Red Kangaroo (*Macropus rufus*) Management Plan for Western Australia 2003-2007

For submission under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

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Index

Background Information

Preamble

The Red Kangaroo Management Plan for Western Australia 2003-2007 is a management strategy for the red kangaroo (*Macropus rufus*) in Western Australia. A management plan for red kangaroos has been in place in Western Australia since 1973 [see Shugg and Prince (1973), Crook and Prince (1984), McNamara and Prince (1986), and the 1987, 1988, 1989, 1990, 1991,1992-1994, 1995-1997 and the 1998-2002 Management Programs for the Red Kangaroo in Western Australia (unpublished)].

There are many stakeholders in the management and conservation of macropod species within Western Australia. The Government of Western Australia makes significant contributions to both the conservation and management of macropods through the maintenance of protected areas and targeted conservation management projects. The commercial kangaroo industry and the general community are also stakeholders in kangaroo management. Every member of the community has the potential to benefit from the effective conservation and management of macropod species in Western Australia.

Aboriginal people have a unique social and cultural interest in kangaroos. This document works within the boundaries of the *Native Title Act 1983* and section 23C(1) of the Western Australian *Wildlife Conservation Act 1950*.

This management plan and the management strategies described in it are designed to integrate with the natural resource management (NRM) strategies of the Western Australian government.

Species Covered in this Plan

The Red kangaroo is one of 50 species of macropod found in Australia, 23 of which were present in Western Australia at the time of European settlement. Subsequent changes to the natural landscape of Western Australia, such as agricultural, pastoral and urban development, have markedly changed the abundance and distribution of some macropod species. In 2002 only 19 of those 23 macropod species in Western Australia remain extant, and two of those are now restricted to offshore islands. Six species of macropod are currently considered 'rare or likely to become extinct' (i.e. threatened) under section 14(2)(ba) of the Western Australian *Wildlife Conservation Act 1950*, and a further four species are listed as 'presumed extinct' (see Table 1).

The red kangaroo is considered common and abundant in Western Australia and is not listed as threatened under State or Commonwealth legislation.

Table 1: Macropod species of Western Australia (Superfamily Macropodoidea), and their conservation status in Western Australia and Australia. The species covered by this management plan are shown in bold type.

Species	**Conservation Status**	
	Western Australia*	**Australia****
Family Macropodidae		
Red Kangaroo *Macropus rufus*	**Common**	**Common**
Western Grey Kangaroo *Macropus fuliginosus*	Common	Common
Euro *Macropus robustus*	Common	Common
Antilopine Kangaroo *Macropus antilopinus*	Common	Common
Western Brush Wallaby *Macropus irma*	Common	Common
Tammar Wallaby *Macropus eugenii*	Common	Common
Black-flanked Rock-wallaby *Petrogale lateralis*	Threatened	Vulnerable
Short-eared Rock-wallaby *Petrogale brachyotis*	Common	Common
Rothschild's Rock-wallaby *Petrogale rothschildi*	Common	Common
Monjon *Petrogale burbidgei*	Common	Common
Nabarlek *Peradorcas concinna*	Common	Common
Quokka *Setonix brachyurus*	Threatened	Common
Northern Nailtail Wallaby *Onychogalea unguifera*	Common	Common
Crescent Nailtail Wallaby *Onychogalea lunata*	Extinct	Extinct
Central Hare-wallaby *Lagorchestes asomatus*	Extinct	Extinct
Spectacled Hare-wallaby *Lagorchestes conspicillatus*	Common	Common
Rufous Hare-wallaby *Lagorchestes hirsutus*	Threatened	Vulnerable
Banded Hare-wallaby *Lagostrophus fasciatus*	Threatened	Vulnerable
Family Potoroidae		
Brush-tail Bettong *Bettongia penicillata*	Common	Common
Burrowing Bettong *Bettongia lesueur*	Threatened	Vulnerable
Nullarbor Dwarf Bettong *Bettongia pusilla*	Extinct	Extinct
Gilbert's Potoroo *Potorous gilbertii*	Threatened	Endangered
Broad-faced Potoroo *Potorous platyops*	Extinct	Extinct

*Conservation status as per Schedule 1 of the Western Australian *Wildlife Conservation (Specially Protected Fauna) Notice 2002*.

**Conservation status as per the *EPBC Act 1999*.

Species Disadvantaged by European Settlement

European settlement has had a greater negative impact on the smaller macropods than the larger kangaroo species. Macropod species that have gone extinct or declined in number since European settlement tend to fall below a mean adult body weight of 5.5kg (Critical Weight Range, CWR; Burbidge and McKenzie, 1989), namely the smaller wallabies, hare-wallabies and bettongs. Many species have severely declined in range or number since European settlement, persisting only as small populations in remnant patches of native habitat, or in island populations. The Banded-Hare and Rufous Hare-Wallabies are extinct on the mainland in Western Australia, but common on a small number of islands that have not been subject to landscape modifications or the introduction of predators. Until recently the Burrowing Bettong was also extinct on the mainland but has recently been reintroduced.

No single cause for the decline of small macropods has been identified (Johnson *et al*., 1989; Morton 1990). Instead a combination of factors has been suggested, including habitat modification and loss, changes in fire regimes, and grazing by introduced herbivores. Predation by feral foxes and cats has been implicated as a major cause of local extinctions following habitat fragmentation.

Species Advantaged by European Settlement

The larger-bodied kangaroo species have generally been advantaged by European settlement, and these species are secure and widespread across Western Australia. Kangaroo population estimates in Western Australia in 2002 were 1,687,000 for Red Kangaroos and 642,000 for Western Grey Kangaroos. A reduction in predation following the construction of a dingo-proof fence around the sheep rangelands, and the provision of additional water sources and pasture are the most likely reasons for population increase (see discussion in Pople and Grigg, 1999).

Some kangaroo species have also recorded increases to their distribution. The Western Grey Kangaroo is confined to the southerly parts of Western Australia and has not extended its range since European settlement, while the Red kangaroo occupies most of the arid and semi-arid rangelands of Western Australia but is absent from the un-watered desert regions (see Figs. 1.7 and 1.10 in Caughley *et al*., 1984).

Legislation and Scope of this Plan

The Red Kangaroo Management Plan for Western Australia 2003-2007 has been developed to satisfy the requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (the *EPBC Act*).

This management plan is restricted in its application to the conservation and management of the Red kangaroo (*Macropus rufus*).

Considered within this management plan is the commercial utilization of the red kangaroo. The export of commercial red kangaroo products from Australia requires Commonwealth government approval under the *EPBC Act*. Annual commercial red kangaroo harvest quotas for Western Australia must also be approved by the Commonwealth Minister for the Environment and Heritage.

Red kangaroos and all native fauna in Western Australia are protected under the *Wildlife Conservation Act 1950*. Harvesting of a protected species in Western Australia requires a licence under Regulation 6 of the *Wildlife Conservation Regulations 1970*. The taking of red kangaroos in Western Australia is regulated via licence and tag procedures detailed in Regulations under this Act. This legislative framework applies to the entire State of Western Australia.

Pursuant to Section 35 of the *Agriculture and Related Resources Protection Act 1976*, the Red kangaroo is declared by the Agriculture Protection Board as a "Category A7" declared animal in the whole of Western Australia. Category A7 declaration applies in respect of an area if the animals are native to that area and are animals for which a management program should, in the opinion of the Board, be approved and implemented in relation to that area.

The non-commercial destruction of red kangaroos is not considered within this management plan. This management plan covers commercial harvest management actions and is submitted as an *Approved Wildlife Trade Management Plan* under the *EPBC Act.*

This management plan is valid for a five-year period, from 1 January 2003 to 31 December 2007.

Goals and Aims

Goals of this Management Plan

This management plan has three goals:

- to maintain populations of Red Kangaroos over their natural range in Western Australia in an ecologically sustainable manner;
- to contain the deleterious effects of Red Kangaroos on other land management values; and
- where possible, to manage kangaroo species as a renewable natural resource providing the conservation of the species is not compromised.

For the purpose of this management plan, the use of the term ecological sustainability encompasses the following principles as they relate to red kangaroo conservation and management:

- Protect biological diversity and maintain viable populations of red kangaroo across its natural range;
- Apply a precautionary approach to management, to ensure that management actions conducted within this management plan minimize the risk of unwanted or unintended outcomes to red kangaroos, their habitat and ecosystems (the precautionary principle);
- Provide for inter-generational equity by ensuring that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

- Ensure that decision-making processes relating to red kangaroos effectively integrate both long-term and short-term economic, environmental, social and equitable considerations; and
- Ensure that conservation and management programs for red kangaroos acknowledge and accommodate the interests of Aboriginal stakeholders where appropriate.

Measures of Performance

This management plan has four aims that set strategic directions for the management of commercial red kangaroo harvest in Western Australia. Under each aim are one or more objectives that detail operational directions for red kangaroo management.

Progress towards each objective will be measured by the completion of key actions and clearly defined performance targets and measurable indicators.

Objectives will be audited against performance measures annually, with a major assessment and review at the end of the five-year term of the management plan. Mechanism will be developed to ensure that performance measures are linked to future management strategies, by incorporating that learnt from previous successes and failures.

AIMS OF THE MANAGEMENT PLAN

The aims of this management plan for red kangaroos are:

1. **Ensure conservation of red kangaroos through monitoring and promotion of research.**

   Monitor red kangaroo populations using appropriate survey techniques, support research targeted to key areas identified for red kangaroos, and promote the regional conservation of red kangaroo populations across their natural range.

2. **Manage red kangaroo populations as a sustainable commercial harvest.**

   Manage commercial harvest of red kangaroo species through a best practice quota setting system, effective licence and tag procedures, and monitoring and maximizing compliance with relevant legislation. Improve understanding of the impacts of commercial harvest on red kangaroos, their habitat and ecosystems.

3. **Adhere to best practice animal welfare standards in conservation and management programs for red kangaroos.**

   Adhere to animal welfare standards by maximizing compliance with the Commonwealth *Code of Practice for the Humane Shooting of Kangaroos* and the Western Australian *Animal Welfare Act 2002.*

4. **Ensure effective communication and education of *kangaroo* conservation and management programs throughout the community.**

   Promote the Western Australian Red Kangaroo Management Plan through public education and consultation. Support and administer a kangaroo management advisory committee to guide the development of the commercial red kangaroo industry in Western Australia, and investigate an equitable and efficient distribution of costs within the commercial red kangaroo industry. Promote legislation and policy relevant to red kangaroo management in Western Australia.

Aim 1. Conservation

Ensure conservation of red kangaroos through monitoring and promotion of research

Conservation of red kangaroo populations within Western Australia is the key aim of this management plan. All management actions conducted within this management plan must not be detrimental to the long-term conservation and population viability of red kangaroos across their natural range.

1.1 MONITORING

Objective: **Monitor regional red kangaroo populations using an appropriate survey technique.**

Adequate monitoring of a population is essential to ensure its proper management. The Commonwealth and the Department of Conservation and Land Management (DCLM) has conducted standard aerial surveys of Western Australian kangaroo populations since 1981 (see Grigg *et al.,* 1999 for details of methodology), providing a high quality monitoring dataset on which to base management decisions. In addition, regular monitoring provides direct information on population trends of red kangaroo populations in Western Australia.

Monitoring is conducted in three Kangaroo Management Regions (Figure 1).

The following three techniques may be used for monitoring red kangaroo populations:

1. Broad-scale aerial survey using fixed wing aircraft and fixed strip-width transect survey methodology;
2. Medium-scale aerial survey using fixed wing aircraft and fixed strip-width transect survey methodology; and
3. Small-scale (intensive) ground surveys on foot using line transect survey methodology.

Between 1981 and 1993, large-scale aerial surveys of the density and distribution of red kangaroo populations in Western Australia were undertaken on a triennial basis. Following advice from the former Australian Nature Conservation Agency that it was withdrawing its assistance to Western Australia for kangaroo surveys after 1993,

DCLM replaced the triennial surveys over the entire pastoral zone with an annual survey system, covering approximately one-third of the previous total survey area each year. The total survey area has been divided into three regions (Figure 1), each with an area of over 300,000km^2. These survey zones are also the population monitoring and harvest regions. Population estimates are derived from these surveys using the nationally accepted standardized correction factors for temperature and vegetation density (see Figs 1a-c).

Figure 1a: Red Kangaroo Population estimates for the Southern Zone of WA (Standard Caughley Correction Factors, with temperature correction).

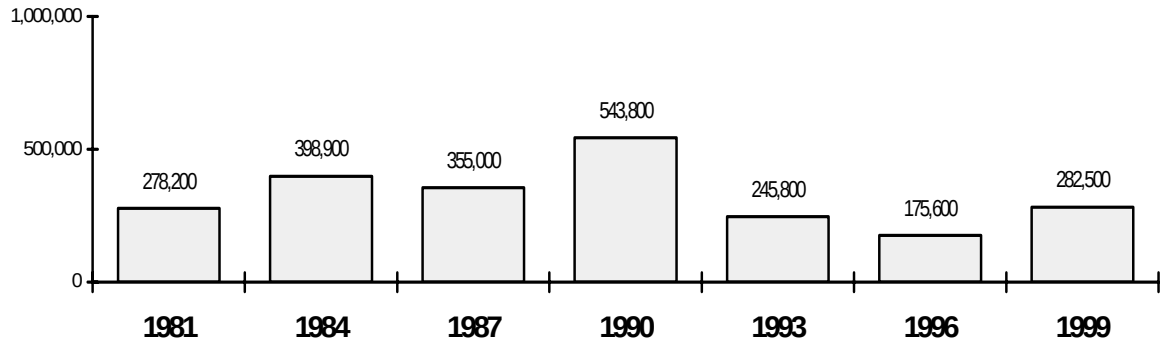


Figure 1b: Red Kangaroo Population estimates for the Central Zone of WA (Standard Caughley Correction Factors, with temperature correction).

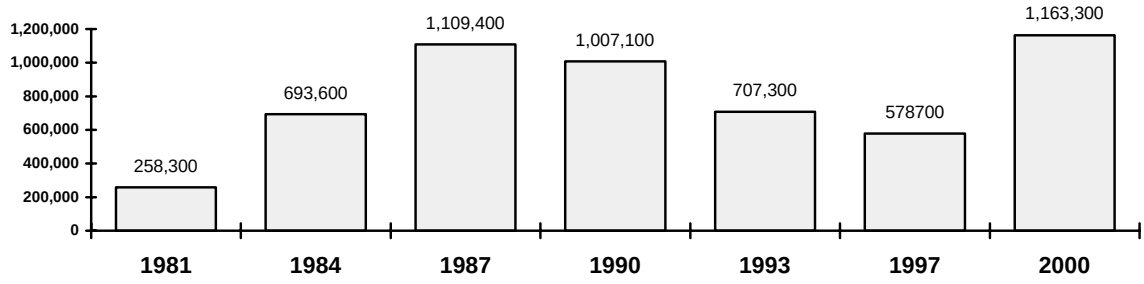
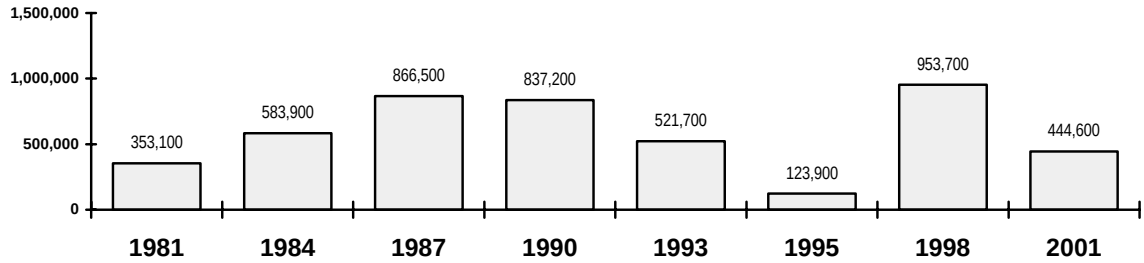


Figure 1c: Red Kangaroo Population estimates for the Northern Zone of WA (Standard Caughley Correction Factors, with temperature correction).



Population estimates are prepared for the survey zones on an annual basis, taking into account the direct survey results in each zone and adjacent areas, as well as rainfall patterns for the preceding years, long-range rainfall forecasts for the coming year and other monitoring results. The available information is also analyzed to provide an indication of likely forward trends across harvest areas, for assistance in commercial quota setting.

From 2003, the DCLM will continue the triennial system of full surveys over the survey zones and will also undertake additional surveys over a series of three one-degree latitude by one-degree longitude monitor blocks (around a total of 32,000km^2 in area) in each of the regions not fully surveyed that year. The same series of three monitor blocks will be flown every year to give an annual update on trends in populations. The monitor blocks are listed in Table 2, below. Survey results for these areas will be used to confirm population trend information indicated by rainfall records. In any case where there is a divergence between rainfall trends and the aerial survey monitoring indications the most conservative population estimate will be used for quota calculations.

Table 2: Monitor blocks for aerial surveys in Western Australia.

Northern Region	Central Region	Southern Region
23^0 to 24^0 S x 116^0 to 117^0 E	27^0 to 28^0 S x 116^0 to 117^0 E	31^0 to 32^0 S x 122^0 to 123^0 E
24^0 to 25^0 S x 115^0 to 116^0 E	27^0 to 28^0 S x 117^0 to 118^0 E	31^0 to 32^0 S x 123^0 to 124^0 E
24^0 to 25^0 S x 116^0 to 117^0 E	28^0 to 29^0 S x 116^0 to 117^0 E	31^0 to 32^0 S x 124^0 to 125^0 E

Ground surveys are used primarily for areas that are not suitable for aerial survey. Areas that are not subject to commercial harvest, but on which red kangaroos are managed actively or particular issues arise (e.g. National Parks), are currently monitored on an annual or as needs basis using small-scale ground surveys on foot.

Reviews of survey methodology, such as the revision of species correction factors and the frequency of monitoring events, may be conducted in the future. Full details of survey techniques and monitoring results will be reported in the quota proposal document submitted annually to the Commonwealth Minister for the Environment and Heritage. Monitoring results will also be released to stakeholders and the general public.

Key Actions:

- Monitor one survey zone subject to sustained commercial harvest in full and a standard series of three one-degree by one-degree blocks in the other two survey zones annually; and
- Review survey techniques regularly, and update practices where necessary.

Performance Measures:

- Regional red kangaroo populations described and quantified in a manner that allows for informed management decisions to be made on an annual basis. Measured via:

  Number of Kangaroo Management Regions monitored and reported in quota proposal.

  Precision of population estimates for each Kangaroo Management Region.

1.2 RESEARCH

Objective: Support research into key areas specified for red kangaroos.

Along with regular monitoring, the promotion and completion of strategic research is an integral component of successful wildlife management. Research improves scientific knowledge of a species and its interaction with its environment, and can allow for the experimental testing of management strategies. Results of research can be used to guide and prioritise future management decisions and actions.

DCLM will base involvement in red kangaroo research on a number of key research areas, which are currently considered most important and relevant to red kangaroo conservation and management in Western Australia.

Research projects are currently focused within one of the following key areas:

1. Population dynamics, distribution and abundance of red kangaroos in Western Australia; and
2. The relationship between red kangaroo abundance and that of introduced herbivore (domestic and feral) across the rangelands in Western Australia.

Specific projects that may be promoted for research in the future include revision of red kangaroo correction factors and aerial survey methodology for Western Australia, and an assessment of remote sensing or a combination of remote sensing and aerial survey methodology as tools for quota setting. Future research may be promoted as part of an adaptive management experiment (see text box on page 18). DCLM may also support or promote future research in other relevant areas (e.g. animal welfare).

The DCLM will endeavour to maintain a current understanding of kangaroo research being conducted in government departments, industry and universities within Western Australia. Worldwide trends in wildlife management will also be assessed. Literature surveys of kangaroo and wildlife management research will be completed regularly, with key findings and results disseminated to staff as appropriate and included within current practices when necessary.

Key Actions:

- Conduct periodic literature reviews of current research;
- Maintain regular contact with university and industry partners conducting research on red kangaroos; and
- Incorporate research findings into current techniques where appropriate.

Performance Measures:

- Networks established and maintained with university and industry research partners allowing the DCLM to maintain a current understanding of red kangaroo research developments and issues. Measured via:

  Number of active red kangaroo research projects with DCLM endorsement or involvement;
  Number of industry and university research partners; and

- Attendance and involvement of DCLM staff at scientific conferences and workshops relevant to red kangaroos.

1.3 REGIONAL CONSERVATION

Objective: **Facilitate the conservation of red kangaroos across their natural range**.

In Western Australia large areas of land have been reserved as national parks and nature reserves for the purpose of conserving native fauna and flora and natural ecosystems. The area of land reserved for national parks and conservation parks at 30 June 2002 was 5,799,416 hectares and 10,825,039 hectares were reserved for the conservation of flora and fauna as nature reserves, giving a total area reserved for conservation of 16,624,455 hectares or 6.5% of Western Australia. The identification and acquisition of parks and reserves is an ongoing process and updates of the areas of land reserved are published in DCLM's annual reports (see http://www.naturebase.net/about_calm.html).

Parks and reserves contribute directly to the conservation of red kangaroos throughout their natural range. Considering only those parks and reserves larger than 10,000 hectares in area, as at June 2002 there were more than 20 such conservation areas, totalling in excess of 10 million hectares, which are inhabited by red kangaroos. Within these areas commercial harvesting of red kangaroos is not permitted.

Over the period 1999 to 2002, considerable areas of the rangelands were purchased to add to the conservation reserve system. Under the State Government's "Gascoyne Murchison Strategy" and with considerable financial assistance from the Commonwealth's Natural Heritage Trust, over 3 million hectares of pastoral lease has been purchased for this purpose. Progressively, these areas will be incorporated into the formal conservation reserve system. In the interim, they will be managed for biodiversity conservation.

The conservation of red kangaroos in Western Australia is maximized by focusing efforts at the regional level of red kangaroo populations. By focusing at the regional level the wide diversity of natural landscapes within Western Australia are incorporated into the conservation of red kangaroos. In addition, community involvement in red kangaroo conservation will be maximised by focusing communities and interest groups on their own region. A regional conservation approach is also consistent with the regional approach applied to the management of the commercial red kangaroo harvest.

Regular population monitoring includes monitoring of red kangaroo populations in parts of the State outside of the commercially harvested region (e.g. National Parks and other lands vested in the Conservation Commission of Western Australia and lands under Aboriginal management). These surveys will provide a more complete picture of red kangaroo density and distribution in Western Australia, and ensure that the regional conservation of red kangaroos covers regions with both high and low densities of kangaroos.

Key Actions:

- Map public and privately owned nature reserves, including the extent of suitable red kangaroo habitat; and
- Ensure population monitoring includes survey of red kangaroos outside the current commercially harvested zone.

Performance Measures:

- Regional conservation of red kangaroos is facilitated by determining the extent and distribution of available habitat for red kangaroos. Measured via:

  Number of regions supporting red kangaroos; and

  Density of red kangaroos in each region.

Aim 2. Ecologically Sustainable Commercial Harvest

Manage kangaroo populations as a sustainable commercial harvest

Commercial harvest allows for a specified number of red kangaroos to be taken on an annual basis for commercial utilisation. Commercial quotas are set annually by the DCLM to be approved by the Commonwealth Minister for the Environment and Heritage, and specify the maximum number of red kangaroos that can be harvested for commercial utilisation in a calendar year.

The commercial harvest of red kangaroos in Western Australia is managed by the DCLM at the regional level, through the release of regional quota allocations and a system of licensed field kangaroo shooters operating on one or more individual properties.

Commercial harvest quotas are set at a regional level, using the Kangaroo Management Regions (see Table 2 and Figure 2) and the involvement of the Kangaroo Management Advisory Committee (see Appendix 1). Only selected parts of the State are available for commercial harvest.

Table 2: Western Australian Red kangaroo Management Regions (*Management areas not subject to standard aerial survey).

Region	Northern Region Management Areas	Central Region Management Areas	Southern Region Management Areas
Management Areas Included In the Region	Pilbara	Murchison	Leonora-Eastern Goldfields
	Ashburton West	North-East Pastoral	Coolgardie
	Aqshburton East	Gascoyne (east)	Dundas
	Carnarvon	Magnet	Nullarbor
	Gascoyne (west)	Northern Agricultural	North Eastern* Agricultural
		Bay Pastoral	South Eastern Agricultural
		Sandstone	Central Agricultural*
		Yilgarn	South Western*
		Western Coastal	South Coastal*

Commercial harvest allows for landholders to manage red kangaroos as a component of total grazing pressure, and for red kangaroos to be promoted and used as a resource (see text box on page 19). Within the life of this plan, the DCLM will promote and/or support further research investigating the red kangaroo component of total grazing pressure, and the impact of red kangaroo density on rangeland biodiversity and condition.

2.1 QUOTA SETTING

Objective: **Determine the number of red kangaroos to be taken for commercial harvest through a best practice quota setting system that takes account of regional priorities and the conservation status of red kangaroos.**

The total number of red kangaroos that can be taken for commercial harvest within Western Australia in a calendar year is the *commercial red kangaroo harvest quota.* A quota proposal document is submitted annually to the Commonwealth Minister for the Environment and Heritage for approval under this management plan.

A best practice quota setting system is used to set variable harvest quotas, based on a percentage of direct estimates of population size. The quota setting system utilises the most recent red kangaroo density estimates, and accounts for the size and suitability of regions to red kangaroos. Commercial harvest quotas have previously been allocated on a State wide basis but will be allocated to Kangaroo Management Regions under this management plan. Management areas may be aggregated into larger management regions for the purpose of quota setting and distribution, and to provide sufficient flexibility to adjust the distribution of quota should there be evidence of broad-scale changes to red kangaroo density or distribution. Use of management regions and proposed distribution of quota will be detailed in the annual quota proposal document submitted to the Commonwealth Minister for the Environment and Heritage.

In general terms the commercial harvest quota for each region (sub-quota) is determined using information on:

(a) current population trends;

(b) seasonal conditions;

(c) review of previous annual harvests, as documented by Prince (1984a) and shown for the period since 1970 in Table 3;

(d) the proportion of the red kangaroo habitat and population not subject to harvesting;

(e) current land use practice and trends in land use;

(f) red kangaroo population objectives; and,

(g) significance of the take outside the commercial quota.

Table 3: Commercial harvest and quota details for Red Kangaroos in Western Australia, 1970-2001 (harvest figures rounded to the nearest 1,000).

Year	Quota	Harvest
1970	-	275,000
1971	225,000	173,000
1972	260,000	197,000
1973	200,000	119,000
1974	150,000	128,000
1975	142,250	110,000
1976	167,190	145,000
1977	168,000	151,000
1978	152,000	130,000
1979	180,000	151,000
1980	180,000	100,000
1981	160,000	135,000
1982	160,000	138,000
1983	140,000	162,000
1984	140,000	138,000
1985	160,000	162,000
1986	180,000	154,000
1987	200,000	150,000
1988	230,000	217,000
1989	290,000	185,000
1990	290,000	224,000
1991	290,000	187,000
1992	350,000	108,000
1993	350,000	140,000
1994	220,000	152,000
1995	220,000	105,000
1996	160,000	126,000
1997	180,000	116,000
1998	180,000	110,000
1999	350,000	144,000
2000	350,000	124,000
2001	250,000	150,000

Source: McNamara and Prince (1986) and Departmental records. Note that while quotas were first set at the Commonwealth level in 1975, a system of quotas for Red Kangaroos had been implemented in Western Australia in 1971.

Commercial Harvest Quota

Commercial harvest quota is allocated to allow for a long-term sustainable harvest of red kangaroos from each region. A standard harvest quota approach tracking populations will be employed, with variations possible in response to rapid population growth or population decline. Quotas will be set at the regional (aerial survey zone) level as a proportion of the aerial survey population estimate. Quotas will normally be set at 15% of the population estimate, but may be increased in the year following a full aerial survey where the population is demonstrated to be rapidly growing. Quotas may be decreased below 15% when populations are indicated to be falling in regions where populations are not at historically high levels. These harvest levels are within the range that is considered sustainable for red kangaroo populations harvested at a constant rate (Caughley, 1987), and populations harvested at these levels are expected to fluctuate primarily in response to seasonal conditions such as rainfall and pasture availability.

Threshold Densities

Threshold densities represent a range of kangaroo density within which kangaroo populations will be sustainable and over which there will be relatively low impact of kangaroos on land condition. Threshold densities specify an upper and lower threshold for regional red kangaroo populations. In some Kangaroo Management Regions harvest strategies may be linked to identified upper and lower densities for regional red kangaroo populations (see threshold harvesting strategy below).

Threshold densities must be sustainable at the level of regional red kangaroo populations, and take account of habitat types and suitability, long-term red kangaroo monitoring data, precision of population estimates, and the potential impacts of different harvest strategies.

Management Actions to Regulate Quota Setting

One of two harvest strategies will be employed in each Kangaroo Management Region:

1. Constant proportional harvest will set harvest quotas at a standard percentage of estimated populations each year. These levels are currently set at a maximum of 20% of estimated Red Kangaroo populations, and 15% of estimated Western Grey Kangaroos and Euros.
2. Threshold harvest will set higher harvest quotas above an identified threshold, and no harvest quotas below. Harvest quotas requested for threshold harvest must be sustainable for red kangaroo populations, and be approved by the Commonwealth Minister for the Environment and Heritage in the annual quota proposal document.

In addition to one of the two harvest strategies identified above, the following management action will be completed for all regions that commercially harvest *kangaroos*:

3. Harvest returns will be analysed regularly to check for the presence of sudden or severe shifts in the sex bias of commercial harvest, or the regional or State wide harvest rate. Where these shifts are detected, further population monitoring may be conducted, and/or commercial harvest in a region or zone may be restricted,

and/or a region may be closed to commercial harvest. This management action serves as a safeguard during adverse environmental conditions such as drought, to ensure that commercial harvest does not negatively impact on the sex or size structure of red kangaroo populations to their long-term detriment.

Quota setting mechanisms for each Kangaroo Management Region, including quota percentages and threshold densities, will be clearly stated in the annual quota proposal document submitted to the Commonwealth Minister for the Environment and Heritage.

Key Actions:

- Use quota setting system to set annual quota and submit to the Commonwealth Minister for the Environment and Heritage for approval, detailing number of red kangaroos taken through commercial harvest and other methods (non-commercial destruction) as well as average carcass weight and harvest sex ratios; and
- Review and refine quota setting procedures and threshold densities as required.

Performance Measures:

- No change to State wide conservation status of red kangaroos due to commercial red kangaroo harvest; and
- Regional red kangaroo populations maintained above or within regional threshold densities (where they are used) as a result of commercial red kangaroo harvest.

Adaptive Management

Adaptive management is currently being suggested as more appropriate for natural systems than traditional management approaches (e.g. Johnson, 1999; Olsen and Braysher, 2000; Pople and McLeod, 2000). Adaptive management ("learning by doing") addresses the inherent uncertainty and complexity of natural systems by directly manipulating management actions, and using the results to obtain an optimal management capacity. It promotes the use of information gained from the successes and failures of management actions, instead of the sole use of detailed scientific studies.

Adaptive management is appropriate for a socially complex system such as *kangaroo* management, as the conflicting goals and desired outcomes of all user-groups will be considered in the development of future management strategies.

The actions covered by this management plan will incorporate the use of adaptive management principles and strategies where possible. Adaptive management strategies will be detailed in the annual quota proposal document submitted to the Commonwealth Minister for the Environment and Heritage, and released to the general public.

Kangaroos as a Resource

Kangaroos can be so numerous in rural areas they are considered as pests, due to fears of competition with domestic stock for pasture and water. In the latter part of the 19th century, kangaroos were considered vermin and bounty payments and organised drives were common.

Over the last 30 years, management plans for kangaroos and the scientific literature have suggested that kangaroos should be considered as a resource and not a pest. The Western Australian Kangaroo Management Program has promoted this ideal for the past 10 years, and continues the promotion of resource use within this management plan.

The nature of competition between domestic stock and kangaroos is frequently debated, and greater scientific evidence is required to qualify the extent and type of competition. It is generally acknowledged that at high densities kangaroos can cause unwanted impacts to a number of competing land uses including conservation of biodiversity.

This management plan does not promote the pest status of red kangaroos by allowing for commercial harvest solely to mitigate the impacts that may be caused by red kangaroos at high densities. Rather, this management plan promotes the use of red kangaroos as a sustainable resource. Allowing for this land management component of the commercial quota promotes the commercial utilisation of red kangaroos, and should minimise the number of kangaroos that are shot and left in the field (either illegally or under non-commercial destruction permits).

Kangaroos have the potential to be a significant economic resource to rural communities. Commercial harvest may enable landholders to generate an economic return from kangaroo harvest from their property, either indirectly through reduced grazing pressure, or through direct involvement in the industry.

Kangaroo meat is recognised as high quality game meat, being both low in fat and cholesterol. Kangaroo meat has been approved for human consumption in Western Australia since 1993 and kangaroo meat products for human consumption are sold within Australia and exported overseas. Kangaroo skins provide a high quality and durable leather for a number of uses. Harvest of kangaroos in Western Australia is permitted for whole carcasses with the skin attached or skin only, and shooters are encouraged to take whole carcasses ensuring that maximum use is obtained from each carcass.

Management of total grazing pressure is now recognized as a land management practice by pastoralists and government agencies. Along with this comes the recognition that kangaroos represent only a *component* of the total grazing pressure, and that domestic stock and feral herbivores need to be managed in combination with the control of kangaroos. Grigg (e.g. 1987, 1989, 1995) has long maintained that “sheep replacement therapy” may be necessary to reduce land degradation, by encouraging farmers to reduce sheep numbers and shift focus to the harvest of kangaroos. Yet, such a mixed-farming enterprise may only result when kangaroos are a resource with a notable monetary value and landholders have some property rights in the kangaroos existing on their properties.

2.2 LICENSING AND COMPLIANCE

Objective: **Maintain effective regulation of the commercial kangaroo industry through licence and tag procedures, and monitoring of compliance.**

Licences and Tags

The commercial red kangaroo industry in Western Australia is closely regulated via a number of licence and tag procedures. An Open Season Notice has been gazetted for red kangaroos pursuant to section 14(2)(a) of the *Wildlife Conservation Act 1950* and has been declared for parts of Western Australia. Within the areas defined in that Open Season Notice licensed kangaroo shooters may harvest red kangaroos so long as they have prior written authorization from the owner or manager of the lands from which the kangaroos are to be taken, and a copy of that written authorization must be provided to the DCLM, and the properties to which the authorization(s) apply must have been endorsed on each kangaroo shooter's licence. No changes can be made to the shooting venues without authorization of the Executive Director of the DCLM.

Kangaroos may only be shot by a licensed kangaroo shooter pursuant to Regulation 6 of the *Wildlife Conservation Regulations 1970*. Conditions attached to that licence stipulate that all shooting is to be carried out in accordance with the *Code of practice for the Humane Shooting of Kangaroos*, and that only kangaroos killed in accordance with the Code of Practice may be delivered to a kangaroo processor. Only firearms licensed under the Western Australian *Firearms Act 1973* and of high-powered centrefire rifle of at least .222 calibre may be used to harvest kangaroos.

All carcasses taken under each shooter's licence must be directed either to an approved chiller facility owned by the shooter and that must be located at a registered venue specified on the shooter's licence, or to an approved chiller facility owned by a licensed kangaroo processor and is located at a registered venue specified on the processor's licence.

All carcasses or skins taken in the field must have an approved tag attached to them at all times when in transit to authorized chillers, to licensed processors and while on the premises of licensed processors and until immediately before processing commences.

Licensed kangaroo shooters, processors and skin dealers are all required to submit monthly returns in an approved format. Non-compliance may result in prosecution and or the cancellation of the relevant licence.

KANGAROO SHOOTER

Licence issued under *Wildlife Conservation Regulations 1970*

Regulation 6

Allows:

The licence holder to take kangaroos by means of a firearm on a property that falls within the area described in the *Open Season Notice for Red Kangaroos*, and to sell the carcasses or skins to a *Kangaroo Processor*.

Relevant detail:

- The licence holder must comply with all relevant provisions of the Act and Regulations.
- The licence holder must also hold a current Firearms Licence pursuant to the *Firearms Act 1973* and only use firearms that are of a centrefire type and greater than .222 calibre.
- The licence holder may only take red kangaroos in accordance with the conditions of the Red Kangaroo Open Season Notice published in the Government Gazette.
- The licence holder may only shoot red kangaroos on a property for which they have received written authorization from the property owner or manager and those property details are endorsed on their current shooter's licence.
- All *kangaroos* must be shot in accordance with the *Code of Practice for the Humane Shooting of Kangaroos*.
- The licence holder must affix to each carcass an approved tag. The tag must be valid for the species.
- The licence holder must not deliver to a processor a kangaroo that has killed with a shot to any part of the body other than the head.
- The licence holder must carry their licence on them at all times while operating in the field and provide the licence to any authorized officer on request.
- The licence holder must supply returns to DCLM in the approved format and at specified dates.

KANGAROO PROCESSOR

Licence issued under *Wildlife Conservation Regulations 1970*

Regulation 7

Allows:

The licence holder to process red kangaroo meat products and skins.

Relevant detail:

- Licence holder must comply with all relevant provisions of the Act and Regulations.
- The licence holder must only accept kangaroo carcasses from a licensed *Kangaroo Shooter.*
- The licence holder must only accept kangaroo carcasses that have an approved tag affixed.
- The licence holder must supply returns to the DCLM in the approved format and at the specified dates.
- The licence holder must not accept any carcase that has not been taken with a single shot to the brain.

KANGAROO SKIN DEALER

Licence issued under *Wildlife Conservation Regulations 1970*

Regulation 10

Allows:

The licence holder to keep and sell kangaroo skins.

Relevant detail:

- The licence holder must only purchase and tan skins that have an approved tag affixed and that have been purchased from a person licensed to take or sell such skins.

IMPORT OR EXPORT LICENCE

Licence issued under *Wildlife Conservation Regulations 1970*

Regulations 18 (Export) and 19 (Import)

Allows:

The licence holder to export or import kangaroo products.

Relevant detail:

- Every consignment of kangaroo products must be accompanied by an import or export licence issued by the DCLM.
- Licences are only valid for single consignments and for the date(s) specified on the licence.
- Licences to export kangaroo products will only be issued if the relevant authority in the State or Territory to which the consignment is destined approves the importation of the fauna to that State or Territory.

NB: Export of kangaroo products from Australia requires a separate permit issued by Environment Australia.

Monitoring of Compliance

The DCLM is responsible for overseeing enforcement and monitoring of compliance with the *Wildlife Conservation Act 1950* and *Wildlife Conservation Regulations 1970* and specified conditions of licences. Specialist investigations and compliance staff, may be involved in compliance or enforcement issues that relate to red kangaroo management. At least eight DCLM Wildlife Officers are involved in compliance and enforcement issues within the commercial red kangaroo industry in regional areas on a regular basis, and a further 11 Wildlife Officers are available to assist them and to also monitor compliance by licensees located in the Perth metropolitan area.

Non-specialist operational and administrational staff that operate within the Kangaroo Management Program of the DCLM are involved in compliance checks on a regular basis. All serving Western Australian Police officers and Fisheries Inspectors are *ex officio* Wildlife Officers under the Act and may also conduct compliance checks and operations on behalf of the DCLM.

DCLM officers conduct regular and random checks of red kangaroos stored at registered field chillers and kangaroo processing works. Each approved kangaroo tag carries a unique identification number, and is valid for a particular species (colour coded) and is registered to a Kangaroo Shooter or Kangaroo Processor. This number can be used to track a carcass detailing when and where it was taken, by which Kangaroo Shooter, and to which Kangaroo Processor it was sold.

Carcasses are inspected for compliance with the *Code of Practice for the Humane Shooting of Kangaroos*. Ensuring compliance with the Western Australian *Health Act* and the relevant regulations relating to game meat is the responsibility of officers of the Western Australian Health Department.

Kangaroo Shooters and Kangaroo Processors are required to submit returns to the DCLM on a monthly basis. The DCLM maintains a computerised database that stores this return information along with all licence details. Regular reports will be compiled and checked for compliance, and reports on potential offenders will be provided to field-based compliance staff in a timely manner.

The DCLM will regularly review its kangaroo management compliance strategy and operations, to ensure that compliance efforts are strategically targeted and cost-efficient, are adequate to detect non-compliance incidents, and are adequate to promote and enforce compliance with relevant legislation.

Key Actions:

- Maintain effective licence and tag issue procedures for the commercial red kangaroo industry (e.g. Kangaroo Shooters, Kangaroo Processors, Kangaroo Skin Dealers);
- Maintain an up-to-date database and produce reports for regular compliance checks.; and
- Conduct regular and random unannounced compliance checks at field chillers (e.g. an appliance, room or structure approved by the DCLM for providing

refrigeration purposes, and registered with the DCLM) and kangaroo processing plants.

Performance Measures:

- Compliance program, including maintenance of database and field monitoring, are adequate to evaluate levels of compliance within the commercial red kangaroo industry.

Measured via:

Number of compliance checks at field chillers and processing plants.
Number of staff involved in compliance that relates to commercial red kangaroo harvest; and
Extent and type of compliance reports produced by database.

- Levels of compliance with legislation (*Wildlife Conservation Act*, Regulations under this Act, Conditions of Licences) maintained above 90% and approach 100% within the commercial red kangaroo industry in Western Australia. Measured via:

  Number of non-compliance incidents and expiations.

2.3 IMPACTS OF COMMERCIAL HARVEST ON KANGAROOS

Objective: **Improve understanding of the impacts of sustainable commercial harvest on red kangaroos, their habitat and the ecosystems of which they form part.**

Monitoring and minimizing the potential negative impacts of the activities covered by this plan are classed as high priorities among regular management actions, particularly for the activity of commercial harvest. This is consistent with the requirements of Commonwealth and State legislation that oversee harvesting of native species, and the precautionary approach that is used for management actions covered by this plan.

Monitor Harvest Levels

The commercial harvest of red kangaroos from each region will be collated quarterly. This information will be submitted in quarterly harvest reports to Environment Australia and presented to stakeholders and the public in the DCLM's annual report (see http://www.naturebase.net/about_calm.html). Harvest figures will also be considered in combination with numbers removed through other methods (e.g. non-commercial destruction), and with environmental conditions that may impact on population size or structure (e.g. drought).

Information on the demographics of the red kangaroo harvest (currently sex and weight) are obtained through harvest returns submitted by Kangaroo Shooters. Long-term datasets of harvest returns from South Australia, New South Wales and Queensland are currently being analysed as part of a collaborative research project between the Government departments responsible for management of kangaroos and external scientists. These datasets have previously been researched in Western Australia and the results published (see Prince 1984b). Potential exists to repeat

that research using datasets collected since 1979 and to conduct comparisons between the two periods.

Identify Potential Impacts of Harvest

Potential positive and negative impacts of harvest on red kangaroo populations, habitat and ecosystems are discussed in Appendix 3. Within Western Australia, these impacts are likely to vary both spatially and temporally.

The following recommendations are given to improve understanding of the impacts of commercial harvest:

1. Identify all potential positive and negative impacts to red kangaroos, their habitat and ecosystems. Expand on current knowledge through regular perusal of scientific literature, results of previous actions, and consultation with key stakeholders and community.
2. Develop ways to monitor the presence of the impacts identified in (1).
3. Identify or develop management controls that can be implemented to minimize or prevent negative impacts.

Information to assist this process may be obtained through an adaptive management approach or through current research projects in which are taking place in other parts of Australia.

Key Actions:

- Record and analyse number and sex of red kangaroos taken through commercial harvest;
- Submit quarterly reports to Environment Australia detailing numbers removed through commercial harvest and other methods (e.g. non-commercial destruction) as well as carcass weight and harvest sex ratios; and
- Use literature survey and consultative techniques to identify all potential impacts of harvest on red kangaroo, their habitat and ecosystems.

Performance Measures:

- Potential impacts of harvest documented and monitored in a way that allows for the development of management controls to minimize the potential negative impacts of harvest on red kangaroos, habitat and ecosystems. Measured via:

  Number of regions with documented totals of commercial destruction and other methods (e.g. non-commercial destruction); and
  Extent and type of monitoring conducted to detect potential impacts.

Aim 3. Animal Welfare

Adhere to best practice animal welfare standards in conservation and management programs for kangaroos

Minimization of animal suffering is a key aim of the management of red kangaroos in Western Australia. All reasonable efforts will be made to ensure management actions covered within this management plan are humane and minimize animal suffering.

Regular reviews of the humaneness of red kangaroo management policy and practice will be conducted, and modifications to existing practice will be made as required. Any research on kangaroos conducted by the DCLM requires approval from the DCLM's animal ethics committee and any research conducted by external parties requires the approval of properly constituted independent ethics committee.

3.1 MAXIMISE COMPLIANCE WITH ANIMAL WELFARE LEGISLATION

Objective: **Maximise compliance with the *Code of Practice for the Humane Shooting of Kangaroos* and the Western Australian *Animal Welfare Act 2002*.**

All red kangaroos taken in Western Australia under the *Wildlife Conservation Act* must be killed in accordance with the *Code of Practice for the Humane Shooting of Kangaroos* (published by Environment Australia, Second Edition, dated 1990, as varied from time to time; hereinafter referred to as the *Code*). This requirement is enforced for all licences that allow for destruction of kangaroos.

To maximise compliance with the *Code,* a copy of this document is distributed to Kangaroo Shooters upon receipt of their initial licence, and upon every occasion the *Code* is revised, or whenever a Kangaroo Shooter requests a copy. All regional staff that may issue destruction licences will be informed of the *Code* and its requirements.

It is a licence condition in Western Australia that all kangaroos taken for the commercial industry are taken humanely, as identified in the *Code*. It is also a licence condition that no kangaroos may be accepted for processing unless they have been killed with a shot to the brain. There will be zero tolerance with variations from these licence requirements, with enforcement action taken where breaches are detected.

There is a need for the *Wildlife Conservation Act* and associated regulations to be amended to require competency testing of persons engaged in the kangaroo industry. The DCLM, the Western Australian Professional Kangaroo Shooters Association and the State Kangaroo Management Advisory Committee have all encouraged those involved in the industry to undertake competency training and testing. A voluntary training course for commercial shooters of kangaroos for human consumption and pet food is currently run by the Western Australian Department of Health. This course is the same course offered by the Open Training Education Network (OTEN) of TAFE New South Wales. A shooting accuracy test has been

developed by the Professional Shooters Association of Western Australia, but this is not compulsory at present. The DCLM will establish a compulsory requirement for competency testing prior to the issue of new kangaroo shooting licences through legislative change during the life of this program. In addition, current licensees will be required to complete competency testing within three years of the commencement of this management plan.

A recent report investigating the extent of compliance with the *Code* found that 95.1% (95% confidence interval: 90.7%-97.5%) of carcasses from commercially harvested kangaroos in Western Australia were head-shot (RSPCA Australia, 2002). This result was comparable to the National average of 95.9% and a considerable improvement from the 1985 State average of 81.0%. The DCLM will continue to strive to improve these figures through regular examination and review of compliance and enforcement strategies.

As of 1 January 2001 the DCLM has made it a licence condition that prohibited kangaroo shooters from selling, and kangaroo processors from accepting, carcasses from animals that had not been killed with a single shot to the brain. This zero tolerance policy will be continued and will be enforced during the life of this plan.

The DCLM will participate in the proposed 2003 review of the *Code,* and will distribute and enforce any revised version of the *Code* (once completed) to all kangaroo shooters and kangaroo processors.

Administration of the newly established Western Australian *Animal Welfare Act 2002* is not the responsibility of the DCLM. However, steps will be taken to ensure that all licensed kangaroo shooters are made aware of the existence of this new piece of legislation and appreciate those sections of the Act that have relevance to their commercial harvest activities.

Compliance with animal welfare legislation is a priority for DCLM staff conducting checks of field chillers and meat processing plants. DCLM officers will routinely check for compliance with the requirements of the *Code of Practice for the Humane Shooting of Kangaroos* and the *Animal Welfare Act 2002.*

Key Actions:

- List compliance with the *Code of Practice for the Humane Shooting of Kangaroos* as a condition of licence for all licences that allow for destruction of red kangaroos;
- Distribute *Code of Practice for the Humane Shooting of Kangaroos* as part of licence issue processes;
- Participate and support the proposed 2003 review of the *Code of Practice for the Humane Shooting of Kangaroos*;
- Make the satisfactory completion of a competency test a prerequisite for new licence applicants and a requirement for licence renewal for current licensees involved in the shooting of red kangaroos; and
- Include animal welfare checks as part of routine compliance inspections.

Performance Measures:

- Levels of compliance with animal welfare legislation maintained at or near 100% for all actions detailed within this management plan. Measured via:

  Number of non-compliance incidents and expiations;
  Extent of monitoring and compliance activities;
  Extent and type of anecdotal reports and public concerns; and
  Results of commissioned reviews and reports.

Aim 4. Communication and Education

Ensure effective communication and education throughout the community

The public profile of red kangaroo management in Western Australia is moderate, in part due to the politic nature of specific management objectives, in part due to the modest number of stakeholders involved in the commercial red kangaroo industry. The maintenance of effective communication links between the DCLM, industry stakeholders, regional land management and conservation groups, and the wider community is considered an important component to the success of the program. The DCLM will also focus on the development of strong links with other kangaroo and wildlife management organizations within Australia.

Effective communication structures are essential for adaptive management experiments, which require high levels of stakeholder involvement. Both industry and community are likely to benefit from their involvement, by the incorporation of their feedback into future management policies and practices for red kangaroos.

4.1 PROMOTE KANGAROO MANAGEMENT PROGRAM

Objective: **Promote the Western Australian Kangaroo Management Program through public education and consultation with stakeholders and the community.**

The Western Australian red kangaroo management plan will be promoted to the commercial kangaroo industry and the general public. Promotion may include the use of radio and print media, and attendance at scientific conferences and rural field days. A copy of this management plan will be placed on the DCLM's website (see http://www.naturebase.net/about_calm.html) and hard copies will be made available to anyone requesting them. Annual quota allocations and harvest data for previous years and the current year's quota will also be made available to the public via these mechanisms. Annual reports on the program will also be provided to Environment Australia.

The DCLM will develop factual information sheets for the major stakeholders in the commercial *kangaroo* industry, including landholders, regional Natural Resource Management (NRM) groups, Kangaroo Shooters and Kangaroo Processors. Information sheets will cover background information on commercial harvest and detail current legislation, licence procedures and conditions. Fact sheets will also be developed for the general public, schools and interest groups, providing an easy-to-

read synopsis of red kangaroo management in Western Australia. Fact sheets will promote the need to control total grazing pressure, including that of red kangaroos, to assist conservation of biodiversity. For the purpose of public education, these fact sheets will be provided in combination with material detailing the conservation of threatened macropod species.

Key Actions:

- Promote the Western Australian Kangaroo Management Program, and particularly this management plan, through radio and print media and attendance at scientific conferences and field days;
- Maintain information on relevant to this plan on the DCLM website as a point of access for the general public; and
- Develop fact sheets for major stakeholders in the commercial red kangaroo industry and the general public.

Performance Measures:

- Western Australian Kangaroo Management Program promoted and explained in a manner that provides opportunities for both the commercial kangaroo industry and the general community to be adequately informed on red kangaroo management issues and practices. Measured via:

  Number of media submissions and requests;
  Extent and type of feedback received by the DCLM; and
  Amount of consultation and communication with targeted groups.

4.2 INDUSTRY REFERENCE GROUP

Objective: **Continue to promote and support an industry group to guide the development of the commercial *kangaroo* industry in South Australia.**

The DCLM has supported a reference group for the commercial kangaroo industry since 1971, when the Kangaroo Management Advisory Committee (KMAC) was formed. The KMAC provides an opportunity for all stakeholder organizations to actively participate in directing the future development of the commercial red kangaroo industry in Western Australia.

The current terms of reference of KMAC include:

1. Provision of a forum for discussion and policy development between key industry and regulatory groups;
2. Identification of key opportunities and threats to the development of the kangaroo industry;
3. Identification of issues relating to product marketing and to research and development efforts; and
4. Development of clear communication structures between decision-making groups and participants in all sectors of the industry.

Members are appointed following nomination by their respective organizations and stakeholder groups. Current membership comprises one nominee from each of the;

The KMAC membership, including deputies consists (as at September 2002) of representatives of each of the following:

Department of Conservation and Land Management (2);
Department of Agriculture (2);
Pastoralists and Graziers Association of Western Australia (Inc) (2);
The Western Australian Farmers Federation (Inc) (2);
Kangaroo shooters (2); and
Kangaroo processors (2).

The DCLM provides secretarial and executive officer support to the group. Terms of office are currently appointed for a period of three years. Meetings are convened annually, or more often if required, and non-government members qualify for sitting fees and reimbursement for travel at standard rates approved for use within the Government of Western Australia. The group currently reports to the Western Australian Minister for Environment.

Key Actions:

- Convene annual meetings of the Kangaroo Management Advisory Committee; and
- Provide executive officer and secretarial support for the Kangaroo Management Advisory Committee.

Performance Measures:

- Annual meetings of the Kangaroo Management Advisory Committee allow for the investigation of key kangaroo management issues, and facilitate the adoption of revised management procedures within the Western Australian Kangaroo Management Program. Measured via:

  Extent and type of issues covered by the Kangaroo Management Advisory Committee;
  Number of recommendations from Kangaroo Management Advisory Committee to the Western Australian Kangaroo Management Program; and
  Extent of correspondence between Kangaroo Management Advisory Committee and other parties.

4.3 PROMOTE RELEVANT LEGISLATION AND POLICY

Objective: **Promote legislation, policy and guidelines relevant to conservation and management of kangaroos.**

Kangaroo management in Western Australia is influenced and regulated by a number of pieces of Commonwealth and State legislation and policy (Appendix 1). This legislation includes the *Wildlife Conservation Act 1950*, which provides for protection of native species (Section 14), the taking of protected species (Section 15) and hunting and food gathering by Aborigines for non-commercial purposes (Section 23(1)). Other key guidelines or legislation for kangaroo management in Western Australia include: the *Conservation and Land Management Act 1984* as amended, the *Land Administration Act 1997,* the *Agriculture and Related Resources Protection Act 1976* and the *Native Title Act 1983,* the *Animal Welfare Act 2002* and the *Code of Practice for the Humane Shooting of Kangaroos.*

The DCLM will aim to promote relevant legislation, policy and guidelines to the commercial red kangaroo industry and the wider community, through one or more of the following measures:

1. Distribution of relevant legislation/policy as part of a licence issue process;
2. Inclusion of legislation/policy details and requirements on fact sheets for industry and community; and
3. Promotion of legislation/policy during media submissions and correspondence.

All staff that work on the Western Australian Kangaroo Management Program will maintain a current awareness of relevant legislation and policy through regular information transfer or training.

Key Actions:

- Distribute legislation/policy as part of licence issue process where necessary;
- Incorporate promotion of relevant legislation/policy in fact sheets for stakeholders and community; and
- Promote legislation/policy wherever possible through involvement with media and on the DCLM website.

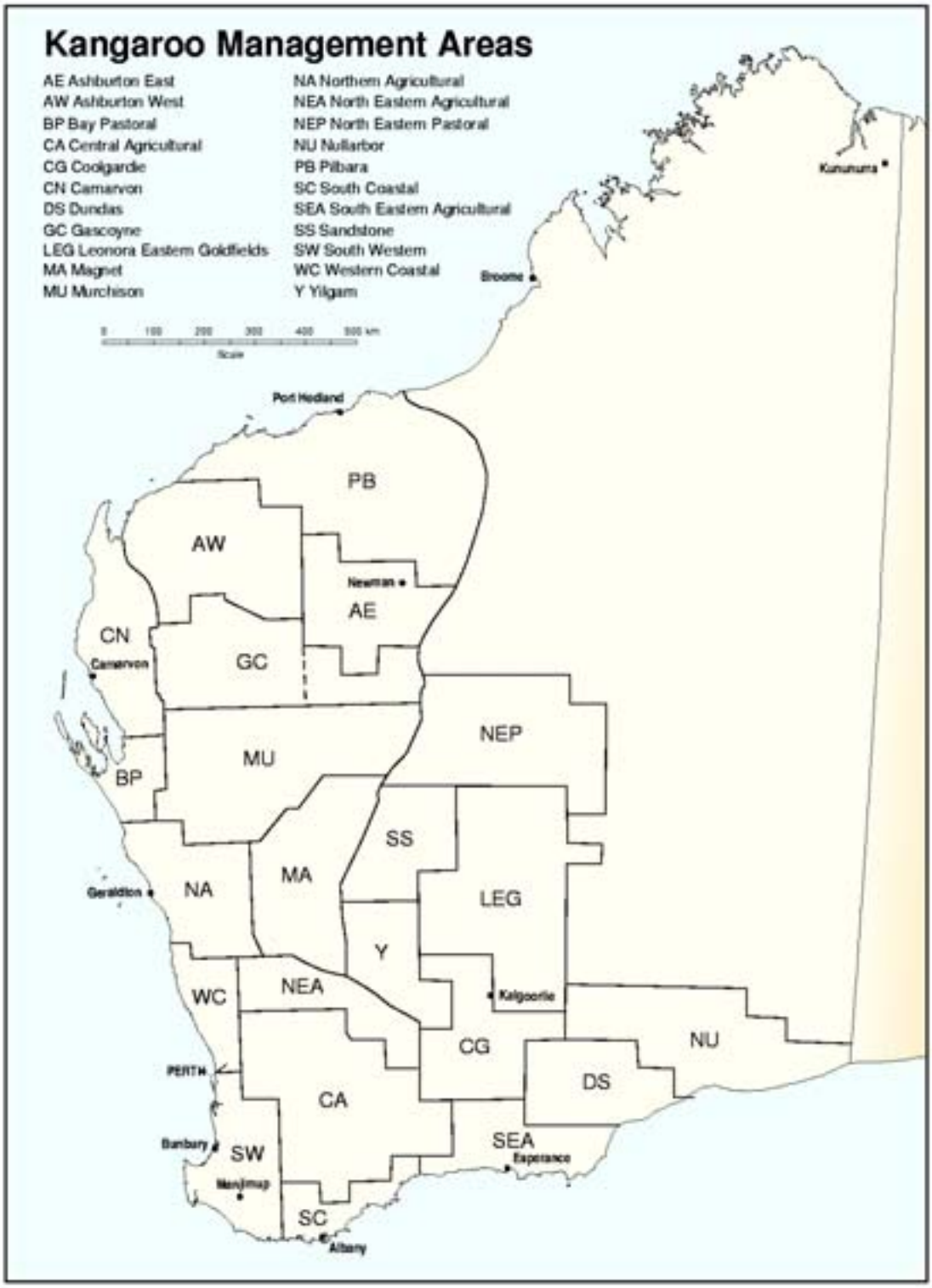
Performance Measures:

- Legislation promoted in a manner that provides an opportunity for all stakeholders in the commercial red kangaroo industry and interested members of the community to maintain awareness of relevant legislation. Measured via:

  Extent of distribution of legislation/policy with licences and fact sheets; and
  Number of times legislation/policy promoted in media submissions and correspondence.

Figure 1. Kangaroo monitoring survey zones in Western Australia

Figure 2. Kangaroo management regions in Western Australia



Glossary

Approved Tag
A tag issued for attachment to the skin or carcass of a kangaroo taken for commercial use.

Commercial Red Kangaroo Quota
The total number of red kangaroos that can be taken for commercial utilization in a calendar year. The commercial red kangaroo quota must be approved annually by the Commonwealth Minister for the Environment and Heritage.

Ecologically Sustainable Development
Uses the definition of the Commonwealth Government (1990), that ecologically sustainable development is “using, conserving and enhancing the community’s resources so that ecological processes on which life depends are maintained, and the total quality of life now and in the future can be increased”.

Red Kangaroo
The kangaroo species to which this management plan applies: Red Kangaroo (*Macropus rufus*).

Kangaroo Shooter
The shooter who is allowed by licence,, to take kangaroos by means of a firearm, and sell carcasses to a Kangaroo Processor.

Kangaroo Processor
The holder of a Kangaroo Processor licence, allowing them to process kangaroo carcasses, and sell whole carcasses, meat products and skins.

Kangaroo Skin Dealer
The holder of a Kangaroo Skin Dealer licence, allowing them to buy, tan and sell kangaroo skins.

Landholder
The owner or occupier of specified lands.

Precautionary Principle
Uses the definition of the Rio Conference on Environment and Development (1992), that the precautionary principle is “where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation”. This is recognized as a principle of Ecologically Sustainable Development.

Quota Proposal Document
A document prepared by the Western Australian Department of Conservation and Land Management, outlining proposed commercial quotas for each kangaroo species for the upcoming year. Submitted to the Commonwealth Minister for Environment and Heritage for approval under the *Environment Protection and Biodiversity Conservation Act 1999.*

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Appendix 1. Western Australian Kangaroo Management Advisory Committee and Conservation Commission structure and function.

The State Kangaroo Management Advisory Committee (KMAC) was established in 1971. It provides advice to the Minister for Environment and Heritage who is responsible for the *Wildlife Conservation Act 1950.* The KMAC membership, including deputies consists (as at September 2002) of representatives of each of the following:

Department of Conservation and Land Management (2);
Department of Agriculture (2);
Pastoralists and Graziers Association of Western Australia (Inc) (2);
The Western Australian Farmers Federation (Inc) (2);
Kangaroo shooters (2); and
Kangaroo processors (2).

The Conservation Commission of Western Australia is established by the *Conservation and Land Management Act 1984*. The Commission's functions include the provision of advice to the Minister responsible for the Act on the development of policies for the conservation and management of the flora and fauna of the State, whether on public land or private land. Its membership, as stipulated by S.21 of the Act (in force at September 2002), comprises:

Nine persons appointed by the Governor on the nomination of the Minister for the Environment and Heritage who, in the opinion of the Minister -

(a) have knowledge and experience in :

(i) the conservation or management of biodiversity;

(ii) environmental management, including the management of the natural environment for use for recreational purposes; or

(iii) the sustainable use of natural resources; or

(b) have a particular function or vocational interest relevant to the functions of the Conservation Commission;
and who, in the opinion of the Minister, are able to make a contribution to the functions of the Conservation Commission.

One member is to be a person who, in the opinion of the Minister –

(i) has knowledge of and experience in Aboriginal cultural and Aboriginal heritage matters relevant to the functions of the Conservation Commission; and,
(ii) is able to make a contribution to the functions of the conservation Commission.

Appendix 2:

Policy and Legislative Framework for Kangaroo Management in Western Australia

There are a broad range of policies, legislation and guidelines that set a framework for the conservation and management of red kangaroos in Western Australia. Legislation and policy exists at both the Commonwealth (National) and State level, and in addition, there are many plans that operate at the regional or local level which incorporate kangaroo issues, such as regional natural resource management plans.

Key legislation and policy in place at the Commonwealth and State level are shown below.

COMMONWEALTH

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Export Control Act 1982*
- *National Residue Survey Administration Act 1992*
- *National Residue Survey (Excise) Levy Act 1998*
- *Native Title Act 1983*
- Code of Practice for the Humane Shooting of Kangaroos 1990
- National Kangaroo Management Guidelines (draft)

STATE

- *Wildlife Conservation Act 1950*
- *Conservation and Land Management Act 1984*
- *Land Administration Act 1997*
- *Agriculture and Related Resources Protection Act 1976*
- *Animal Welfare Act 2002*

Appendix 3:

Assessment of the Impacts of this Management Plan

BACKGROUND INFORMATION FOR THIS MANAGEMENT PLAN

Current Conservation Status of Kangaroos, Distribution and Extent of Habitat

The species of kangaroo covered by this management plan is listed as common in both Western Australia and Australia. In addition, this species is not listed on threatened species schedules for the Commonwealth or any of the States.

The distribution of red kangaroos in Western Australia is detailed in Pople and Grigg (1999). Information on the annual distribution of red kangaroos in Western Australia will be presented in the quota proposal document submitted to the Commonwealth Minister for the Environment and Heritage. The current distribution of red kangaroos generally reflects the extent of suitable habitat for this species. The extent of suitable habitat for red kangaroos will be mapped at a finer scale as part of an objective of this management plan (Aim 1: Objective 3).

Background Information to Red Kangaroo Populations

The reproductive biology of red kangaroos has been extensively studied (see review in Dawson, 1995). Female red kangaroos are polygamous. Breeding of red kangaroos can occur year round, except under very poor environmental conditions. Red kangaroos have a short gestation. Embryos are born at an early stage of development, with further development occurring in the pouch. Under good seasonal conditions, red kangaroos can have three young simultaneously at different stages of development.

Red kangaroo populations fluctuate primarily in response to seasonal conditions, such as rainfall and pasture biomass (Caughley, 1987). Survival rates of juveniles and adults are highly variable, with much lower survival of *kangaroos* during drought conditions.

History of Commercial Harvest

The commercial harvest of red kangaroos in Western Australia has been managed by the DCLM at the regional level since the early 1971. Historically, commercial harvest was restricted to a commercial utilization zone, divided into three management regions, and further divided into 20 management areas.

Availability of the Restricted Parts of the State for Harvest

An Open Season Notice for red kangaroos has been declared under the provisions of section 14(2)(a) of the *Wildlife Conservation Act 1950*. Under the provisions of this Notice red kangaroos may only be taken from certain parts of the State, excluding all National Parks, Nature Reserves, Conservation Reserves and lands vested in the Western Australian Conservation Commission and that are managed for the conservation of biodiversity.

Dynamics of Kangaroo Harvest

Recent commercial harvest levels in Western Australia have fluctuated around a mean of 150,190 carcasses per annum (range 100,000 – 275,000). These harvest levels represent a mean utilization of 69.76% of the annually approved commercial harvest quotas. The greatest harvest of red kangaroos in Western Australia is from Kangaroo Management Regions situated in the northern and central pastoral rangelands of Western Australia.

Commercial harvest is biased towards larger red kangaroos as Kangaroo Shooters are paid on a per kilogram basis. The size dimorphism between the sexes means that more male red kangaroos are harvested than females. Red Kangaroos are taken preferentially over Western Grey Kangaroos and Euros, due to their easier accessibility and their larger size. Economic factors and climatic factors both influence red kangaroo harvest in Western Australia. Low commodity prices for kangaroo products can result in a reduced incentive to harvest red kangaroos, relative to the incomes that kangaroo shooters could derive from working in other industries. Heavy seasonal cyclonic rains can result in limited or no access to large tracts of land that support populations of red kangaroos that would otherwise be subject to harvest. The period of exclusion due to local flooding events can be lengthy (3-5 months).

Economic considerations result in a commercial red kangaroo harvest that is patchy within management regions. Greatest harvest levels occur around easily accessible tracks and terrain. Timbered or rocky areas can remain inaccessible to commercial harvest, and act as refuges (along with conservation estate) for red kangaroo populations.

Management of Total Grazing Pressure

This management plan promotes the management of red kangaroos as part of the management of total grazing pressure on pastoral leases in Western Australia. Excessive herbivore (native and introduced) grazing pressure can lead to negative impacts on biodiversity and land condition.

Experience from areas that have had domestic stock removed [e.g. east of Carnarvon in the Central Management Zone; Gardiner (1986a, b); Norbury and Norbury (1993); Norbury *et al.* (1994)] suggest that effective regulation of grazing pressure requires the control of all sources of grazing pressure acting on the land, including domestic stock, feral herbivores such as rabbits and goats, and management of free-ranging red kangaroos.

LEGISLATIVE REQUIREMENTS

This management plan for *kangaroo*s is required to satisfy the requirements of the legislation specified in Section 303FO of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* These requirements include ensuring that this plan must not be detrimental to the survival of the species covered by this plan, or any relevant ecosystem. In addition, the legislation requires that the impacts covered by this plan on the species and the species habitat are properly assessed, that the plan is ecologically sustainable, and that the plan includes measures to monitor any potential environmental impact(s).

Information to address these issues for red kangaroo management and the activities of this plan are covered below. An assessment of this plan against this piece of legislation is shown in Tables 2 and 3.

Potential Threats to Kangaroo Species

Reviews by Pople and Grigg (1999) and Olsen and Braysher (2000) have detailed potential threats or impacts to kangaroo populations. A summary of these impacts is provided below.

- **Environmental impacts**

  Drought is likely to be the greatest environmental impact on red kangaroo populations. The rate of increase of red kangaroo populations is strongly linked to rainfall through its impact on pasture availability. Declines of red kangaroo populations during drought are likely to have occurred since prior to European settlement, as red kangaroos were restricted to habitat around permanent waters. The increased availability of water points across the pastoral rangelands means that food resources are now the major limiting factor of red kangaroo populations during drought. Mortality during drought is highest amongst adult males and juveniles (Bayliss, 1985). Red kangaroo populations have high rates of increase when conditions improve.

  Flooding may impact on red kangaroo populations through increasing the chances of localised epizootics (see Disease below).

- **Habitat loss and modification**

  Since European settlement, large tracts of native habitat have been cleared to make way for agricultural land uses. Native vegetation remains in remnant patches and in National Parks and reserves and in a modified form in pastoral rangelands. Red kangaroos have generally benefited from these changes to land use, although heavily cleared areas are thought to be detrimental (Pople, 1989).

- **Disease**

  Disease outbreaks have been reported as causes of mortality in kangaroo populations. Speare *et al.* (1989) have reviewed the diseases of kangaroos. Irregular localized population crashes have been associated with lumpy jaw, arbovirus infection, coccidiosis and choroid blindness. Disease by itself is not considered an important mortality factor, but may have a compensatory effect in

combination with stressful conditions such as over-crowding, lack of food, or periodic flooding.

- **Predation**

  Predators of red kangaroos include dingoes, wedge-tailed eagles, foxes and humans. Robertshaw and Harden (1989) have identified dingoes and humans as major sources of predation. Mortality due to dingo predation is likely to be low in areas protected by wild dog fences and or where dingo numbers are controlled. More recently foxes have been shown to be significant predators of newly emerged joeys for a number of the larger kangaroo species (Arnold *et al.* 1991; Dawson 1995; Banks *et al.* 2000). Non-human predators generally focus on juvenile kangaroos. Predation on *kangaroos* may be influenced by other factors that increase vulnerability, such as poor seasonal conditions. Predation by man on kangaroo populations includes commercial harvest, non-commercial destruction and traditional Aboriginal hunting practices. Current commercial harvest levels are considered sustainable for kangaroo populations (Caughley, 1987). Population monitoring suggests that rainfall remains the main influence on kangaroo populations.

POTENTIAL IMPACTS OF THIS MANAGEMENT PLAN

Potential impacts of this management plan are considered below for the activities of commercial harvest and management of red kangaroos on National Parks and Nature Reserves. Management controls in place to minimize or monitor these impacts are also detailed.

Impacts on Kangaroos

Commercial harvest could potentially impact on red kangaroos directly via harvest at unsustainable levels, or via demographic or genetic impacts on harvested populations. Animal welfare concerns are a potential impact for all types of destruction.

- **Sustainability of Commercial Harvest**

  The following factors promote the sustainability of commercial harvest in Western Australia:

  1. Commercial harvesting quotas are based on direct monitoring data of red kangaroo populations.
  2. Conservative species correction factors are used (see Pople and Grigg, 1999).
  3. Commercial harvest quotas are set at levels that are considered ecologically sustainable for red kangaroo populations (Caughley, 1987).
  4. Commercial harvest is patchy within Kangaroo Management Regions and individual properties, leaving many areas of (unharvested) refuge habitat.
  5. The size of the region harvested is modest in comparison to the large geographic distribution of *kangaroos.*

  Management controls are in place within the commercial quota setting system to ensure that harvest levels remain sustainable and to maintain red kangaroo

populations within or above specified threshold densities. Annual monitoring allows for any other mortality agents acting on red kangaroo populations to be accounted for in the setting of annual commercial harvest quotas (e.g. animals lost through drought, disease, or road kill).

Where higher harvest levels are requested as part of an adaptive management strategy, they must be sustainable at the level of regional red kangaroo populations. Full details on harvest levels and strategies will be included in the annual quota proposal document.

Numbers removed through non-commercial destruction are low compared to that taken through commercial harvest. These figures are monitored and compiled regionally in quarterly harvest reports to Environment Australia.

- **Demographic impacts of harvesting**

Commercial red kangaroo harvest in Western Australia is biased towards large kangaroos, and more males are taken than females due to size dimorphism. Potential changes to the sex and age structure of harvested kangaroo populations could result, such as harvested populations having a female bias or a lower average age compared to unharvested populations.

Intensive harvesting may change the age structure of red kangaroo populations at particular localities. However, the patchy nature of the harvest will decrease the demographic impacts of harvesting on red kangaroo populations, due to rapid recolonisation of harvested areas by immigrating kangaroos, and the presence of refugia for kangaroos in unharvested areas. Demographic impacts of commercial harvest are mirrored in unharvested red kangaroo populations following drought (e.g. female-bias, less large adults).

Pople and McLeod (2000) have shown that harvesting a kangaroo population going into a drought is likely to have population impacts that are quickly lost as the population recovers from drought. This is because harvesting at the onset of drought removes animals that would be otherwise be lost from the population as the drought progresses.

Potential demographic impacts of commercial harvest on Western Australian red kangaroo populations are currently monitored through carcass sex and weight data provided on harvest returns. There is a management control in place to ensure that there are no irreversible negative impacts on the sex or size structure of harvested red kangaroo populations.

- **Genetic impacts of harvesting**

There are concerns that selective harvesting of red kangaroos will lead to impacts on the genetic diversity and fitness of harvested populations. Research (see review by Hale, 2000; report to NSW National Parks and Wildlife Service) suggests that commercial harvesting at current levels has negligible impacts on the genetic diversity and fitness of kangaroo populations, due to:

1. The size of kangaroo populations in relation to the numbers removed through harvesting;

2. Large geographic ranges of genetic kangaroo populations relative to the size of the harvested area. This is in part due to the migration of individuals across large distances; and
3. Patchiness of the commercial harvest, and immigration of new individuals into harvested areas.

- **Animal Welfare Concerns**

Allowing for a commercial harvest and non-commercial destruction of red kangaroos from the wild has potential impacts on animal welfare. Animal welfare concerns are considered unlikely for actions conducted as part of this management plan, due to:

1. The presence of Commonwealth and State legislation for animal welfare, include the *Code of Practice for the Humane Shooting of Kangaroos*;
2. The enforcement of legislation as a condition of licence for Kangaroo Shooters;
3. The intention to implement training requirements for Kangaroo Shooters during the life of this plan to raise standards above those already reported on (RSPCA 2002); and
4. The presence of a compliance program to maximize and monitor compliance with red kangaroo management legislation.

Impacts on Habitat

Impacts on habitat due to actions detailed within this management plan are more likely to be positive than negative. Reduced red kangaroo grazing pressure on palatable vegetation species may lead to an increase in regeneration of these species, and an increase in biodiversity. Regeneration of native vegetation may lead to a reduction in the amount of non-palatable weed species.

Vegetation recovery following red kangaroo management would be most likely in combination with the management of total grazing pressure (i.e. where domestic stock have been removed or lowered and numbers of feral herbivores are closely controlled). Ability to achieve the desired vegetation response is likely to depend on the extent of the reduction in red kangaroo grazing, and the length of time of reduced grazing pressure (see Norbury *et al.* 1993; Norbury and Norbury 1993).

Potential negative impacts on habitat include damage to vegetation caused by Kangaroo Shooters driving off tracks. These disturbance events are considered minimal in Western Australia as Kangaroo Shooters tend to operate off already-formed tracks, and the area affected relative to the extent of pastoral rangelands is minute. The impacts of disturbance events to vegetation may vary according to the type of vegetation.

Impacts on Ecosystems or Other Species

There are few potential ecosystem impacts of commercial red kangaroo harvest. There is a potential positive impact on feral species such as foxes and cats, through the presence of red kangaroo carcasses left in the field as a food resource.

Commercial destruction is likely to have less impact than animals that are shot and left in the field, as most of the carcass is removed for processing.

There are no likely trophic level impacts of red kangaroo harvest, given the position of red kangaroos in the food chain. The only prey of kangaroos that is likely to increase through reduced red kangaroo numbers is native vegetation. The only native predator that might be disadvantaged through a reduction of red kangaroo numbers is the dingo, and this is unlikely as dingoes are largely excluded from the main harvest region by the dog baiting programs.

Table 4: Requirements of the *Environment Protection and Biodiversity Protection Act 1999*. Section 303FO – Approved Wildlife Trade Management Plan.

	Legislative Requirement	How Requirement is Addressed in this Management Plan
(1)	The export of a specimen is in accordance with an approved wildlife trade management plan	• This management plan is submitted for approval as an *Approved Wildlife Trade Management Plan.*
(3)(b)	There has been an assessment of the environmental impact of the activities covered by this plan, including an assessment of	
(i)	The status of red kangaroos	• Conservation status of red kangaroos is detailed in p.5 Appendix 3. Ref: p.39.
(ii)	The extent of the habitat of red kangaroos	• Distribution of red kangaroos is detailed in Appendix 3. Ref: p.39. • Habitat will be mapped as part of Aim 1: Objective 3. Ref: p.13.
(iii)	The threats to red kangaroos	• Threats to red kangaroos are detailed in Appendix 3. Ref: p.41-42.
(iv)	The impacts of the activities covered by the plan on the habitat or relevant ecosystems	• Potential impacts of the activities are detailed in Appendix 3. Ref: p.42. • Regional differences in management will be detailed in the annual quota proposal document. Ref: p. 15.
(3)(c)	The plan includes management controls directed towards ensuring that the impacts of the activities covered by the plan are ecologically sustainable to red kangaroos, other taxa and ecosystems	• Ecological sustainable management is included within the goal of this management plan. Ref: p.7. • The quota setting system includes management controls and performance measures to ensure that commercial harvest levels are sustainable in the long-term for red kangaroos populations. Ref: p.15.
(3)(d)	The activities covered by the plan will not be detrimental to the survival of red kangaroos, the conservation status of red kangaroos, and any relevant ecosystem.	• Harvest levels are based on direct population monitoring. Ref: p.9-11. • No change to the conservation status of red kangaroos due to commercial harvesting is listed as a performance indicator. Ref: p.18.
(3)(e)	The plan includes measures to:	
(i)	Mitigate and/or minimize the environmental impacts covered by this plan	• Effective licence procedures are in place to regulate the commercial harvest. Ref: p.20-23. • Minimising impacts is detailed in Aim 2: Objective 3. Ref: p.24.
(ii)	Monitor the environmental impact of the activities covered by this plan	• Red kangaroos populations are monitored regularly across the entire commercial harvest zone. Ref: p.9. • Harvest returns are collected to monitor characteristics of harvest. Ref: p.24-25. • Monitoring the impact(s) of harvest is detailed in Aim 2: Objective 3. Ref: p.24-25.

(iii)	To respond to changes in the environmental impact of the activities covered by the plan	• Harvest returns will be collated and submitted quarterly to Environment Australia. Ref: p.25. • Harvest returns will be analysed regularly to check for the presence of sudden or severe shifts in harvest rate or sex bias. Ref: p.17. • An adaptive management approach will be promoted as part of this management plan. Ref: p.18, 25. • Management controls are in place for commercial harvest levels, along with performance measures and a feedback mechanism to ensure that these are linked to future management actions. Ref: p.17-18, 24.
(3)(f)	The conditions applicable to the welfare of red kangaroos are likely to be complied with.	• Aim 3 relates to ensuring that management actions conducted under this plan are humane to kangaroos. Animal welfare legislation is stated, and management actions are detailed. Ref: p.26. • Compliance with animal welfare legislation is enforced as a condition of permit. Ref: p.20-21-22. • There is a compliance program in place to monitor and enforce compliance with animal welfare legislation. Ref: p.23-24.

Appendix 4:

Code of Practice for the Humane Shooting of Kangaroos

Endorsed by the Council of Nature Conservation Ministers

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 page 5.

Department of the Environment and Heritage

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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 conciousness. 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.

(iii) Kangaroos must be shot using a centrefile 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 carcases 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 were 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.

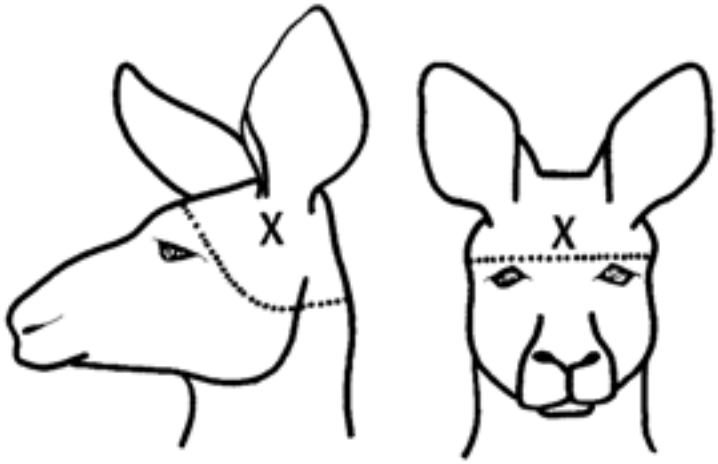
(iii)The waiving of any requirements of this code shall not relieve the shooter of the absolute requirement to provide a sudden and painless death for the target kangaroos.

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).

Species	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 centrefire 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 minimum 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. Shotgun 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).

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