NSW **National Parks and Wildlife Service**

Kosciuszko National Park

Horse Management Plan

December 2008

Department of **Environment & Climate Change** NSW

Acknowledgments

This Horse Management Plan was prepared by staff of the South West Slopes and Snowy Mountains Region of the NSW National Parks and Wildlife Service (the Service) incorporating the advice of the Kosciuszko National Park Horse Management Steering Group.

Valuable information and comments were provided by Service specialists, the Regional Advisory Committee and members of the public.

ISBN 978 1 74122 831 1
DECC 2008/254

For additional information or enquiries about of the plan, contact the Service's Tumut Office at:

7a Adelong Road
Tumut NSW 2720

or by phone on (02) 6947 7000.

Front Cover Photos

Mt Kosciuszko, headwaters of the Snowy River (NPWS file photo)
Horses crossing the Snowy Mountains Highway (M.Bowden, 2007)
Horse impact Peppercorn Creek (G.Wilks, 2007)
Yarrangobilly Caves (N.Lesniak, 2007)

Kosciuszko National Park

Horse Management Plan

December 2008

Executive Summary

Kosciuszko National Park is the largest national park in NSW and one of the largest conservation reserves in Australia. The Park was declared in 1944 and is now a UNESCO Biosphere Reserve. It contains continental Australia's highest mountains as well as a great variety of outstanding scenery, natural features and plant and animal communities.

The National Parks and Wildlife Service (the Service), a division of the Department of Environment and Climate Change, has a legal duty to protect native habitats, native fauna and flora, geological features and wildlife within its reserves. We also have a responsibility to minimise the impact of introduced species, including horses.

History of Horse Management in the Park

Control of horses in the Park began in the early 1970s with a licensed horse roping/brumby running program, however public and Service concerns over the inhumane practice and the adoption of the Plan of Management in 1982 resulted in the practice being banned. By the late 1990s the environmental impacts from a growing horse population became increasingly obvious, with new tracks, damage to stream and riverbanks, trampling of bogs and damage to native vegetation.

In 2000 in response to legislative responsibilities, the Snowy Mountains Region of the Service began to prepare a horse management plan to protect the alpine area of the Park. The plan was released and implemented in 2003.

In 2006 a Plan of Management for Kosciuszko National Park was formally adopted and one of its objectives is to reduce the distribution and abundance of introduced animal species found in the Park. The Plan of Management called for the exclusion of horses from key areas and for a Feral Horse Management Plan to be prepared for the whole of the Park. This plan is part of our response to that commitment.

Community Views

The Service knows that there is a wide range of views in the community about how the horses in the Park should be managed. A Horse Management Community Steering Group has helped to write this plan.

The Steering Group examined the range of horse management methods available, including fertility control, fencing, shooting and capture and removal methods and some of the issues associated with each of the methods in the document. After reviewing the different methods, the Steering Group recognised that different techniques are best suited to different situations depending on issues such as mob size, geography and season. The Group agreed that as with any vertebrate pest program, a combination of different techniques will give the most effective result.

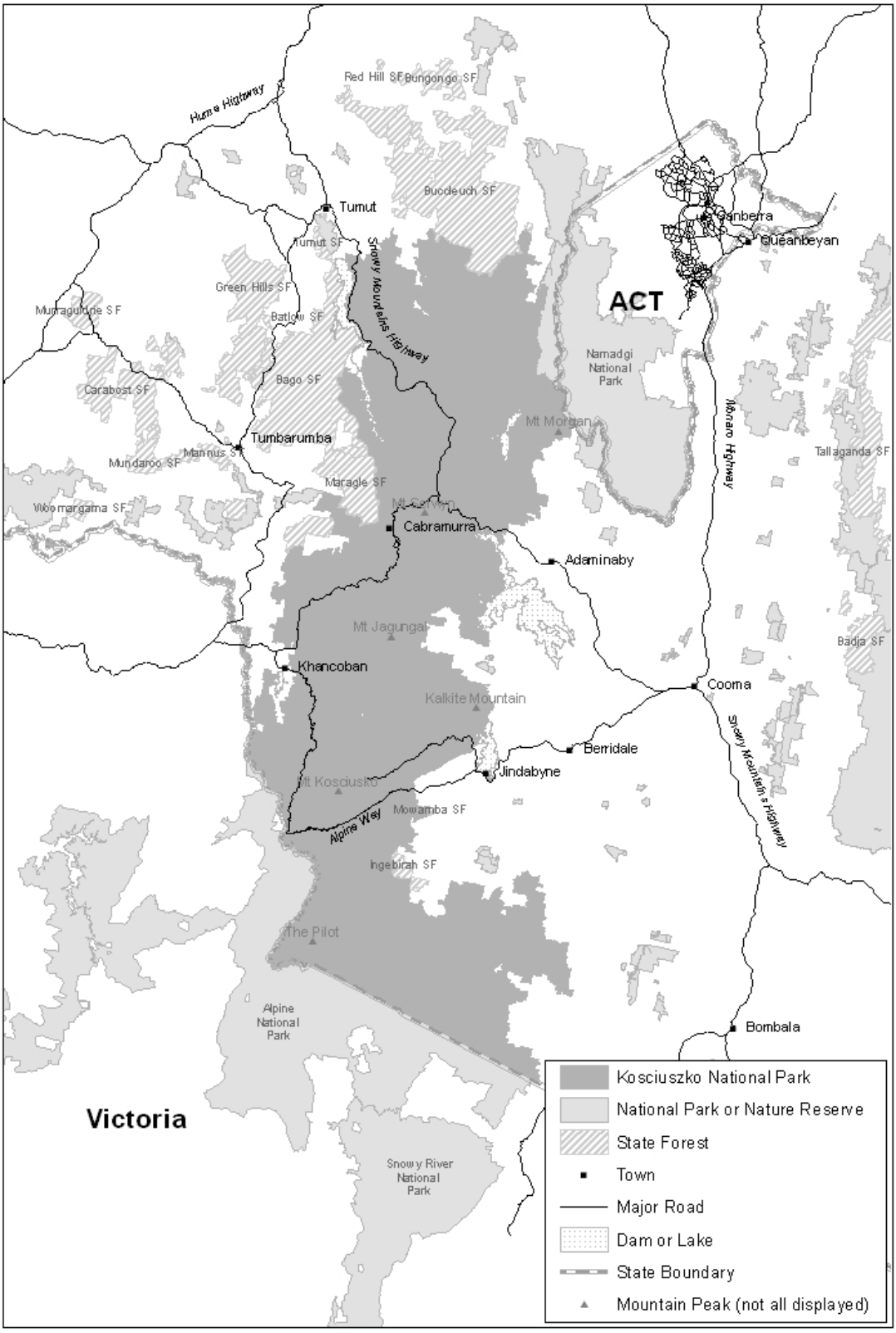

Figure 1: Kosciuszko National Park and surrounds

TABLE OF CONTENTS

List of Figures and Tables

Acronyms Used in the Plan

DPI	Department of Primary Industries
DECC	Department of Environment and Climate Change
PZP	Porcine Zona Pellucida
REF	Review of Environmental Factors
KNP POM	Kosciuszko National Park Plan of Management

1. Introduction

1.1 Kosciuszko National Park

Kosciuszko National Park (the Park), at 673,542 hectares, is the largest national park in NSW and one of the largest conservation reserves in Australia. Located in the south-eastern corner of the Australian mainland, between latitudes 35°30'S and 37°02'S and longitudes 148°10'E and 148°53'E, the Park straddles the Great Dividing Range, here known as the Snowy Mountains (See Figure 1 for a map of the Park and surrounds).

The Park is a very special place as it contains the highest mountains on the Australian continent, unique glacial landscapes and unusual plants and animals, some of which are found nowhere else. The cultural landscapes of the park are wide-ranging in type and significance and protect a large number of cultural remains and histories.

The snow-fed rivers of the mountains provide some of Australia's most important water catchments and the need to protect these catchments was a significant factor in the establishment of Kosciuszko State Park in 1944.

The Park's natural and cultural features attract about three million visitor days each year. These visitors go bushwalking, camping, mountain biking, skiing, horse riding, and four wheel driving.

Kosciuszko National Park is managed by two regions of the Department of Environment and Climate Change (DECC). The Snowy Mountains Regional office manages the southern section of Kosciuszko National Park (the area approximately south of Happy Jacks Trail to the Victorian border). The South West Slopes Regional office manages the north of the Park (the area north of Happy Jacks Trail to the Park boundary).

This plan will apply to the whole Park.

1.2 Horses in Kosciuszko National Park

Horses have been present in the Kosciuszko area since the 1830s when Europeans first explored the region (NPWS 2003). Over time many horses were released or escaped and populations of horses soon became established in the mountains.

Stockmen in the mountains undertook sporadic control of horses by shooting, trapping and brumby running when they became a nuisance. Following the establishment of the national park a system of licensed brumby running was introduced, however as a result of environmental and animal welfare concerns this approach was abandoned in the 1980s. From this time there was no formal control of horse populations until the development of a horse management program for the alpine area of the Park which was released in 2003.

In 2005 it was estimated that there were over 1,700 horses in Kosciuszko National Park.

1.3 Why We Need a Horse Management Plan

In 2006 the Department of Environment and Climate Change developed a management plan for Kosciuszko National Park (DEC 2006). This legal document outlines how the Department will manage the Park in the future.

The plan of management commits the DECC to removing horses from several key areas within the Park including

- the Yarrangobilly and Cooleman Plain limestone karst areas
- the Main Range
- areas adjoining the Victorian and Australian Capital Territory national parks
- locations where they are a safety risk (such as highways)
- areas where they are causing environmental damage and
- feeder areas for all of the areas listed above.

The plan also calls for the implementation of the Feral Horse Management plan for the alpine area and the preparation of a similar plan for the entire park; hence the development of this horse management plan.

The plan of management aims, wherever possible, to use introduced animal control measures that include multiple control methods, target multiple species and form part of an integrated ecological restoration program. With this aim in mind, this horse management plan will be linked with the restoration plan for the Park, and will be implemented as part of an integrated pest management strategy across KNP.

1.4 How the Plan was Prepared

In 2007 the National Parks and Wildlife Service established the Kosciuszko National Park Horse Management Community Steering Group to provide input into the preparation of a horse management plan for Kosciuszko National Park.

This community-based steering group was made up of 13 members from relevant organisations and was created to guide the development of the plan to ensure it implemented the actions of the 2006 Kosciuszko National Park Plan of Management and developed methods for the removal of horses from the Park in a humane manner.

2. Objectives

The objectives of the Horse Management Plan for Kosciuszko National Park are:

- to exclude horses from
  - the Main Range Management Unit;
  - the Yarrangobilly Management Unit;
  - the Cooleman Plain Management Unit;
  - safety risk areas such as highways;
  - areas of the park where horses have not been or have only recently been recorded (e.g. Jagungal);
  - areas of the park adjoining other Australian Alps national parks and reserves; and
  - feeder areas for all of these parts of the park. (see Figure 2)

- to reduce horse numbers in other specific areas to reduce the risk they pose. These areas would be where horses have an impact on public safety, the environment or on the cultural heritage of the Park

- to make sure that all horses are treated humanely throughout the removal process and their removal complies with current Codes of Practice

Further guiding principles are:

- to work with neighbours and the community in NSW, the ACT and Victoria to ensure that an integrated and cooperative approach is used to reduce the impact of horses on the Park;

- to make sure that the community is consulted about how we are going to remove the horses;

- to ensure that the removal process does not harm the natural and cultural values of the Park;

- to continue to research and monitor horse populations and the impact they have on the environment, and use this information to improve horse management practices;

- to monitor advances in horse control methods, such as fertility control, to ensure the most effective methods are being utilised in the program.

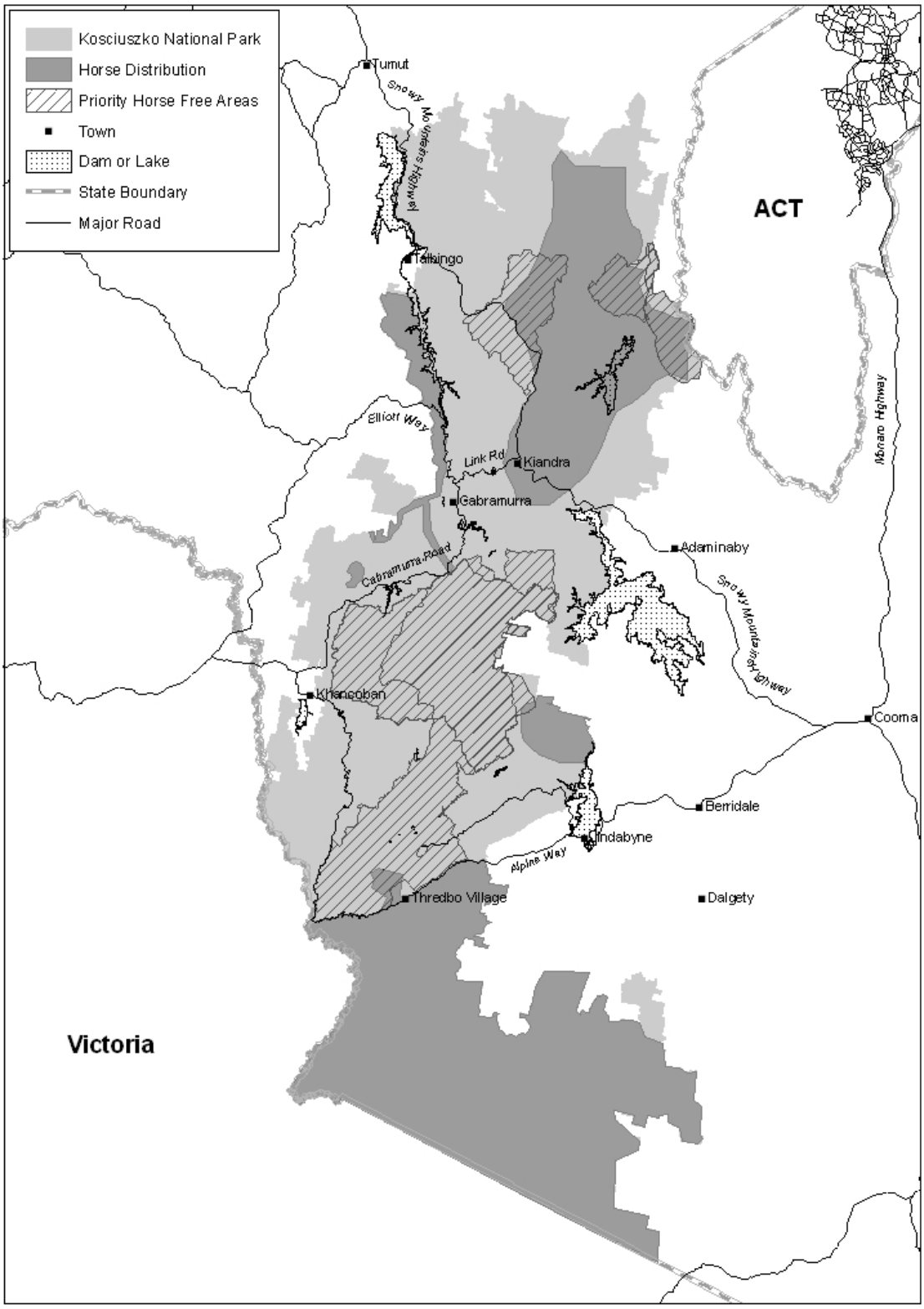

Figure 2: Map of Kosciuszko National Park showing current approximate horse distribution and proposed horse free areas

3. Background

3.1 Why Kosciuszko National Park is important

The Park contains a number of features of international and national significance including its

- animals and plants
- soils, karst, landforms
- cultural heritage
- tourism and recreation functions.

National Significance

The Park forms part of a series of largely interconnected natural areas from north to south along the Great Dividing Range of Eastern Australia.

Protecting this corridor is a conservation opportunity of national significance. The Park is very important to Australia because it provides clean water to south-eastern Australia. It is also economically significant for south-eastern Australia as a tourist attraction, particularly during the winter months.

The Park contains the highest mountains in what is the flattest and lowest of continents. Although few of the mountains rise above 2000m, they represent much of the snow-covered region of Australia. They have many glacial landforms and have an exceptional diversity of alpine plants and species that provide habitats for rare and unusual animal species.

The Park also has significant karst systems, deep river valleys and many frost hollows. Its vegetation includes snow gum woodlands and subalpine grasslands, extensive eucalypt forests, cool temperate rainforest, box woodlands and stands of native cypress pines.

The vegetation of the Park is amongst the most diverse on the continent, reflecting the range of climates, rocks, soils, landforms, and altitudes present. In total, 853 species of native plants have been recorded in the Park (Montague-Drake 2005).

Vulnerability to Human Disturbance

Three separate parts of the Park have been identified in the Park Plan as containing natural and cultural values of exceptional significance that are particularly vulnerable to human induced disturbances. These are the alpine landscapes of the Main Range and the Yarrangobilly and Cooleman Plain karst catchments.

The true alpine area of Australia is less than .01 per cent of the continent. The Kosciuszko alpine area is Australia's largest alpine ecosystem, at about 120 square kilometres along the Main Range. Twenty one species here are found nowhere else. Many alpine plants here are small shrubs and ground-hugging plants, and are very sensitive to damage by heavy animals such as horses. The short summer growing season also means that recovery from damage is very slow (Montague-Drake 2005).

Catchment

The Park contains the headwaters of the Snowy, Murray and Murrumbidgee Rivers, which makes it one of the most important catchments in Australia. Within the Park, the sphagnum bogs (commonly called peat moss) and snow patch communities play an important role

because of their water holding capacity. High quality water supplies for towns/cities, for power generation and irrigation depend on the protection of this catchment.

Karst Ecosystems

Collectively, the limestone karst areas of the Park are nationally significant because of their landforms and for the animals and plants that live there. Individually the Yarrangobilly and Cooleman Plain areas are especially significant for their beauty, their rocks and soil, and their water-related qualities.

We can only manage karst systems by protecting the entire karst catchments. This is because karst systems are amongst the most vulnerable of ecosystems, partly because if they are damaged it takes vast amounts of time for them to be formed again. Their integrity depends upon the relationship between rock, water, soil, vegetation and air remaining essentially unchanged. Any interference with this relationship can result in their degradation.

Karst ecosystems are at risk from the changes that come with the activities of introduced animals, including horses. These impacts include damage to vegetation and removal of vegetation which leads to erosion, and silt clogging up the karst system.

3.2 Historical overview of horses in the Snowy Mountains

In Australia, non-domestic horses are generally known by three terms; brumbies, wild horses and feral horses. The term brumby is attributed to Sergeant James Brumby, who left his horses to run free on his land in NSW when he was transferred to Tasmania in the 1830s (HWP 2002). A 'feral' animal is defined as an exotic or non-native animal originally introduced for domestic purposes, which has survived in the wild (although some feral animals, eg foxes and rabbits, were not introduced for domestic purposes). Horses can become feral if they are left to fend for themselves (Dobbie *et al.* 1993).

Horses have been in Australia since the arrival of the First Fleet in 1788. These horses came from Cape Town, South Africa, and they were probably Cape horses or Barbs. After the arrival of the first few horses, a steady stream arrived in the new colony. In eastern Australia horse numbers increased massively from 14,000 in 1830. Australia now has the largest population of wild horses in the world, with more than 300,000 (Dobbie *et al.* 1993).

Australia has suitable conditions for horses, and the only real checks on horse populations are people and natural events like fire, drought and heavy snowfalls. Where horse numbers are not kept in check they not only increase in numbers, they increase the areas they graze. The areas they graze are highly likely to continue expanding if we do nothing to control them (Walter 2002). In essence, by acting decisively now to reduce horse numbers, a worse situation can be prevented, and animal welfare concerns are reduced.

Horses, cattle and sheep arrived with the first European explorers and settlers into the high country in the 1830s. Substantial use of the high country for cattle and sheep grazing soon followed. Horses were essential for anyone living in the mountains, for both travel and for moving stock.

During drought horses were often let go, would escape or were purposely released to improve the quality of mobs, which were captured and used as stock horses. Populations of horses soon became established, although the numbers were never reported to be large by stockmen who previously used the area.

Horse Control in the Past

During the grazing era horses were culled when they competed with grazing stock. Use was occasionally made of horses by trapping them and selling their skins. Horse roping or 'brumby running' was undertaken as a recreational activity and to source horses for local events such as the Cooma and Jindabyne rodeos.

Around 1970 the National Parks and Wildlife Service introduced, for a trial period of three years, a system of licensed horse roping/brumby running in the Park as a way to manage the activity, and as a means of controlling horse numbers. Very few licences were issued and all were for the southern part of the Park in the Tin Mines area, Lower Snowy and Byadbo areas. There were reports of unlicensed roping in the north and south of the Park but by 1972 horse roping itself was causing concern. People were worried about the environmental damage caused by the activity and about the welfare of the horses, and many wondered whether horse roping was actually controlling horse numbers. These concerns continued through the late 1970s.

In 1982, through the adoption of the Kosciuszko National Park Plan of Management, the Byadbo and Pilot Wilderness areas were declared as wilderness. Recreational horse riding is banned in wilderness areas, so this effectively put an end to legal brumby running. Since then there has been some illegal brumby running and some people have continued to release horses into the Park.

In 2003 a horse management plan was prepared for the alpine region of Kosciuszko National Park (NPWS 2003). The aim of this plan was to reduce the impacts of horses on the highly sensitive alpine vegetation of Kosciuszko. The alpine plan recommended a trial of three horse removal methods: trapping, roping and mustering.

The 2006 Plan of Management for Kosciuszko National Park called for the continued implementation of the Feral Horse Management Plan for the alpine area, and the preparation of a similar plan for the entire park.

Cultural Values Attributed to Horses

For some visitors, the sighting of introduced animals such as wild horses detracts from their visit, while for others such encounters may add to the richness of their experiences in the park. This attachment to feral horses, as distinct from any other exotic species inhabiting the park, is due in part to their romanticised place in Australian history (DEC 2006).

There is no doubt that horses have played an important part in the history of Australia's development as they have been involved in exploration, carting of supplies, forestry, mining, racing, transportation, grazing and droving, and as part of the mounted police and Australian Light Horse Regiments. However, elsewhere in Australia the role of the horse is commemorated in literature, memorials and in museums.

The wild horse population of Australia is the highest in the world (Dobbie *et al* 1993), therefore the cultural values attributed to this species are in no way threatened by the proposal to reduce horse numbers in Kosciuszko National Park.

3.3 Impacts of Horses

Environmental Impacts

It is widely recognised that Australian alpine plants and animals did not evolve in association with hoofed animals or pastoral activity (Costin, Gray, *et* al 2002). Horses are large, heavy animals and only a small part of each horse comes into contact with the ground. The geomorphology of the Australian alpine area is very sensitive to compaction and is easily eroded. For this reason, alpine and sub-alpine environments are much more susceptible to trampling damage than most other Australian environments (Whinam and Comfort 1996).

Research into the impacts of horses in Australia has shown that horses create networks of trails, compact soil, cause widening and collapse of stream banks, damage wetlands, and contribute to erosion (Dyring 1990; Marshall & Holmes 1979; Lance *et al* 1989; Chappell *et al* 1971; McGinty *et al* 1978; Environment ACT 2007)

Previous research in the sub-alpine and montane areas of Kosciuszko has found that horses create an extensive network of trails wherever they move, as a result of compaction of the soil. Dyring (1990) found that dry soils needed only 20-50 passes by unshod horses before significant compacting occurred. This means that a group of four horses would only need to pass twice a day for 5 days along a new track to cause significant compaction.

Figure 3: Examples of track formation and trampling of vegetation caused by horses in the Rams Head area of Kosciuszko National Park (Photos: K. Green)

Compaction of trails and wallow sites often leads to increased erosion, particularly in steep areas, as water races unchecked down the slopes. Exposed soil can also be prone to frost heave during winter months. Dyring (1990) found that the general soil loss from tracks in her study area averaged 40 to 156 cc per metre^2. More soil was lost from the wider tracks, suggesting an increase in erosion with an increase in exposed soil surface. In wet peaty areas erosion occurs through runoff and from displacement of soil to the side of trails as hooves sink in deeply (Marshall & Holmes 1979; Lance *et al.* 1989).

Figure 4: Dry wallow on Fifteen Mile Spur created by horses rolling. Vegetation is removed and soil is compacted and exposed making it susceptible to frost heave and erosion. Tape measure at top of photo is set at 1metre (Photo: M. Bowden, 2007).

Compacted areas on trails, in wallows, and in rest areas have been found to be considerably drier than adjacent untrampled areas as a result of greater evaporation from bare areas, decreased pore space in the soil from compaction and reduced infiltration following compaction and greater runoff (Chappell *et al*. 1971; McGinty *et al*. 1978).

Horses have been found to cause significant damage to stream banks at drinking and crossing sites, including slumping and collapsing of banks and damage to surrounding vegetation (Dyring 1990). Horses prefer to cross from more 'solid' ground beside an established crossing, rather than risk falling on a churned up track, therefore stream crossings are constantly being widened.

Figure 5: Stream bank disturbance and siltation resulting from drinking and crossing by horses on Peppercorn Creek (Photo: G. Wilks, 2007).

The wetlands and bogs of the Snowy Mountains are extremely important as filters and storages for water supply as well as habitats for threatened species (for example, the corroborree frog and the broad-toothed rat). Wetlands contain drinking water and green growth that is very attractive to horses. Research shows that horses will trample sphagnum moss as they search for food, however they do not appear to eat it. Grazing and trampling near wetlands and bogs tended to result in a decrease in sphagnum and sedges, lateral erosion and increased probability of wetland draining. If these wetland areas dry out they can become only stony pavements (Environment ACT 2007). Research shows that although dry soils are more likely to be compacted than wet soils, wet soils are more vulnerable to structural damage (Dyring 1990).

Dyring (1990) found that trampling by horses also led to vegetation differences. Fewer species and fewer plants were found on trampled sites, with less native species diversity, but higher exotic species abundance.

Feral horses are not randomly distributed over the different habitats within the Park. They feed between 51% and 75% of the time and therefore numbers are concentrated in grasslands and heath. This preference for grassland and heath habitats is likely to eventually alter the ecology of these areas by selective grazing (Dyring 1990).

Figure 6: Wetlands and bogs are sensitive to trampling, horses crossing have changed the hydrology, causing them to dry out and increase the amounts of silt deposited downstream (Photo: M. Bowden, 2007).

Horses have also been shown to impact the native fauna of other countries into which they have been introduced including the survival of grass nesting birds (Zalba and Cozzani 2004), reptiles and small mammals (Beever and Brussard 2004)

Safety Issues

Horses, as a large and highly mobile animal, pose a significant risk to motorists using the Snowy Mountains Highway, the Elliott Way, the Alpine Way and other roads within the Park.

Horses regularly cross and travel along these roads. During winter salt is frequently used to de-ice roads; this salt stays on the road shoulder and attracts horses for the rest of the year.

In the past NPWS has received a number of complaints from other park users who have felt that their safety has been threatened by the presence of horses. Horses can be quite large, and stallions are known to act in an intimidating manner when they perceive there is a threat to their mob.

Figure 7: Horses crossing roads in the park, such as these on the Snowy Mountains Highway, pose significant risks to motorists (Photo: M. Bowden, 2007).

Spread of Disease/Health Issues

A number of notifiable infectious diseases that affect horses are endemic or sporadic to NSW including equine infectious anaemia, strangles and anthrax. Anthrax is zoonotic which means it affects both humans and animals. Horses and other livestock are known to carry the parasite *Cryptosporidium parvum*, which can cause serious gastroenteritis in humans if it contaminates drinking water (Environment ACT, 2007). Exotic diseases such as Equine Influenza (EI), equine encephalomyelitis, Potomac fever and other exotic infectious disease would have a major impact on the Australian horse industry if they were to become established here (Department of Primary Industries 2005, 2008).

An outbreak of EI in eastern Australia in August 2007 prompted strict restrictions on the movement of horses throughout New South Wales and Victoria. The outbreak had massive repercussions on horse industry and highlighted the problems that could occur if a horse population became exposed to such a disease

Due to the popularity of recreational horse riding in the park and the ease with which many of these diseases spread, an infectious disease could be passed from domestic horses to the horse population where it would be difficult to control. Not only could the disease then spread onto private properties or over state borders but the welfare of the infected horses could become an issue.

It is important that all horses involved in the trapping program are monitored to ensure they are not carrying infectious diseases. If any horse is suspected of having an infectious disease, Department of Primary Industries regulations will be followed. This will include quarantining both infected animals and other animals that are known to have come in contact with them, notifying the Emergency Animal Disease Hotline and disinfecting all persons, vehicles and equipment involved in the trapping program.

3.4 Horse biology

Horses usually form small social units called harem groups and bachelor groups. Harem groups usually contain a dominant male, a number of females and their offspring. Young males and old males who have been overthrown and lost their mob, form loose Bachelor groups and spend time on their own.

Breeding

Horses normally foal during spring and summer, with a single foal born following a gestation period of 336 days (Dobbie & Berman 1990). They are generally seasonal breeders with oestrus determined by day length. Females reach sexual maturity in 12 to 24 months and although mature females are capable of foaling every year, they usually raise one foal every two years (Wagoner 1977). The horse population can increase by up to 20% per year when conditions are good, but the population growth rate in Kosciuszko is expected to be closer to 8% (Dobbie and Berman 1992; NPWS 2003).

Home Range

The home range of a horse depends on the type of country and the season. The best data we have from similar parks to Kosciuszko National Park suggests that home ranges are more than of 9.76 $km^{2.}$ Bachelor males tend to occupy the largest living areas, whereas harem groups occupy smaller, more stable areas (Dobbie and Berman 1990).

Horses are highly mobile and movement corridors between suitable grazing sites in montane areas are easy to see (Dyring 1990). Horses resist being forced out of their home area, whether by aerial or ground mustering (Dobbie and Berman, 1992).

Life Span

The main causes of death for feral horses are starvation, thirst, ingestion of toxic plants, and internal parasites in foals. In an environment such as Kosciuszko National Park there is little to limit the lifespan of a feral horse. Snowfalls in most areas are light and winters short, there are no predators, and there is abundant water and grass even in times of drought. Although domestic horses can live for more than 30 years, research in other areas has shown that life expectancy in the wild would be less (NSW NPWS 2006). The favourable conditions in Kosciuszko National Park mean that horses could be expected to have longer life spans than those in other parts of Australia however there has been no research into this to date.

Diet

Primarily a grazing animal, horses feed 51 per cent to 75 per cent of the time, and they eat a wide variety of foods (Mayes and Duncan 1986; Pratt *et al.* 1986). They prefer to feed in areas with the greatest concentration of high quality green food and when this is sparse they seek out perennial herbaceous plants (green or dead). They mainly eat grasses but will also feed on roots, bark, buds and fruit when preferred foods are not available.

3.5 Horse Population and Distribution

Methods of Estimating Abundance

To effectively manage a population it is important to estimate its size and distribution. Aerial surveys are often the only practical way of estimating the population size of large animals ranging over large areas (Walter and Hone 2003). Despite the obvious advantages of using aerial surveys to estimate abundance, the method also has several shortcomings. One of the main challenges is to improve the accuracy of surveys, as undercounting commonly occurs (Walter and Hone 2003). Errors in counting can occur because of vegetation cover, species characteristics, flying height, speed, weather conditions, and lack of observer experience (Walter and Hone 2003).

Several methods of aerial survey have been used in the United States, New Zealand and Australia to estimate the abundance of horses. These methods include line transects, strip counts and mark-recapture methods (Walter and Hone 2003; Linklater and Cameron 2002).

Strip transects are the most common form of transect used. With this method aerial surveys are conducted along a fixed line and all animals within a specified distance of the aircraft are counted. It is assumed that all animals in this 'strip' are seen (Montague-Drake 2005). Although this method is easy to carry out and analyse, the reality is that even trained observers see only 60-70% of the animals present in the strip (Montague-Drake 2005).

Line transects are a generalised version of strip transects. With this version the observer flies or walks a fixed line and counts all animals seen, rather than only those within a certain distance (Montague-Drake 2005). The distance and angle to each group is recorded, as well as the size of the group and this information is used to estimate the abundance and density of the population (Montague-Drake 2005). Although this method has been successfully used in many cases it still relies on the assumption that all animals on the transect will be detected, and that the location and measurements are correct, because of this line transects frequently undercount populations between 10-25% (Montague-Drake 2005).

In the mark-recapture methods two observers travel along the same fixed transects and record animals independently of each other (Walter and Hone 2003). Analysis can then be undertaken using the number of animals seen by only one of the observers and the number seen by both. This method is commonly combined with either line transect or strip transect surveys to improve the accuracy of these methods (Walter and Hone 2003).

Current Abundance and Distribution

Both Walter (2003) and Montague-Drake (2005) utilised the mark-recapture method in conjunction with line transects. The aircraft heights and strip-widths were chosen to avoid flushing of animals and double-counts, and in both cases a bar was attached to the helicopter to assist observers in judging the distance to groups of animals.

Walter (2002) conducted research from 1999 until 2002, and estimated that the total population of horses in the Australian Alps National Parks was about 5,200, with approximately 3,000 in Kosciuszko National Park. Following the 2003 bushfires, Walter (2003) conducted further surveys and estimated that the horse population had been reduced by half in the southern region of the Park, but that the northern horse population was intact and continuing to increase.

Montague-Drake undertook a survey of horse numbers in 2005 using similar methods to Walter, and estimated that the population of horses in the southern part of Kosciuszko was about 590 with a density of 1.56 horses per km^2, while the northern end had about 1120, with

a density of 1.67 horses per km^2. This gave a total of 1,700 horses in the park. The average group size recorded on the surveys was 4.38 for the south and 4.17 for the north (Montague-Drake 2005).

Figure 2 shows the current known distribution of horses in Kosciuszko National Park. This information was compiled by Dawson (2005) following aerial surveys.

Current information indicates that horses have been moving into the Park from Maragle and the Bago State Forests, as well as moving back and forth across the border into the ACT and Victoria. It is believed that the relatively high numbers of horses in adjoining areas has been a factor in the movement of horses into the alpine area. As a result the Kosciuszko National Park Plan of Management recommends that horse numbers be reduced in areas adjacent to exclusion zones to reduce the movement of horses into these areas. In addition, a buffer zone along the Victorian and ACT borders and along boundaries with State Forests will assist in any cross border control programs.

4. Community Consultation

There was extensive public consultation during the preparation and exhibition of the Kosciuszko National Park Plan of Management which was adopted in July 2006.

DECC understands that many in the community feel very strongly about horse management, and therefore we were careful to make sure that the public had many opportunities to contribute ideas, advice and support to the plan.

4.1 Who Did We Talk to About Horse Management Issues?

As part of the development of the Kosciuszko National Park Pan of Management the following groups were consulted

- An independent scientific committee. This group consisted of 18 prominent scientists and experts who provided advice on the significance, conditions and threats to the natural, cultural, recreational and social values of the Park
- The Community Reference Group. This group consisted of 20 community representatives from various interest groups
- Members of the Aboriginal Working Group
- The South West Slopes and Snowy Mountains Region Advisory Committees
- Other community interest and stakeholder groups.

The draft Kosciuszko National Park Plan of Management was put on exhibition for 16 weeks

- Submissions were received and after analysing them we made changes to the plan
- The amended plan was then reviewed by the local regional advisory committees and the NPWS Advisory Council before being forwarded to the Minister for the Environment for adoption in June 2006.

The Kosciuszko National Park Horse Management Community Steering Group was established as a result of the development of the Kosciuszko National Park Plan of Management.

4.2 Kosciuszko National Park Horse Management Community Steering Group

The National Parks and Wildlife Service identified the following groups as having an important interest in the way we managed horses in the Park:

- National Parks and Wildlife Service staff;
- South West Slopes and Snowy Mountains Region Advisory Committees;
- New South Wales National Parks Association;
- local Indigenous communities;
- Royal Society for the Prevention of Cruelty to Animals (RSPCA);
- Snowy Mountains Bush Users Group; and Snowy Mountains Horse Riders Association.

The Kosciuszko National Park Horse Management Community Steering Group consisted of 13 members from these groups.

The role of the Community Steering Group was:

> *"to facilitate the development of a horse management plan for Kosciuszko National Park which will recommend future strategies for the humane capture and removal of horses from the Park".*

The Horse Management Community Steering Group held five meetings over 12 months to help prepare the Draft Management Plan and to review any trials. The meetings of the steering group allowed the NPWS to consult with interest groups and discuss options and concerns. As members of the group held widely divergent ideas the final plan does not necessarily reflect the views of all individual participants or interest groups. The draft plan was publicly exhibited for six weeks, and comments from the broader community were welcomed during this period.

4.3 Where to From Here?

Following public exhibition of the draft plan all submissions received were considered and reviewed, and changes were made to the plan as a result. The edited plan was then forwarded to both the Snowy Mountains and South West Slopes Regional Advisory Committees for comment before being approved and released.

Following approval of the plan it will be implemented as part of an integrated pest management strategy across the park, and the results of the program will be made available in NPWS annual reports, and in associated reporting for the Regional Pest Management Strategy. The program will be discussed with Regional Advisory Committees.

Policies and actions will be implemented and reviewed as per the table in Section 10.

5. Horse Management Methods

Horses have a high public profile and management practices therefore receive close scrutiny from interested groups. An example of this is the media attention that followed an aerial cull of horses in Guy Fawkes River National Park in October 2000. Because of this interest in horse management, the techniques we use have to satisfy a wide range of criteria and we have to keep refining them (Dobbie and Berman 1992; Dobbie *et al*. 1993; English 2001).

Managing a population of horses is not new. Control techniques used by the early pastoralists in the area included mustering and trapping, usually targeting younger horses that had potential to be "broken" in to the saddle. We are told of "horse shoots" when the horse population was felt to be excessive or the pasture was needed for other livestock. Various local groups also shot horses just for the "sport" (Wright 1971) and occasionally for dog food.

Management of horse populations is carried out throughout the world and by other Australian states and territories, including in national parks and on other public land.

Removing horses from the alpine areas of Kosciusko National Park has been going on since 2002. Over that time about 206 horses have been removed using mainly trapping in yards using feed, salt and molasses to attract the horses to the yards. Each year the techniques are refined to improve safety to both horses and people and to increase the number of horses removed. From November 2006 to February 2007, 64 horses were removed by contractors, which was a significant improvement on previous years.

There are many ways to remove the horses and we choose the method that best suits the situation. Factors such as mob size, age structure, geography, accessibility and season all will have an impact on which is the best method to use. Combining different techniques will usually be the most effective way, as some methods may not be suitable in certain circumstances. For effective control of horse populations across a diverse park such as Kosciuszko National Park, it is important that all humane and permissible options remain available.

There has been vigorous public debate about the options for managing horses, however, when we carefully examined each option it became clear that there are only a few options which are humane, practical, cost-efficient, environmentally sound and meet current Departmental policy.

An overriding consideration is the fact that horses do have the ability to maintain and potentially increase their population in spite of capture and removal.

The fewer the animals in a population the more it costs per head to remove them.

In planning a program for the removal of horses we need to make sure that:

1. the objectives of the operation are met
2. the best environmental outcomes are achieved
3. economic cost/benefit is realistic
4. the welfare of the animals has been carefully considered
5. those involved in implementing the program have the right skills for the job.

See Table 1 for a summary of horse management methods with a more detailed discussion outlined below.

5.1 Immobilisation using tranquillisers delivered by a dart rifle

The use of dart rifles to deliver tranquillisers to immobilise horses for transport has been suggested as a control method. This method is very labour intensive, costly and requires veterinary supervision. Tranquillisers are difficult to administer to wild animals because they don't stand still for an injection and so this method can be dangerous for the animal.

This method is considered impractical for large-scale reduction of horse numbers in rugged terrain.

5.2 Fertility control

Several techniques of fertility control exist or are under development, and vary in cost and effectiveness. Alternatives include

- surgical desexing of males or females
- contraceptive implants for females
- immunocontraception - where males or females are immunised against their own sperm or eggs.

All three techniques currently require horses to be captured and handled so the method has practical and financial limitations. Although some fertility controls such as Porcine Zona Pellucida can be administered by dart rifle, the range of such rifles means that horses must be trapped for the dose to be delivered effectively. In addition these controls wear off over time meaning that horses need to be re-captured several years later.

Fertility control is not a feasible option at present as there are currently no techniques for wide-scale, cost effective administration of contraceptives. The National Parks and Wildlife Service will keep up to date with changes in technology as this technique may become more practical in the future.

5.3 Fencing

Fencing horses out of sensitive areas is only an option for very small areas of particular concern. It is not commonly used to control animals on public land because it restricts public access and affects the movement of native species. For larger areas such as the alpine area, or along the Alpine Way or Snowy Mountains Highway, fencing would be prohibitively expensive to erect and maintain especially during winter snow.

It would also have significant visual impacts. Even single wire electric fencing would be too expensive, requiring grids for public access roads and trails, as well as posing unacceptable safety risks to the public.

5.4 Culling

Aerial Culling

This method, which involves the culling of horses from helicopters, is widely used throughout Queensland, Western Australia and the Northern Territory. In 1991 the Senate Select Committee on Animal Welfare stated that culling horses from helicopters is the only practical

method for quick, large-scale and humane culling of large animals in inaccessible locations (Dobbie *et al.* 1993).

In October 2000, following a period of prolonged drought and a severe wildfire in Guy Fawkes River National Park, a decision was made to undertake an aerial cull of horses in the reserve. This option was chosen because a large number of horses in the park were suffering from starvation due to both the drought and the fire that had burned most of the horses feed resources. During the three day program a total of 606 horses were culled by properly trained and accredited pest control officers using protocols approved by the relevant authorities (For FAAST protocols see: English 2000). The cull received widespread national media attention and, although supported by conservation groups, was for the most part reported with condemnation. Following an inquiry into the program it was found that of the 606 horses shot only one did not die immediately, and this was due to a malfunction of the bullets used, not the actions of the shooters (English 2000).

In response to community concerns, the NSW Minister for the environment placed a moratorium on aerial culling of horses in NSW national parks, which is still in place.

In a report on the Guy Fawkes River cull (2000), Dr Tony English concluded that the use of aerial shooting in Guy Fawkes River National Park was an appropriate technique under the circumstances and that it was carried out in a humane way, under approved protocols.

It is acknowledged that there is public concern with the large-scale culling of horses, and in particular aerial culling in some areas.

Ground Culling

Ground culling is available as a possible control method. It can be quite effective in relatively flat, accessible country. A problem with ground culling compared to helicopter culling is that it can be difficult to follow up individual animals and ensure that wounded animals are destroyed quickly. In other Australian reserves, horses are trapped and then sedated by veterinarians before being euthanased in the trap yards. This removes the need to follow up wounded animals but is more labour intensive as horses must be trapped and carcasses must be removed and disposed of.

In this plan only injured, very ill or animals which are endangering peoples safety will be euthanased. All treatment of horses will be conducted in accordance with the Model Code of Practice for Human Control of feral Horses published by NSW Department of Primary Industries

The RSPCA has advised that in some circumstances it may be more appropriate to euthanase horses in the Park rather than put them through the stress of loading and transport, particularly if the horse would inevitably end up being destroyed or sent to an abattoir because of their age and ‘wildness’.

5.5 Live capture and removal methods

There are several techniques that can be used to capture and remove live horses; these methods are discussed in detail below and are summarised in Table 1. Issues generally associated with these techniques include:

- There are environmental impacts associated with horse riding
- There is stress on horses as a result of the capture and then transportation from the Park

- There is a risk of injuries to riders and horses
- The methods are labour intensive
- There may be conflicts between horse riders and other Park users
- Different methods of capturing horses are not equally efficient.

Trapping horses in yards using lures

This option involves attracting horses to an area using feed, molasses or a mineral block. Once the horses are using the salt, portable yards are erected which allow the horses to continue to access the block. A trigger is then set which activates a gate to trap the horses. Horses are then loaded onto a truck or trailer and removed from the Park.

In remote locations horses can be led by mounted riders to a truck but this is labour intensive and can pose a risk to the riders.

This method was trialled by National Parks staff and volunteers in southern parts of the Park in 2001and 2002. Some of the issues identified during this trial were:

- Salt only attracted horses if they couldn't get enough in the area naturally. This means the method would be successful in some areas and not in others.

- Trapping in the alpine area was only safe during November to May. In the Dead Horse Gap area, high visitor numbers during January and at Easter mean even less time is available.
- The method is labour intensive because the yards are always in relatively remote locations, so this process always takes a lot of time and people.

- There is always a risk of interference with the trap yards and trapped horses because of the generally high level of visitors to in the alpine and sub-alpine areas.

Despite the disadvantages of this method it is viewed by the wider community as the most acceptable method of control as it allows adoption and re-homing of horses through contractors and re-homing charities.

Trapping horses in a specially constructed trap paddock

A trap paddock is constructed with several points of entry. The paddock may be constructed in stages to allow horses to become used to the concept of a fence barrier. It is preferable that the location of a trap paddock contains water.

A mineral block can be placed in the paddock or suspended from trees to help attract the horses. Once horses are moving in and out of the trap paddock the exit points are closed off until eventually all exits are closed and the horses are trapped.

The horses are then brought into a smaller trap yard where they are handled over a period of time to quieten and prepare them for leading out or loading onto transportation.

Issues associated with this method include:

- we have to keep the horses in the paddocks for some time
- there is always a risk of interference with the yards
- this is not a suitable technique to use in areas with high visitor numbers.

Mustering using a helicopter/ mustering into a net trap

This option involves mustering horses into a trap using a helicopter or horse riders. Long fences direct the horses into the yards where they are held and then led by horse riders to or loaded directly onto trucks for removal from the Park.

This method relies heavily on finding a suitable location for the trap to be effective. The trap must be constructed quickly so horses are not aware of the activity. There is a safety risk to the helicopter and/or riders. The use of helicopters to run horses, places more stress on animals than trapping does, and escaped horses can learn to avoid the sound of a helicopter.

A positive aspect of this method is that it is possible to capture a large number of horses at one time, if there are a lot of them together.

Mustering using coacher horses

This technique involves introducing educated, domesticated horses into free ranging horse mobs before the muster. The presence of coacher horses has been shown to reduce stress in the free-ranging horses while being mustered towards the trap site. If the herd becomes unruly the coacher horses allow the riders to turn the herd until it settles. Once the horses are moving in the desired direction, horses are mustered into a trap or large yard.

Where this technique has been used in central Australia, the yards are very large to allow horses to enter the yard at a reasonable pace and still be able to pull up and settle before encountering panels. If horses run into steel panels they will hurt themselves.

If this method was to be used in northern Kosciuszko National Park, captured free ranging horses could be educated to fencing, trained to take feed and then released as coacher horses. These horses could help to educate other horses to take feed and respect barrier fencing.

Mustering using low stress behavioural technique

This method uses the principles of working with basic natural animal instincts to produce low stress outcomes. Using this technique horses can be walked or slowly moved into a large paddock where they can be educated to fencing, then moved progressively into smaller paddocks where horse handlers work with the horses to quieten and prepare them for leading out or loading onto a transporter. Holding horses in a paddock for a length of time may not be suitable in sensitive or high visitation areas.

Brumby Running under a contract system

Brumby running is a method of capturing horses from horseback. It involves roping horses, then leading them to where they can be loaded onto a truck and removed. This method has been used in Victoria to reduce horse numbers in remote areas.

Parks Victoria records show that in recent years about 200 horses per year have been removed this way. Recent research also indicates that the average catch of horses using this method as reported by the Alpine Brumby Management Association of Victoria is one horse every one to two rider/days, depending on the skill of the rider (NPWS 2003).Recently Parks Victoria have made the decision to incorporate a trapping program into their feral control program as roping alone is not reducing the overall population of horses.

Issues associated with this method include

- it can target horses in more remote areas

- it requires skilled riders and the number of riders with sufficient skills to capture horses in this way is limited
- there are environmental impacts that come with running horses, particularly in fragile alpine and sub-alpine environments, however, the environmental impacts are spread across a wide area
- there is always a risk to riders in remote and difficult terrain
- it can be stressful for horses and there is a risk of injury
- the activity may cause conflicts with other Park users, particularly in wilderness areas where horse riding is not permitted except for management purposes
- there are significant issues concerning the humaneness of this method.

Roping

Like brumby running, this method involves roping horses from horseback before leading them to trap yards or to trucks.

Roping has been distinguished from brumby running in this plan because in the scope of the plan roping refers only to the capture of injured horses or trap-shy horses staying close to but outside trap yards. Roping is not considered to be and will not be used as an overall method of control but rather as a complimentary method to be used by experienced horsemen in conjunction with the trapping program.

Table 1– Horse Management Methods

Control Method	Efficiency	Risk to horses	Terrain Suitability	Risk to People
Immobilisation/Tranquiliser • Dart rifle	• Difficult to administer • Small numbers or one off • Impractical for large numbers	• Can result in injuries if horses stumble over rough ground • OK in a yard	• Require clear/open area • Good in a yard	• Possible injection of chemical • Handling a large animal
Fertility Control • Immuno-contraception • PZP	• Currently labour intensive, • Require recapture	• Possible injury in capture/handling	• Isolated populations	• Handling a large animal
Fencing	• Effective for small sensitive areas • Impractical for large areas, snow loads	• Low injury risk • Effect mob movement	• Ideal in clear areas • Difficult in steep, rocky areas • Horses walk around end of a single run	• Minor injuries possible with fence installation • Impact on people and their movement
Aerial Culling	• Effective for large and small numbers • Can get close to the animal and follow up any wounded animals	• To abide by DPI code • Low injury risk if carried out by qualified shooters	• Not suitable for tall forest • Good in open-woodland	• Safety of air crew • Need to clear/avoid public
Ground Culling	• Effective for small numbers • Highly effective if contained in a trap or yard	• Chance of not being able to follow up injured horses in the field	• Effective in flat open terrain	• Minimal with accredited shooters • Need to clear/avoid public
Trapping • Use of lures to catch animals in trap yards	• Effective for large numbers • Large effort for small numbers • A tried method	• Low injury risk in handling/transport • May end up in abattoir	• Close as possible to vehicle access • Not suitable for remote/rugged terrain	• Minor risk while handling a large animal once trapped
Mustering • Use of riders and/or helicopters to run horses into yards with wings	• Effective • Require skilled riders/pilots • Require a good knowledge of the horse mob & terrain • Hard to deal with escapees	• High risk of injury	• Flat open terrain valleys • Need to run them on known escape routes & within home range • Close as possible to vehicle access	• High risk of injury for riders & pilots • Minor risk while handling a large animal once trapped
Mustering using Low Stress Behavioural Technique • Use of people & helicopters to walk horses into yards with wings by using animal's natural instincts)	• Results variable can be effective for large/small numbers • Require skilled riders/pilots • Require a good knowledge of the horse mob & terrain	• Low risk of injury	• Flat open terrain, valleys • Need to move them on known escape routes & within home range • Close as possible to vehicle access	• Moderate risk for people on the ground & pilot while moving horses • Minor risk while handling a large animal once trapped
Brumby Running • Use of riders to chase and rope/lasso horse	• Effective but time consuming for single/small numbers • Requires skilled riders • Requires good knowledge of horse mob and terrain • Hard to deal with escapees	• High risk of injury	• Flat open terrain valleys • Need to run them on known escape routes & within home range • Good for accessing horses in remote country	• High risk of injury for riders • Moderate/High risk while handling a large animal once caught
Roping	• Effective for small numbers but can be time consuming • Requires skilled riders	• High risk of injury • Useful for capturing injured horses	• Good in areas close to yards	• Moderate/high risk while handling a large animal once caught.

Environmental Cost/Impact	Cost	Legal	Public Opinion
• Helicopter/ground shooting • Some impact of vehicle when retrieving animal	• Too expensive for large numbers • Good for 1-2 horses	• Requires veterinary supervision	• Humane if goes well
• Denuding areas if trapping	• Too expensive at present for large numbers	• Requires involvement of animal ethics committee	• Humane/good
• Minor impact on vegetation • Impact on movement of other fauna	• Good for small areas • Too expensive to construct & maintain large areas	• Require REF • If used alone does not meet requirements of KNP POM	• People movement impeded • Impact on aesthetics • Pro-horse people prefer this
• Carcass not removed	• Is a widely used cost effective method	• Accredited Shooters • Moratorium in place in NSW	• Public opinion divided • Widely used in WA, QLD and NT
• Minor impact pending mode of transport	• Good for small numbers • Too labour intensive and so expensive for large numbers	• Accredited shooters	• Public opinion divided
• Trampling of trap site	• Cost variable • Expensive under current contract system • Need to find market for horses	• Necessary to keep to DPI & DECC codes of practice	• More acceptable to people
• Trampling of areas running horses & holding yards	• unknown	• Necessary to keep to DPI & DECC codes of practice.	• Public opinion divided
• Trampling of holding yards	• Cost variable pending willingness of horses to be moved	• Necessary to keep to DPI & DECC codes of practice	• Unknown but probably more acceptable to people
• Trampling of areas chasing horses & holding yards	• unknown	• Recreational Brumby Running is banned in NSW National Parks	• Public opinion divided
• Trampling of areas while chasing horses	• Unknown	• Will be undertaken by experienced riders in line with the Codes of Practice.	• Public opinion divided

6. Methods to be Implemented

The Horse Management Community Steering Group recognised that different techniques suit different situations depending on factors such as mob size, age structure, geography, accessibility and season. As with the management of any vertebrate pest a variety or combination of different techniques are likely to achieve the most effective results.

The steering committee considered several factors associated with the different control methods including:

- Cost
- Animal welfare considerations
- Environmental impacts
- Legal considerations
- Public opinion

After reviewing all available methods and current data the Steering Group decided on two preferred methods:

- Trapping using lures; and
- Mustering using low stress techniques

Trapping using lures will be the primary method with low stress mustering to be trialled as another broad scale option. These methods were chosen as they are the most humane and most effective methods currently available in New South Wales. The NPWS recognises that any control program needs to use a combination of methods to achieve the best outcomes. The NPWS will also keep up to date with any new more suitable methods. For this reason NPWS will reassess the control methods available throughout the program to ensure objectives can be met.

The Steering Group and the wider community recognise that there are different opinions about the use of culling techniques to remove horses from the Park. On this basis, it is proposed that only injured, very ill or a horse that threatens the safety of people will be euthanased.

The Steering Group had different views regarding the level of stress of one method versus another. They agreed that stress was almost impossible to measure and was dependent on the skill level of the operator. To reduce the stress and increase the humaneness of any control programs, only experienced horse handlers will be used. All staff will be trained in correct procedures and contractors will be made aware of current Codes of Practice.

7. Exclusion Zones and Feeder Areas

The 2006 Plan of Management for Kosciuszko National Park calls for horses to be excluded from the following areas:

- Main Range Management Unit
- Yarrangobilly Management Unit
- Cooleman Plain Management Unit
- Safety risk areas such as highways
- Areas of the park where horses have not been or have only recently been recorded
- Areas of the park adjoining other Australian Alps national parks and reserves
- Feeder areas for all these parts of the park.

Feeder Areas

A feeder area is an area adjacent to a horse exclusion zone, from where horses are known to be moving into that exclusion zone.

As the size of such a feeder area is dependant on the vegetation, topography, and water resources of an area, and on the size and composition of each horse mob. Feeder areas change over time as a result of changes in the weather, environment and density of horse populations. It is not possible to chart these areas on a map. Staff and operators will monitor horse populations in exclusion zones and areas adjacent to exclusion zones and if populations continue to grow will undertake control programs in these feeder areas.

Cooperative Control

NPWS have a responsibility to ensure introduced species do not move across park borders into other Australian Alps national parks and reserves. Allowing animals to cross into these areas increases the environmental impacts in these reserves and means the costs and resources associated with pest species programs in these areas are much higher. For this reason the Horse Management Plan for Kosciuszko National Park will aim to exclude horses from areas of the park bordering other national parks and reserves, e.g. Namadgi National Park.

A second issue faced by NPWS is that horses are known to be entering the park from adjoining properties and state forests, including the Bago and Maragle State Forests. In order to minimise movement of horses across park boundaries, and to help ensure the objectives of the program can be met, NPWS will endeavour to undertake cooperative control programs with Forests NSW and with neighbouring landholders. As part of this cooperative effort NPWS may decide to introduce further exclusion zones along park boundaries.

Control in the Rest of the Park

The control program in this plan aims only to exclude horses from the areas defined above. The decision may be made to reduce horse numbers in other areas of the park if they are judged to be causing unacceptable impacts to the environment or the cultural heritage of the park, or they pose a risk public safety. Control may also be undertaken to halt the spread of diseases such as Equine Influenza.

8. Future of Removed Horses

It is proposed that horses captured in the Park will become the property of a contractor, a horse dealer or interest group depending on circumstances, interest, ability to meet current welfare codes, and cost.

Once horses are handed over to a contractor, dealer or group, the Service is no longer responsible for what happens to them. It will be the responsibility of the carrier when removing horses from the Park, to make sure that horses are treated humanely while being moved.

There is legislation in place, e.g. the *Prevention of Cruelty to Animals Act*, which sets out how people must control and treat an animal and the penalties if the law is broken.

The Department of Primary Industry has produced Codes of Practice and Standard Operating Procedures for the humane capture, handling and destruction of feral animals including horses. This Service will comply with these Codes and Standards.

Contractors or staff will be required to record and report to the Service on the results of any trapping and mustering operations. This information will include

- a record of all horses removed, including sex, colour and approximate age
- the numbers/locations of horses sighted
- advice on any accidents or injuries to any horse or rider
- the number of rider/days used to capture the horses
- the number of horses used in capture/removal of horses.

The contractor or the Service will be required to provide suitable horse transport for the removal of horses from the Park and facilities for housing, yarding and agistment after removal.

Once they are removed from the Park, some horses will have the potential to be trained as riding horses, carriage horses or pets. Some horses, because of their age and 'wildness' would inevitably end up being destroyed or sent to an abattoir. This is the case with thousands of horses in Australia every year, which cannot be used either commercially or as pets.

There has been discussion about contractors involved in removing horses from the Park setting up a central register or web site for people interested in obtaining a horse removed from the Park and the Service will encourage this approach.

A number of Horse Adoption groups have contacted the NPWS during the exhibition of this plan, NPWS is willing to discuss options with any relevant groups in the future and will encourage contractors to do the same.

9. Monitoring, Repair and Evaluation.

We will need to be able to measure the success and or failure of the final plan in achieving its objectives. The plan will need to operate as a flexible document with the potential to develop, as various control methods are trialled, evaluated and modified.

Below is a list of the most important aspects of the program, each of which will be evaluated.

- The humane treatment of horses, i.e. injuries to animals
- The safety to people involved in the trapping
- The number of horses removed
- The environmental impacts
- The reduction of risk to motorists
- The resources required for long-term programs, ie people, funds
- The impact of capture methods on Park visitors, and impact of visitors on the program
- The success of contract arrangements.

We will undertake monitoring over the long term because this is necessary for establishing rates of environmental change that horses are imposing on natural systems. To understand the effects of introduced animals it is more important to look at the speed of change over time than to just look at the amount of change at any one time.

We will setup partnerships with universities or other interest groups to do the long term monitoring of

- erosion trends
- population assessments
- habitat use
- grazing trials
- weed transmission (Dyring 1990) and
- the impact on threatened species habitat.

9.1 Monitoring and repairing the environmental impacts of the removal programs

The Service will do an environmental assessment of activities related to the capture and removal of horses from the Park because trapping can cause removal of vegetation and soil compaction over small areas.

Horse Trap Sites

As this program will be long term, some trap sites may be reused each year. At the end of trapping programs, disturbed sites will be repaired.

All sites will be monitored and further treatment will be given to areas that don't stabilise. We will use permanent photo points to monitor the sites before and after treatment, to help in improve our treatment of the sites.

Using remote locations

At this stage, most trapping sites will be located in easily accessible areas, to avoid the need for temporary tracks.

Environmental impact monitoring

To measure changes over time and how our management strategies are working, we will have an environmental monitoring program in areas across the Park. This program will involve assessing vegetation and water quality at 4 sites that show signs of existing impacts from horses within the proposed horse control areas.

9.2 Evaluating the capture and removal programs

The effectiveness of the horse removal program will be assessed by measuring horse numbers within the designated target areas, their density and distribution across the Park, and the level of impacts associated with horses.

We propose to do aerial surveys of horses in the north and the south at least every five years and ground surveys every year in areas where horse removal operations will be conducted. We will continue to keep a watch on reports from staff and the public about the presence of horses or signs of horses, vehicle collisions with horses and 'near misses'.

Photo monitoring points will be established in areas of the park where horse impacts are known to occur and these will be revisited at the beginning and end of each trapping season. In addition a number of transects will be set up in exclusion areas to monitor the recovery of horse trails/bogs, following the exclusion of horses.

We will evaluate the cost of the horse management program. We will also assess the people, efficiency, funding, and equipment that we will need to run a long-term horse management program.

NPWS believes there is a need to identify captured horses and is investigating the viability, effectiveness and efficiency of various methods. Contractors will be required to keep records of the fate of all animals. Branding or micro-chipping methods may be adopted as these will discourage new owners from releasing animals and will make tracking and record keeping much easier.

The Horse Management Plan will be reviewed in 5 years to ensure objectives are being met and the best available control methods are being used. This review will be undertaken by NPWS staff and reported to the Snowy Mountains and South West Slopes Regional Advisory Committees.

9.3 Monitoring the humaneness of capture and removal programs

An important aspect in this project is to ensure that animal welfare is not compromised.

Our approach allows for us to modify techniques if necessary. Animal welfare experts are involved in the Horse Management Community Steering Group, and they will continue to advise on horse welfare issues during the life of the program.

As well as the humane treatment of horses, it is also important to assess the safety of those involved in the capture and removal of horses, therefore all injuries will be recorded.

10. Policies and Actions

Objective	Policy	Action
To exclude horses from those areas defined in Section 7.	Horse populations in exclusion zones and feeder areas are monitored and reduced where possible.	Establish photo monitoring points and transects within exclusion zones to record horse numbers, impacts and trails.
		Undertake a control program each year using the methods outlined in the horse management plan.
		Continue to monitor horse populations in feeder areas and undertake control in these areas as necessary.
		Undertake aerial surveys in the north and south of the park every 5 years using the mark-recapture line-transect method.
To reduce horse numbers in other specific areas to reduce the risk they pose. These areas would be where horses have an impact on public safety, the environment or on the cultural heritage of the Park	Horse populations in Kosciuszko National Park are monitored and reduced where they are judged to be causing inappropriate impacts to natural and cultural heritage values	Monitor environmentally sensitive areas and areas with cultural heritage values for horse damage
		Establish photo monitoring points in the above areas if horse damage becomes visible and revisit these points on a yearly basis to establish the level of impact.
		Undertake control programs in the above areas if significant impacts from horses are occurring.
	Horse populations in the vicinity of public roads are reduced to minimise risk to public safety	Continue to monitor horse populations adjacent to sealed roads through on-ground surveys and ‘poo’ counts.
		Undertake control programs in ‘buffer zones’ around public roads.

Objective	Policy	Action
To ensure that all horses are treated humanely throughout the removal process and their removal complies with current Codes of Practice	Horses are captured and removed in a humane manner, and current Codes of Practice are followed	Train all staff in the appropriate methods of trapping and removal.
		Ensure all staff and contractors are aware of the Codes of Conduct for trapping, transport and euthanasia of horses.
	The RSPCA are involved in the control program	Update the RSPCA of removal techniques being used and encourage RSPCA representatives have ongoing involvement in the trapping and removal process.
		Record all injuries to both staff and horses.
	The control program is undertaken in a transparent manner, with measurable goals.	Ensure records of all horses removed are kept up to date. Ensure contractors keep records of the fate of all removed animals.
		Report on the results of the yearly control program in NPWS annual reports and in the regional pest management strategy
		Review the horse management plan in 5 years.

11. Legislative framework

The legislation and policy guidelines regarding the management of horses within Kosciuszko National Park are outlined in Table 2.

Table 2: Legislation and guidelines that provide a framework for management of horses within Kosciuszko National Park.

National Parks and Wildlife Act 1974	• Establishes the National Parks and Wildlife Service • Provides for establishment and management of conservation reserves and the protection of native flora and fauna and Aboriginal relics. • Requires the NPWS to carry out works considered necessary for the management or maintenance of NPWS lands. This includes management of feral species. • Requires that a Plan of Management be prepared for each reserve. The NPWS is required to give effect to plans of management.
Kosciuszko National Park Plan of Management 2006	• The plan describes the natural and cultural values of the Park, management objectives and appropriate management practices. • Identifies the Kosciuszko alpine and karst areas as areas of outstanding natural resources with natural values such as outstanding scenery, alpine vegetation and glacial landforms. The plan identifies the management practices for these areas including the exclusion of horses from these areas. • The plan prohibits public access by vehicle or horse to certain significant areas of the Park (including the alpine area and wilderness areas), except for essential management purposes. • The plan also recommends the creation of a Feral Horse Management Plan for the whole of Kosciuszko National Park. • The plan states that specific areas must be kept horse free and reduce horse numbers in other specific areas to minimise: the likelihood of horses causing a traffic hazard; risk to public safety; or the impact on environmental or cultural heritage.
Threatened Species Conservation Act 1995	• Aims to conserve biodiversity by protecting and encouraging the recovery of threatened species, endangered populations and endangered ecological communities in NSW.
Wilderness Act 1987	• This Act states that wilderness areas must be managed to protect or restore their unmodified state in the absence of significant human interference but it permits opportunities for appropriate self-reliant recreation.
Environment Planning and Assessment Act 1979	• Regulates land use within NSW. • Requires the NPWS to consider the environmental impacts of management programs. • The framework used to carry out this assessment is a review of environmental factors. Where a significant effect is likely, the Act requires the preparation of an environmental impact statement. Where there is likely to be a significant effect on threatened species, populations or ecological communities, a species impact statement is required.
Prevention of Cruelty to Animals Act 1997	• Prohibits cruelty to animals. • Imposes obligations for persons in control of an animal to provide, among other things, food, drink, shelter, and veterinary care for the animal under their control. This is relevant where an animal's movement is restricted, for example in a trapyard.

NPWS = National Parks and Wildlife Service

12. Bibliography

Alpine Planning Project Team. 1989. *Alpine National Park: Cobberas-Tingaringy unit proposed management plan*. Department of Conservation, Forests and Lands, Victoria**.**

Bell, K.L. & Bliss, L.C. 1973 Alpine disturbance studies: Olympic National Park USA. *Biological Conservation* **5**:25-32.

Bureau of Land Management. *Code of Federal Regulations relating to the Protection, Management and Control of Wild Free-Roaming Horses and Burros*. Bureau of Land Management, USA. http://www.wildhorseandburro.blm.gov/regs.htm [Accessed 24 August 2006]

Bratton, S.P. Hickler M.G. & Groves, J.H. 1977, *Trail and campsite erosion survey for Great Smoky Mountains National Park.* Management Report 16, United States National Park Service, Southeast Region.

Braysher, M.L. 1993, *Managing Vertebrate Pests: Principles and Strategies.* Australian Government Publishing Service, Canberra.

Byles, B.U. 1932, *A Reconnaissance of the Mountainous Part of the River Murray Catchment in New South Wales.* Bulletin Number 13, Commonwealth Forestry Bureau, Canberra.

Chappell et al., 1971 in Dyring, J. 1991. *Management implications of the 1988-1990 Study: The impact of feral horses (Equus caballus) on subalpine and montane environments in Australia.* Applied Ecology Research Group, University of Canberra

Costin, A.B. 1954, *A Study of the Ecosystems of the Monaro Region of New South Wales.* Government Printer, Sydney.

Costin, A.B. Gray, M. Totterdell, C.J. & Wimbush, D.J. 2000, *Kosciuszko Alpine Flora*. CSIRO/Collins Australia.

Dale, D. & Weaver, T. 1974, Trampling effects on vegetation of the trail corridors of North Rocky Mountain forests. *Journal of Applied Ecology* **11**:767-772.

Dawson, M. J. 2005, *The Population Ecology of Feral Horses in the Australian Alps – Management Summary*. Unpublished report to the Australian Alps Liaison Committee, April 2005.

DEC 2005, *Trial horse capture and removal program in Guy Fawkes River National Park – 2004/05 evaluation report*. Internal report of the North Coast Region, Parks & Wildlife Division, Department of Environment & Conservation (NSW).

DEC 2006, *Kosciuszko National Park - 2006 Plan of Management*. Department of Environment and Conservation, Sydney.

Department of Primary Industries. 2005, *Equine Influenza*. http://www. dpi.nsw.gov.au/agriculture/livestock/horse/influenza [Accessed 4th March 2008]

Dobbie, W. & Berman, D. 1990, *Movement and home range of feral horses in central Australia*. Unpublished internal document, Conservation Commission of the Northern Territory, Alice Springs.

Dobbie, W. & Berman, D. 1992, *Control of Brumbies in central Australia.* Conservation Commission of the Northern Territory, Alice Springs.

Dobbie, W.R. Berman, D. & Braysher, M.L. 1993, *Managing Vertebrate Pests: Feral horses.* Australian Government Publishing Service, Canberra.

DoC. 2004. *Kaimanawa Wild Horses Working Plan 2004 – 2009.* Department of Conservation, Wellington. http://www.doc.govt.nz/Conservation/002~AnimalPests/Kaimanawa-Wild-Horses [Accessed 24 August 2006]

Dyring, J. 1990, The impact of feral horses (*Equus caballus*) on sub-alpine and montane environments in Australia. MSc thesis, University of Canberra.

Dyring, J. 1991. *Management implications of the 1988-1990 Study: The impact of feral horses (Equus caballus) on subalpine and montane environments in Australia.* Applied Ecology Research Group, University of Canberra.

Eberhardt, L.L. 1987. Population projections from simple models. *Journal of Applied Ecology* **24**(1):103-118.

Eberhardt, L.L. Marjorowicz, A.K. & Wilcox, J.A. 1982, Apparent rates of increase for two feral horse herds. *Journal of Wildlife Management* **46**(2): 367-374.

English, A.W. 2000, *Report on the cull of feral horses in Guy Fawkes River National Park in October 2000*. A report presented to the NSW Minister for the Environment in Nov 2000. http://www.nationalparks.nsw.gov.au/PDFs/english_report.pdf [Accessed 24 August 2006]

English, A.W. 2001, *A report on the management of feral horses in national parks in New South Wales.* Unpublished, released September 2001, http://www.nationalparks.nsw.gov.au/PDFs/english_report_final.pdf [Accessed 24 August 2006]

Environment ACT 2007, *Namadgi National Park Feral Horse Management Plan*

Feist, J.D. 1971, Behaviour of feral horses in the Pryor Mountain Wild Horse Range. MSc thesis, University of Michigan.

Gillieson, D., Davies, J. & Hardley, P. 1987, *Gurrangorambola Creek horse track monitoring, Kosciusko National Park*. Unpublished paper to the Royal Australian Institute of Parks and Recreation Conference, Canberra, Oct 1987.

Hill, H. 1997, *Old Currango*. Tumut and Adelong Times. Tumut, NSW.

HWP. 2002, Report of the Heritage Working Party on the Horses of the Guy Fawkes River National Park to the Minister for the Environment February 2002. Volume 1:Final Report.

Landsberg, J. 1999. *Horse Riding in Canberra Nature Park*. CSIRO Wildlife and Ecology, Canberra.Lance et al., 1989 in Dyring, J. 1991. *Management implications of the 1988-1990 Study: The impact of feral horses (Equus caballus) on subalpine and montane environments in Australia.* Applied Ecology Research Group, University of Canberra

Linklater, W.L. & Cameron, E.Z. 2002, Escape behaviour of feral horses during a helicopter count. *Wildlife Research* **29** pp221-224.

Marshall & Holmes, 1979 in Dyring, J. 1991. *Management implications of the 1988-1990 Study: The impact of feral horses (Equus caballus) on subalpine and montane environments in Australia.* Applied Ecology Research Group, University of Canberra

Mayes, E. & Duncan, P. 1986. Temporal patterns of feeding behaviour in free ranging horses. *Behaviour* **97**:105-129.

McGinty et al., 1971 in Dyring, J. 1991. *Management implications of the 1988-1990 Study: The impact of feral horses (Equus caballus) on subalpine and montane environments in Australia.* Applied Ecology Research Group, University of Canberra

Montague-Drake, R. 2005, *Results of Aerial Surveys to Determine Wild Horse Densities and Abundance in Northern and Southern Kosciuszko National Park*. A report by the Reserve Conservation Unit, Parks and Wildlife Division, Department of Environment and Conservation.

NPWS. 2003, Horse Management Plan for the Alpine Area of Kosciuszko National Park. NSW National Parks and Wildlife Service, Jan 2003.

NPWS. 2006, Impacts of Recreational Horse Riding in Northern KNP – Annual Report 2006. Report prepared by the South West Slopes Region, NSW National Parks and Wildlife Service (unpublished).

NSW National Parks and Wildlife Service. 2006, *Guy Fawkes River National Park: Horse Management Plan*. Department of Environment and Conservation NSW, Sydney South.

Pratt, R.M. Putman, R.J. Ekins, J.R. & Edwards, P.J. 1986, Use of habitat by free ranging cattle and ponies in the New Forest, Southern England. *Journal of Applied Ecology* **23**:539 –557.

Summer, R.M. 1986. Geomorphic impacts of horse traffic on montane landforms. *Journal of Soil and Water Conservation* **41**:126-128.

Thiele, K.R. & Prober, S.M. 1999, *Assessment of Feral Horses (*Equus caballus*) in the Australian Alps.* A Report to the Australian Alps Liaison Committee.

Trudgill, S.T. 1977, *Soil and Vegetation Systems*. Oxford University Press, Oxford.

Wagoner D.M. 1977, *The Illustrated Veterinary Encyclopaedia for Horsemen.* Equine Research Publications, Texas.

Walter, M.J. 2002, The population ecology of wild horses in the Australian Alps. Ph.D. Thesis, University of Canberra, Canberra.

Walter, M.J. 2003, The Effect of Fire on Wild Horses in the Australian Alps National Parks. Unpublished report.

Walter, M.J. & Hone, J. 2003, A comparison of 3 aerial survey techniques to estimate wild horse abundance in the Australian Alps. *Wildlife Society Bulletin* **31**(4) pp1138-1149.

Whinam, J. & Comfort, M. 1996, The impact of commercial horse riding on sub-alpine environments at Cradle Mountain, Tasmania, Australia. *Journal of Environmental Management* **47**:61-70.

Wright, P. 1971, *Memories of a Bushwhacker*. University of New England, Armidale.