts

Carp are thought to cause a number of impacts in New South Wales, including reduced water quality, altered fish species composition, bank erosion, turbidity and reduced aquatic plant growth' (West and Saunders 2007 p63). Among our study informants, carp were generally rated as a medium-level pest in the Upper Hunter. They are considered a nuisance by fishers and an environmental threat by resource managers.

In the Upper Hunter, carp are considered a pest because they:

- are an abundant but undesirable species for anglers, reportedly being 'smelly', 'not good eating' and 'a nuisance', although can be 'good sport to catch' — in this respect, anglers estimated that 10–20% of fish caught in Lake Glenbawn are carp
- prey on native and other more desirable fish, including bass and yellow belly fingerlings that are periodically released by the fishing clubs into Lake Glenbawn to enhance sports fishing
- are believed, due to their feeding and burrowing behaviour, to have a negative impact on waterways, causing bank instability and sediment disturbance (and thus poor water quality), which in turn, has a negative impact on other fish.

# 6.8 Wild deer

## 6.8.1 Distribution and incidence

West and Saunders (2007 p 40) reported that wild deer are an emerging pest animal in New South Wales, possibly due to illegal deliberate relocation and release for hunting. According to their incidence map, deer occur mostly on the western side of Mt Royal Range as far up as Murrurundi in the northern part of the Hunter RLPB district and to some extent in the western parts of the Barrington Tops. Deer are also reportedly encountered in the upper parts of the Upper Hunter's side valleys close to the forests.

## 6.8.2 Issues and impacts

Our study informants generally rated deer as a moderate to minor pest in the Upper Hunter, although they made little specific mention of issues or impacts. Deer are typically not seen as a problem for landowners. In the north of the district, deer can be a danger to road users, and there are signs on the New England Highway warning motorists of deer. IAG records indicate that between 2004 and 2006 they dealt with nine insurance claims for collisions involving deer in the Hunter Region. The number of injuries to people is not known.

Some informants noted that deer are emerging as a species for hunting and 'some' deer hunting using bows and rifles takes place on private as well as public land in the Upper Hunter. Game Council data indicates that three deer were taken by licensed local hunters in the area in 2007.

# 6.9 Wild horses

## 6.9.1 Distribution and incidence

At the time of our first fieldwork visit to the Upper Hunter the New South Wales equine influenza outbreak was occupying the attention of local agricultural agencies, with movement control in place and a program of horse vaccination underway. Hence, there was some interest in the distribution and numbers of wild horses in the district. Officials estimated the wild horse population west of the Barrington Tops at between 100 and 200 animals. Up to 120 of these horses reportedly live on the Singleton Army Base.

## 6.9.2 Issues and impacts

Wild horses are reported to be damaging areas of native vegetation on the Singleton base and in the higher and wetter areas of the national parks. However, other than their potential for harbouring equine influenza and therefore presenting a risk to the valuable horse breeding industry of the Upper Hunter, wild horses are not seen as presenting problems for farmers and other land users. Hence, they are generally rated as a minor pest. IAG reported that between 2004 and 2006 there were 36 motor insurance claims for road accidents involving horses in the Hunter region. It is not known how many of these (if any) involved wild horses, and if any resulted in human injury.

## 6.10 Feral cats

## 6.10.1 Distribution and incidence

Feral cats were rated as a minor pest animal among our study informants. West and Saunders (2007) reported that in 2004 feral cats were only really present in areas surrounding the towns of the Upper Hunter (Singleton, Broke, Denman, Muswellbrook and Scone). In this respect, the Upper Hunter Shire Council's records indicate it impounded 36 cats, mostly strays, in the district in 2006.

#### 6.10.2 Issues and impacts

The only negative impact of feral cats noted by our informants was a loss of native birdlife and small native animals due to preying. The major social effect is therefore a reduction in the quality and enjoyment of the natural environment, and cultural loss.

# 7. Conclusions and recommendations

The case study of the Upper Hunter Valley in New South Wales set out to identify, understand and possibly quantify the social impacts of invasive animals in an area with a typical range of land uses. This concluding section summarises the findings on the social impacts, evaluates the utility of the case study for a national-level assessment and suggests an alternative approach.

# 7.1 Reflections on the case study

## 7.1.1 Main conclusions

The Upper Hunter case study has provided a detailed picture of the nature and extent of the social impacts of invasive animals in one particular context. It tells us how the various social impacts flow out of economic and environmental impacts, how they interact and how they are actually felt. It also provides the detailed knowledge of social impacts that is necessary to allow us to design a meaningful national quantitative survey. Aspects of this national survey design are detailed further below.

For the most part, we found that the effects of pest animals in the Upper Hunter are economic and environmental, and are seen as such by the key stakeholders and agencies. Indeed, most study informants and agency representatives were not able to identify any direct social impacts. Most of the social impacts of pest animals in the Upper Hunter therefore seem to flow out of the economic changes and impacts (such as when farm household incomes are reduced) or the environmental impacts (such as when carp invade a valued fishery).

Nevertheless, some informants recognised that direct social impacts do occur. Examples are the psychological distress to farmers caused by wild dog attacks on their stock, and the distress and injuries to motorists when they collide with feral animals. Intracommunity conflicts are also recognised as an outcome of (i) attempting to implement pest control programs in the context of changing land use patterns and (ii) the migration into rural communities of people with different sets of values, including towards feral and farmed animals.

Our study showed that pest animal problems are but one of a number of interlocking social, economic and environmental challenges facing people in rural Australia today. It enabled us to assess the feasibility of conducting a detailed social impact assessment using official information and qualitative research methods.

## 7.1.2 Limitations of the case study

The data we obtained allowed us to describe, but not fully quantify, the social impacts of invasive animals in the Upper Hunter area. However, the case study cannot be used to extrapolate social impacts to other contexts and communities because:

- the area studied is not fully representative of the nation in terms of the incidence and cost of pest animals — in practice, only wild dogs, foxes and feral pigs currently seem to be causing concern
- quantitative data on the incidence and amount of negative and positive economic, environmental or social impacts was largely inaccessible, inappropriate or unavailable

- key baseline data about the local environment, resource and land uses, communities and their wellbeing was also lacking, inappropriate or inaccessible
- the types and intensity of effects were found to be highly variable consistent with Yin's (1994) arguments about the utility of case studies.

The Upper Hunter case study may illustrate the impacts of particular pest animals in other parts of the New South Wales tablelands or in similar environments, but could not in itself serve as the basis for a national extrapolation. It is likely that no regional case study would contribute on its own a sufficiently representative set of invasive animal incidence and impacts to be able to be extrapolated nationally.

## 7.2 Towards a national estimation of social impacts

As discussed above, individual case studies are unlikely to provide sufficient appropriate data to extrapolate social impacts to a national level. Even if a representative case study area or several areas could be identified and sufficient data for them could be obtained from which to extrapolate, there would still be a need for suitable baseline data for the rest of the country from which to extrapolate. The Rural Lands Protection Boards in New South Wales have a centralised structure, reporting to their state council, but other states do not have a similar structure for aggregating data and information. Even so, the kind of data that such regional boards can provide represents only some of the data needed for meaningful extrapolation.

Also, although national data on abundance and density of invasive animals is available, it would be inappropriate to use such data alone to assess or imply social impacts on a national scale. Surveys of the presence or extent of invasive animals provide almost no information as to the nature or extent of social impacts arising from invasive animals in the area. Social impacts are not a property of the invasive animals; they are a property of the interaction between invasive animals and people (and things that people hold dear, such as pets and farmed livestock and interesting ecosystems). Even the existence of the animals themselves may not be necessary for a social impact to arise: fear alone may be enough to cause an impact, for example, on a person's work pattern or their health. The information that is most needed is the extent to which the diversity of people in Australian society perceive and experience the social impacts of invasive animals.

We therefore recommend a different approach to the estimation of the social impacts of invasive animals nationally. A comprehensive assessment would require the systematic collection of primary data from across the entire Australian community. It would involve a well-resourced sociological survey of the national rural and urban publics.

Such a survey would require a minimum of 1000 respondents, as a sample of this size would provide an acceptable standard error (of three percentage points or less) for estimates of a proportion (ie if we found that 50% of the population had experienced a particular impact, statistically we would have 95% confidence that the true value lay between 47% and 53%). For the survey results to accurately represent the views of the Australian population, the sample must be recruited randomly, which would require administration by telephone or post. However, because the social impacts of invasive animals are felt disproportionately by agricultural and outdoor recreational interests, which are not uniformly distributed in the population, people with these interests would need to be over-sampled to gain sufficient numbers of respondents in these categories. Analysis would require weighting of the sample.

Because of the complexities of national data collection, the need for weighted sampling and the unavailability of population lists in this age of privacy laws, data collection would require the services of a national market research firm. As a rough estimate, the total cost of such a survey would be around \$100,000. The scale of survey we have suggested represents a minimum: if any comparisons between groups of respondents are required the sample size and cost would need to be increased.

A survey such as we have recommended would provide the best way to quantify the social impact of invasive animals in Australia.

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