

New South Wales

Commercial Kangaroo Harvest Management Plan 2007 - 2011



Effective for the period : 1 January 2007 - 31 December 2011

Department of **Environment and Conservation** NSW



NEW SOUTH WALES

COMMERCIAL KANGAROO HARVEST

MANAGEMENT PLAN

2007 - 2011

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DEFINITIONS

Carcase - the entire body (including the skin) of the *kangaroo*, excluding the head and viscera.

Code of Practice for the Humane Shooting of Kangaroos - the current nationally-endorsed Code, endorsed by the Council of Nature Conservation Ministers, last revised in 1990. A reference to this Code will also apply to any future nationally-endorsed subsequent codes.

Ecologically sustainable development - this plan employs the definition contained in the *Environment Protection and Biodiversity Conservation Act 1999*. In general this definition includes the precautionary principle, inter-generational equity, conservation of biological diversity and ecological integrity, and improved valuation of environmental factors.

Landholder - owner or occupier of specified lands.

Kangaroo - the *kangaroo* species that can be utilised in accordance with this management plan: the red kangaroo (*Macropus rufus*), western grey kangaroo (*M. fuliginosus*), eastern grey kangaroo (*M. giganteus*) and wallaroo (*M. robustus erubescens* and *M. robustus robustus*).

Note: All other italicised terms have the meaning prescribed in the New South Wales *National Parks and Wildlife Act 1974*.



New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011

1. INTRODUCTION

This management plan has been developed to satisfy the requirements of the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* and to meet the legislative and other requirements of the New South Wales Government.

This management plan relates only to the commercial harvest of the following *kangaroo* species within New South Wales:

- red kangaroo (*Macropus rufus*);
- eastern grey kangaroo (*Macropus giganteus*);
- western grey kangaroo (*Macropus fuliginosus*); and
- wallaroo (*Macropus robustus*, including both *M. r. erubescens* and *M. r. robustus*).

Where the term *kangaroo* is used within this document it refers to all of the aforementioned macropod species and subspecies.

This management plan is current for a maximum five-year period from 01 January 2007 to 31 December 2011.

In Australia the export of *kangaroo* products requires Commonwealth Government approval under the *Environment Protection and Biodiversity Conservation Act 1999*.

Under the New South Wales *National Parks and Wildlife Act 1974* (the NPW Act), *kangaroos* are 'protected fauna' and the New South Wales Department of Environment and Conservation (DEC) is responsible for the 'protection and care of fauna'. The utilisation of *kangaroos* in New South Wales is regulated under the NPW Act and New South Wales *National Parks and Wildlife Regulation 2002* (the Regulation) through the issue of various licences and tags.

This management plan does not provide the framework for the management of *kangaroos* within land dedicated or declared under Part 4 or Part 4A of the NPW Act and managed by DEC e.g. national parks and nature reserves. *Kangaroos* cannot be commercially taken in such conservation reserves, a total area in excess of 6.5 million hectares or approximately seven percent of the state.

This plan relates only to the commercial harvest of *kangaroos* within New South Wales. The non-commercial culling of *kangaroos* in New South Wales is not regulated by this plan. DEC regulates the non-commercial culling of *kangaroos* through the provisions of the NPW Act.

The primary goal of the management plan is to ensure that the commercial harvest of *kangaroos* is ecologically sustainable. This will be achieved through the application of the best available scientific knowledge, best practice management and monitoring of outcomes to ensure the viability of *kangaroo* populations is not compromised by any action undertaken in accordance with this plan.



This management plan incorporates an adaptive approach to management. Adaptive management is the systematic acquisition and application of reliable information to improve management over time. The adaptive management provisions of this plan facilitate the investigation of different strategies using scientifically rigorous experimentation to not only support appropriate adjustments to management practices, but to improve knowledge and inform future program reviews.

This plan will set the framework for the commercial harvest of *kangaroos* to provide for the management of *kangaroo* populations in accordance with the principles of ecologically sustainable development. Management in this context provides for the sustainable harvesting of *kangaroos* for products such as meat and leather to supply the Australian and international markets. Management also assists in balancing environmental, social and economic interests through the collaborative management of a sustainable resource.

This plan prohibits the taking of *kangaroos* for skins only.



2. LEGISLATIVE FRAMEWORK

2.1. Commonwealth

The relevant provisions under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) came into force on 11 January 2002, following the incorporation of the former *Wildlife Protection (Regulation of Exports and Imports) Act 1982*. The EPBC Act provides legislative provisions requiring the development and approval of wildlife trade management plans in order for permits to be issued for the commercial export of wildlife products.

The EPBC Act states that the Commonwealth Minister for the Environment and Heritage may approve a wildlife trade management plan for a maximum of five years. The EPBC Act specifies that such approval must only be given if the Minister is satisfied that:

- (a) the plan is consistent with the objects of Part 13A of the EPBC Act;
- (b) an assessment of the environmental impacts of the activities of the plan has been undertaken;
- (c) the plan includes management controls directed towards ensuring that the impacts of the activities covered by the plan are ecologically sustainable;
- (d) the activities in the plan are not detrimental to the species to which the plan relates or any relevant ecosystem; and
- (e) the plan includes measures to mitigate, monitor and respond to the environmental impacts of the activity covered by the plan.

In deciding whether to declare a plan, the Minister must also have regard to whether:

- (a) legislation relating to the protection, conservation or management of the specimens to which the plan relates is in force in the State or Territory concerned; and
- (b) the legislation applies throughout the State or Territory concerned; and
- (c) in the opinion of the Minister, the legislation is effective.

Finally, in resolving whether to declare a plan the Minister must also be satisfied that if an animal is killed, it is done in a way that is generally accepted to minimise pain and suffering. Animal welfare standards for the commercial harvesting of *kangaroos* are detailed in the *Code of Practice for the Humane Shooting of Kangaroos* (Appendix A). All *kangaroos* must be taken in accordance with this Code or any subsequent relevant nationally-endorsed Codes that replace that document.



2.2. New South Wales

All *kangaroo* species and subspecies are 'protected fauna' in New South Wales under the *National Parks and Wildlife Act 1974*. However, the *National Parks and Wildlife Act 1974* and the *National Parks and Wildlife Regulation 2002* make provisions for the licensing of a range of activities relating to the commercial harvesting of *kangaroos* in New South Wales.

Kangaroos can only be taken in accordance with this management plan under a licence issued by DEC. Moreover, under this management plan the commercial harvesting of *kangaroos* in New South Wales is presently restricted to the commercial Kangaroo Management Zones illustrated in Figure 1. However, within the life of this plan new commercial *kangaroo* harvesting zones may be opened, on the basis of population surveys, in areas of New South Wales where commercial harvesting of *kangaroos* is not currently occurring.

The licensing process as it relates to *kangaroo* harvesting is summarised in a flow chart (Figure 2) and described in more detail below. The licensing process commences with a *landholder* applying for an *occupier's licence* and nominating a licensed *trapper* to undertake the shooting. For the commercial harvest of *kangaroos*, both a *trapper's licence* and an *occupier's licence* are required. Other activities associated with the commercial utilisation of *kangaroos* require licences specific to those activities (such as *fauna dealer's* and *skin dealer's licences*).



Figure 1: Current New South Wales Kangaroo Management Zones

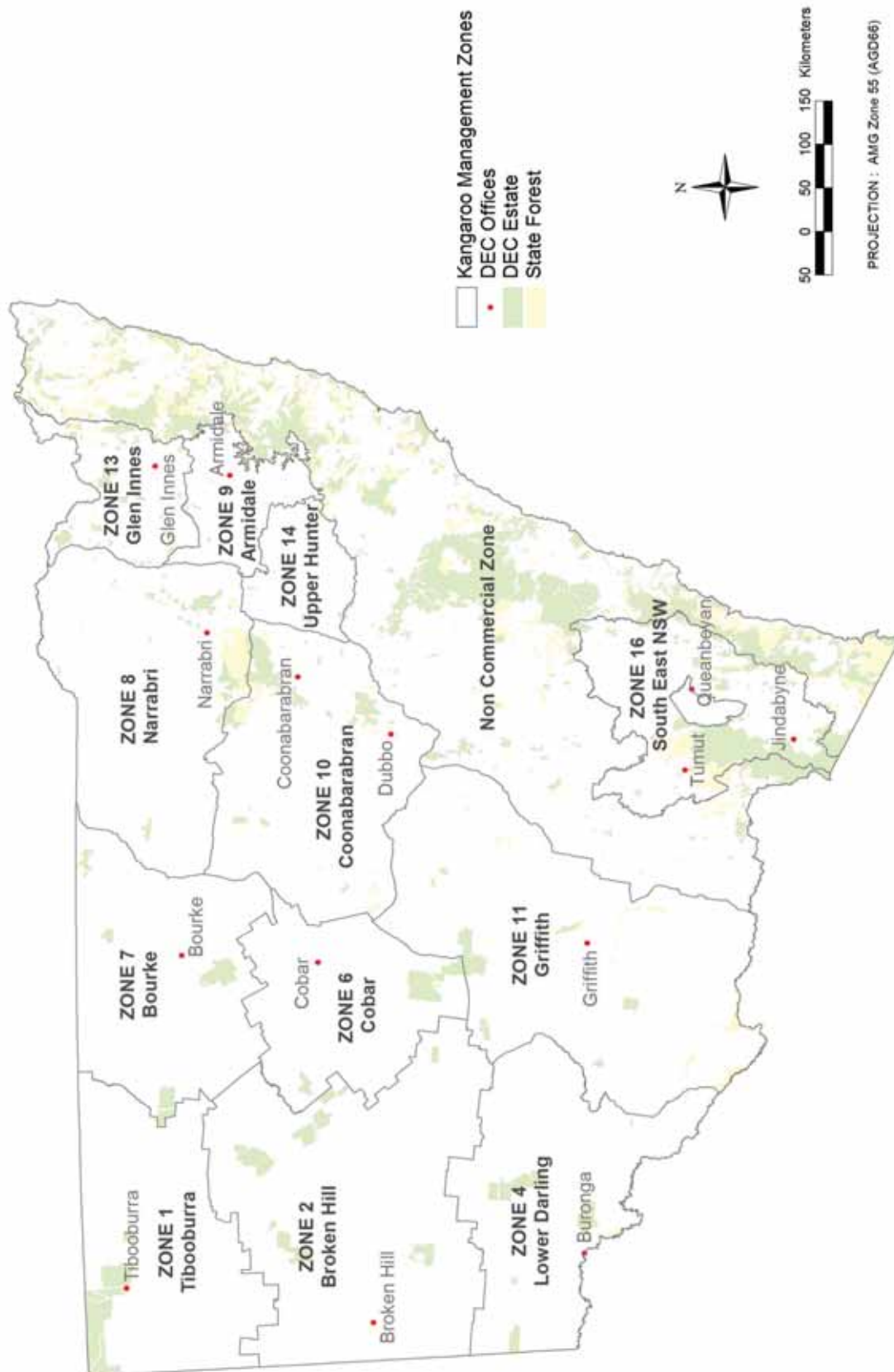
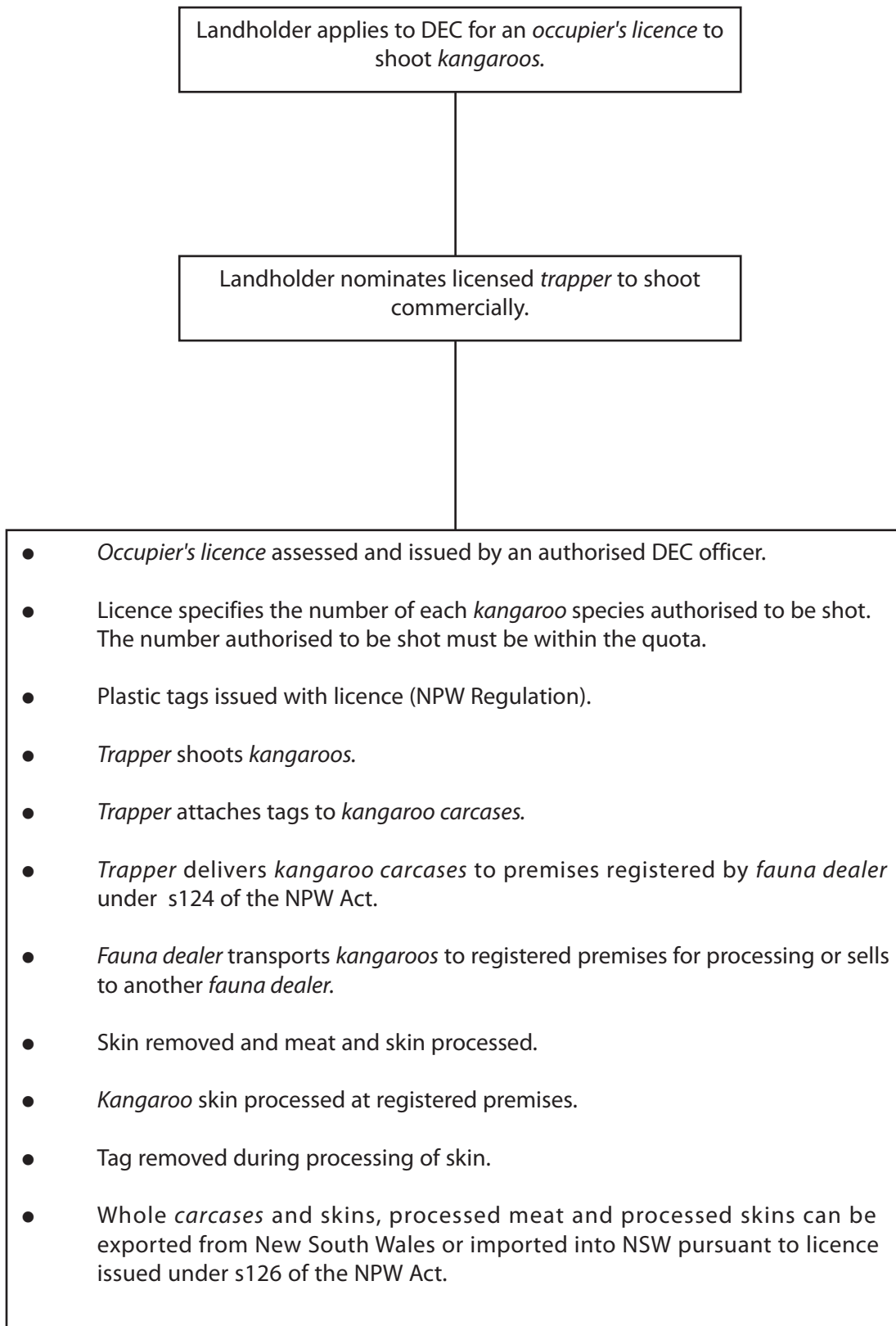


Figure 2: New South Wales Commercial Kangaroo Licensing Flow Chart



Occupier's Licence

Issued under section 121 of the *National Parks and Wildlife Act 1974*.

As it relates to commercial *kangaroo* harvesting an occupier's licence entitles the holder to:

- kill, or to permit a person holding a *trapper's licence* issued under section 123, to kill, a specified number of *kangaroos* on the *occupier's* lands.

The licence also authorises the sale of *kangaroos* taken under the authority of the licence only to licensed *fauna dealers*.

For commercial *kangaroo* harvesting an *occupier's licence* is subject to a condition requiring tags to be affixed or attached to the *carcase* of all *kangaroos* taken under the authority of the licence. The licence must not be issued unless the licensee has been supplied by DEC with sufficient tags to enable the licensee to comply with the relevant condition. For further details on the issue of tags refer to section below.

Before approving an application for an *occupier's licence*, an authorised DEC officer will consider relevant information, including confirming that:

- the application has the landholder's original handwritten signature;
- the number of each kangaroo species the applicant seeks to take is within the commercial quota for that species in that Kangaroo Management Zone;
- the person the *occupier* has nominated to shoot the *kangaroos* is licensed under s123 - that is, holds a *trapper's licence*.

Occupier's licences are subject to conditions that include, but are not limited to:

- Tags must only be used on the property for which they were issued.
- Tags must only be used by the *trapper* nominated on the licence.
- The *occupier* must ensure that the *trapper* does not harm more than the number of each species stated on the licence.



Trapper's Licence

Issued under section 123 of the *National Parks and Wildlife Act 1974*

As it relates to commercial *kangaroo* harvesting a *trapper's licence* authorises the holder to:

- kill *kangaroos* for the purposes of sale.

A *trapper's licence* does not authorise the taking of *kangaroos* in lands dedicated or declared under Part 4 or Part 4A of the *NPW Act* and managed by DEC e.g. national parks and nature reserves.

Before approving an application for a *trapper's licence*, an authorised DEC officer will consider relevant information, including confirming that:

- the applicant holds a current Firearms Licence that allows the person to possess and use the appropriate firearm.
- the applicant has successfully completed the firearms accreditation for *trappers* through the New South Wales Firearms Safety and Training Council Ltd, and that accreditation is current.
- the application has the applicant's original handwritten signature.

If the applicant has not previously done so they must successfully complete New South Wales TAFE course 5725 - Australian Game Meat Hygiene and Handling within three months of being licensed.

Trapper's licences are subject to conditions that include, but are not limited to:

- All *kangaroos* must be shot in accordance with the current *Code of Practice for the Humane Shooting of Kangaroos* (Appendix A) .
- The *trapper* must not possess or offer for sale any *kangaroo carcass* containing a bullet wound in the body.
- The *trapper* must immediately attach a plastic tag issued for use on that property to each *kangaroo* taken.
- *Kangaroos* may only be sold to the registered premises of a *fauna dealer* licensed under s124 of the *National Parks and Wildlife Act 1974*.
- The *trapper* must provide to DEC monthly return(s) for each *occupier's licence* where the licensee was the nominated *trapper*.
- The *trapper* must only sell whole *carcasses* with the skins attached.



Fauna Dealer's Licence

Issued under section 124 of the *National Parks and Wildlife Act 1974*

As it relates to commercial *kangaroo* harvesting a *fauna dealer's licence* authorises the holder to:

- buy or sell *kangaroos* as a *fauna dealer* at or on any premises that are registered under this section.

Before approving an application for a *fauna dealer's licence*, an authorised DEC officer will consider relevant information, including confirming that:

- the application has been signed by a person with appropriate authority, where the applicant is a company;
- the application falls within current DEC policy for the issuing of licences under this section; and
- registration certificates are to be issued for each of the premises at which the applicant proposes to carry on business as a *fauna dealer* in New South Wales as required under s124(2).

Fauna dealer's licences are subject to conditions that include, but are not limited to:

- The *fauna dealer* must only purchase *kangaroos* from the holder of a current *trapper's licence* or *fauna dealer's licence*.
- The *fauna dealer* must not purchase, possess, process or sell a *kangaroo carcass* that contains a bullet wound in the body.
- The *fauna dealer* must only treat or store *kangaroo* skins or *carcasses* at a registered premise.
- The *fauna dealer* must supply monthly returns to DEC in the form provided by DEC.



Skin Dealer's Licence

Issued under section 125 of the *National Parks and Wildlife Act 1974*

As it relates to commercial *kangaroo* harvesting a *skin dealer's licence* authorises the holder to:

- buy or sell *kangaroo* skins as a *skin dealer* at or on any premises that are registered under this section.

Before approving an application for a *skin dealer's licence*, an authorised DEC officer will consider relevant information, including confirming that:

- the application has been signed by a person with appropriate authority, where the applicant is a company; and
- registration certificates are to be issued for each of the premises at which the applicant proposes to carry on business as a *skin dealer* in New South Wales, as required under s125.

Skin dealer's licences are subject to conditions that include, but are not limited to:

- The *skin dealer* must only purchase *kangaroo* skins from the holder of a current *fauna dealer's (kangaroo)* or *skin dealer's (kangaroo) licence*.
- The *skin dealer* must not have in his or her custody or control any *kangaroo* skin that does not have a commercial tag attached.
- The *skin dealer* must only treat or store *kangaroo* skins at a registered premise.
- The *skin dealer* must supply monthly returns to DEC in the form provided by DEC.



Import and Export Licence

Issued under section 126 of the *National Parks and Wildlife Act 1974* pursuant to clauses 50 and 51 of the *National Parks and Wildlife Regulation 2002*

As it relates to commercial *kangaroo* harvesting an *import and export licence* authorises the holder to:

- import or export *kangaroos* to or from New South Wales.

Before approving an application for an *import or export licence*, an authorised DEC officer will consider relevant information, including confirming that:

- the applicant is the holder of a current *fauna dealer's* or *skin dealer's licence* in New South Wales; and
- the import or export is in accordance with the current New South Wales Commercial Kangaroo Harvest Management Plan or an approved wildlife trade management plan in another state.

Import and export licences are subject to conditions that include, but are not limited to:

- the licensee must supply quarterly returns to DEC in the form provided by DEC; and
- the licence number of the consignor is clearly marked on each package containing protected fauna that is either imported or exported.

Tags

Section 121(2) and clauses 48 and 49 of the *National Parks and Wildlife Regulations 2002*. Tags are issued as a condition of an *occupier's licence*.

- The DEC must issue plastic tags in a quantity equal to the number of *kangaroos* a person is authorised to take under the *occupier's licence*.
- A fee (fixed by the *Director-General*) must be paid to DEC for the tags.
- The tags must be from a series issued specifically for that year, individually numbered and a different colour for each consecutive year.
- Tags are issued for a specific property and are not transferable to another property.
- The tags must be self-locking.
- Where a landholder has nominated a *trapper* on an *occupier's licence*, the landholder must supply the tags to the *trapper*.
- Tags must be attached to the skin of *kangaroos* commercially utilised and locked in to prevent removal.
- A tag can only be removed from the *kangaroo* skin during the skin tanning process.



3. BIOLOGY, ECOLOGY AND CONSERVATION OF KANGAROOS

3.1. Introduction

Kangaroos are among the most widely studied species, largely as a consequence of the commercial harvest. The biology, ecology, conservation status, threats and issues relating to the conservation and harvesting of the *kangaroo* species that are the subject of this plan have been comprehensively documented in a large number of widely available publications. It is beyond the scope of this plan to reiterate the contents of these publications as they relate to *kangaroos* and their management. Accordingly, the following sections provide only a summary of the variety of publications that address specific aspects of *kangaroo* biology, ecology, conservation, management and harvesting.

3.2. Biology and Ecology

The information in this section has largely been adapted from the background information for *kangaroo* management in *Commercial harvesting of kangaroos in Australia* (Pople & Grigg 1999).

A comprehensive understanding of the biology and ecology of a harvested species is a pre-requisite for ensuring there is a sound basis for sustainable commercial use. In the case of the harvested *kangaroo* species there is a vast amount of information published pertaining to their biology and their ecology. An exhaustive review of this literature is not possible in the context of this plan, hence the following sections will only briefly summarise the key information relevant to commercial harvesting and provide references to more detailed information on specific aspects of *kangaroo* biology and ecology.

3.2.1. Introduction

The four *kangaroo* species that are the subject of this plan are abundant over a broad area of the continent and New South Wales (Figures 3 to 6). The three most abundant species (red kangaroo, eastern grey kangaroo and western grey kangaroo), which comprise 95% of the commercial harvest, are particularly common over the sheep and cattle grazing pastures of western New South Wales. Within the sheep rangelands, the provision of permanent watering points has meant that *kangaroos* are now more likely to be limited by food than water (Oliver 1986). This has had a profound effect on their distribution as well as their abundance (Newsome 1965a). It has been suggested that sheep and cattle also improved the habitat of *kangaroos* through facilitative grazing; creating a sub-climax pasture (Newsome 1975). These changes to the environment would have been most pronounced in the late 1800s when average sheep numbers in the rangelands of New South Wales were nearly twice what they are today (Caughley 1976). Other changes were also wrought upon Australia's rangelands following European settlement - numerous species of eutherian herbivores and predators were introduced and became established in the wild; at the same time numerous small native mammal species disappeared and many are now extinct. As Caughley (1987b) explained, not only was the habitat modified, but the ecological system was 'changed beyond recognition'. The current distribution and abundance of *kangaroos* may therefore bear only a vague resemblance to what it was prior to European settlement.

3.2.2. Red kangaroo (*Macropus rufus*)

Red kangaroo is the most abundant species of *kangaroo*. It is distributed over much of dry, inland Australia and is the only species exclusively restricted to the arid zone (Tyndale-Biscoe 2005) (Figure 3). This distribution reflects the interaction between mean annual precipitation and mean annual temperature (Caughley *et al.* 1987). Red kangaroo occupies a wide range of habitats including mulga and mallee scrub, shrubland, woodland, grassland and even desert (Caughley 1964; Russell 1974; Johnson & Bayliss 1981; Low *et al.* 1981; Short *et al.* 1983; Strahan 1995). However, Strahan (1995) and Russell (1974) describe a preference of this species for open plains habitat.

Many scientists consider that vegetation clearing, provision of artificial watering points and control of dingo (*Canis lupus dingo*) populations to facilitate the grazing of domestic stock in the pastoral zone have "improved" the habitat for red kangaroo and thus resulted in a general population increase from pre-European times (Russell 1974; Newsome 1975; Caughley *et al.* 1980; Squires 1982; Grigg 1982). Conversely, intensive agriculture is not regarded as beneficial to the species (Grigg 1982; Short & Grigg 1982). However little red kangaroo habitat has been altered by intensive agriculture.

Red kangaroo is a herbivore; accordingly its role in the ecosystem can be defined as a primary consumer. Several detailed dietary studies have been undertaken on this species (Griffiths & Barker 1966; Chippendale 1968; Storr 1968; Bailey *et al.* 1971; Ellis 1976), with all indicating a preference for green herbage including grasses and dicotyledonous plants. Although they prefer to eat grasses and forbs, when these become scarce red kangaroos will switch to chenopods and black bluebush, and in some areas will even browse shrubs (Tyndale-Biscoe 2005).

The reproductive biology of red kangaroo has been thoroughly studied (Frith & Sharman 1964; Newsome 1964a, b, 1965b; Sharman 1964; Sharman & Pilton 1964). Females come into oestrus at approximately 35-day intervals and are therefore potentially fertile throughout the year. Periods of extreme drought, however, may lead to suppression of the oestrus cycle. Females can come into breeding condition almost immediately after drought-breaking rains. Pregnancy does not interrupt recurrence of oestrus. The female may give birth 33 days after mating and the result from this post-partum mating remains a quiescent blastocyst until the previous young is about to leave the pouch or is lost prematurely (embryonic diapause).

Studies of behaviour and social organisation have been conducted by Caughley (1964) and Croft (1980). Red kangaroo is a gregarious species (Kirkpatrick 1967) and although relatively large groups may sometimes form, these groups are unstable in their composition (Croft 1980). The only enduring red kangaroo relationship is between the mother and her young. The mating system of the red kangaroo appears to be based on polygamy (Croft 1980).

Several studies have examined the movement patterns of red kangaroo (Frith 1964; Bailey 1971; Denny 1980; Croft 1980; Priddel 1987). These studies indicate that the majority of the population is relatively sedentary, moving distances of no more than 10 kilometres, although a small proportion of animals may move tens or hundreds of kilometres. Individual home ranges have been found to overlap. In western New South Wales Croft (1991) found that red kangaroos had weekly home ranges of 259 to 560 hectares.



The population dynamics of red kangaroo have been studied in detail with much of the information being derived from regular aerial surveys. These surveys provide a means of assessing the response of macropod populations to environmental conditions, particularly rainfall. J Caughley *et al.* (1984), working in New South Wales, found that the rate of increase in numbers was related to rainfall. Populations decreased when rainfall was approximately 90 millimetres below average and, except when rainfall was extremely high, increased when rainfall exceeded the 90 millimetres below average level. The maximum annual rate of increase was approximately 45 percent per annum, but under average rainfall, populations increased at 30-35 percent per annum. In poor conditions, populations declined at a maximum rate of 55 percent per annum. Robertson (1986) observed a 30 percent per annum decline in the red kangaroo population at Kinchega National Park in western New South Wales during the 1982-83 drought. Similar population changes have been observed in South Australia by Grigg (1982).

Red kangaroo is subject to predation by the dingo. Shepherd (1981) has made direct observations of dingo predation of red kangaroo, concluding that they prefer juveniles as prey and that the dingo might be able to limit the rate of increase of red kangaroo populations. Caughley *et al.* (1980) were more definite in their conclusions concerning dingo predation, and attribute the high densities of red kangaroo in the sheep country of South Australia, Queensland and New South Wales to the elimination of the dingo from these areas.

3.2.3. Eastern grey kangaroo (*Macropus giganteus*)

Eastern grey kangaroo is distributed across eastern Australia from northern Queensland to Tasmania between the inland plains and the coast (Russell 1974; Strahan 1995) (Figure 4). The distribution corresponds with areas where rainfall either has little seasonal trend or where rainfall in summer exceeds rainfall in winter (Caughley *et al.* 1987). Eastern grey kangaroo is abundant and occupies a range of habitats including woodland, shrubland, open forest, and semi-arid mallee and mulga scrubs (Caughley 1964; Calaby 1966; Bell 1973; Russell 1974; McCann 1975; Taylor 1980; Hill 1981; Strahan 1995; Southwell 1987).

Poole (in Strahan 1995) considers it likely that the development of the pastoral industry has led to a marked increase in the abundance of this species. Furthermore, the eastern grey kangaroo has been moving westward for the past 70 years due partly to the increase in watering points for sheep and cattle (Tyndale-Biscoe 2005). Conversely, intensive agriculture with its associated widespread tree clearance has not been beneficial to the species (Short & Grigg 1982). The western boundary of the eastern grey kangaroo range is probably maintained by competition with red kangaroos and wallaroos because the latter species have a better tolerance of high temperatures and uncertain rainfall (Tyndale-Biscoe 2005).

Eastern grey kangaroo is a herbivore and therefore a primary consumer. Detailed dietary studies indicate that the species is a grazer with a preference for grasses, such as spinifex (*Triodia metchelli*), growing in woodlands (Kirkpatrick 1965; Griffiths & Barker 1966; Southwell 1981; Taylor 1983b).

Reproductive biology of eastern grey kangaroo has been well studied (Kirkpatrick 1965, 1967; Poole 1975; Kirsch & Poole 1972). Breeding occurs throughout the year but there is a peak of births in summer. The oestrus cycle is 46 days and the gestation period 36 days. Post-partum ovulation does not occur in eastern grey kangaroo and quiescent blastocysts are rarely found in this species.



The social behaviour of eastern grey kangaroo reflects their seasonal breeding and preference for woodland habitat. Eastern grey kangaroo is gregarious (Southwell 1984a), forming groups that are unstable in their composition (Southwell 1984b). There are three common associations related to essential life functions: male-male agonistic behaviour to establish hierarchical rank; males courting oestrus females - this species has a polygamous mating system (Jarman & Southwell 1986); and the mother-young association (Tyndale-Biscoe 2005).

Eastern grey kangaroos are less mobile than red kangaroos. Studies of eastern grey kangaroo movement by Jarman and Taylor (1983) and Jarman and Southwell (1986) indicate that the species occupies well-defined, overlapping home ranges. Few individuals have been shown to disperse; those that do are young males.

The population dynamics of eastern grey kangaroo were examined during the aerial surveys of J. Caughley *et al.* (1984) which were undertaken at two sites on the inland plains of New South Wales, one to the east of, and one to the west of, the plains. The eastern site contained both eastern grey kangaroo and western grey kangaroo, which cannot be reliably distinguished from the air. Eastern grey kangaroo was far more abundant than western grey kangaroo (J Caughley *et al.* 1984) so the changes observed can be attributed almost entirely to eastern grey kangaroo. J Caughley *et al.* (1984) found that populations had a maximum rate of increase of 35 percent per annum where rainfall was above average, and a rate of increase of 25 percent per annum at average rainfall. Populations declined only when rainfall was well below average.

Aerial survey has been the main means by which broad-scale estimates of eastern grey kangaroo populations have been obtained. Prior to 1987, the only broad-scale estimate for the eastern highlands, where fixed-wing aerial surveys are not possible, was a "plausible guess" of five per square kilometre (Caughley *et al.* 1983). Preliminary results from the recent helicopter survey in New South Wales indicate an average density in suitable habitat of 11 per square kilometre. Recalculating this estimate for all of the survey area (including both suitable and unsuitable habitat) gives a density of nine per square kilometre, considerably higher than that of the five per square kilometre guess of Caughley *et al.* (1983). Taylor (1983b) recorded localised densities of 14 per square kilometre and 31 per square kilometre for eastern grey kangaroo on his two study areas on the New England Tableland of New South Wales.

Eastern grey kangaroo is subject to predation by the dingo (Robertshaw & Harden, 1985). Removal of dingoes from areas of eastern grey kangaroo habitat has reduced the effects on populations of this natural predation.

3.2.4. Western grey kangaroo (*Macropus fuliginosus*)

Although eastern and western grey kangaroos have probably diverged from a common ancestor quite recently, the biological and ecological differences between the two species are subtle. Indeed, western grey kangaroo was only confirmed as a separate species from eastern grey kangaroo in 1972 after detailed investigation of electrophoretic, serological, morphological and reproductive evidence (Kirsch & Poole 1967, 1972). Poole (in Strahan 1995) in reviewing information on western grey kangaroo commented that many aspects of the species' biology and ecology are so similar to eastern grey kangaroo that they hardly needed to be described separately. Accordingly, only the principal points of difference are addressed in this summary.



The western grey kangaroo is, perhaps, named inappropriately because the species actually occurs across the south of the continent, with a distribution extending northwards through western New South Wales and into a small area of southern central Queensland (Figure 5). This distribution corresponds to areas of aseasonal or winter rainfall (Caughley *et al.* 1987). Where western grey kangaroo overlaps in its range with eastern grey kangaroo, the latter is more abundant. Both species have similar habitat preferences and western grey kangaroo, too, has benefited from pastoralism but been disadvantaged by intensive agriculture (Short & Grigg 1982).

Concerning western grey kangaroo, Coulson and Norbury (1988) found that, like eastern grey kangaroo, it feeds mainly on grasses. Norbury (1987), working in northwestern Victoria, found that they ate more than 75 per cent grass in a mixed pasture but, as pasture biomass declined, shifted to forbs and shrubs. Barker (1987) described a similar shift from forbs and grasses to shrubs for western greys feeding on pastures in western New South Wales and southern Queensland. This contrasted with red kangaroos and eastern grey kangaroos, which continued to feed on grasses and forbs as pasture biomass declined.

Reproductive biology of western grey kangaroo shows some minor differences from eastern grey kangaroo: the mean lengths of oestrus cycle (35 days) and gestation (30.5 days) are shorter, and western grey kangaroo does not exhibit embryonic diapause (Poole, in Strahan 1995). Breeding may occur year round, except in very poor seasons.

Both eastern and western greys are less mobile than reds. Studies of eastern grey kangaroo by Jarman and Taylor (1983) and Jarman and Southwell (1986) indicate that the species occupies well-defined, highly overlapping home ranges. Few individuals have been shown to disperse, those that do being young males. Western greys were studied by Priddel (1987) and Priddel *et al.* (1988a, b) and show the same general patterns, with individuals occupying relatively small home ranges that overlap extensively.

3.2.5. Wallaroo (*Macropus robustus*)

Wallaroo has the widest distribution of the larger macropod species. It occurs across the entire mainland continent and is only absent from the extreme northern and southern portions of the continent (Russell 1974; Strahan 1995) (Figure 6). Despite their relative abundance, members of this group are infrequently seen because of their association with mountains and rocky hill country (Dawson 1995). A consequence of their close association with such habitats is that wallaroo distribution is discontinuous. This discontinuity has resulted in wallaroo being a species which shows considerable variation in external characteristics such as coat colour, coat texture and ear length. In the most recent review of the species, Richardson and Sharman (1976) suggested that the number of sub-species recognised should be four, which they considered reflected the extremes of the variability present. Two wallaroo sub-species are found in New South Wales - the eastern wallaroo (*M. robustus robustus*), which is common on the eastern and western slopes of the Great Dividing Range; and the euro or inland wallaroo (*M. robustus erubescens*), which is found in the drier areas of the state (Dawson 1995).

Wallaroo occupies a wide range of habitats but prefers areas with steep escarpments, rocky hills or stony rises (Calaby 1966; Kirkpatrick 1968; Russell 1974; McCann 1975; Strahan 1995; Taylor 1985). Newsome (1975) considers that the alteration of vegetation communities to sub-climax spinifex by the grazing of sheep in north-west Western Australia has enabled wallaroo to invade previously unoccupied valley areas.



Wallaroo appears to occur at lower overall densities than the other large macropods, but high densities can occur in localised areas. Surveys over small-scale areas of favourable habitat have revealed densities of 16 to 44 per square kilometre at Fowlers Gap in western New South Wales (Croft 1981) and 7 to 55 per square kilometre on grazing properties of the New England Tablelands (Taylor 1983a). Recent broad-scale ground surveys across the eastern highlands in Queensland and New South Wales give a more representative picture of overall density. In south-east Queensland, wallaroo attained an average density of 11 per square kilometre across 65,000 square kilometres of suitable habitat (Southwell & Fletcher 1989). In the New England and western slopes region of New South Wales, preliminary results from a recent ground survey indicate an average density of 6 per square kilometre in 45,000 square kilometres of suitable habitat (Southwell & Weaver, unpublished data).

Wallaroo is a herbivore, and hence a primary consumer. Detailed dietary studies have been undertaken by Ealey and Main (1967), Storr (1968), Ellis (1976), Squires (1982), and Taylor (1983b). Taylor (1983b) found that in the tablelands of New South Wales wallaroo had a broadly similar diet to eastern grey kangaroo, consisting primarily of grasses. In the arid Pilbara region of Western Australia, wallaroo was found to concentrate on spinifex (Ealey & Main 1967). The species is thus a grazer.

The reproductive biology of wallaroo has been studied by Sadlier (1965), Ealey (1963), Kirkpatrick (1968) and Poole and Merchant (1987). Like red kangaroos, wallaroos are opportunistic breeders. Under normal conditions females breed continuously, giving birth to a single young every eight to nine months. However, if drought persists for more than six months, female wallaroos enter a state of anoestrus until they either die or the drought breaks (Tyndale-Biscoe 2005).

Wallaroo is less gregarious than the other large macropod species (Kirkpatrick 1968; Croft 1981; Taylor 1982). Croft (1981) studied their social behaviour, which is broadly similar to that of other large macropod species. Social groups within groups are highly unstable, the only enduring relationship being between a female and its progeny. Wallaroo also appears to have a similar mating system to the other large macropods.

Studies of movement by Ealey (1967), Croft (1981), and Jarman and Taylor (1983) indicate that the species is relatively sedentary, occupying small home ranges that overlap broadly with those of other individuals. Clancy and Croft (1989) found that males of *M. r. erubescens* in the Fowlers Gap area progressively shifted their centres of activity within their home ranges on a short term basis, a trait shown by some of the females as well. Movements were, however, quite small-scale, within a couple of kilometres and home ranges remained stable from year to year.



Figure 3: Distribution of red kangaroo (*Macropus rufus*)

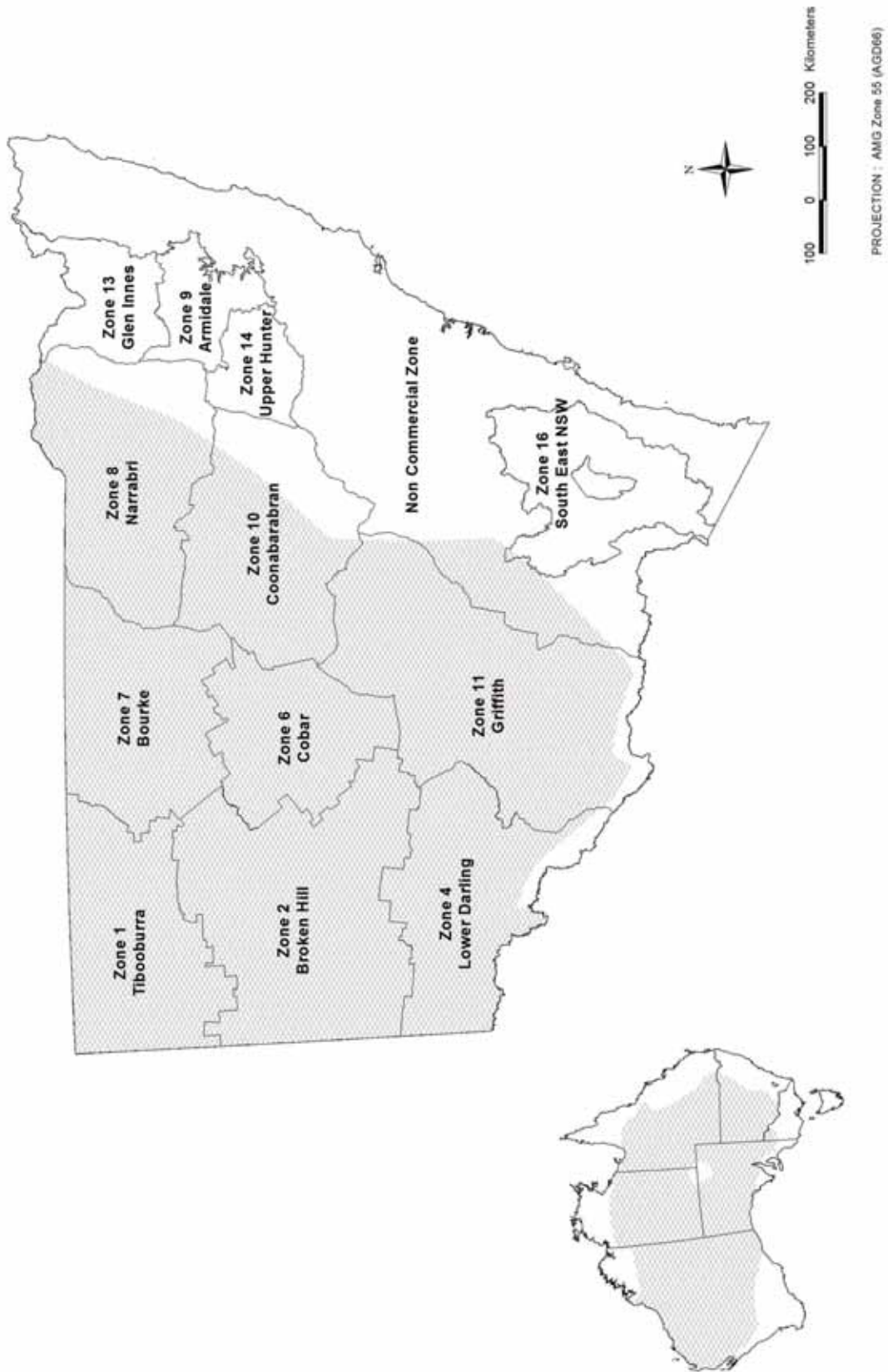


Figure 4: Distribution of eastern grey kangaroo (*Macropus giganteus*)



Figure 5: Distribution of western grey kangaroo (*Macropus fuliginosus*)

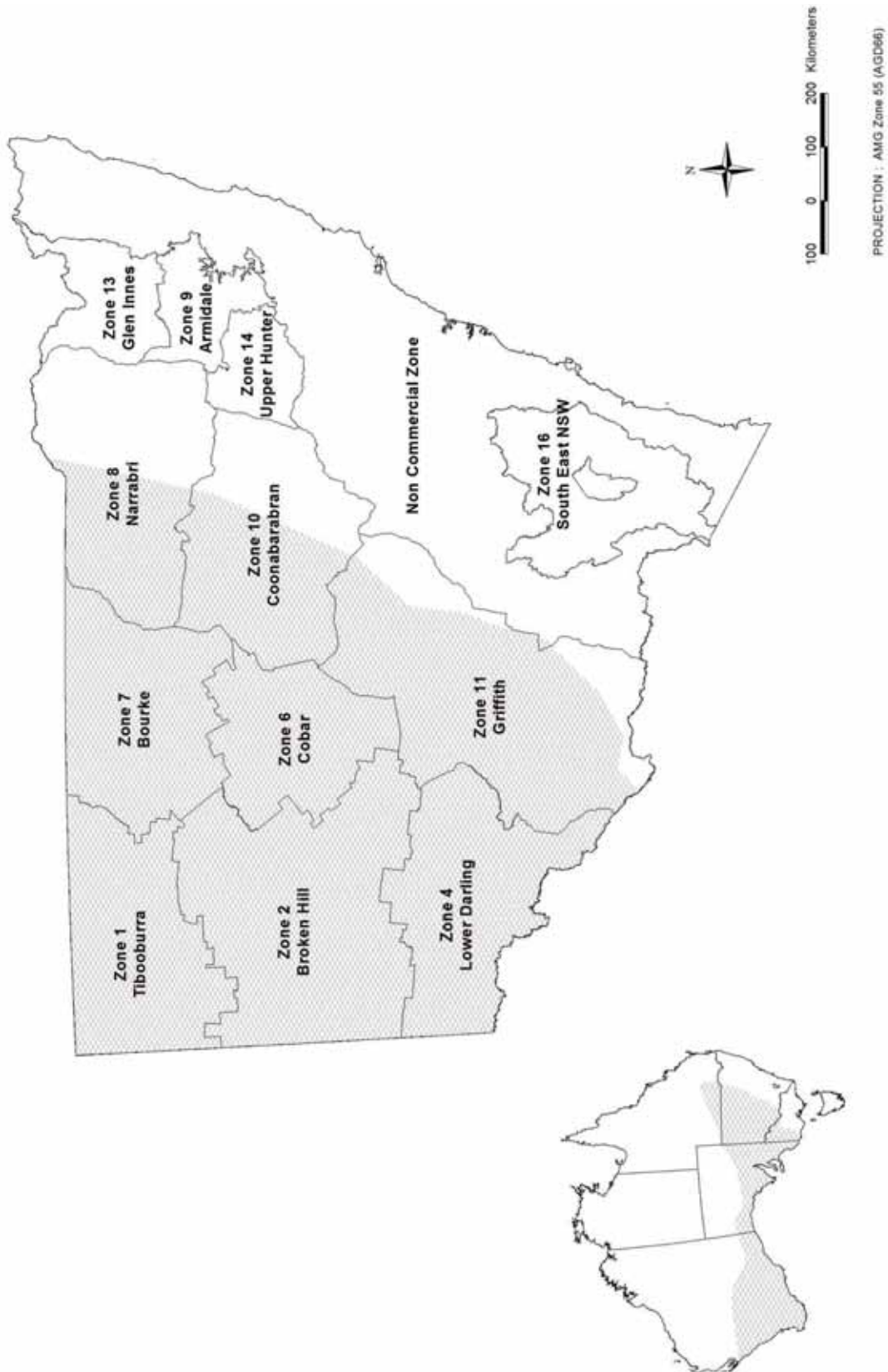
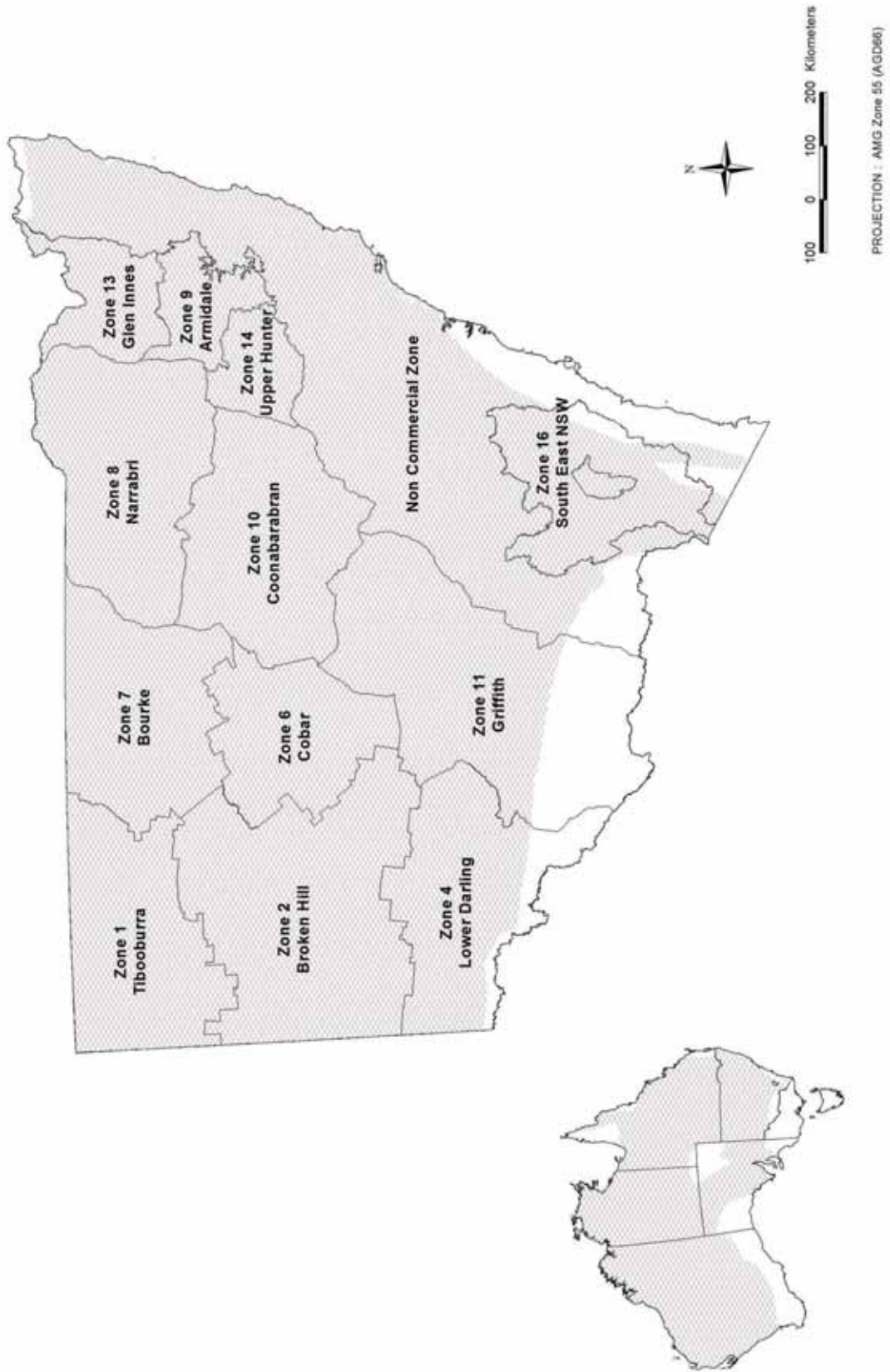


Figure 6: Distribution of wallaroo (*Macropus robustus*)



3.3. Conservation Status

The conservation status of the commercially harvested *kangaroo* species in New South Wales reflects their abundance and thus their utilisation. No commercially harvested *kangaroo* species in New South Wales is listed as a threatened or endangered species under either State or Commonwealth legislation (Table 1). In addition, the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species identifies all of the *kangaroo* species subject to commercial harvesting in New South Wales as lower risk, falling into the sub-category of least concern, which encompasses species that do not qualify for the conservation dependent and near threatened sub-categories (Table 1).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments - including the Government of Australia - the aim of which is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES accords varying degrees of protection to more than 30,000 species of animals and plants, which are listed in the three CITES Appendixes. None of the *kangaroo* species commercially harvested in New South Wales is listed in the CITES Appendixes (Table 1).

Table 1: The New South Wales, Commonwealth IUCN and CITES conservation status of the kangaroo species to which this plan relates.

Species	NSW	Commonwealth	IUCN	CITES
Red Kangaroo	Common	Not Listed	Lower Risk	Not Listed
Eastern Grey Kangaroo	Common	Not Listed	Lower Risk	Not Listed
Western Grey Kangaroo	Common	Not Listed	Lower Risk	Not Listed
Wallaroo	Common	Not Listed	Lower Risk	Not Listed

3.4. Threats, Issues and Assessment of Impacts

In the context of commercial *kangaroo* harvesting in New South Wales: threats to the conservation status of harvested *kangaroo* species are limited; issues relating to the conservation and harvesting of *kangaroos* are well understood; and assessments of the impacts of harvesting on *kangaroos*, as well as other species, habitats and ecosystems, are comprehensive.

3.4.1. Threats and issues pertinent to the conservation status of kangaroos

The conservation status of *kangaroos* in New South Wales has the potential to be threatened by a range of environmental and anthropogenic factors. Many of these potential threats - from drought and flood to disease and predation - are ecosystem and environmental processes beyond the control of DEC. Nevertheless, as evidenced by the scientific literature, these processes are not considered a threat to the conservation status of *kangaroos* (Table 2).

Potential anthropogenic threats to the conservation status of *kangaroos* principally arise from the commercial harvest. However, in 30 years of commercial harvesting, viable populations of the harvested *kangaroo* species have been maintained across their natural range and, moreover, the distributional ranges of eastern and western grey kangaroos have expanded. Accordingly, commercial harvesting is not considered a threat to the genetic integrity or conservation status of *kangaroos* in New South Wales (Table 2).

However, to ensure that the commercial *kangaroo* harvest in New South Wales remains sustainable and does not in the future jeopardise the viability of *kangaroo* populations across their range, DEC enacts a range of management controls, including:

1. Undertaking regular and ongoing monitoring of *kangaroo* populations.

The strictly standardised survey techniques employed in New South Wales for the broad-scale monitoring and estimating of *kangaroo* populations are widely regarded as best practice, both in Australia and overseas (Caughley *et al.* 1976; Caughley & Grigg 1981; Anderson & Southwell 1995; Southwell *et al.* 1995; Pople 2004; Pople *et al.* 2006).

2. Managing the commercial harvest using a proportional harvesting strategy based on regular estimates of abundance.

Proportional harvesting strategies have been well studied and are considered safe and efficient for fluctuating populations (Caughley 1987a; Engen *et al.* 1997). Moreover, New South Wales' program of regularly monitoring and estimating abundance allows for any other mortality agents acting on *kangaroo* populations to be accounted for in the setting of annual commercial harvest quotas (e.g. animals lost through drought, disease, or road kill).

3. Using conservative and up to date species correction factors.

DEC employs correction factors - used in estimating *kangaroo* abundance from aerial survey data - which are generally regarded as cautious. In addition, DEC works collaboratively with universities to ensure that correction factors applied remain appropriate. For example, DEC and the University of New England conducted a three-year research project (1998-2000) examining fixed-wing aerial surveys. As a result of this research DEC has since 2001 implemented new bio-regional correction factors for grey and red kangaroos, implemented revised proportions of eastern grey and western grey kangaroos and implemented a new data analysis protocol.

4. Setting commercial harvest quotas at levels that are considered ecologically sustainable for *kangaroo* populations.

Commercial harvest quotas set at 15% of the population estimate for eastern grey kangaroos, western grey kangaroos, wallaroos and 17% of the population estimate for red kangaroos are not only regarded as ecologically sustainable in the scientific literature (e.g. Caughley 1987a; Hacker *et al.* 2003, 2004), but are demonstrably sustainable.

5. Providing refuge habitat.

In New South Wales *kangaroos* cannot be commercially harvested in conservation reserves, a total area in excess of 6.5 million hectares or approximately seven percent of the state. In addition the commercial *kangaroo* harvest is patchy within Kangaroo Management Zones and individual properties, leaving many other areas of unharvested or refuge habitat (Tenhumberg *et al.* 2004).

3.4.2. Assessment of the impacts of commercial *kangaroo* harvest on other species, habitats and ecosystems

Impacts on species, habitats and ecosystems resulting from actions detailed within this management plan are unlikely to be significant, and in many instances are expected to be positive (Table 3). The most notable issue identified in the assessment of impacts (Table 3) is the utilisation of *kangaroo* harvest offcuts by introduced predators, particularly foxes (*Vulpes vulpes*). Some authors (i.e. Read & Wilson 2004) have suggested that *kangaroo* harvest offcuts may sustain predator populations during periods of low prey availability. Maintenance of artificially high predator populations may in turn threaten prey populations, including endangered taxa (Saunders *et al.* 1995). However, given that many *trappers* presently bury harvest offcuts and that harvest offcuts are widely and randomly dispersed across the landscape, it is unlikely that the commercial *kangaroo* harvest will have a significant positive effect on populations of introduced predators.





Table 2: Threats and issues pertinent to the conservation status of kangaroos

Threats	Comments	Selected References*
Drought	Rainfall via its impact on plant productivity is the single most important factor impacting on <i>kangaroo</i> populations and droughts can greatly reduce <i>kangaroo</i> numbers. However, <i>kangaroos</i> are well adapted to a dynamic environment and populations recover quickly after drought-driven population crashes, even with continued harvesting. Therefore drought is not considered a threat to the conservation status of <i>kangaroos</i> .	Bayliss 1987; Cairns & Grigg 1993; Cairns <i>et al.</i> 2000; Caughley <i>et al.</i> 1985; McCarthy 1996; Pople 2003; Pople <i>et al.</i> submitted; Robertson 1986
Disease	A range of parasites and pathogens affect <i>kangaroo</i> populations. Epidemics have caused significant short-term reductions in <i>kangaroo</i> numbers in particular areas; however, these populations have recovered rapidly. Diseases are not considered important agents of mortality in <i>kangaroos</i> in the long-term and therefore do not pose a threat to the conservation status of <i>kangaroos</i> .	Caughley 1987a; Gilroy <i>et al.</i> 1999; Kirkpatrick 1985; Pople & Grigg 1999; Speare <i>et al.</i> 1989
Flood	Flooding has been found to affect the short-term distribution and abundance of <i>kangaroos</i> and has been associated with occasional localised epizootics. Flooding is not considered a threat to the conservation status of <i>kangaroos</i> .	Choquenot 1991; Clancy <i>et al.</i> 1990
Habitat loss and modification	The three largest species of <i>kangaroos</i> have benefited significantly from habitat modification, with numbers increasing and ranges extending due principally to the expansion of grasslands. Conversely, <i>kangaroo</i> numbers have generally declined where there is intensive agriculture, urbanisation or extensive clearing. However, despite more than 200 years of heavy exploitation and clearing of the land the larger <i>kangaroos</i> have maintained their populations or increased in abundance and range; accordingly, habitat loss and modification is not considered a threat to the conservation status of <i>kangaroos</i> .	Calaby & Grigg 1989; Dawson <i>et al.</i> 2004; Pople <i>et al.</i> submitted; Short & Grigg 1982
Harvesting - general	In 30 years of managed harvest viable populations of the harvested <i>kangaroo</i> species have been maintained across their natural range. Furthermore, the distributional ranges of eastern and western grey kangaroos have expanded. Harvesting is not considered a threat to the conservation status of <i>kangaroos</i> .	Cairns & Coombs 1992; Calaby & Grigg 1989; Dawson <i>et al.</i> 2004; Grigg & Pople 2001
Harvesting - genetic impact	Harvesting has the potential to alter the genetic structure and genetic diversity of a population. However, there is no theoretical, empirical or modelled evidence of genetic impacts at current levels of <i>kangaroo</i> Harvesting. Therefore harvesting is not considered a threat to the genetic integrity or conservation status of <i>kangaroos</i> .	Clegg <i>et al.</i> 1998; Hacker <i>et al.</i> 2003, 2004; Hacker & McLeod 2003; Hale 2001, 2004; Tenhumberg <i>et al.</i> 2002, 2004
Predation	In some circumstances dingoes (<i>Canis lupus dingo</i>) have been shown to limit <i>kangaroo</i> populations, and there is increasing evidence for this species having a regulatory effect. Other predators such as foxes (<i>Vulpes vulpes</i>) and wedge-tailed eagle (<i>Aquila audax</i>) do not appear to exert much influence on the harvested species of <i>kangaroo</i> . Predation is not considered a threat to the conservation status of <i>kangaroos</i> .	Banks <i>et al.</i> 2000; Caughley <i>et al.</i> 1980; Corbert & Newsome 1987; Jarman & Denny 1976; Pople & Page 2001; Thompson 1992

* Where applicable and/or available

Table 3: Impacts of the commercial kangaroo harvest on other species, habitat and ecosystems

Potential Impacts	Comments	Selected References*
Reduction in soil quality and land stability	There is unlikely to be a reduction in soil quality or land stability as a consequence of the commercial <i>kangaroo</i> harvest as <i>trappers</i> generally operate on already-formed tracks. Moreover, <i>kangaroo</i> harvest offcuts have been shown to contribute to soil nutrient retention and cycling, thereby improving soil quality.	Wilson & Read 2003
Detrimental effects on water bodies, watercourses, wetlands and natural drainage systems	There is no evidence that suggests the commercial <i>kangaroo</i> harvest will have detrimental effects on water bodies, watercourses, wetlands and natural drainage systems.	
Vegetation clearing or modification	No vegetation is likely to be cleared or modified as a consequence of the commercial <i>kangaroo</i> harvest. The commercial harvest may however provide indirect benefits to vegetation by potentially contributing to an integrated approach to reducing total grazing pressure or facilitating the retention of vegetation that provides habitat for <i>kangaroos</i> by private landholders.	Fisher <i>et al.</i> 2004; Grigg 1988, 1995
Detrimental effects on threatened flora species, populations, or their habitats	There is no evidence that the commercial <i>kangaroo</i> harvest has a detrimental effect on threatened flora species, populations, or their habitats.	
Endangering, displacing or disturbing native fauna, or creating a barrier to their movement	Native fauna is unlikely to be endangered, displaced or disturbed as a consequence of the commercial <i>kangaroo</i> harvest. The commercial harvest is, moreover, unlikely to create a barrier to the movement of native fauna. <i>Kangaroo</i> harvest offcuts are however utilised by birds of prey thereby benefiting these species.	Read & Wilson 2004
Detrimental effects on threatened fauna species, populations, or their habitats	There is no evidence that the commercial <i>kangaroo</i> harvest has a detrimental effect on threatened fauna species, populations, or their habitats. There may be indirect effects on threatened fauna species and/or populations as a consequence of the commercial <i>kangaroo</i> harvest, however such effects are not likely to be significant (see section on introduced predators below).	
Detrimental impacts on ecological communities of conservation significance	Ecological communities of conservation significance are unlikely to be impacted by the commercial <i>kangaroo</i> harvest.	

* Where applicable and/or available





Comments		Selected References*
<p>Potential Impacts</p> <p>Positive effects on introduced predators</p>	<p><i>Kangaroo</i> harvest offcuts are utilised by introduced predators, particularly foxes (<i>Vulpes vulpes</i>) and may sustain populations of these predators during periods of low prey availability. Maintenance of artificially high predator populations may in turn threaten prey populations, including endangered taxa. However, given that many trappers presently bury harvest offcuts and that harvest offcuts are widely and randomly dispersed across the landscape, it is unlikely that the commercial <i>kangaroo</i> harvest will have a significant positive effect on populations of introduced predators.</p>	<p>Kay <i>et al.</i> 2000; Read & Wilson 2004; Saunders <i>et al.</i> 1995</p>
<p>Positive effects on introduced herbivores</p>	<p>The commercial <i>kangaroo</i> harvest, by reducing <i>kangaroo</i> populations and thus competition, may allow populations of introduced herbivores such as goat (<i>Capra hircus</i>) and rabbit (<i>Oryctolagus cuniculus</i>) to increase. However, the limited magnitude of the reduction in <i>kangaroo</i> numbers coupled with the ongoing and extensive pest animal control programs undertaken in New South Wales ensure that the commercial <i>kangaroo</i> harvest is unlikely to have a significant positive effect on populations of introduced herbivores.</p>	

* Where applicable and/or available

4. GOALS AND AIMS



4.1. Goal

The overarching goal of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 is:

To maintain viable populations of kangaroos throughout their ranges in accordance with the principles of ecologically sustainable development.

The principles of *ecologically sustainable development* are defined in the *Environment Protection and Biodiversity Conservation Act 1999*.

In order to attain the overarching **goal** this management plan has seven **aims**, each of which encompasses a particular facet of *kangaroo* management. When the aims are combined they set strategic directions for the management of the commercial *kangaroo* harvest in New South Wales.

Under each **aim** are one or more **actions** that detail both how the aim will be delivered and operational directions for *kangaroo* management. A range of **performance indicators** for each **action** have also been developed so that progress towards achieving the **goal** and **aims** of the management plan can be measured.

Throughout the life of this plan **aims** will be audited against **performance indicators** annually, with a major assessment and review at the end of the five-year term of the management plan.



4.2. Aims

The aims of this management plan are:

- 1. MANAGE COMMERCIAL OPERATORS VIA LICENSING**
Manage the utilisation of *kangaroo* species in accordance with the provisions of the NPW Act and Regulation, New South Wales Government policies, the *Code of Practice for the Humane Shooting of Kangaroos* and this management plan.
- 2. ENSURE HUMANE TREATMENT OF KANGAROOS**
Promote improved animal welfare outcomes and ensure that the commercial harvest of *kangaroos* under this plan is carried out in accordance with the *Code of Practice for the Humane Shooting of Kangaroos*.
- 3. MONITOR INDUSTRY COMPLIANCE**
Monitor the *kangaroo* industry to ensure compliance with this management plan, licence conditions, the requirements of the NPW Act and Regulation and the *Code of Practice for the Humane Shooting of Kangaroos*.
- 4. MONITOR KANGAROO POPULATIONS**
Monitor *kangaroo* populations and set commercial quotas to ensure *kangaroos* are utilised in accordance with the goal of the management plan. Direct and indirect monitoring will be undertaken in all areas where *kangaroos* are commercially utilised.
- 5. FACILITATE ADAPTIVE MANAGEMENT AND RESEARCH**
Promote adaptive management experiments and studies using historical data from *kangaroo* industry returns and population data to improve our understanding of *kangaroos* and their interaction with environmental, social and economic systems. Facilitate research into other aspects of *kangaroo* ecology and/or harvest management as required to fill knowledge gaps.
- 6. UNDERTAKE PROGRAM REPORTING AND REVIEW**
Undertake regular reporting and a final program review in consultation with affected community and stakeholders to ensure that the management is fully informed and to ensure outcomes remain consistent with the goal of the management plan.
- 7. PROMOTE COMMUNITY AWARENESS AND PARTICIPATION**
Promote greater understanding of the program through informed public and private sector participation in management of the commercial utilisation of *kangaroos*.



5. MANAGEMENT ACTIONS AND PERFORMANCE INDICATORS



AIM 1: MANAGE COMMERCIAL OPERATORS VIA LICENSING

In order to ensure that viable populations of *kangaroos* are maintained throughout their ranges, the commercial *kangaroo* industry in New South Wales is closely regulated via a range of licensing and tag procedures provided for under the NPW Act and Regulation. The legislative basis for licensing and licensing procedures are described in detail in Section 2.2.

ACTION 1: All relevant activities are licensed in accordance with the applicable New South Wales legislation and DEC policy.

All applications for licences relating to New South Wales commercial *kangaroo* industry operations are to be assessed, processed and issued in accordance with the provisions of the *National Parks and Wildlife Act 1974* and the *National Parks and Wildlife Regulation 2002* and relevant DEC policy.

Performance Indicator:

1.1 All licences across New South Wales are assessed, processed and issued in accordance with New South Wales legislation and DEC policy.

A select audit of licences issued will be undertaken on a quarterly basis to ensure that licences are being issued in accordance with the relevant legislation and policy, DEC procedures are being followed correctly, accurate information is being entered into appropriate databases and that licences are being assessed and issued appropriately. The quarterly audits will be conducted randomly in DEC licensing offices, thereby ensuring that all licensing offices will be audited at least once during the life of this plan. This performance indicator is also a measure of success in the training of staff who approve and issue licences.



ACTION 2: Licence conditions are effective and reflect current New South Wales legislation, DEC policy and the goal and aims of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011.

To effectively and efficiently manage commercial *kangaroo* operations in New South Wales, licence conditions must be effective and consistent with New South Wales legislation, DEC policy and the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011. Accordingly, the standard licence conditions for each licence type will be reviewed, and where necessary amended, in response to changes in New South Wales legislation and/or DEC policy. All proposed amendments to licence conditions will be assessed by DEC's legal representatives prior to implementation and licensees will be advised of changes to their licence conditions in writing.

Performance Indicators:

- 2.1 Licence conditions are reviewed at least annually and where necessary amended.**
- 2.1 Licensees are advised in writing of changes to licence conditions within one month of such changes being approved by the Manager, Kangaroo Management Program.**



AIM 2: ENSURE HUMANE TREATMENT OF KANGAROOS

Animal welfare is of prime concern to DEC. The Code of Practice for the Humane Shooting of Kangaroos is the current nationally-endorsed animal welfare standard for the commercial harvest of *kangaroos*. Accordingly, compliance with this Code is required of the commercial *kangaroo* industry. Any approved subsequent code/s will similarly be adopted as the animal welfare standard for the commercial harvest of *kangaroos* in New South Wales. Conditions attached to *trapper's licences* provide financial disincentives for shooting other than in accordance with the Code. Similar conditions apply to *fauna dealer's licences*.

ACTION 3: DEC will work with the New South Wales Firearms Safety and Training Council Ltd to ensure that all *trappers* are competent to achieve the standards set out in the Code of Practice for the Humane Shooting of kangaroos.

In order to ensure that the *kangaroo* harvest is humane, *kangaroo trappers* are required to demonstrate their competency in relation to the Code of Practice for the Humane Shooting of Kangaroos prior to obtaining their licences. The accreditation program is conducted by the New South Wales Firearms Safety and Training Council Ltd and includes both a written test and a shooting test. *Trappers* must renew their accreditation every five years and cannot renew their *trapper's licences* if their accreditation has expired.

Performance Indicator:

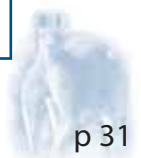
- 3.1 All successful applicants for *trapper's licences* have completed the approved accreditation and their accreditation is current.**

ACTION 4: DEC staff will monitor compliance with the Code of Practice for the Humane Shooting of Kangaroos by commercial *kangaroo* industry operators.

DEC authorised officers undertake regular and opportunistic inspections of *kangaroos* taken by licensed *trappers* and all premises registered by licensed *fauna dealers*. DEC does not tolerate breaches of the Code of Practice, and where *kangaroos* have been found to be taken other than in accordance with the Code, Penalty Infringement Notices are issued or licensees are prosecuted as appropriate. This "zero tolerance" policy of animal welfare breaches demonstrates DEC's commitment to ensuring that the commercial harvest of *kangaroos* is humane.

Performance Indicator:

- 4.1 All licensees who are found to have breached licence conditions relating to animal welfare are issued with Penalty Infringement Notices or are prosecuted as appropriate.**



ACTION 5: DEC will facilitate research into improving animal welfare outcomes associated with the commercial harvest of *kangaroos*.

DEC will work with external research organisations to identify and investigate animal welfare issues relevant to the commercial harvest of *kangaroos*. Such research may include aspects of the biology and ecology of *kangaroos* as they relate to the commercial harvest, or harvest techniques. Contributions by DEC may include funding and/or in-kind support such as the provision of harvest data.

Performance Indicator:

- 5.1 Issues associated with the animal welfare aspects of the commercial harvest are identified and a research prospectus is prepared and distributed to universities and other research institutions during the life of this plan.**



AIM 3: MONITOR INDUSTRY COMPLIANCE

Monitoring commercial *kangaroo* industry compliance with the provisions of New South Wales legislation, DEC policy, the goal and aims of the NSW Kangaroo Harvest Management Plan 2007 - 2011 and licence conditions is essential to effectively maintaining viable populations of *kangaroos* throughout their ranges and to ensuring public confidence in the management of *kangaroos* in New South Wales.

ACTION 6: DEC staff will undertake both regular and opportunistic monitoring of compliance by commercial *kangaroo* industry operators.

In order to assess industry compliance authorised officers of DEC will, on both a regular and opportunistic basis, inspect *kangaroos* taken by licensed *trappers* and all premises registered by licensed *fauna dealers*. The inspecting officers will check to ensure that the *kangaroos* have been taken in accordance with the NPW Act and Regulation, the NSW Commercial Kangaroo Harvest Management Plan 2007 - 2011 and licence conditions. Assessments to ensure compliance with the current Code of Practice for the Humane Shooting of Kangaroos will be a priority.

In addition, DEC has a Memorandum of Understanding (MoU) with the NSW Food Authority in relation to the inspection of premises used to store *kangaroo carcasses*. Under the terms of this MoU, issues pertinent to DEC will continue to be examined by NSW Food Authority officers during their inspections of *trappers* and registered premises, and referred to DEC for investigation if required. Authorised DEC officers will reciprocate.

Performance Indicators:

- 6.1 On receipt of *trapper's licence* applications the authorised DEC officer assessing the applications will ensure that applicants have both a valid and current New South Wales firearms accreditation and a current Firearms Licence.**
- 6.2 All chiller premises are inspected on average every three months during the life of this plan by Kangaroo Management staff and/or staff of the New South Wales Food Authority to ensure compliance with New South Wales legislation and licence conditions.**
- 6.3 All *kangaroo* processing works in New South Wales are inspected by Kangaroo Management staff and/or staff of the New South Wales Food Authority to ensure compliance with New South Wales legislation and licence conditions.**
- 6.4 During the life of this plan *trapper's* vehicles loaded with *kangaroo carcasses* are inspected opportunistically to ensure compliance with New South Wales legislation and licence conditions and the results of these inspections are documented.**



ACTION 7: Activities not in accordance with the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 and New South Wales legislation will be investigated and where an offence has been committed and it is appropriate, prosecuted.

Investigation and prosecution of activities not in accordance with the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 and New South Wales legislation is essential for delivery of the plan and for maintaining public, industry and stakeholder confidence in the effectiveness of the plan as a mechanism for maintaining the viability of *kangaroo* populations, and thus the commercial *kangaroo* industry.

Performance Indicator:

7.1 Reports of unlicensed activities and activities in breach of licence conditions are investigated to the fullest extent possible, and where sufficient evidence is available offenders are issued with Penalty Infringement Notices or prosecuted as appropriate.

ACTION 8: The accuracy of industry returns will be continually monitored during the life of this plan.

It is a licence condition that commercial *kangaroo* industry operators submit regular returns to DEC. The data obtained from these returns is essential for monitoring whether industry is harvesting *kangaroos* within approved quotas and for reporting to the Commonwealth Government, industry and the public. In addition, the data from industry returns is utilised in indirect monitoring of *kangaroo* populations.

Performance Indicator:

8.1 During the life of this plan, all incoming industry returns are scrutinised and discrepancies are investigated and resolved.

Auditing of industry returns encompasses manual assessment of returns, application of the customised licensing database utilised by DEC which includes numerous validation rules that assist in ensuring the integrity of data, and extensive verbal and written communication between DEC staff and industry operators.



ACTION 9: A compliance database will be maintained to support investigations, inspections and audits.

A compliance database for use in kangaroo management investigations, inspections and audits will be maintained for use by staff involved with kangaroo management. The database facilitates compliance reporting to the Commonwealth Government and other stakeholders and also easy access to information for relevant authorised DEC officers.

Performance Indicator:

9.1 A compliance database is maintained.

Relevant compliance information stored in the customised database includes reports of alleged breaches of the NPW Act and/or licence conditions, investigation activities undertaken and outcomes of investigations. Data input is accurate and timely.



AIM 4: MONITOR KANGAROO POPULATIONS

Monitoring commercially harvested *kangaroo* populations, both directly and indirectly, is essential to effectively maintaining viable populations of kangaroos throughout their ranges.

The four currently commercially utilised kangaroo taxa - *M. rufus*, *M. giganteus*, *M. fuliginosus*, and *M. robustus robustus* - are widespread and abundant in New South Wales. The 2006 population estimate for these species of *kangaroos* in commercial Kangaroo Management Zones (KMZs) totalled approximately 5.8 million. *M. robustus erubescens*, has not been monitored since 2002, at which time the population of this species was estimated to be approximately 12,000.

A great deal is known about the biology of kangaroos including their habitats, distributions (Section 3), diets and reproduction, and this knowledge is continually improving. In particular, the reproductive biology of *kangaroos* has been researched extensively. While there are variations between the *kangaroo* species (e.g. gestation period, lactation period and interval between young), these are relatively well understood and accounted for in the various quotas set for each species. In addition, there is abundant information from direct (periodic) and indirect (continuous both temporally and spatially) monitoring of *kangaroos*.

The commercial take of *kangaroos* in KMZs is patchy. Even within a single property the rate of take can vary from zero (unshot areas) to areas heavily utilised. *Kangaroos* may move between areas of different utilisation rates. In heavily wooded areas the take can be restricted to the established property tracks only, resulting in use of relatively thin strips of land through the property. In other areas the entire property may be accessible and utilised. Generally commercial utilisation of kangaroos will be biased towards larger animals and therefore males. Historically the commercial take in New South Wales has been male biased. *Kangaroo* mortality during drought is also male biased, and female biased populations in unshot areas have been observed. *Kangaroos* are polygamous and females will mate with available males. In a female biased population (due to commercial use), with favourable seasonal conditions, almost all females will have pouch young.

Results of aerial surveys since the mid-1980s show that *kangaroo* populations fluctuate primarily in response to seasonal conditions. However epidemic mortalities of *kangaroos* have been recorded, usually following flooding rain. Reports based on aerial surveys suggest significant short-term reductions in populations, greater than 50%, have occurred in some areas.

As illustrated in Section 3 of this plan a wide range of literature relating to *kangaroos* and their management is currently available; of particular interest is a comprehensive review prepared for the Commonwealth Government titled *Commercial harvesting of kangaroos in Australia*. This review is available on the Commonwealth Department of the Environment and Heritage website:

<http://www.deh.gov.au/biodiversity/trade-use/wild-harvest/kangaroo/harvesting/index.html>

and encompasses topics including the biology of the harvested *kangaroo* species, the effects of harvesting on *kangaroo* populations, animal welfare issues and the conservation status of the harvested *kangaroo* species.



ACTION 10: Population surveys will be conducted annually for the western plains and three yearly for tableland zones and other areas that require helicopter surveys.

Kangaroo population estimates obtained from surveys (direct monitoring) will be used as the basis of setting commercial quotas following the procedures set out in this management plan.

Across the western plains of New South Wales fixed-wing aircraft are used to survey *kangaroo* populations annually. Survey lines have been established at regular intervals across this region and the same lines are surveyed at the same time every year to allow comparison of results between years.

In the northern and southern tablelands and Barrier Ranges areas much of the terrain is too steep to be safely surveyed using fixed-wing aircraft so helicopters are used instead. Analysis of risk indicates that helicopter surveys undertaken every three years provide an acceptable balance between survey intensity and frequency (Pople 2003; Pople *et al.* 2003; Pople *et al.* 2006). Survey frequencies shorter than three years are prohibitively expensive, and longer than three years increase the risk to *kangaroo* populations.

Full details of survey techniques and data analysis protocols will be contained in a separate document provided to the Commonwealth, and available to the public via the Kangaroo Management Program web page.

For the four species currently harvested commercially - *M. rufus*, *M. giganteus*, *M. fuliginosus*, and *M. robustus robustus* - the quota will be adjusted based on the most recent population estimate and will therefore account for all *kangaroo* mortalities, including those unrelated to commercial use.

A commercial harvest quota for *M. robustus erubescens* will only be set after direct monitoring of this population in the Barrier Ranges district via helicopter survey.

Performance Indicators:

10.1 *Kangaroo* population estimates are obtained using standard survey methodology throughout the life of this plan.

There are three standard survey techniques that may be employed for direct monitoring of *kangaroo* populations.

1. Broad-scale aerial surveys using fixed-wing aircraft (fixed strip-width transect survey methodologies). This technique is used to obtain annual population estimates in the western areas of the New South Wales commercial zone.
2. Medium/small-scale surveys using a helicopter (line transect survey methodology). This technique is used primarily in areas not suitable for fixed-wing surveys, e.g. South East New South Wales, Northern Tablelands and Barrier Ranges district. Surveys will be conducted at a frequency of at least once every three years while a commercial quota is in force.
3. Small-scale surveys conducted on foot (line transect survey methodology). This technique is rarely employed in this context due to the high associated costs.



10.2 Ground surveys are conducted as required to verify the ratio of eastern grey kangaroos to western grey kangaroos in areas where both species occur.

Ground surveys utilising the line transect survey methodology are used to establish a ratio between the two species as *M. giganteus* and *M. fuliginosus* cannot be distinguished from the air. There is currently no evidence that the ratio of these species changes significantly in a short period of time, and therefore surveys are not required on a frequent basis and may not be required during the life of this plan. Harvest data will be monitored and should a significant change in the ratio be indicated, ground surveys will be initiated.

ACTION 11: Commercial kangaroo harvest quotas will be set in accordance with the provisions of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011.

The commercial quota for a species is the maximum number that can be utilised commercially in a calendar year. Quotas will be set for each commercially harvested kangaroo species for which current population estimates are available in specific Kangaroo Management Zones (KMZs) (Figure 1 illustrates New South Wales KMZs). The Commonwealth Government will be advised of the quotas prior to implementation. Any changes to the commercial KMZ boundaries will be advertised on the New South Wales Kangaroo Management Program web page and described in the quota report to the Commonwealth.

Each *occupier's licence* for the commercial use of kangaroos specifies the number of each species that can be taken. When the annual quota for a species has been reached in a KMZ, no additional *occupier's licences* will be issued allowing commercial utilisation of that species in that KMZ until the following year.

Unless undertaken as part of an approved adaptive management experiment (see Action 15), commercial quotas will be set at 15% of the population estimate for eastern grey kangaroos, western grey kangaroos and wallaroos and 17% of the population estimate for red kangaroos. Not all kangaroo species are harvested in each New South Wales Kangaroo Management Zone. It is important to note that the most recent scientific information available is considered when determining annual quotas and that analysis of this information may result in quotas being decreased in order to maintain the viability of kangaroo populations.

Based on the population dynamics of the kangaroos, quotas set at 15 to 17% are considered sustainable in the long-term. It is expected that kangaroo populations will continue to fluctuate primarily in response to seasonal conditions.

Performance Indicators:

11.1 All commercial kangaroo harvest quotas are set in accordance with the provisions of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 throughout the life of the plan.

11.2 The Commonwealth Government is advised of commercial harvest quotas for the following calendar year by 30 November.



The Quota Report will contain the following information:

- population estimates for each species in each zone and method of survey used;
- quotas calculated as proportion of population estimate as per the approved Commercial Kangaroo Harvest Management Plan (including Special Quota);
- any proposed changes to quotas;
- any new commercial zones and justification based on survey;
- charts showing trends in population/quota/take.

11.3 If Commonwealth approval is required for quotas set above the rates specified in the plan as part of an adaptive management experiment, such approval is obtained before the additional quota is implemented.

11.4 The Quota Report is made available to the public via the Kangaroo Management Program web page.

ACTION 12: Special kangaroo harvest quotas will be set in accordance with the provisions of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011.

A **special quota** for commercial KMZs will be set annually at a **maximum of five percent (5%) of the population estimate of each kangaroo species.**

The sole purpose of special quota allocations is to provide for commercial utilisation of *kangaroos* that would be shot and left in the field under the normal non-commercial licensing system. The special quota will therefore minimise the number of *kangaroos* shot under non-commercial licences. The special quota can only be considered for release when the commercial quota for a particular KMZ has been fully issued. The use of this quota will depend on **one or more** of the following:

- climatic trends and local conditions;
- exceptional circumstance declarations; and
- *kangaroo* population trends.

The decision on whether or not to make the special quota available at any particular time will be made by DEC following consultation with the Kangaroo Management Advisory Panel and consideration of these factors.

Special quota allocations and the use of the special quota will be reported to the Commonwealth in the Quota Report and Annual Report.

Performance Indicator:

12.1 Special kangaroo harvest quotas are set and utilised in accordance with the provisions of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011.



ACTION 13: *Kangaroo* populations will continually be monitored indirectly throughout the life of this plan.

Indirect data on *kangaroo* populations will be obtained continuously throughout the life of this plan from commercial *kangaroo* industry returns. Licensee returns detail the number of each species taken and data on average carcase weights, sex and location of take, depending on the type of licence.

Ongoing monitoring of licence returns by the Kangaroo Management Section will identify significant changes in the average weights of harvested *kangaroos*, which, for example, can provide an indication of population health.

Performance Indicator:

13.1 Sudden or acute changes in the average weights of harvested *kangaroos*, as ascertained from licence returns, are investigated to determine where practicable the cause of the change.

If average weights for any species (male and female separately) fall below the long-term average (at least the last ten years) by more than one standard deviation in any calendar quarter, weights will then be monitored monthly and possible contributing factors examined. If necessary, management action will be taken to ensure the sustainability of the *kangaroo* population. Actions may include reducing or suspending the commercial harvest for that species in that zone, or increasing survey intensity at next survey.



AIM 5: FACILITATE ADAPTIVE MANAGEMENT AND RESEARCH

Adaptive management experiments and studies using historical data from *kangaroo* industry returns and population data are essential to improving our understanding of *kangaroos* and their interaction with environmental, social and economic systems and thereby effectively maintaining viable populations of *kangaroos* throughout their ranges. Research into particular aspects of *kangaroo* ecology or harvest management can also assist in ensuring that the commercial harvest is sustainable in the long term. While there has been a large body of research on the ecology and management of *kangaroos*, there are information gaps which, when filled, may lead to more effective management of the commercial harvest.

ACTION 14: Historical data relating to the commercial *kangaroo* harvest in New South Wales will be analysed during the life of this plan to identify trends; this analysis will be considered in future *kangaroo* management programs.

Previous *kangaroo* management programs have obtained a wide range of information relating to the commercial harvesting of *kangaroos* in New South Wales. This information will be analysed to provide data on trends in *kangaroo* populations, utilisation rates, average weights and other specific information relating to either the commercial harvest or *kangaroo* populations generally.

The analysis of historical data relating to the commercial *kangaroo* harvest in New South Wales may be undertaken by a range of individuals or organisations including tertiary students, university professionals, consultants or DEC.

Performance Indicators:

14.1 Analysis of historical *kangaroo* harvest and management data is undertaken during the life of this plan.

Data analysis research proposals must be accompanied by a project plan that clearly identifies the goals and objectives of the proposed research and outlines performance indicators that enable an assessment of the success (or otherwise) of the research.

14.2 The results of analysis and research using historical *kangaroo* harvest and management data are published in an appropriate forum.

Consideration of research findings and the results of any analysis are essential in not only the development of future Commercial Kangaroo Harvest Management Plans, but also for facilitating the adaptive management of *kangaroo* populations, which in turn will aid in maintaining viable populations of *kangaroos* throughout their ranges. The appropriate forum will vary according to the type of research or analysis. At a minimum, the results of any research undertaken using DEC data should be provided to DEC, and ideally be made available from the Kangaroo Management Program web page.



ACTION 15: Where practicable experiments will be performed to test deliberate management interventions during the life of this plan.

Under active adaptive management, management activities are conducted as a deliberate experiment. Alternative strategies are viewed as treatments and are implemented through statistically valid experimental design; monitoring is the data-collection step of the experiment. Active adaptive management can establish cause-and-effect relationships between activities and changes in ecological conditions.

All proposals to undertake active adaptive management experiments will be reviewed by the Kangaroo Management Advisory Panel and will be critically assessed by DEC with reference to the following criteria:

- the proponents' awareness of relevant background information;
- whether the proposal considers alternative models and hypotheses;
- whether the proposal is scientifically rigorous and statistically valid;
- whether the proposal incorporates a monitoring program;
- that there is substantial evidence that the risk of permanent damage to *kangaroo* populations is low;
- that the proposal is consistent with the goal of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 and relevant New South Wales legislation; and
- that the proposal includes consideration of how management may be modified to accommodate the new knowledge gathered from the intervention.

All experiments that affect the commercial utilisation of *kangaroos* must also demonstrate how the experiment provides for reasonable business planning and investment.

Performance Indicators:

15.1 All proposals to undertake active adaptive management experiments are reviewed and assessed by DEC in accordance with the criteria outlined in this plan.

15.1 All necessary approvals are obtained prior to experiments testing deliberate management interventions commence.

In certain situations DEC will seek approval from the Commonwealth Department of the Environment and Heritage. Experiments requiring such approval may comprise a harvest rate in excess of the harvest rates set out in this plan.

15.3 All adaptive management experiments are continuously monitored and conducted according to approval conditions.

As per the criteria outlined above all active adaptive management experiment proposals must have monitoring programs incorporated. Monitoring programs must be maintained during the life of the experiment. All monitoring must be conducted in accordance with any conditions imposed with the approval.



15.4 Results of all experiments testing deliberate management interventions are published in an appropriate forum.

The appropriate forum for dissemination will vary according to the type of research and the target audience. However, it is expected that any research conducted as an active adaptive management experiment in accordance with the provisions of this plan will be made available to for the information of the Kangaroo Management Advisory Panel (KMAP - see Aim 6) and DEC for inclusion on the Kangaroo Management Program web page.

ACTION 16: DEC will facilitate research into the ecology and harvest management of *kangaroos*.

DEC will work with external research organisations to identify and investigate issues relevant to the commercial harvest of *kangaroos*. Such research may include aspects of the biology and ecology of *kangaroos* as they relate to the commercial harvest, or harvest techniques. Contributions by DEC may include funding and/or in-kind support such as the provision of harvest data. During the life of this plan, priorities for research will include the relationship between the commercial harvest and introduced and native animals.

Performance Indicator:

16.1 Issues associated with the ecology of harvested species and the management of the commercial harvest are identified and a research prospectus is prepared and distributed to universities and other research institutions during the life of this plan.



AIM 6: UNDERTAKE PROGRAM REPORTING AND REVIEW

Regular program review and concomitant reporting is essential to effectively maintain viable populations of *kangaroos* throughout their ranges as it ensures that management outcomes remain consistent with the goal and aims of the plan and that management is fully informed.

ACTION 17: An annual report on the New South Wales Kangaroo Management Plan 2007 - 2011 will be prepared and submitted to the Commonwealth.

An annual report detailing the operation of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 for the previous calendar year will be prepared and submitted to the Commonwealth. This report will provide information on the previous year's quotas and harvest rates, any use of special quota and details of surveys conducted. This report will also identify whether any adaptive management experiments were undertaken and provide details about compliance actions undertaken within the auspices of this plan. Finally, this report will audit plan aims against performance indicators so that progress towards achieving the goal of the management plan can be measured.

Performance Indicators:

17.1 An annual report on the operation of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 for the previous calendar year is submitted to the Commonwealth by end of March of the following year.

The Annual Report will include the following information:

- Actual harvest, by zone and species, compared to quota;
- Any Special Quota utilised;
- Sex bias and average weights for each species in each zone;
- Non-commercial cull statistics within the commercial harvest zone ;
- Compliance statistics:
 - number of premises inspected;
 - number of Penalty Infringement Notices issued and reason for issue;
 - number of alleged offences investigated and outcomes;
 - number of prosecutions undertaken (offence and outcome); and
 - any joint surveillance/enforcement activities completed.
- Any unusual situations that arose (e.g. flood/disease outbreak; market factors);
- Any experiments or research undertaken by DEC or sponsored by DEC

17.2 All annual reports prepared during the life of this plan are posted on Kangaroo Management Program web page.



ACTION 18: The review of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 will commence no later than twelve months prior to the expiry of this plan.

The review of the New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 will commence no later than twelve months prior to the expiry of this plan in order to assess the success of the plan in achieving its goal. The review will be conducted with the aim of improving on the current plan in the development of subsequent plans.

Performance Indicators:

18.1 The schedule of DEC Commercial Kangaroo Harvest Management Plan review activities initiated no later than 12 months prior to the expiry of this plan will include, but is not limited to:

- **strategic planning prior to a full review of the program;**
- **compilation of reports including reviews of relevant literature;**
- **public meetings / forums including the KMAP and invited scientists;**
- **public exhibition of new draft program; and**
- **KMAP review of public submissions.**

18.2 The success of the current plan in achieving its goal is assessed by measuring performance indicators.

18.3 The results of the plan review are presented to the Commonwealth and are placed on Kangaroo Management Program web page.



AIM 7: PROMOTE COMMUNITY AWARENESS AND PARTICIPATION

The public profile of *kangaroo* management in New South Wales is high, in part due to the sometimes contentious nature of the commercial harvest, and in part due to the large number of stakeholders involved in the commercial *kangaroo* industry. Consequently community awareness of and participation in *kangaroo* management is considered a key component to the success of the program, and thus the maintenance of viable populations of *kangaroos*

ACTION 19: Members of the Kangaroo Management Advisory Panel will be provided with relevant information and afforded the opportunity to advise DEC on key *kangaroo* management issues throughout the life of this plan.

The Kangaroo Management Advisory Panel (KMAP), which is convened by DEC, is the main forum through which stakeholder group representatives can raise issues for discussion, as well as communicate their group's positions and interests to Government on a regular basis. Stakeholder groups presently represented on KMAP encompass animal welfare, the *kangaroo* industry, landholder groups, Aboriginal communities, conservation organisations and government. Member organisations hold their appointed positions for three-year terms. The function of KMAP is to advise the Director-General of DEC on matters pertaining to the implementation and review of the New South Wales Commercial Kangaroo Harvest Management Plan. Relevant information is provided to members of KMAP to ensure that they have appropriate information in order to make informed decisions as part of their advisory role.

Performance Indicators:

- 19.1 KMAP is provided with monthly updates on commercial harvest and tag issue throughout the life of this plan.**
- 19.2 KMAP is provided with other relevant information as required or as necessary throughout the life of this plan.**
- 19.2 KMAP meets at least twice per year to review progress of New South Wales Commercial Kangaroo Harvest Management Plan 2007 - 2011 in relation to the goal and aims of the plan.**



ACTION 20: Relevant public documents will be made available on the Kangaroo Management Program web page.

The provision of information to members of the public promotes understanding of the New South Wales Commercial Kangaroo Harvest Management Plan and allows members of the community to form better-educated opinions regarding *kangaroo* management issues.

Performance Indicator:

20.1 Throughout the life of this plan the Kangaroo Management Program web page contains the following information as a minimum standard:

- The current and previous Commercial Kangaroo Harvest Management Plans;
- Monthly tag issue and commercial harvest statistics;
- Historical harvest statistics;
- Population survey reports;
- Current population estimates;
- Current commercial quotas;
- Ratified minutes of recent KMAP meetings;
- Contact information for the Kangaroo Management Section; and
- Current forms for commercial *kangaroo* licences.

Additional relevant information will be posted on the Kangaroo Management Program web page as available and appropriate.

ACTION 21: Publicly available information will be provided to interested parties on request.

The provision of information to members of the public promotes understanding of the New South Wales Commercial Kangaroo Harvest Management Plan and allows members of the community to form better-educated opinions regarding *kangaroo* management issues.

Performance Indicator:

21.1 Publicly available *kangaroo* management information is distributed to interested parties as soon as practicable after such a request.



ACTION 22: Where appropriate relevant DEC staff will participate in media interviews and prepare media releases.

Participation in media interviews and preparation of media releases can be an effective mechanism for communicating information regarding *kangaroo* management to a broad audience and moreover improves program transparency and accountability and therefore public confidence.

Performance Indicators:

22.1 DEC staff participate in interviews with the media where appropriate.

The Manager, Kangaroo Management Section, Director, North West Branch and other senior DEC officers participate in appropriate interviews on request from media agencies.

22.2 Media releases are prepared when appropriate for issues of interest to the community such as population surveys and the release of quota for the next calendar year.

ACTION 23: Relevant information regarding licensing arrangements will be developed as required and distributed to all licensees.

Licensees and operators will be provided with written information relevant to their licensing arrangements to assist in achieving a high level of compliance with the licensing framework.

Performance Indicators:

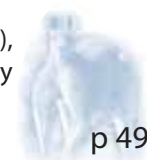
23.1 A copy of the current Handbook for *Kangaroo Trappers* is issued with every trapper's licence throughout the life of this plan to ensure that licensees are apprised of relevant licensing requirements and responsibilities.

23.1 A chiller operator's handbook is developed and published during the life of this plan and thereafter issued with every chiller registration to ensure that operators are aware of relevant licensing requirements and responsibilities.



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APPENDIX

Code of Practice for the Humane Shooting of *Kangaroos*



Code of Practice for the Humane Shooting of *Kangaroos*

The Council of Nature Conservation Ministers (CONCOM) was composed of all Commonwealth, State and Territory Ministers having responsibility for national parks and wildlife. In July 1991 the CONCOM was amalgamated with the Australian and New Zealand Environment Council to form the Australian and New Zealand Environment and Conservation Council (ANZECC).

Addresses of government nature conservation agencies are found on the last page of this code.



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PREFACE

The Council of Nature Conservation Ministers (CONCOM) is composed of all Commonwealth, State and Territory Ministers having responsibility for national parks and wildlife. CONCOM is advised by a Standing Committee consisting of the Heads of Commonwealth, State and Territory Authorities responsible for national parks and wildlife matters.

This '*Code of Practice for the Humane Shooting of Kangaroos*' has been prepared by the CONCOM Special Working Group on Cruelty Aspects of the Taking and Holding of Native Fauna. During the course of its preparation, drafts of the Code were circulated widely for public comment.

The Code sets an achievable standard of humane conduct and is the minimum required of persons shooting *kangaroos*.

Endorsed in principle by Council on 30 May 1985, the Code is intended to be implemented through education and State and Territory legislation as appropriate. This Code is based on the knowledge and technology available at the time of publication and may need to be varied in the light of new knowledge.

PREFACE TO THE SECOND EDITION

Since the code was originally published, there have been numerous comments on its value and suggestions on its improvement. In particular, the RSPCA and the National Advisory Committee on *Kangaroos* have recommended a number of changes. An ad hoc Working Group on the *Code of Practice for the Humane Shooting of Kangaroos* was formed to consider these suggestions and revise the code. The revised code was endorsed by CONCOM on 20 September 1990.

Further comments are welcome, and should be forwarded to the Wildlife Management Section, Environment Australia - Biodiversity Group, GPO Box 787, CANBERRA ACT 2601.



INTRODUCTION

This Code of Practice has been produced to ensure that all persons intending to shoot a free-living *kangaroo* are aware of the welfare aspects pertinent to that activity. In this Code the term '*kangaroo*' means all species of the family Macropodidae within the superfamily Macropodoidea and so applies to *kangaroos*, wallaroos or euros, wallabies and pademelons.

All shooting of *kangaroos*, whether on public or private land, is subject to law. The laws may differ between localities and the Government Wildlife Authority in the state or territory in which the shooting will occur can advise on the relevant provisions. Except where specifically exempted by law, states and territories will require the shooter to have a licence or permit issued by the Government Wildlife Authority and this Authority will specify any conditions or restrictions applying to that licence or permit.

When shooting a *kangaroo* the primary objective must be to achieve instantaneous loss of consciousness and rapid death without regaining consciousness. For the purposes of this Code, this is regarded as a sudden and painless death. Commonsense is required to assess the prevailing conditions. Where the conditions are such as to raise doubts about achieving a sudden and painless kill, shooting must not be attempted.

The Code is divided into three sections covering the method of shooting, despatch of injured *kangaroos* and pouch young and shooting for scientific purposes, and has three schedules specifying firearms, ammunition and points of aim. In each section an introduction provides background to the conditions which must be adhered to by all persons shooting *kangaroos*.

METHOD OF SHOOTING

The species of *kangaroos* which are shot differ in size and there is enormous variation in the terrain and prevailing weather conditions at the time of shooting. The combinations of firearms and ammunition are considered adequate to ensure a sudden and painless death for the target animal under most environmental conditions, provided that the shooting is done in accordance with the other conditions set out in this Code. However, it is the shooter's responsibility to ensure a sudden and painless death for target animals, and under unusual conditions firearms and ammunition that exceed the minimum requirements may have to be used.

With a centrefire rifle a sudden and painless death is consistently achieved by the projectile striking the brain of the target animal. Thus the brain is the required point of aim for this class of weapon. Centrefire rifles are specified for all *kangaroo* shooting except where the smaller wallabies are to be shot in or adjacent to forest or scrub. Such shooting is often carried out in daylight; the animals are flushed at close quarters and are unlikely to be stationary. In these cases the licence or permit issued by the Government Wildlife Authority may authorise the use of shotguns. At ranges up to the maximum specified in Schedule 1, a shotgun will cause a sudden and painless death if the pattern is centred on the head, neck or chest of the target animal. The shooter must be able to place a clear shot into one of these target areas whether the animal is moving or stationary.

Firearms

Conditions

- (i) The minimum specifications for firearms and ammunition are set out in Schedule 1. *Kangaroos* shall only be shot with a combination of firearms and ammunition that complies with or exceeds those minimum specifications.
- (ii) In the environmental conditions in which the shooter operates the combination of firearm and ammunition selected must ensure the sudden and painless death of each target animal. Evidence of compliance with the minimum specifications in Schedule 1 is no defence in administrative and/or legal proceedings concerning a breach of this Code if the combination used by the shooter has not achieved a consistently sudden and painless kill.
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- (iii) *Kangaroos* must be shot using a centrefire rifle unless use of a shotgun is specifically allowed by the licensing authority.
 - (iv) A rifle must be sighted in against an inanimate target before commencing each day's shooting.

Shooting platform

Conditions

- (i) *Kangaroos* must not be shot from a moving vehicle or other moving platform.

Target animal

Conditions

- (i) The target *kangaroo* must be clearly visible.
- (ii) When a rifle is used the target *kangaroo* must be stationary and within a range that permits accurate placement of the shot.
- (iii) When a shotgun is used the target *kangaroo* must be within the range specified in Schedule 1 and in a position where a clear shot can be fired at the head, neck or chest.

Point of aim

Conditions

- (i) A shooter using a rifle must aim so as to hit the target *kangaroo* in the brain (see diagram in Schedule 2), except in the case of an injured or wounded animal where a brain shot may be impractical.
- (ii) A shooter using a shotgun must aim so that, whether the target *kangaroo* is stationary or mobile, it will be hit in the head, neck or chest by the centre of the pattern.

INJURED KANGAROOS AND POUCH YOUNG

No matter how carefully the shooter aims, some *kangaroos* will not be killed outright. Wounded *kangaroos* must be dispatched as quickly and humanely as possible.

When killing a wounded animal a brain shot may be impractical. For example, the accurate placement of a shot in the brain may require capture and restraint of the animal; this would increase suffering and be inconsistent with the objective of sudden and painless death. In such circumstances a heart shot may be the most humane means of dispatch. In some special circumstances, where a wounded *kangaroo* is encountered, it may not be practicable to shoot the animal, as at a practical range the acceptable points of aim may be obscured, and at a close range the use of a high powered rifle may be unsafe. In these special circumstances a heavy blow to the skull to destroy the brain may be the most appropriate and humane means of dispatch.

Kangaroo shooters often shoot more than one *kangaroo* out of a group before driving to the carcasses to retrieve them. This is acceptable provided that where an individual *kangaroo* is wounded no further *kangaroos* are shot until all reasonable efforts have been made to dispatch the wounded animal.

Shot females must be examined for pouch young and if one is present it must also be killed. Decapitation with a sharp instrument in very small hairless young or a properly executed heavy blow to destroy the brain in larger young are effective means of causing sudden and painless death.

Larger young can also be dispatched humanely by a shot to the brain, where this can be delivered accurately and in safety.



Conditions

- (i) The shooter must be certain that each animal is shot dead before another is targeted.
- (ii) If a *kangaroo* is thought to be alive after being shot, every reasonable effort shall be made immediately to locate and kill it before any attempt is made to shoot another animal.
- (iii) When located, wounded animals must be killed by a method that will achieve a rapid and humane death, where practical by a shot to the brain.
- (iv) Under circumstances where a shot to the brain of an injured animal is impractical or unsafe, a shot to the heart is permissible (see Schedule 3).
- (v) In circumstances where, for dispatch of a wounded *kangaroo*, a shot to either the brain or heart is impractical or unsafe, a very heavy blow to the rear of the skull to destroy the brain (see Schedule 2) is permissible. To ensure a humane kill, a suitably hard and heavy blunt instrument must be used (e.g. metal pipe, billet of wood etc. carried for this purpose).
- (vi) If a female has been killed, the pouch must be searched for young as soon as the shooter reaches the carcass.
- (vii) The pouch young of a killed female must also be killed immediately, by decapitation or a heavy blow to the skull to destroy the brain, or shooting.

SHOOTING FOR SCIENTIFIC PURPOSES

Permits to shoot *kangaroos* for scientific purposes are sometimes requested. Because of the circumstances and locations in which such shooting may take place, and because of specific research requirements (e.g. to obtain anatomical items such as intact skulls for diagnostic examination and museum reference collections), it may be necessary to allow exemptions from the general conditions such as point of aim and shooting platform.

Such variations must never detract from the primary responsibility of the shooter to provide a sudden and painless death for the target animals.

Conditions

- (i) The provisions of this Code shall apply to the shooting of *kangaroos* for scientific purposes except where express provision to the contrary is included in the permit/licence under which the animals are shot.
- (ii) The licensing authority should only issue such a permit/licence if it is satisfied that;
 - (a) the Animal Care and Ethics Committee (or equivalent) at the relevant institution has examined and approved the proposal; and
 - (b) the method of shooting will result in sudden and painless deaths for the animals authorised to be killed.
- (iii) The waiving of any requirements of this code shall not relieve the shooter of the absolute requirement to provide a sudden and painless death for the target *kangaroos*.



SCHEDULE 1: Minimum Specifications for Firearms and Ammunition

(Note: Ammunition must be loaded to at least the specifications shown to ensure a sudden and painless death for the target animals)

Prescribed firearm and firearm/ammunition combinations

Group 1

Red Kangaroo
(*Macropus rufus*),
Eastern grey kangaroo
(*M. Giganteus*),
Western grey kangaroo
(*M. fuliginosus*),
Euro or wallaroo
(*M. robustus*)
Agile wallaby (*M. agilis*),
Whiptail wallaby (*M. parryi*)

A centre rifle, fitted with a telescopic sight. Nominal bore size 0.569cm (0.224") and centrefire case capacity of at least .222 Remington.

Ammunition shall have an expanding projectile (soft or hollow point) of not less than 324 mg (50 grains) and provide a minimum muzzle energy of 1542 joules (1137 foot-pounds).

[.222 Remington with 50 grain projectile must be loaded to achieve a muzzle velocity of 975 m/sec (3200 ft/sec) to achieve this muzzle energy.

Group 2

All members of the family
Macropidae other than those
listed in Group 1.

a) A centrefire rifle fitted with a telescopic sight. Calibre and ammunition sufficient to achieve at least a minimum muzzle energy of 975 joules (720 foot-pounds) { e.g. .22 Hornet; 45 grain projectile and loaded to achieve muzzle velocity (m.v.) of at least 2690 ft/sec, or .17 Remington; 25 grain projectile loaded to achieve m.v. of at least 3610 ft/sec }.

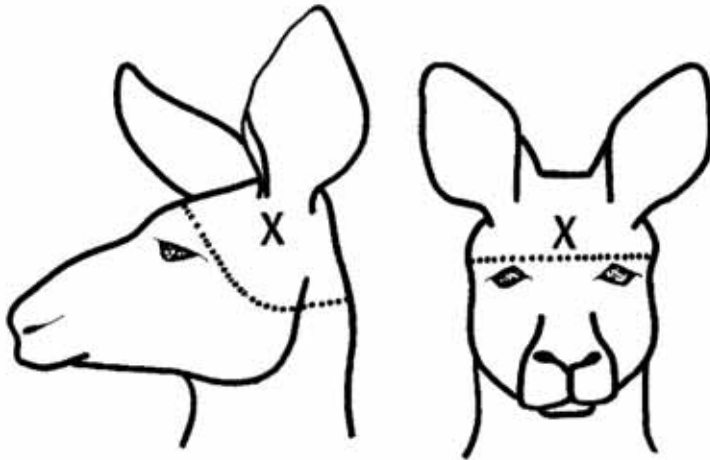
or

b) Shotguns of 12 gauge or larger using No. 2, 1, BB or larger shot. Maximum range for shotguns of 30 metres.

Shotguns cartridges must be loaded to provide a dense and random pattern (e.g. 12 gauge cartridge requires a shot load no less than 36g = 1.25 oz = 63 BB shot pellets).



SCHEDULE 2: Point of Aim (X) for a Shot to the Brain and Location of the Brain. (All kangaroos)



Note: A shot to the side of the head is preferred as it is a larger target area.

SCHEDULE 3: Point of Aim (+) for a Shot to the Heart. (Applicable only as described for injured kangaroos and specified shotguns)



