Kaimanawa Horses Plan

The Department of Conservation is responsible for the management of horses known as the "Kaimanawa wild horses" because in 1981 a large part of their range was created a protected area under the Wildlife Act 1953.

This document discusses a number of management options for the Kaimanawa wild horses and makes recommendations, the rationale for which is also discussed.

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Preface

The Department of Conservation is responsible for the management of horses known as the "Kaimanawa wild horses" because in 1981 a large part of their range was created a protected area under the Wildlife Act 1953. Also, the Department is fundamentally concerned with the preservation and protection of our natural and historic resources, significant indigenous flora and fauna, natural ecosystems, and landscapes on land it manages and advocating the protection of these elsewhere.

In the Moawhango Ecological District these roles must be reconciled as the horses have been shown to adversely effect nationally significant ecological values.

The Department released a Draft Management Strategy for the Kaimanawa wild horses for public comment in 1991. Concurrently, a series of research programmes was initiated to determine more precisely the ecology of the horses, their impacts on the environment and to identify possible options for management.

The research has demonstrated a need to remove all horses from parts of the protected area and to reduce horse numbers in all remaining areas, in order to promote ecological conservation values. Management is then necessary to ensure the remaining horses stay out of the zero density areas and to ensure the horse

population does not threaten ecological values in the areas where they are retained.

Genetic researchers have advised that a minimum effective population of 300 horses will maintain the genetic variability of this herd.

Public comments reveal a wide public interest in the Kaimanawa wild horses. A variety of values associated with these horses and perspectives on their management were identified. The Department chose to convene a working party of representatives of the main interest groups to clarify associated values and perspectives and to develop this plan.

The Regional Conservator

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This document discusses a number of management options for the Kaimanawa wild horses and makes recommendations, the rationale for which is also discussed. These recommendations were developed via a consultative process, which considered different perspectives identified in response to the 1991 and 1995 draft plans. They are also based on an analysis of several areas of research commissioned in recent years.

The representatives of a number of interest groups were asked to evaluate the "values" basis for their views and weigh different values against each other to determine priorities. In doing so they were able to more accurately define the objectives for a Kaimanawa Wild Horse Plan in the context of the Moawhango Ecological District. From this it was possible to suggest options for management which would act to eliminate, reduce or mitigate the adverse effects of the horses on the other conservation values in the area, while being mindful of horse welfare concerns. The plan also suggests options for management which act to retain the positive values associated with the Kaimanawa wild horse herd.

No one representative of the group dominates this plan. It is a composite of many views. The approach was adopted that if a view held some aspect to be important and the other members were not opposed to the action necessary to promote this view and its outcomes, it was acceptable for inclusion. This approach, adopted initially, was an attempt to cater for all views and values. In this way some consensus was achieved, as values were often not in direct conflict.

Then an effort was made to weigh up the "benefits and liabilities" of various options, catering for the different values to a greater or lesser degree. Numerous aspects of management were considered in this appraisal of options. These included: the level of difficulty and time frame for implementation; financial considerations; the long term effectiveness of the option; management tools;

humaneness; as well as the retention of positive and elimination of negative values.

The result was the identification of a number of values which could not be compromised and a number that could be catered for with compromise. The working party concluded that the Kaimanawa wild horse population should not be allowed to continue to grow unchecked, especially where it compromises the indigenous environment. A range of population control options were also reviewed. Criteria for assessing the relative humaneness of techniques were developed.

Beyond "population control", three possible horse range options are discussed in this document. Each assumes that population growth will be controlled as an inevitable feature of management. The possible horse range options are :

Option A	Retain the Present Horse Range.
Option B	Reduce the Current Range to a Southern Zone.
Option C	Move the Horses to a New Place.

It is important to recognise that the working party, while emphasising the clarification and balancing of subjective values and perspectives, was also provided with and guided by research reports. The reports' scientifically quantified results were evaluated and their results debated.

The recommendations suggested in this document therefore are endeavouring to provide for both;

a. the quantitatively defined needs in relation to protecting the environment and the horses
b. the qualitatively defined human ambitions concerning a desirable future situation.

This document reports on the processes involved in making choices, as well as reporting on the characteristics of the Moawhango Ecological District and of the Kaimanawa wild horses. Information sources on the ecology and the horses are referenced in the bibliography.

The diagram below describes the process by which recommendations for preferred management options were derived.

Executive Summary

The Kaimanawa Wild Horse Working Party concluded there are four aspects to resolving the conflicts surrounding management of the Kaimanawa wild horses. They are :

1. Eliminating the impacts of the horses on important conservation values,
2. Ensuring all treatment of the horses is humane,
3. Establishing ways to preserve and control the horse herd long term to eliminate the negative and retain the positive values they have,
4. Deciding who is best to carry out long term management.

Many of the recommendations proposed relate to policy rather than practical applications of wild horse management. These recommendations therefore require follow up work before they can be implemented.

1. **Eliminating the Impacts of the Horses on Important Conservation Values.**

A need to remove all the horses from parts of the district and management problems in other areas have led the working party to propose a zero density area covering about 70% of the current range.

A relocation of 300 horses to an area of outside the current range has been proposed to see if a relocated herd retains the intrinsic values currently associated with the wild herd.

Further research is needed to determine if a reduced herd can coexist within the modified red tussock ecosystem in the south of the range. The majority of the horses are found in the Argo zone. It is in this area that a herd of approximately 500 horses will be left and managed while research is undertaken to determine if and at what density their impacts are minor or acceptable on the ecological values in the zone.

This plan allows three years from implementation to complete the research. The Department of Conservation will be responsible for controlling population growth of the herd and for monitoring the outcomes.

A review is proposed three years from implementation, to analyse all aspects of relocation and in situ management, to decide which option to pursue.

2. **Ensuring all Treatment of Kaimanawa Wild Horses is Humane.**

The working party reviewed various techniques for managing the horses (pages 63-67). Rather than advising on methods of implementing each part of this plan, the working party developed criteria for all handling and culling of the horses, to ensure their treatment is humane.

3. **Mechanisms for Preservation and Control of the Herd.**

The herd retained in the Argo zone will continue to be subject to immunocontraception research being undertaken by Massey University, to determine if it's a feasible technique and to develop its use to control horse reproduction. Until immunocontraception is able to be applied to management of the whole herd, annual (or biennial) culling operations will be necessary to maintain a stable population. Humane treatment criteria (Appendix V) must be satisfied at all times. A Kaimanawa Wild Horse Trust will be established and agreements/contracts will be negotiated with the army and the Trust which will bind possible future managers to act accordance with the objectives of this plan.

4. **Who will Manage the Herd in the Future?**

The working party recommends the removal of the protected area for the Kaimanawa wild horses as it is no longer serving its intended purpose and is a restrictive management tool.

If the Kaimanawa Wild Horses are Retained on Army Land

It is recommended that a management contract or agreement between the army as land manager and the Minister of Conservation be established. This will define the role and responsibilities of the parties bound by it. It will replace the Schedule IV listing and act as security for the horses, as it will be an agreement to manage the horses in accordance with the objectives of this plan. The Department of

Conservation will conduct reviews of the effectiveness of management and will also be able to review the terms of the contract/agreement.

The army would be responsible for the management and preservation of the horses.

A Kaimanawa Wild Horse Trust will be set up so that the public can continue to have a role in the preservation of the herd. The Department would consult with the Trust during any review of the effectiveness of army management of the herd.

It is envisaged that the Trust's role in this relationship would be an advisory one, in which representatives of an interested/concerned public are kept informed on management of the horses and on their welfare, and in turn are available to provide help and/or guidance when the army requests it.

If the Kaimanawa Wild Horses are Relocated to a New Site

It is envisaged that if the horses are relocated to non-army land then the Kaimanawa Wild Horse Trust will take over responsibility for their management and preservation. To provide security for the herd, a contract/agreement between the Kaimanawa Wild Horse Trust and the Department, similar to that with the army, can be established. Secure leases will be needed from the landowner of any new site, (if the Trust does not own it).

Part A: The Background

- Historical Overview
- Public Participation
- The working party process
- Members of the working party
- The working party approach
- Key goals
- Department of Conservation's role
- Research programmes

1. Historical Overview

1.1 No Protected Area: Pre 1981

Feral horses have inhabited the central North Island since the 1870s. Prior to 1981 there was no official monitoring of horse numbers, movements or range, or any formal management. It was generally believed that there were plenty of wild horses. Pressure from land development, increased competition with the activities of people and hunting, drove down the number of wild horses and reduced their range to a fraction of its original extent.

The Kaimanawa Wild Horse Committee was formed under the aegis of the New Zealand Forest Service in 1978, as members of the public and landowners in the area had become concerned about declining wild horse numbers. In 1979 it was found that approximately 174 wild horses remained in the Southern Kaimanawa area, the majority were seen in the Motumatai zone of the current horse range, (Aitken et al. 1979).

1.2 Protected Area, No Management : 1981 to 1989

The protected area for "horses known as the Kaimanawa Wild Horses" was established in 1981, in response to a public lobby raising concern that the decline

in the number of these horses would lead to their complete loss from the area. At that time, no official record was made of the reasons for concern, which led to this "protected area" being established.

It is thought likely that a population study by Aitken at al and recommendation to preserve the Kaimanawa wild horses, along with the seven reasons why they recommended preservation, provided the basis for protection. While the timing suggests Aitkens et al. information provided the basis for protection, a direct link cannot be made.

The protected area was established without research into the effects protection would have on the herd's population, or to determine what effects the horses would have on the environment. There was no public consultation undertaken to determine the wider range of views held about the Kaimanawa wild horses. The horse population has been monitored since that time.

Independently of the protected area being established, a formal vegetation research programme in the Moawhango Region was begun in 1981. (Prior to this scientists had conducted studies in the area, thus establishing an information base and experience of the area).

These two streams of study (horse population and ecology), demonstrate that important biogeographic features and ecological qualities share the area with an increasing number of horses. Horse numbers and densities became a concern as horse modification had increasingly adverse effects on the environment. The degree of impact and the environment's ability to withstand horse impacts needed to be determined.

1.3 Research & Interim Management: 1989 to October 1994

A Draft Management Strategy was prepared pursuant to Section 41(1)(e) of the Wildlife Act 1953, in order to reduce or eliminate the impacts of horses on natural values in specific areas. While there is normally no public participation process for plans prepared under the authority of this Act, the Minister chose to generate public participation and the Draft Management Strategy was released and public responses analysed.

A final strategy was not implemented as the public reaction to the draft had indicated wide differences of views concerning aspects of management, particularly concerning methods of population control. The plan had also identified areas in which information was not available to make well informed decisions. Interim measures have been employed which attempt to maintain a status quo, while research programmes have been undertaken to yield the information requirements needed for an effective and appropriate long term strategy for management of the Kaimanawa herd.

1.4 Developing this Plan : Post October 1994

In October 1994 the "Kaimanawa Wild Horse Working Party" was convened by the Department of Conservation. The rationale for a working party was to facilitate the development of an optimal management strategy, which has considered and incorporated a wide representation of the public's views.

The working party provided the opportunity for members to critically review the recommendations of researchers and debate any contentious claims and issues. The working party approach also intended to increase understanding among interested parties, as exposure to different ideas was a feature of the working party process. The members of the working party are also in the position to inform the wider public through the organisations they represent.

The time frame for public participation in the planning process for this Kaimanawa wild horse plan is provided below.

2. Public Participation

1991

The Draft Management Strategy (1991) and this plan (1995) are prepared pursuant to Section 41(1)(e) of the Wildlife Act 1953. There is no public participation process for plans prepared under the authority of this Act. However, an informal procedure to generate public participation was adopted by the Minister. The steps were:

1. Public notification of the draft plan.
2. Consultation with specific interest groups.
3. Submissions by interested parties.
4. Preparation of a report on the submissions.
5. The Minister requested relevant Conservation Boards receive a copy of the Department's report and make recommendations. The Rangitikei /Hawkes Bay Conservation Board was also asked to evaluate and make recommendations on the protected area.
6. Department reports directly to the Minister.

1991 - 1994

1. A number of research initiatives recommended in the draft strategy have been effected.
2. Emergency meeting of the Department of Conservation, Animal Ethics Committee was presented with a protocol to ensure horse welfare concerns were adhered to during interim control measures.
3. Interim horse population control measures have been taken, including three musters, two sales and shooting near S.H.1 and near the Waiouru township.

1994 - 1995

1. Working party of interest groups and Department staff convened, 16/10/94.
2. Public seminar to present latest information relevant to management, 2/11/94
3. Review analysis of submissions to the Draft Management Strategy 1991
4. Working party selected plan structure, discussed values and issues, (23/11/94).
5. Working party reviewed and debated the benefits and liabilities of different management contexts (15/12/94).
6. Working party critique of the content of a proposed draft plan (1 & 2/2/95).
7. Working party reviewed / debated options and made recommendations, (16/3/95).
8. Draft Plan 1994 released for public comment, (26/5/95)
9. Public have 30 working days to return their comments, (due 7/7/95).
10. Analysis of public comments to be completed and sent to working party members, along with recommended changes to be considered by the members (Due August 1995).
11. Working group meets to review public comments and recommend changes to the plan, (25 August and 13 September 1995).
12. Kaimanawa Wild Horse Plan finalised, with recommendations to the Minister (December 1995)

3. The working party process

The members have met at regular intervals to discuss issues, interpret information, clarify management objectives and review options for management. They have been kept informed of progress in the writing of the plan and have had opportunity to contribute directly to its structure and content. As well, they have debated the techniques and strategy recommended in the plan.

4. Members of the working party

Representatives of interest groups who had commented on the Draft Management Strategy 1991 and who reflected a range of views in the community were invited to participate in the working party process. The following groups were represented.

- Bill Carlin (Regional Conservator, Wanganui). Department of Conservation, Working Party Chairperson
- Bill Fleury (Senior Conservation Officer, Department of Conservation, Wanganui)
- Susan Jane Owen (or) Kurt Janson (Department of Conservation, Head Office Policy Analysts)
- Jane Johnston (Working Party Co-ordinator, prepared plan). Contracted by Department of Conservation
- Richard Heerdegen, Rangitikei/Hawkes Bay Conservation Board (Rangitikei/Hawkes Bay Conservation Board Chairperson).
- Audrey Severinsen, Rangitikei/Hawkes Bay Conservation Board
- Peter Pharazyn, Rangitikei/Hawkes Bay Conservation Board
- Elizabeth McFarlane & Sandra Shearer, International League for the Protection of Horses. Present at 23/11/94 meeting. Formally withdrew on 1st February. Not present for debates.
- Jim Boyd, Kaimanawa Wild Horse Preservation Society (President)
- Ian Boyes, Kaimanawa Wild Horse Preservation Society (Vice President)
- Kevin Smith, Royal Forest & Bird Protection Society (Conservation Director)
- Keith Chapple, Royal Forest & Bird Protection Society (Deputy President)
- Peg Loague, Royal New Zealand Society for the Prevention of Cruelty to Animals (National President)

New Zealand Army Liaison: John Mangos, N.Z. Army Training Group (Land Management Officer).

The following agencies have contributed to the Working Party, but not attended the meetings.

Landcare Research N.Z. Ltd, Rotorua & NZ Ecological Society: Geoff Rogers (Ecologist/Botanist)

Rare Breeds Conservation Society (N.Z. Inc)
Mike Willis (President)

Massey University :
Dept of Ecology, Clare Veltman & Alison Franklin
Dept of Animal Science, Hugh Blair
Dept of Veterinary Clinical Science, Kevin Stafford
Equine Blood Typing & Research Centre, Ian Anderson

5. The working party approach

The Department's aims in establishing a working party approach were to

1. Facilitate the development of an appropriate and effective plan for the management of Kaimanawa wild horses.
2. Increase the degree and effectiveness of public participation, in the planning process.
3. Increase the understanding of the issues by the interest groups who represent and inform the wider public.

6. Key goals

The key goals for management initially formulated by the working party were

- To ensure that the welfare of the horses be dealt with appropriately.
- To ensure the sustainability of the natural features of the land with respect to any horse impacts.

7. Department of Conservation's role

The Department of Conservation was established in 1987 under the Conservation Act 1987 and now looks after approximately one third of New Zealand's land area for the protection of our native plant and animal life and our historic heritage, and advocates the conservation of natural and historic resources on all lands.

As well as the Conservation Act 1987, a number of other statutes apply and/or provide insight into interpreting conservation values, when considering some of themanagement issues relevant to the Kaimanawa wild horses. A summary of key sections from selected Acts is provided in Appendix I.

The Department's effectiveness in achieving its conservation role is dependent to a large degree on its ability to prioritise work. To this extent the Department is developing a ranking system to aid in identifying indigenous, threatened plants and animals which require urgent assessment for conservation action, (refer "Setting Priorities for the Conservation of New Zealand's Threatened Plants and Animals", published by the Department of Conservation 1994). The seventeen criteria, used to determine threatened, indigenous species priorities, assess the following five factors:

1. Taxonomic Distinctiveness - how different is the group in question to other groups?
2. Status of the Species - how well is the current population doing? What is its condition?
3. Threats Facing the Species - how well is their habitat doing? What is its condition?
4. Vulnerability of the Species - is the group able to adapt to new conditions?
5. Human Values - what importance do people give to the group?

Applying these criteria, several plant species within the wild horse protected area have been identified as needing urgent conservation action. Furthermore the area contains many biogeographically significant plants and communities and is important for rare plant biodiversity. The area is also important as the major refuge for montane tussock grasslands in the North Island.

The Department of Conservation is responsible for the Kaimanawa wild horses as they were provided with a protected area by Wildlife Order (No.2) 1981, under the Wildlife Act 1953.

The Department of Conservation currently has no ranking system to prioritise conservation action for the types of values identified as important by advocates for the Kaimanawa wild horses. If the listing in Schedule IV was removed, any conservation effort by the Department would become a matter of choice. This has

been a key issue addressed by the working party. There is no other introduced animal with the status accorded the Kaimanawa wild horses. Other introduced animals do have "control" plans which aim to control population size, (in order to protect habitats, ecosystems and landscapes), or attempt to eradicate them from particular areas, (e.g. rats from certain offshore islands).

The reproductive capacity and other characteristics of the Kaimanawa herd make it an unlikely candidate for conservation action by the Department of Conservation. Most species management plans, for conservation purposes, endeavour to help populations of at risk indigenous species through breeding recovery programmes.

The Department of Conservation's role is complicated in this instance because a major threat facing many of the plants and habitats in need of conservation action, (within the wild horse range), is horse impacts.

8. Research programmes

Research programmes initiated by the Department have contributed to understanding of the area and of the horses. Several interim reports on current studies have been made to the Department and researchers continue to provide updated and new information for use in decision making and management of the Kaimanawa herd, as well as for use in advocating for the preservation of ecological conservation values in the Moawhango Ecological District.

Research undertaken by ecologist, Dr G M Rogers concentrated on the biogeographic character of the Moawhango Ecological District. This research has identified a significant number of rare and endangered plants and habitats. Rogers has also undertaken a vegetation monitoring programme to assess the impact of horses (hare and other grazers), on the flora, vegetation, habitats and landscapes of the region.

The nationwide Protected Natural Areas Programme was set up to identify and protect examples of the full range of indigenous biological and landscape features in New Zealand, and thereby maintain the distinctive character of the country. Moawhango Ecological Region was prioritised for a Protected Natural Area report by Wanganui, Tongariro-Taupo and Hawkes Bay Conservancies of the Department of Conservation because of its highly distinctive ecological and landscape character, the lack of protected natural areas, the fragmented state of natural resource and scientific information, and the rapid conversion of tussock grassland to improved pasture in recent years. As a result of research for this programme, Rogers suggested nine Recommended Areas for Protection in the Moawhango, of which four are located within the Kaimanawa wild horse protected area.

Rogers' research has been the basis of a number of management objectives developed by the Department, including advocating that army land management programmes control the spread of invading plant and animal pests, as well as reduce the impact of army activities on the natural environment. This research has been fundamental and crucial in deriving the Wanganui Conservancy Conservation Management Strategy, particularly concerning management objectives and options relevant to conserving environmental qualities in the Moawhango Ecological Region. Developing a plan for the management of wild horses, to protect the natural environment, is one aspect of many conservation objectives for the region.

As a result of the observations of environmental qualities and of the increasing number of horses in the range resulting in greater impacts on the environment, the Department instigated a series of research programmes aimed at achieving effective wild horse population control and environmental protection.

All contract reports to the Department of Conservation, undergo peer review by the research agency before they are presented to the Department, where they undergo further peer and policy review before being accepted by the Department. In addition a number of these reports have been published in scientific journals, where they are subject to further scientific review.

8.1 Current Research Initiatives

To date research initiatives have aimed to determine the following:

1. Biogeographical characteristics; ecosystems/habitats/flora/fauna/ landscape/ geographical features. (Landcare Research Ltd/ Rogers)
2. State of the environment; Appraisal of the Place of Wild Horses in the Kaimanawa Mountains; Modification attributable to horses as agents of change. (Landcare Research Ltd / Rogers)
3. Wild Horses Population Census Data, since 1979. (Department of Conservation et al)
4. Kaimanawa Wild Horse Biological Research genetic typing, blood analysis, physiological and anatomical study.

   Massey University; Equine Blood Typing & Research Centre (Dr Ian Anderson), Dept of Animal Science (Dr Hugh Blair).

5. Kaimanawa Wild Horse Biological Research aimed at providing the Department of Conservation with the means to control Kaimanawa horse numbers, (possibly using immunocontraception).

   Breeding biology and behaviour, demography, sociology, diet, health and welfare, Massey University; Dept of Ecology (Alison Franklin and Dr Claire Veltman).
   Dept of Veterinary Clinical Science (Dr Kevin Stafford)

6. Fertility Control of Population Growth - immunocontraception trial. Massey University; Dept. of Ecology & Dept. of Veterinary Clinical Sciences.
7. "Appraisal of the general feasibility of Immuncontraception for the control of the Kaimanawa Horses". Report by Dr Jay F. Kirkpatrick (a developer of immunocontraception for feral horses in the United States)
   Contracted by the International League for the Protection of Horses.
8. Relocation trials; including capture (muster), yarding, auction, sale, transportation, of wild horses. The I.L.P.H. has investigated post sale horse welfare.
   Department of Conservation contractors (J. Tullock)
9. Literature Review - of relevant reports, documents and other wild or feral horse management strategies.

NOTE:

Most reports on these investigations are unpublished reports to the Department of Conservation. The bibliography references these reports. It is followed by a list of those experts and other people with whom the working party consulted.

Part B: Information Overview

- Moawhango Ecological Region
- Kaimanawa wild horses
- Characteristics of the Kaimanawa wild horses

- Sustainable Management Issues
- Environmental Impacts of the Kaimanawa herd

1. Moawhango Ecological Region

The Moawhango is a highly distinctive montane / sub-alpine area of the central North Island, with rolling hills and plateaus, (refer figure 1). It has the North Island's most extensive remaining red tussock grasslands, along with mixed shrubland, forests, wetlands and sub-alpine herbfields. The wild horse range, (refer figure 2), within the Moawhango District, encompasses a unique range of basin floor, wetland and flush zone habitats and contains many outstanding botanical and ecological features.

The region is largely in a natural or semi-natural state, with few intrusive features in the landscape. This wilderness quality adds to the region's appeal for conservation purposes.

The Kaimanawa wild horse range has 16 species featuring in the national list of threatened, rare and local plants, (refer Appendix 2). In addition Rogers commented that the Moawhango district contains (possibly) the highest national concentration of plants with unusual and often rare occurances, (refer Appendix 3). Many of these plants, as well as those in Appendix 2, have their strongholds in the South Island, but are also found only in the horse range in the North Island. Others have distributional limits coinciding with the wild horse range. In combination, these two lists show that the area occupied by the horses is important for rare plant diversity.

Some of these plants are threatened by the spread of introduced Hieracium pilosella (mouse ear hawkweed), others are subject to damage by horses, for example, Amphibromus fluitans (a wetland grass) which occurs in one tarn only. Likewise Deschampsia caespitosa, (a tussock grass) is in danger from horse grazing. Basins in the Moawhango River headwaters are an important site for a number of small herbs. They include two threatened and unnamed species of forget-me-nots, Myosotis (sp. "Volcanic Plateau" aff. M. pygmaea and M. pygmaea var. glauca) and a small buttercup, Ranunculus recens. Figure 2 shows the distribution of the most rare or biographically important plant species within the horse range.

Within the horse range, wetlands (including ephemeral wetlands) have the highest concentrations of species in the endangered list. These habitats are very susceptible to damage and modification by even low numbers of horses. Rare plant protection is essentially a matter of habitat protection. Almost all the threatened species are low stature or prostrate plants in tussock grasslands, flush zones or on peak bogs. The linkages between these ecosystems must be maintained in order to protect habitats and the ecological character as a whole.

The high concentration of threatened and notable species is due in part to an unusual combination of features and events which have led to a number of sites supporting unusual habitats. For instance, cold air inversion and poor drainage, have given rise to sites which have been without trees for millennia.

"Hard tussock grasslands in basins, sites that have probably never supported forests since the last glaciation, were identified as a unique habitat and one particularly vulnerable to gross damage by the current densities of horses." (Rogers 1989)

Rogers has highlighted the urgency for intervention, to decrease the modification of habitats if preservation efforts are to be effective. Current levels of impacts in the environment, are not sustainable. They will lead to the irreversible destruction of habitats for some species.

The region is ecologically very diverse. A number of sustainable management techniques are necessary if a management objective is to preserve this diversity.

"The region is important as one of only three major landscape refuges for red tussock grassland below treeline in the North Island", (Rogers 1991).

To maintain the values of the current landscape and ecology, some areas may require human intervention. For example, some of the areas of tussockland would be succeeded by shrub in thirty to sixty five years unless fire was allowed to burn occasionally to maintain the current tussock state.

For a detailed description of the Moawhango Ecological Region and Department of Conservation management objectives in the area, refer to "Wanganui Conservancy Conservation Management Strategy", Chapter 9, "Moawhango Tussocklands". This document describes fully the characteristics of the area and the comprehensive set of objectives relating to minimizing all adverse effects on the environmental values in the region. Also refer to Rogers', "Survey Report For The Protected Natural Areas Programme" on the Moawhango Ecological Region 1993. In this report Rogers recommended four areas for protection within the horse range. Figure 3 shows the location of these areas. The areas recommended for protection were selected on the basis of a number of criteria including; naturalness, representativeness, diversity, special features, cultural influences, aesthetic and landscape values and other management related issues.

Appendix III lists (as well as plant species), the threatened and rare wildlife species which have been observed within the wild horse range. While no wildlife inventory has been conducted, the area appears to support a high population of New Zealand falcons and is likely to have considerable value as a refuge for other wildlife.

Figure 4 shows the ecological zones defined by Rogers in order to describe the ecological character of different areas within the Moawhango Ecological District. These zones became the basis for recommendations by Rogers and have also been used to define areas for study into the ecology of the horses.

Figure 1 : Location of the moawhango ecological district

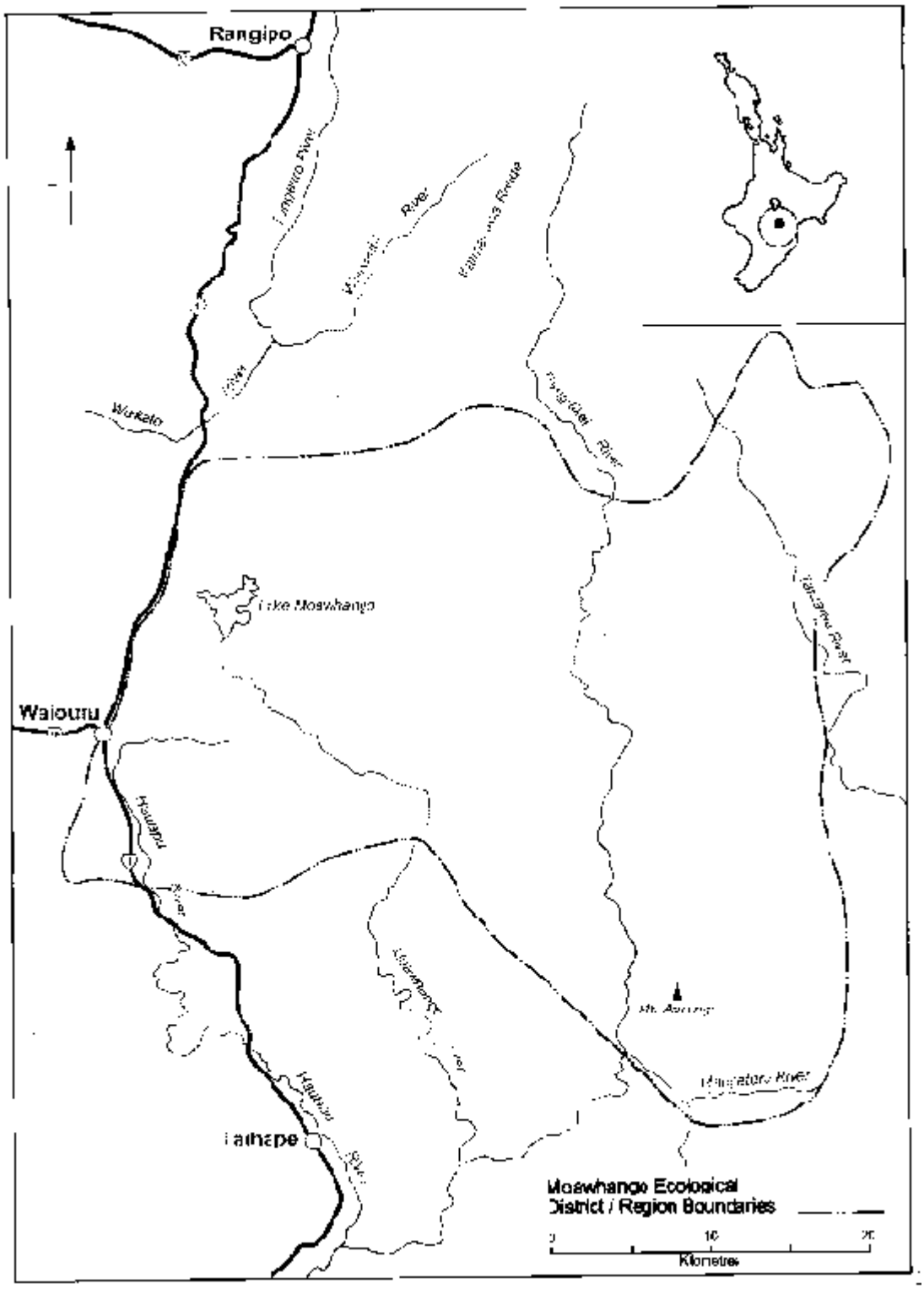


Figure 2 : Distribution of the most rare or biogeographically significant plant species within the kaimanawa wild horse range

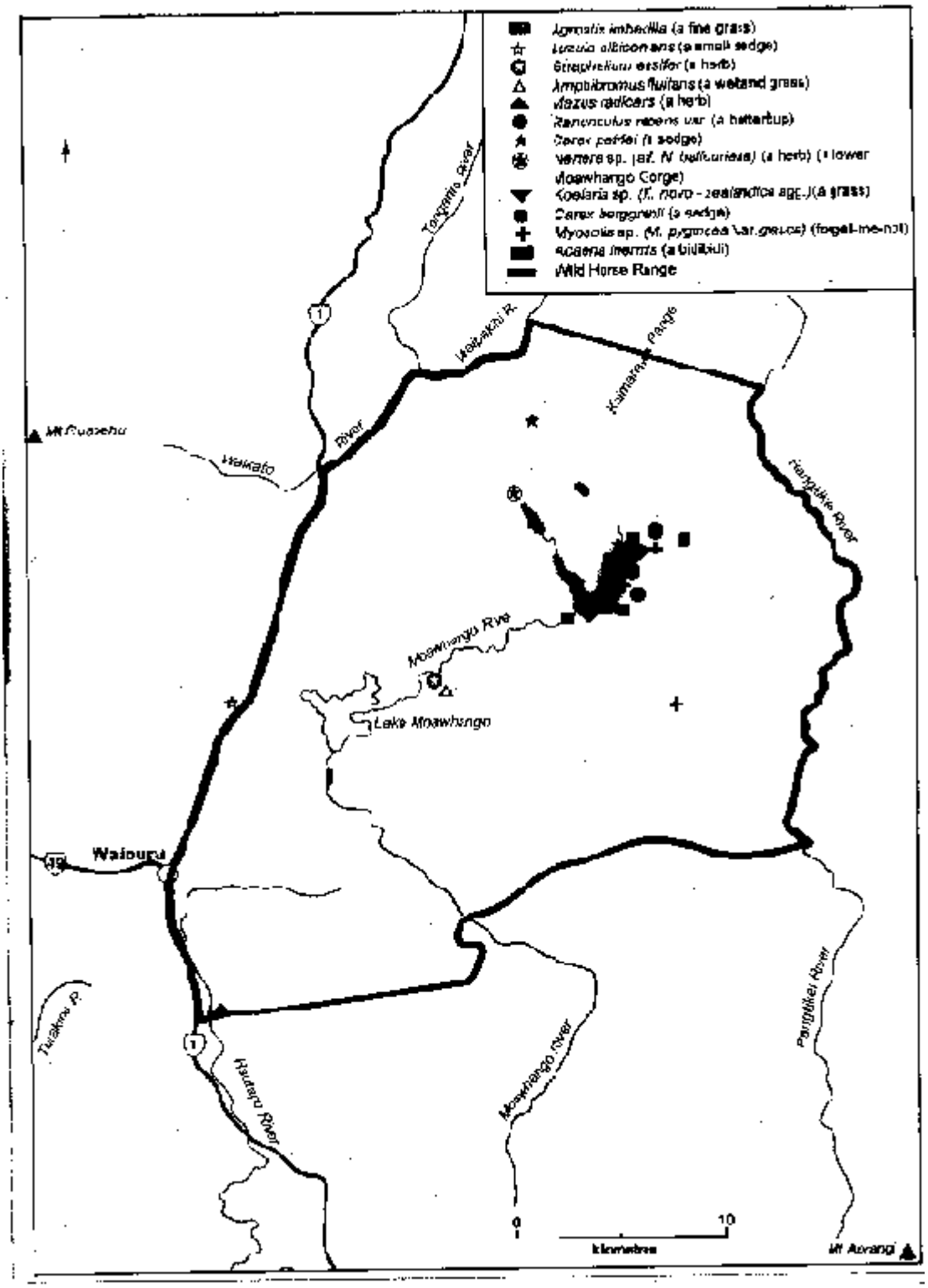


Figure 3 : Recommended areas for protection

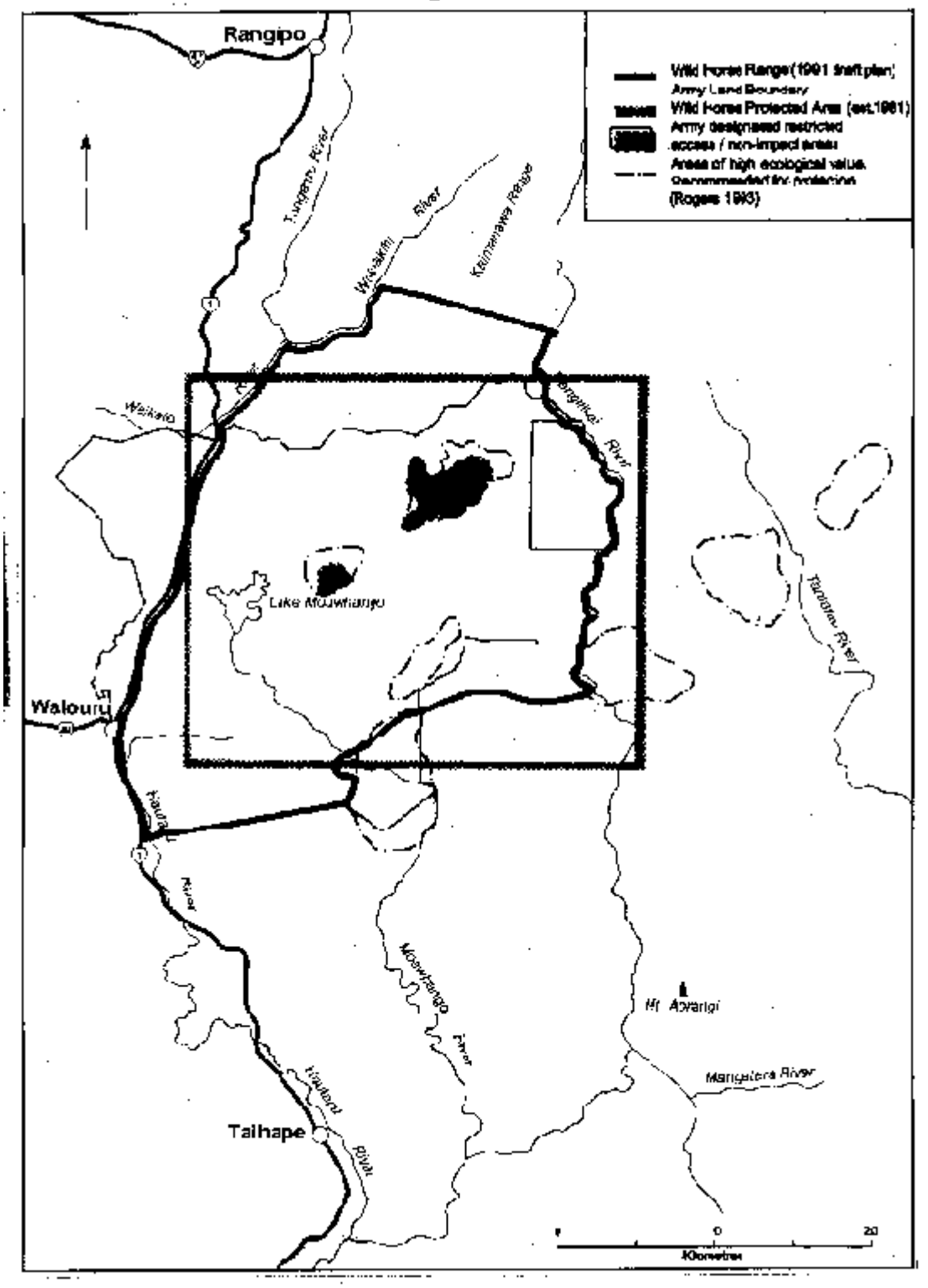
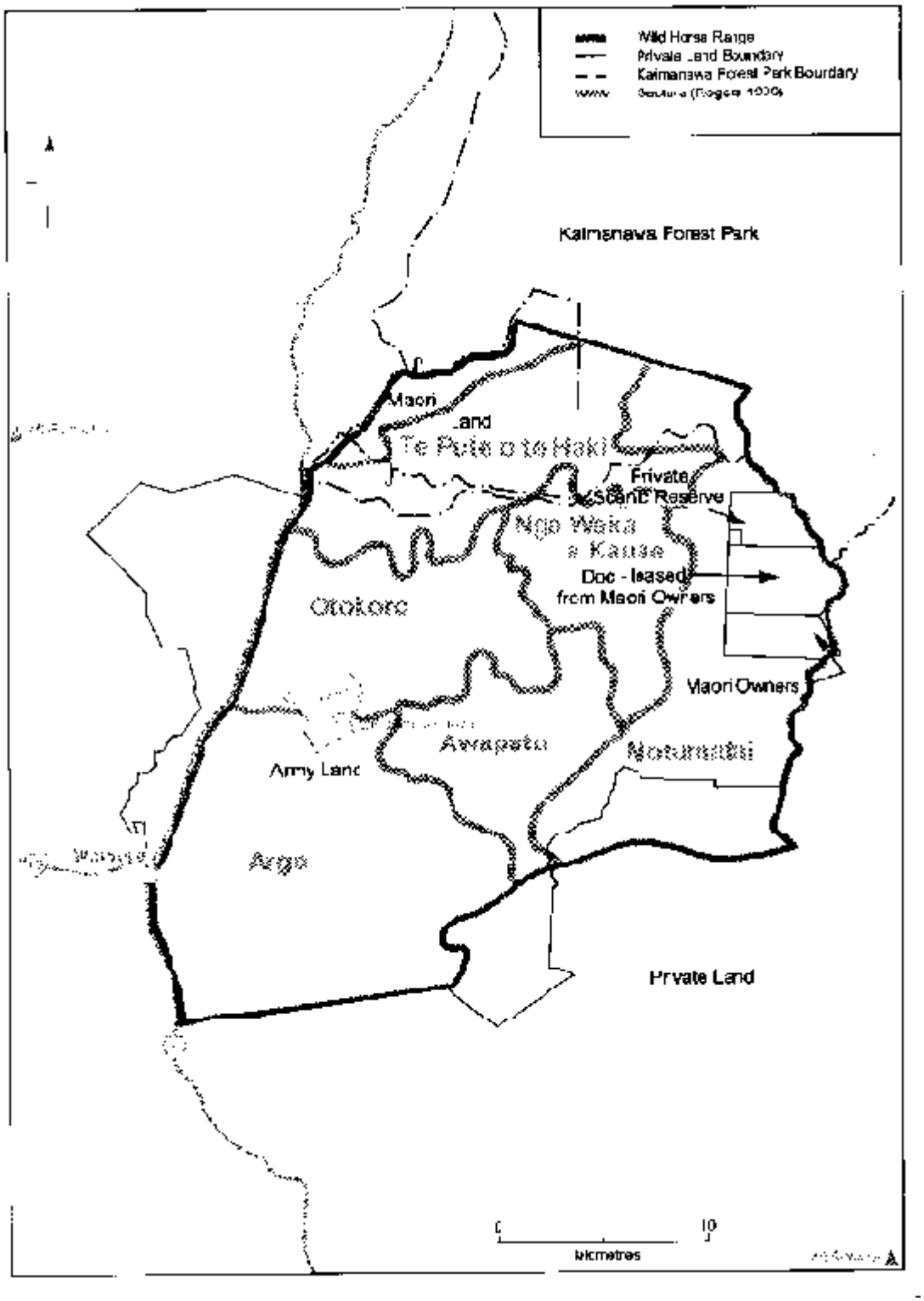


figure 4 : Ecological zones



2. Kaimanawa wild horses

2.1 How were the Kaimanawa wild horses protected?

The Kaimanawa wild horses were listed in the Fourth Schedule of the Wildlife Act 1953 by an Order in Council on the 31st August 1981. This schedule lists wildlife not protected, except in areas and during periods specified in the Minister's notification. The order cited as the Wildlife Order (No.2) 1981, protects horses

known as the Kaimanawa wild horses within a specified area (shown in figure 3), but does not specify a time period for protection. The purpose of the Fourth Schedule is given in Section 7 (1) of the Act, which applies to "certain wildlife not protected" unless "the Minister considers that hunting by other persons is likely to interfere with studies and investigations of or campaigns against the wildlife specified in that schedule carried out by the Department, he may from time to time in his discretion, by notification, declare that any wildlife for the time being specified in that Schedule may not be hunted or killed or had in possession in such area and during such period as are specified in the notification."

The order to protect the horses was made with limited consultation with landowners in the area. Land tenures occupied by the horse range cover Crown land (Army Training Group & Department of Conservation acting as managers), Maori land (some leased to Department of Conservation), and private land owned or leased by individuals. Private land includes "protected private land" (Mr Batley's, Motumatai Private Scenic Reserve) located in the north east of the horse protected area, which is subject to the Reserves Act 1977. The confusion of land management practices and objectives within the "Kaimanawa wild horse protected area" complicates issues of horse management, (refer figure 4).

Currently the horses are denied access to part of the protected area due to barriers such as the emergency provisions to prevent horses settling near S.H.1, the fencing off of private land, the flooding of part of the area by Lake Moawhango for hydro power generation and the activities of the army. They are also denied access to parts of the protected area due to natural physical barriers, such as rugged terrain along parts of the Rangitikei River. It is evident that the actual area available to the horses is smaller than the 70,000 square hectares indicated by the border of the area shown in figure 3. As the population has grown, horses have spread outside of the protected area. They are migrating to the north (towards Kaimanawa Forest Park), the west (towards Tongariro National Park), and attempting to move south.

The above considerations and the results of various lines of research have given cause for the working party, to re-evaluate the current protected area and the purpose of the Schedule IV notification. The working party considered, "Is this (currently) an appropriate technique for maintaining and managing Kaimanawa wild horses?"

The answer to this depends on the purpose of, first, maintaining a population (what values are being preserved?) and second, the objectives of management, (what is feasible and best, given the objectives?). In order to clarify these questions, both the past reasons for preservation and current perceptions and values were considered.

2.2 Why were the Kaimanawa wild horses provided with a protected area in 1981?

In 1978 a committee for the protection of Kaimanawa wild horses was established, which lobbied for protection of the horses. A population study commissioned by this committee and undertaken in 1979 by four Massey students, (Aitken et al), counted just 174 horses and made the recommendation that steps be taken to preserve the Kaimanawa wild horses. Seven reasons for that recommendation were provided. It is likely that these reasons led to the preservation of these horses, (under Section 7 (1)), as they had been shown to be something of an unknown quantity, in need of further research and their continued presence was threatened.

The reasons were, in effect, the identification of questions. These have now been researched and will be addressed here as public responses to the Draft Management Strategy 1991 revealed concern that management could not

proceed without their clarification. Each reason for protection is given below along with comments which address the questions raised.

1. The conditions under which these animals live are unique, not only in New Zealand but worldwide."

The "unique conditions" is a reference to the distinctive Moawhango Ecological District, which contains unusual and rare environmental characteristics.

The unique conditions is also a reference to the unmanaged state that these horses were believed to have lived in, to the degree that no (official/managed) selective culling operation had influenced the herd. Most other free-ranging horse populations (in Australia, N.Z., U.S.A., U.K., & Europe) are managed to some degree. The fact that the population dropped significantly during the 1950s to the 70s suggests that severe culling did occur, but as it was unofficial, the selective influence of such operations is unknown.

2. "Scientifically valuable comparisons can be made between this population and other groups of wild or feral equids such as free living zebra, New Forest ponies, Assateague ponies and wild mustangs. The Kaimanawa population is of special value since there has been comparatively little interference by man."

Current research has shown many similarities between Kaimanawa wild horses and other feral populations. No comparative differences between these and other wild or feral horses which could qualify them as being significantly different have been reported. As a consequence there is little present scientific justification for preservation on this basis.

The last sentence is similar in meaning to reason 1, however it is not referring to the selective or (alternatively) random culling of horses from the herd, but to the lack of deliberate breeding interference. Since the original releases of (selectively bred) domestic strains, deliberate genetic manipulation by people has been minimal. Apart from the occasional introduction of new stock into the horse range, natural horse reproductive behaviour has been the driving force in reproductive selection. The working party agreed that while the Kaimanawa herd had not been "managed", it had been interfered with.

3. "There may be physiological and anatomical differences between these horses and domestic animals as a result of adaption to survival in this unique environment. The differences may be of special note with regard to parasitology and nutrition.

"Survival in this environment has not extended to physiological or anatomical variation", (Kevin Stafford, Dept. of Vet. Clinical Sciences, Massey Uni.). There are no physiological or anatomical adaptations or differences between these and other mixed breed horses. The Kaimanawa horses are in essence the progeny of a variety of released (or escaped) domestic horses.

The physiological responses of the Kaimanawa horses to parasites and to the nutritional conditions in which they feed are not thought to be significantly different to the expected responses of free-ranging horses.

4. "Behavioural traits which have evolved to facilitate survival may be of importance, both for their value in comparison with domestic animals and for the determination of "natural" behaviour patterns for the formulation of

an ethogram. By comparison with this, the presence of abnormal pathological behaviour in domestic animals could be assessed."

Observers report that many of the behaviour traits of these wild horses is consistent with similar horse herds. The working party also heard from people who stated that the behaviour or "character" of a Kaimanawa horse when captured and domesticated is different to other horses. The working party considered that while differences are likely between the behaviour of these horses individually and as a herd to that of domestic horses, the value of transferring observations directly from the untamed (wild) behaviour to the tamed (domestic) behaviour is very limited.

5. "A genetic resource of animals selected by natural rather than artificial means may be of future value as a source of traits associated with "hardiness" as well as "agility".

The Kaimanawa wild horses are not a distinct breed. They are mixed breed horses, which have proven difficult to genetically type as they contain many genetic influences. Natural selection could be said to have occurred, in that foal mortality is more likely to affect the weaker foals and young. However, this has not led to a discernable genetic resource base adapted to these environmental conditions. The releases of domestic horses into the horse range have introduced new genetic stock, at random, into the genetic pool.

Dr Anderson of the Equine Blood Typing and Research Centre at Massey University commented in 1991 that there "appears to be an interesting, possibly unique assortment of genetic markers in this population of horses". In other words, they have an unusual mixture of genetic influences. This does not mean they are a distinct breed.

He also commented that he had found a peculiar grouping of alleles in the blood which is indicative of inbreeding or line-breeding, as a result of a low population base in the past.

No definitive statement on the possible future value of these horses is able to be made.

6. These animals have historical value as the remnant of once larger groups of horses in the central North Island."

The Kaimanawa wild horses have come to represent all wild horses of the central North Island. Their larger historical value could arguably therefore be retained at any central North Island location and is not dependent on the present location of the herd. However, this herd is located in an area with a history of wild / feral horses in its own right. In order to retain the local historical link to the area, as well as the greater central North Island link, any location of a representative herd should endeavour to be as close as possible to the current range.

7. "They have an intrinsic aesthetic value."

The Kaimanawa wild horses have intrinsic value on a number of counts (for example, as individual horses, as a herd of horses, as free-ranging/feral/wild horses, as mixed breed horses, as a natural resource).

Many commentators refer to the horses "right to exist" (with as little interference as possible), interpreted as an "existence value".

Aesthetic value is a subjective perception, "appeal" or "interest" value is variable and can be seen as positive or negative depending on individual perceptions. Aesthetic value is also correlated to the surroundings; some people like wild horses in tussocklands, while others see them as pests in that context.

In addition to the above reasons...

In addition to the above reasons, Aitkens et al. reported that the mare:foal ratio they observed of 1:0.31, was a low birth and recruitment rate. They suggested a high rate of abortion, due to poor winter nutrition and wet and cold conditions, could be responsible. They stated, "If the population is closed, careful watch must be kept on numbers. Since replacement rate is low and total numbers are not large, there is a possibility of a serious decline. In view of these facts it is the opinion of the party that culling to reduce numbers will not be necessary in the immediate future." (Aitken et al. 1979). This assumption has been found incorrect. Rapid population growth occurred in the absence of culling, as a recruitment rate, indicated by the mare:foal ratio (1:0.31) is approximately 20% per annum, if foal mortality is low. It is also thought that the census estimate of 174 horses in 1979 may have a large margin of error.

2.4 The United Nations - Food and Agricultural Organisation (F.A.O.)

The Forest Service, "Wild Horse Committee", provided the F.A.O. with the information and recommendations reported by Aitken et al, pertaining to the herd. This information led the Food and Agricultural Organisation to list the"Kaimanawa wild horses" on its register of biologically unique equines. F.A.O. recommended a population of 1,000 animals to ensure the future viability of the herd, without critically reviewing information received.

This organisation is interested in the conservation of livestock genetic resources, usually in the form of breeds (strains or varieties) in which special combinations of genes have been accumulated by artificial selection over a period of time. Breeds which are common in a country, but rare in another due to restrictions, will also be included (e.g. zoo specimens). They also list feral herds and flocks, when specifically conserved, as they are of interest because they have been free from artificial selection, since the time the animals escaped from domestication. Their genotype will represent a sample of the breed at that time, (often hundreds of years ago), modified only by natural selection and genetic drift.

The inclusion of Kaimanawa wild horses on the register is currently being reviewed, as it is likely these horses do not fit any of the criteria for inclusion. The horses have not been selectively bred for any preferred traits; nor are they representative of a domestic breed of the past, preserved as a result of becoming free, thereby retaining past traits; nor are they a true representation of a feral population modified only by natural selection and genetic drift, as releases of new stock into the herd over its history have had an influence in the genetics of the herd.

3. Characteristics of the Kaimanawa wild horses

The population was first studied in 1979 and since 1989 other studies have been instigated. Recent studies undertaken by Massey University researchers have described the characteristics of the Kaimanawa wild horse population. Their reports have also provided supplementary observations on other feral herds. The following data is provided by Franklin et al. (1994).

3.1 Horse ecology and demographic research results

"Feral horses are versatile and adaptable animals, they are able to survive in a diverse range of habitats, with very different living conditions and plant

communities. Recent studies of the Kaimanawa wild horses have shown them to share many features with other feral horse populations around the world."

Reproduction in wild horses

Oestrus commonly occurs at around two years, although it may occur earlier, as a two year old mare has been observed to foal. The gestation period of horses is eleven months.

In the Kaimanawa herd courting was observed to run from September to December, during which time several stallions may have encounters with a mare. Foaling runs from September to March (indicating a longer courting season than observed). The majority of foals are born in November.

Mare to Stallion ratio in horses mustered

The mare to stallion ratio in the June 1993 muster was 1:0.62 (i.e 50 mares to 31 stallions) and in the May 1994 muster was 1:0.52 (i.e 50 mares to 26 stallions).

Pregnancy

Of mares captured in 1993 & 1994, 72% & 81% were found to be pregnant. Sample size varied from 26 to 59 mares. Both post mortem examination of slaughtered mares and blood sampling analysis of mustered mares were used to determine pregnancy.

Average annual reproduction success

The demographic structure of the mustered horses in 1993 & 1994, was used to estimate the number of mares among the unclassified (unsexed) horses counted in field observations. A big difference was observed in average productivity of mares, in different zones. Expressed as a foal to mare ratio, the range was 0.2:1 in the Nga Waka a Kauae zone to 0.44:1 in the Otokoro zone.

Average Foal to Mare Ratio

The average foal to mare ratio in the 1992-1993 breeding season was 0.34:1 (34 foals to 100 mares) and in the 1993-1994 breeding season was 0.32:1.

Fertility observed in other wild herds

Fertility rates vary with age. The young breeding mare may not breed successfully in consecutive years. At between 6 to 9 yrs the mares are most fertile, able to breed in consecutive years. They will be pregnant and lactating or have a foal and a yearling with them in the band. Fertility rates do change depending on the population under study, but it is approximately 50 to 55% of 6 to 9 year olds that achieve foaling in consecutive years. This rate drops off after 10 yrs and old age commences at approximately 16 yrs.

Reproduction in successive years

In 1993 and 1994 respectively, 59% & 60% of bands with foals did not have yearlings. Only 26% had both, (leaving 14% with only yearlings).

Survival and mortality in wild herds

Juvenile and adult annual survival rates are high (82% -97%) depending on the (feral) population under study. The Kaimanawa horses have no natural predators, however internal and external parasites pose problems for horses. In large bands, the individual suffers less from fly attacks, which may account for large groups observed in certain situations overseas, (e.g Australia).

High population growth rates are chiefly a product of high adult survival ratesand a predictable annual production. The foal survival rate appears to be lower in the Kaimanawa herd than measured elsewhere and it is unclear why this is the case.

The 80% pregnancy rate found in Kaimanawa mares compared to the 33% foaling rate at 3 months of age observed in the field, indicates significant abortion &/or mortality at, or soon after birth.

Foal survival

Foal survival was estimated by counting foal to mare ratios in 1993 and yearling to mare ratios in 1994. Comparing these ratios for the area generates a survival index. The range is 0% in Otokoro, to 81% in Awapatu. Over the whole range an average foal to yearling survival rate of 50% was calculated.

Adult mortality

Sixty three skeletons were located, of which 82% were able to be aged from their dental skeletons. Only 5 were foals. Most of the skeletal remains were horsesbetween 4 and 6 years of age. An accurate estimate of adult mortality was unable to be made. Differences between the occurrence of males and females were not significant.

Population growth rate

Population growth rate is a function of birth rate minus death rate (and of migration, which is assumed to be minimal).

Ecological research at Massey University has shown that in this youthful population, 62% (1993) to 66% (1994) are mares, 32 to 34% of which produce a foal each year. Over the whole range, the average foal mortality was calculated to be 50%. These figures generate an estimate of population growth rate for that year (93-94) of approx. 10%, however, adult mortality has not been included in this calculation. This figure is lower than that derived from census counts of the total population taken over the past decade, which generate a figure for annual average population growth rate of approximately 16%.

3.2 Health and disease

Kaimanawa horses are not in a bad state of health, generally. The following observations were reported.

Most of the adult horses have the equine herpes virus, but this doesn't appear to be detrimental to the horses.

The analysis of trace elements shows that the values are close to or within the normal range of values published for horses, but zinc levels are very low.

The presence of endoparasites :

- roundworm makes up the largest proportion of endoparasites.
- faecal egg counts are very high. (Research of other herds have shown a negative correlation exists between the egg count and the condition of the horse).

- the skeletal degeneration is normal natural degeneration with chronological age for horses.

"Differences (reported by some commentators), between the physical appearance of horses in the north of the range and those in the south are likely to be attributable to nutritional differences", (personal observation A. Franklin).

3.3 Population structure and behaviour

Horse densities (1993-94)

Densities are not uniform across the range, the variation is from 1horse/7ha, the maximum observed in the Argo Valley (within the Argo zone), to 1horse/892.7ha in the Otokoro zone. Each zone has different attributes and supports different numbers of horses at different times of the year. A diversity of living conditions gives rise to a diversity of horse population densities. Other populations range from 1horse/1.14ha on Cumberland Island, to 1horse/422ha at Beauty's Butte in the U.S.A. However all of the feral horse studies cited in literature refer to populations which are managed to some extent.

A population inhabiting a moorland range which has similarities in appearance to the Moawhango tussocklands, is the Exmoor ponies in England. They are maintained at a density of 1horse/25ha. In the Exmoor area however, the ecological values and the horse values are compatible at this density.

To help understand the variations in density of the different zones it may be helpful to understand what promotes band membership changes. Variations may reflect no more than the history in the range, but it may also reflect decisions by a mare not to settle in an area where an essential resource is scarce.

Home range

The changeable population in the Argo throughout the year (seasonal) suggests the bands do move about the range. To date, the size and permanence of the home range is not well understood, but it appears the home range is more flexible than observed in other studies, possibly due to the availability of water throughoutthe range.

In this area there is no indication of a correlation between the size of a band and the area of the band's range. The lack of yearlings in the north compared to the presence of foals could indicate either foal mortality or movement out of the area once a foal is old enough to move.

In the U.S.A., capture and release trials have shown that horses have a strong tendency to return to their home range. This may be because of a necessity to return to familiar territory in which the location of waterholes is known to the horses, (U.S. Dept. of the Interior).

Band structure as observed in field studies between March and June 1993

There were 44 single horses, 66% of which were male (44% F). 13.5% of bands consisted of bachelors only. 86.5% were breeding bands (stallion, mare and mixture of foals & yearlings or young mares and young stallions).

Total number of bands observed was 229.

Mean band size is 5 horses, however the range is 2 to 21 horses.

Core members of familiar bands remained fairly stable over the study year.

Interactions between neighbouring bands

Social patterns closely match those in other wild horse populations. Bands reduce when mares and foal move to a new group. This behaviour may show that the mare is sensitive to male quality or to resource availability. Also an oestral mare or young stallion moves away from its family band to establish mating relationships. These lone animals may take some time to join a new band, or in the case of a bachelor stallion form his own band.

Social interaction

75% of grooming is conducted by adult mares, they groom the young and stallions but not other mares. Foals sniff one another. Herding is carried out only by stallions.

3.4 Plant production and Horse Nutrition in the Argo Valley

Plant growth was measured in three plant communitites, tussock and grass, manuka scrub and grass, and grass. Lowest values were measured at the tussock and grass plots. Growth varied significantly with time of year and with exposure to herbivores.

Daily energy requirements of horses & food availability

A 300kg horse (an average young adult male), in light work needs 60.29 MJ per day for maintenance.

The gross energy available to horses in the standing crop was measured at the Massey University Nutrition Laboratory, it varied from 16.993 KJ/g to 17.869 KJ/g

Horses obtain approximately 37.5% of the gross energy available in food, by digestion, (i.e a horse receives 6.37 to 6.7 KJ per gram of the (dry matter) food available in the Argo).

This requires each horse to eat at least 10kgs of dry matter per day. The production (in kgs) of the grassland area (616ha) in the Argo Valley was calculated. From these figures a calculation for the number of horses able to be supported by plant production (an esimate of "carrying capacity"), was made; this was simplified by assuming no energy costs for growth or reproduction, in effect it is assumedthat the population comprises average young adult males only.

The number of horses that can be supported by plant production in Argo Valley (a small part of the Argo zone)

This was derived by estimating the amount of energy available per hectare for horses, if they were the only herbivore. Estimates of "stock carrying capacity" should ideally be made when equilibrium is reached between horses and plants. There are no data for determining if this is the case or not in the Argo Valley and in fact the wide range of horse numbers observed in the area suggests an unstable system. The observed range from 50 to 150 horses (in the 616 ha foraging area of the Argo Valley), may therefore indicate seasonal movement in response to resource availability.

The estimated number of horses able to be supported by plant production ranges from 1 horse per 4.1ha (Oct-Dec) to 1 per 12.3ha (Feb- Apr). The lower density (1/12.3ha) must be considered the current annual maximum for a "stock carrying capacity". Army exercises in the Argo Valley may also be an influence on changeable horse densities.

This is not a measure of ecological or environmental sustainability, but only of plant production to horses. This estimate does not take into account the metabolic cost of breeding and growth, (consider that over half of the animals over 4 will be pregnant for 11 months of the year).

Nor does it take into account other food sources not present in the cages or plots, such as tussock and shrubs, which horses do eat and which may offer additional nutritional value that was not calculated in estimating the amount of foraging area in the Argo Valley. Furthermore, the exclusion cages did not test only for the effects of horses on the vegetation, they also excluded hare, rabbits and other grazing herbivores that may share the area.

3.5 Kaimanawa wild horse population censuses

Population censuses

It is fundamental for a population management strategy to have an accurate measure of the attributes of the population it is endeavouring to control, whether it be a specific total population, the birth rate, the mortality rate or the populationgrowth rate. Long-term maintenance of a viable population requires sound estimates of these.

The aerial survey method has been adopted by the Department to conduct biennial census counts of the protected area. It is recognised that there are a number of variables which can affect the accuracy of aerial counts. The Department is attempting to rigorously standardise the method used, to hold bias (error) constant. It is then possible to treat aerial survey estimates as relative rather than absolute measures of abundance. The indices obtained in this way, will allow accurate estimation of the population's rate of increase. The 1994 survey also attempted to determine the degree of error in the method, by conducting spot ground counts at the same time as the aerial count. Unfortunately, an estimate of error was not able to be generated. It is generally accepted, by those who conduct aerial surveys of wild or feral animals, that such a method consistently undercounts (10 to 20%), the true number of animals in an area, (Caughley, 1974).

The more accurate method for determining the rate of population growth, is to measure fertility and survival rates, as population increase is a function of these. Current Massey research continues to capture the data required for the variables of population dynamics to be estimated more accurately

In the absence of accurate long term or stable fertility and survival rates, the aerial survey is the most effective and efficient method available for determining the size of the population and extrapolating growth rates (from population change over time).

Population figures

Table 1 below shows the total population counts from 1979 to 1994,

TABLE 1: POPULATION INCREASE IN THE KAIMANAWA WILD HORSE HERD

Census Year	Horse Number (total)	Band Number	Musters	Census Method
1979	174	-	-	Best estimate: (Massey student study Aitken et al and army information

1986	532	99	-	Helicopter; exhaustive search of all catchments
1988	736	133	-	Helicopter; exhaustive search of all catchments
1990	1102	216	-	Helicopter; exhaustive search of all catchments
1992	1183	-	-	Helicopter; through search of 85% of the horse range
1993	-	-	June 233	
1994	1576	285	May 131 June 137	Helicopter; using satellite navigation and transect coverage of the area
1995			June 69	

NOTES:

1. Band = a semi-stable "group" of horses, usually comprising a stallion, mares and their young, which make up a herd.
2. An additional census was taken at Christmas 1987, but is not included hereas a fixed wing aircraft was used. Such counts are very inaccurate compared to helicopter counts.
3. International evidence suggests helicopter counts tend to under-estimate a population by between 10-20%.
4. Aerial censuses have been conducted as close to April as possible, for consistency (seasonal variations) or standardisation of method.
5. It is not possible to accurately estimate population growth rate from these figures. Calculations reveal a 15-24% growth rate.
6. The 1979 ground count is considered very inaccurate.

Population growth rates and future projections

Based on the work by Massey and the estimated growth rates calculated from Table 1 data, the population growth rate is estimated to be within a range from 10% to 24% per annum.

Feral populations overseas show growth rates of close to 20% per annum. It is likely that the Kaimanawa herd's population growth rate may be slowing down due to natural attrition taking a high toll on the foals (possibly 50%), in this environment.

The apparent rapid rate of annual increase from 1979 to 1994 in the Kaimanawa herd indicates a doubling of population every 4 years (approx.) since the protected area was established. If left unchecked the population of 1,500 (June 1994), could theoretically rise to 3,000 horses by June 1998. This would assume an unlimited food supply, however it is thought that the tussock vegetation regime could not easily support that number of horses, so natural attrition (mortality) would increase. Horses might attempt to expand their area. Increased mortality would extend the doubling time. Table 2 shows the 1994 Census results by area and age composition.

TABLE 2: 1994 CENSUS RESULTS BY AREA AND COMPOSITION

Zone	Bands	Adults	Juveniles	Total
Argo	109	663	154	817
Awapatu	74	286	42	328
Motumatai	59	196	39	235
Otokoro	22	78	10	88
Nga Waka a Kauae	18	86	13	99
Te Puta o Te Haki (incomplete census)	3	8	1	9
TOTAL	285	1317	259	1576

4. Sustainable Management Issues

There is a variety of land tenures and management aims within the area.

Manawatu Wanganui Regional Council (M.W.R.C.) has classified the area on a zonal basis according to present use and physical characteristics. The army has divided the land into a "land capability classification", which ties in well with the M.W.R.C. zones. The army has also conducted a "land use impact study" (L.U.I.S.) fromwhich it is developing sustainable management principles, for the entire area and also for specific special zones.

4.1 Land classification / zoning for horse management

The area can also be distinguished by classifying the environment into representative ecosystems based on landform-soil-vegetation divisions. Rogers generated such a classification system in the horse range, which formed the basis for vegetation monitoring research and for ongoing horse ecology studies, (figure 4).

In determining suitable techniques for sustainable management, a number of approaches can be taken and different factors considered. The impact of horses must be viewed against several past and present factors influencing rangeland condition: for instance variations in horse density over the range, the impacts of other herbivorous animals (deer, farmed stock, pigs, hares, rabbits), past land use practices (periodic burning and pastoralism), and natural vegetation change, including possible invasion by wilding pine (*Pinus contorta*), hawkweed (*Hieracium*) and heather (*Calluna vulgaris*).

For the purposes of this strategy, the classification system referred to by the working party is that of Rogers, as it accommodates both the significant environmental divisions and the horse population research areas.

4.2 "Carrying capacity" - ecological tolerance limits

The concept of carrying capacity was designed for use in the sustainable management of agricultural land on which the purpose was to support an optimum number of stock. The concept is not very appropriate for this situation in which a number of species co-exist and are competing for the same space and complementary resources within that area. It is possible to quantify the plant production (available to horses) being produced in the area and to calculate the number of horses that could be fed by that vegetation. This figure would not indicate how that number of horses affected the other values in the environment and modified vegetation. Therefore, it is not the "ecological carrying capacity" or equilibrium density for an unharvested population controlled by natural processes.

The "threshold level of horse density", below which unacceptable damage does not occur, varies in different plant habitats, e.g red tussock, hard tussock, capping bogs, basin bogs, flush zones and riparian zones, and this complicates the issue of determining the number of horses to retain in non homogenous areas within the horse range.

Different concepts of "carrying capacity" may be of value as indicators, but not as actual measures of sustainability in this situation.

Rogers research involved assessing the level of horse grazing compatible with maintaining the long term viability of tussock populations, as well as monitoring impacts of vulnerable, biogeographically important species and theirhabitats.

He determined that the (1989 density of) "horses have a "low" impact on widespread shrub-tussocklands dominated by red tussock, manuka and monoao and "high" impact on preferred/ vulnerable/ restricted habitats such as cold air inversion basins dominated by hard tussock, riparian zones of seepage and low stature herbfields and wetlands or mires", (Rogers, 1989).

Consequently Rogers later division, in terms of horse impacts, became one of northern (low horse density sectors) and southern (horse refuge) sectors. These enabled an overview to be taken of the ecological values and the degree of impact observed, in order to make recommendations for horse management.

Rogers' rationale for management recommendations is given as-"in general terms horse impact should be compatible with allowing natural vegetation changeto occur (in most cases toward an increasing woody element), and maintaining native floristic, habitat, and ecosystem biodiversity", (Rogers 1992).

The resulting recommendations made by Rogers in Oct 1992, to the conservation board were as follows..

That in the South : "horse numbers be manipulated for the benefit of indigenous landscapes and for horse welfare or values (aesthetic, historical). Because horses concentrate grazing on basin floors and because the principal valley, Argo Valley, is thoroughly degraded, present horse densities are compatible with maintaining the present vegetation cover. The desirable density of horses to allow rehabilitation of tussocks with removal of stock grazing is difficult to judge in the absence of a monitoring programme."

In the North : "1 horse / 250 ha is judged to be sustainable pressure on flush zones, basin floors, and forest margins based on observation of horse impact onthese places at these densities in the past".

Estimating a possible horse density or "carrying capacity" of the different ecosystems depends on its purpose; sustaining healthy horses, sustaining healthy habitat or a combination of both. The suggestion of 1 horse / 250 ha in the northern sector by Rogers, based on observations over time, (on the degradation of the hard tussocklands and the threat on a number of rare plants and habitats), prompts the question "Can we effectively, over the long term, manage horses to (and at) very low densities in order to sustain these fragile habitats?" Horse social behaviour may make a figure such as 1 horse / 250 ha a fallacy, as the horses could congregate in preferred (and threatened) sites. It is likely that even at low overall densities, the risk or continued threat to some habitats and plant species would continue. Current low density levels haveled to trampling, pugging and grazing, which is threatening the survival of at least six rare plants, including the probable elimination of one grass species.

The concept of carrying capacity has also been brought into question by those working to develop tools for measuring sustainability. Many variables may be needed to calculate carrying capacity accurately, a single unit (number of stock per hectare), is not always an appropriate indicator of the stock level able to be

supported by a unit of land. A flexible measure which can be adjusted, as the variables adjust, is more realistic but much more complicated to calculate. Carrying capacity should change depending on climatic variability from season to season and year to year. Franklin has indicated, that from her observations and calculations, the Argo Valley may be at the upper limit of the number of horses the biomass can maintain.

To manage a sustainable relationship between horses and ecological values, ecological tolerance limits or threshold horse densities would provide better measures than carrying capacity.

4.3 Army Training Group (A.T.G.)

The A.T.G. manages the largest area within the Kaimanawa wild horse protected area. In response to the Resource Management Act (particularly Section 17) and as the army itself desires the preservation of the natural wilderness qualities of thearea, an inventory of land use and impacts has been undertaken by the army as part ofits land management of the area. As a result of L.U.I.S. (Land Use Impact Study), several new policies have been effected. The army has restricted access to specific areas with high conservation values and also designated low impact areas. Vehicle tracks and movement are more controlled, human disturbance is minimised, rubbish is better monitored and an ethic of environmental responsibility is emphasised.

Control of pinus contorta, rabbits and hare is carried out by the army, in order to retain the indigenous natural character of the region. Other species controls are being tested currently.

4.4 Fencing horses out of/into specific areas

Fencing as a barrier to horse access to specific areas has been proposed by a number of commentators on wild horse management. The fencing option does not address the problem of "how to control all the impacts of horses at a tolerable level, for all ecosystems effected indirectly and directly by horses". Horses could continue to modify the special sites indirectly by concentrating their activity in surrounding areas (e.g the fence line). Fencing areas introduces new horse welfare concerns which arise from population growth in a confined area. Space and resources availableto the horses will become increasingly limited if the horses are restricted from preferred sites. It could become necessary to supplement the horses' feed.

Wild horses have the capacity to both damage fencing and be damaged by fencing. The fence line would have to be continually monitored to ensure it remained intact and effective. Monitoring would also be needed to enable response to any horseinjuries.

The army has stated it is strongly opposed to fencing as it desires the natural wilderness quality for training. No construction should be visible. They would therefore not grant permission to fence this land. Permanent fencing of the dimensions required to be an effective long term barrier to horses (particularly along S.H.1), would also be an obstacle to military exercises.

Estimates for fencing three of the Recommended Areas for Protection and along the Desert Road, in order to prevent horse access to these places, range from $350,000 to $1,000,000 depending on the type of fencing. Approximately 69kms of fencing would be required. (Total Department of Conservation fencing effort nationally for 94/95 equalled only 71.5 km.)

4.5 Horse population sustainability

Today the herd is almost ten times greater than it was in 1979, (c.174 to c.1,576 in 1994 census). The rate of growth of the population indicates a doubling time of approximately 4 years.

The horse population is growing at a rate that is not in balance with the environment. A highly modified environment would result if the population was allowed to achieve a natural (biologically determined) "sustainable" relationship. The growth in numbers of horses will lead to diminishing food supplies, increased susceptibility to disease and malnourishment. Eventually increased mortality will act to balance the population to the environment's ability to support it. High foal mortality appears to have occurred in recent years. Such observations indicate action may be urgent to alleviate further suffering.

The sustainability of the herd is also related to the ability of the genetic pool to persist into the future. There is evidence that some inbreeding (line-breeding) has occurred as the horses became isolated, their numbers dropped and new introductions diminished. The minimum population size recommended by the U.N Food and Agricultural Organisation to preserve a sustainable genetic "breed" of horses is 1,000, which is the minimum number the Minister agreed to maintain during interim management, until more was known about the genetic make-up and scientific value of the Kaimanawa wild horses.

Anderson et al. have advised that the Kaimanawa population would lose minimal genetic variation if 300 horses are maintained, (1995). This figure for an "effective population base" is not the same as the ideal number to retain if these horses were a genetically distinct breed, (Refer Appendix IV). The figure of 300 horses in total is therefore based on measurement of the genetic variance within the kaimanawa herd, not on differences between these and other horses.

4.6 Other sustainability issues

The continuance of the natural character of the Moawhango is under threat from a number of invading species, as well as the horses. The managers of land within this area have a role in preserving the natural character by actively eliminating those species threatening to alter it. Because most of the Moawhango grasslands are seral (at a temporary stage of natural vegetation succession), the management challenge may not be for community stasis (to retain it as it is), but rather, to plan for a transformation to shrubland and forest in much of the present horse habitat. The successional transformation of grasslands to shrublands (indigenous or adventive) will substantially reduce the region's ability to support horses. Alternatively management could employ techniques designed to retain the current values and characteristics, asfar as possible. It has been suggested that low density horse/pony grazing may be a mechanism to retain current characteristics of the modified tussocklands of the south and mayreduce wild fire hazard. These suggestions can be tested during the performance monitoring period.

4.7 Environmental crisis management - or is there a possible lead in time before crisis?

Management endeavours to contend with many interrelated problems with limited resources. Decisions on which problem receives the most attention or which should be solved first are usually based on how bad the problem appears to be compared to other problems and are often not based on any scientific measurement of the severity of the problem. However, in this case research has been undertaken and decisions can be based on scientifically rigorous data and interpretation of the causes and effects of changing qualities in the environment. Questions which must be answered are, Are horses causing enough damage in the Moawhango to justify control? How much control is necessary? Should all the

money be spent on measuring/controlling other threats to the area, for instance hieracium, pinus contorta and hare? Is management concerned only with controlling the future impact of horses in the area, or also with the welfare of the horses? What values are associated with the horses, that complicate management options?

There has been debate about every aspect of this plan, including the need for and the importance or otherwise of management.

Because it has been established that impact is significant and that there is a high probability that reducing horse population density will reduce impact, planning for population control should commence urgently. This does not exclude the possibilities for further research, but is more imperative than that research.

This urgency is due to the irreversible nature of the impacts; once a habitat is so modified it is unable to support the rare plants, it is too late to protect it. It is not possible to recreate the unusual and complex conditions necessary to develop a habitat. Once a rare species is extinct, it is forever. The horses are impacting on fragile components of the environment, which are not able to tolerate much of a change in conditions before they are adversely effected. Even apparently minor changes in the environment can lead to irreversible damage and loss.

Currently, management of the horses is sporadic partial control, resulting in short-term relief from horse impact. Management in 1994 was principally targeted at the most urgent problems, as envisaged in the "Draft Management Strategy 1991". A long term objective of horse management is to reduce impacts to "acceptable" levels; It is crucial to know the relationships between horse density and local impacts to allow predictive decision-making and the assigning of priorities. As no singlecontrol option is likely to be successful, an integrated suite of control options, including a monitoring loop that provides feedback, is the only acceptable control strategyif horses stay within their current range.

5. Environmental Impacts of the Kaimanawa herd

The increasing numbers of horses are having adverse effects on the rare, indigenous, qualities of the area. Many impacts are difficult to quantify, especially retrospectively, and results of attempts to do so may not be perfect. Monitoring the results of control operations can help to provide information on relationships between horse density and impacts to give managers information useful for prioritising actions and determining the best levels of control.

In this environment deer, goats, pigs, hare, rabbits and possums are all considered pests. Horses are not, yet they have the same or more severe impacts than any of these species. One reason for horse impacts being worse is simply that the horses are unmanaged, while the land managers are able to control the other plant and animal impacts.

The establishment of "protected flora zones" in 1974 during a land exchange between N.Z. Forest Service and the Defence Department is an indication of efforts to preserve special plants, well before any horse threat was ever perceived.

Rogers, published "Kaimanawa Feral Horses and Their Environmental Impacts" in the "New Zealand Journal of Ecology" (1991) 15(1): 49-64. In this report he comprehensively describes the methodology and results of his research, to that time. A follow-up study was undertaken in 1994. The following observations are drawn from Rogers 1991 and 1994.

5.1 General discussion on horse impacts

Rogers summarised horse impacts as follows, "The most extensive habitat, red tussock (Chionochloa rubra) grassland, was variably affected by horses; tussocks

in restricted mesic sites were heavily grazed and mostly eliminated, but those in extensive xeric grasslands showed little impact. The mixed hard tussock (Festuca novae-zelandiae)/ red tussock grasslands on basin floors and plateaux, which had already been degraded by early European farming, were suffering further depletion from horse grazing. The restricted, high altitude Chionochloa pallens tussock communities were being eliminated rapidly through preferential grazing. Oligotrophic bogs, on the summits and basin floors were largely intact, whereas high nutrient flushes were severely affected by trampling and grazing. Horses appeared to have had little impact upon Nothofagus (Beech) forest understorey. Ten plant species, several of which are vulnerable nationally, occur in the North Island only within the wild horse range. The habitats of five of them were damaged by horses. Throughout the wide basins and plateaux of the north, horses compromised floristic, rare plant habitat, and landscape nature conservation values." (Rogers 1991, "N.Z Journal of Ecology")

The rare, endangered or special plants found within the horses' range are in fact only partially the basis for the Department's concern over the impact of horses. Dr Rogers has also documented the gross modification attributable to horses that is happening to the tussock ecosystems, particularly hard tussock in valley floors and snow tussock on higher ridges.

"The Kaimanawa herd has caused severe degradation of forest-grassland margins and two other grassland communities", (Rogers 89). Uncontrolled grazing is expected to lead to the elimination of the hard tussock grassland from some areas and to favour the spread of weeds.

Horses preferential (feeding) use of habitat areas (grasslands and heath as opposed to forest and shrubland), is likely to lead to change in the ecology, through selective grazing and uneven distribution of dung (redistribution of nutrients and adventive grasses). Frequent use of preferred tracks rather than random routesthrough fragile areas (e.g. flush zones), leads to a concentration of effects on fragile components of the ecosystem.

The extent of tracks within an area is an indication of horse impacts. In an Australian study tracks within a catchment ranged from 3.4 to 5.8 kms of track per square kilometre. This is important as frequent use of a track produces compact soils, which reduces aeration, water infiltration, pore space and water content of soils. Only twenty to fifty horse passes are needed to significantly compact soils, ("Feral Horses in the Alps", edit. Walters & Hallam).

"Much of the land which the horses occupy is class VIII land, which is low in fertility and is vulnerable to erosion. It is not a sustainable use for it to be grazed by any animal, including horses" (R. Quayle, Manawatu Wanganui Regional Council).

The impacts of horses on the representative tussock grasslands, wetlands, and rare plant habitats in which they range have been described by Rogers.

5.2 Direct impacts

- Plants damaged by trampling, removal of grass and baring of ground through grazing and shrub damage by browsing. Of the rare and vulnerable plants and habitats Rogers said "Some species suffered grazing and trampling damage; for instance, Agrostis imbecilla (a fine grass), Carex berggrenii (a sedge), Gnaphalium ensifer (a herb), Koelaria sp. (a grass), and Rytidosperma pumilum (a grass). Another species of restricted distribution in the North Island, Deschampsia caespitosa (a tussock grass), may have been browsed out by horses." (Rogers 1991).
- "In permanent grassland plots, between 1982 and 1989, the mean frequency of seven small prostrate species declined significantly. The

adventive species, hawkweed (Hieracium pilosella), increased significantly, particularly onheavily grazed sites.". Fragile, high nutrient flush zones were highly degraded by horse trampling and grazing, thereby threatening Carex berggrenii (a sedge) irrespective of local variations in horse density and habitat abundance. "As trampling was the main agent of damage, the vulnerability of bogs increased with the wetness. Not only did this disrupt water-flow and increase downstream siltation, but a wide range of weedy rushes, sedge and herbs benefited by colonising the fresh substrates and dung heaps." (Rogers 1991).

- "Permanent photopoints on highly fertile flush zones in the Nga Waka a Kauae showed increasing use by horses in 1989-94. Horse trampling and grazing fractured the saturated turf, causing downslope sedimentation, water ponding, and opportunities for the establishment of weeds. A large tarn in the Awapatu subject to seasonal water level fluctuations attracted heavy use by horses, pugging the tarn floor and littoral zone". (Rogers 1994)
- In moist gullies and stream-beds, observation suggested that the red tussock community was heavily grazed and wrenched tillers littered the ground. This was to the advantage of adventives such as hawkweed (Hieracium pilosella), catsear (Hypochoeris radicata), hair fescue (Festuca tenuifolia), Yorkshire fog (Holcus lanatus), sweet vernal, and browntop. "Smothering weeds (as above), the spread of which is enhanced by horse disturbance, ultimately threaten many species. The likely invasion of heather (Calluna vulgaris) and further spread of hawkweed (Hieracium pilosella) pose a threat to 18 of the biogeographically unusual species which are principally low stature components of tussock grassland and low herbfields." (Rogers 1991).
- "Horses did not significantly graze the established, older populationof red tussock, but the recruitment of red tussock in this degraded community was substantially reduced by grazing. There was no silver tussock in the control plot, probably because it had been browsed out." Direct clipping of common tussock grasses. "A highly significant decrease in the mean height of C. pallens and no C. pallens (tussock) seedlings were seen," (Rogers 1991).

After a reassessment in 1994 Rogers observed that his conclusions did not differ from the earlier assessment, in that rangeland condition indicated further deterioration of preferred horse habitats. Mesotrophic wetlands and plateau, basin, and hillslope red tussock - hard tussock grassland had continued to deteriorate.

5.3 Indirect impacts

Red tussock in the exclosure is well on the way to regaining its former stature after a 14 year absence of horse grazing. The half plot where hares (& rabbits) are excluded has shown that these animals have no significant impact on tussock recruitment at this altitude (Rogers 1995)

These impacts are not as readily identified as being caused by horses, the process of change is slower and often needs to be traced backwards to the cause. They tend to be the cumulative effects of horse activity. They are also more likely to be irreversible as they lead to the destruction of (fragile) habitats and the eradication of particular features from the environment. Research undertaken in the area over the past 13 years has enabled predictive cause/ effect relationships to be identified, so that the indirect effects of horses are better understood.

Long term changes to soil, vegetation and wildlife are potentially serious, and perhaps irreversible, effects of high horse densities. These need to be predicted and taken into account if horses are retained in an area. Currently it is unlikely

that these impacts can be accurately quantified as monitoring to date has been relatively short term.

- Grazing induced exotic grassland borders surround many mountain beech stands. Concentrated browsing and trampling of Nothofagus (Beech) saplings on the margins of the forests appears to have prevented the natural expansion of forest stands through bordering grassland.
- The dispersal of seed (either in dung or in manes and tails), tends to benefit species adapted to grazing or browsing by large animals. The indigenous species in this area are not adapted to grazing by horses.
- Areas which are frequented by horses support fewer plant species and fewer individual plants. Introduced plants are more common along horse tracks and other disturbed areas. Trampling damage and the creation of tracks on unstable hillsides enhances establishment of weedy species.
- High impact on preferred vulnerable/restricted habitats such as cold air inversion basins dominated by hard tussock, riparian zones of seepage and low stature herbfields and wetlands or mires and low impact of horses on shrub tussocklands dominated by red tussock, manuka and monoao.
- "After grazing ceased in the hard tussock exclosure, the frequency ofthe dominant intertussock grass, hair fescue increased significantly. The frequency of 12 low stature species, e.g. sweet vernal, and total species diversity declined significantly because of overtopping by hard tussock and hair fescue. In the control plot, continued grazing pressure led to a significant decline in individuals of the highly palatable species. Other prostrate and/or unpalatable species increased significantly in the low turf." (Rogers 1991)
- "Without grazing, adventive grasses, particularly hair fescue, expanded to dominate the vegetation. In the grazed plot, both species biomass and stature were low for all the potentially taller, palatable grasses such as hard tussock, Festuca nigrescens, hair fescue, Yorkshire fog, silver tussock,and Poa colensoi. The species with the greater biomass in the control were all low- growing turf species that escape heavy horse grazing. Overall, when horses were removed, adventive fescues proliferated at the expense of the native, low stature, inter-tussock flora." (Rogers 1991)
- The rates of change are faster on the hill slopes than basin floors. Acceleration of erosion by removal of vegetation and exposure of soil to the effects of the weather. Acceleration of gully erosion if horses are climbing into rugged areas.
- Compacting soils, over time leads to ecosystem / habitat change. Dry soils are susceptible to compaction, while wet soils are more prone to structural damage. Horses have a heavy impact on mires, irrespective of variations in horse density.
- "Culling of horses on Moreton Island has led to recovery of vegetation (on dunes) and an increase in bird numbers and nestings in wetland areas". (Dobbie & Berman, 1993)

Part C: Key Issues

1. Associated "values" of Kaimanawa wild horses

The working party and public comments identified a number of values and perceptions associated with the Kaimanawa wild horses. The range of values is listed below. It is evident that when interpreting "values", personal perception prevails. Each value can be seen in a positive or negative light and can be thought of as a minor or major attribute.

The working party discussed the relative importance of these values, but finally did not develop a ranking to reflect weightings. Instead an overview approach was taken, in which the relative importance of values as seen by different members was discussed. Following that, as each member had a clearer understanding of what others considered important, different locational contexts were proposed and then critically analysed to see if important positive values were retained and the negative values eliminated or reduced to tolerable levels in each of the contexts.

Table 3 : associated values of kaimanawa wild horses

POSITIVE VALUES	NEGATIVE VALUES
+ Aesthetic / cultural / emotional value + Large herd + Amenity / novelty / exotic value + Intrinsic / existence / wild free/ spiritual value + Remnant / representative / historic value + Research opportunities / scientific value + Grazing adventive grasses may retain the character of modified tussocklands + Commercial value ($) + Grazing may reduce risk of wild fire	- Destructive capacity, reparation ($ value) - Aid dispersal of adventive grasses - Costs of maintaining a herd ($ value) - Nuisance value (escapes/Waiouru township) - Hazard value (access to S.H.I)

As many of these values are not able to be absolutely quantified, it is possible to consider only the relative importance of each. Public comments enable generalisations to be made about associated values, which the working party took into consideration when discussing management.

For instance, the main concern of many people, was to give a message of anti cruelty and a call for mercy. Many people are unable to condone the state sanctioned shooting of a large number of horses, especially when they are wild and free. The overriding impression from these people is the requirement that all treatment should be humane.

The generalisation can therefore be made, that when contributing to the debate on managing Kaimanawa wild horses, many people are benevolent, compassionate and merciful. The ability of the Kaimanawa wild horses to inspire these qualities in people, is in part attributable to the combination of (associated) values listed above, but is also due to human values, placing wild horses in high regard, compared to other creatures and species.

2. Benefits and liabilities

Similar to the appraisal of "values", no attempt is made to quantify the benefits and liabilities associated with retaining Kaimanawa wild horses in different contexts. The table given overleaf presents a broad appraisal of the types of considerations made by the working party in debating options and solutions for Kaimanawa wild horse management.

Benefits are the perceived advantages (good values) associated with these horses. There are a number of views that can be taken on these.

Liabilities are the perceived disadvantages (and/or costs) associated with these horses. As with assets, a number of views can be taken in considering liabilities.

Each of the following contexts is taken in turn in Table 4 overleaf.

A Wild Horses Anywhere in New Zealand, (wild state qualities?)

B Kaimanawa Horses anywhere, (specific horse qualities?)

C Wild Horses in the Kaimanawa Ranges. (location - region specific?)

D Kaimanawa Wild Horses in the Protected Area. (site specific?)

E Wild Horses in a Landscape like the Tussocklands. (location - characteristics specific?)

This appraisal of benefits and liabilities, along with the analysis of the values associated with the Kaimanawa wild horses enabled the working party to make a number of assumptions. These are referred to as "premises" (for management) in Section D, under the heading "Evaluating the Appropriateness of the Horse Range Options".

The diverse views of the public, as to an overall value of the horses can be attributed largely to each individual's weighing-up of the advantages and disadvantages personally perceived to be relevant to the situation. The result was a range of stated opinions from, "the horses are much more important than some small plants" to "the horses are introduced and should not be allowed to live in areas of indigenous vegetation, in any numbers". Consequently the public can be divided into either "horse supporters" or "ecology supporters". This, in effect, is the conflict in need of resolution.

The working party in discussing "benefits" and "liabilities", tried to clarify where these diverse opinions came from; what were the basic assumptions and how these views could be catered for. Many of the assumptions can be said to be subjective, a matter of opinion. As this is the case, it is not pertinent to just argue points for and against the horses and/or the ecology in order to determine correct and incorrect positions. It is more pertinent to identify how the different views can be catered for. It is also important that any proposed actions are guided by the results of research undertaken by experts in the field.

Table 4: perceived benefits and liabilities associated with kaimanawa wild horses.

BENEFITS	LIABILITIES
A RETAINING A WILD HORSE POPULATION ANYWHERE IN NEW ZEALAND	
Cultural (Heritage) / Historic Value.	Population growth requires harvesting or other methods (contraception) to control total numbers, densities, range and to ensure sustainability.
Amenity value (aesthetically pleasing, interesting)	Monitoring the state of the horses habitat, health and population dynamics.
"Existence" / Intrinsic value.	Ensuring a quality habitat, in order to ensure a healthy herd.
Continued research potential - unknown future scientific value, graduate research interest and other education opportunities	Impacts associated with heavy stock on land, (accelerated erosion, tracks, pugging, fouling waterholes, channelling/bank disturbance, grazing pressure, trampling plants, disturbing habitat) - Competition for food with other grazers, if occupying agricultural land

Utilising wild horses in the course of their control offers a means of offsetting the costs e.g. potential for tourism - looking at from afar or closer, part of wilderness experience, tracking, trekking, tele & movie backdrop for scenery, advertising potential.	Competition with indigenous species for habitat & food.
Potential for live capture and sale (private individuals work/recreation horses).	Alteration of natural environment, reducing habitat for indigenous flora and fauna.
Potential for meat export for human consumption and for pet food. (Paramount Export Ltd offered to conduct study/trial to determine the sales potential) and other commercial use - By-Products, hides, hair, etc., can be used.	Fencing (need for/damage to)
Possible benefits of wild horses would accrue to a particular area (possible multiplier effect benefits), rather than elsewhere).	On going future management costs indeterminate
B RETAINING KAIMANAWAS WILD HORSES (For any unique value)	
As in A	As in A
+	+
	If the Kaimanawa wild horses are provided a protected area, it will be necessary to manage the population using appropriate techniques to ensure the maintenance of a viable herd, as well as to control population growth. This would be so, regardless of where they live.
Continued Research Potential into similarities &/or differences between this herd and other wild horses/herds.	Ongoing research into the characteristics of the "Kaimanawa" horses, (herd).
	If the kaimanawa wild horses are agreed to have no "spicial" significance, the liabilities would be the same as for managing any wild horses population, by choice
BENEFITS	LIABILITIES
C RETAINING WILD HORSES IN THE KAIMANAWA RANGES	
As in A	As in A
+	+
Possible control of spread of heather into the tussocklands Possible retention	Repairing damage and modification to hill country environment which could

of character of modified tussocklands as horses graze adventive grasses and suppress succession to shrublands.	experience accelerated erosion and vegetation modification as a result of horse impacts.
Remnant of by-gonetime, local historical significance	Interference with land management objectives, (ability to develop the area)
D RETAINING "KAIMANAWA WILD HORSES" IN THE PROTECTED AREA	
As in A except: less commercial potential, for example tourism, as the army restricts access.	As in A + Research and management is necessary as uncontrolled growth has threatened ecological values.
+	Direct impacts on rare/special indigenous flora, fauna and habitats.
Coexistence with the Army helps ensure access to the herd is restricted, provides greater security for the herd.	Indirect impacts on indigenous flora and fauna, leading to further costs as preservation efforts are required for these species/habitats as a result
Army activities and wild horses are relatively compatible compared to other land uses	Developing an environmental monitoring regime, that accurately gauges the degree of impact and is able to indicate a level of management required to reduce and avoid that impasse
	Developing a management plan to avoid further damage to bioecological values and to ensure the maintenance of a viable population size and structure
	Reduction and modification of rare habitat e.g. aiding spread of Hieracium and Mouse-eared hawkweed (weeds) and other adventive species into the tussocklands
E RETAINING WILD HORSES IN LANDSCAPE LIKE THE KAIMANAWA	
As in A	As in A
+	+
The horses in combination with the tussocklands as a natural landscape enhance aesthetic value. Horses are able to seen relatively easily in this vegetation	Cost of relocating the horses, cost of leasing or purchasing the land
Open nature of the tussocklands enables censuses to be more accurate than other scenery	
Open nature of the tussockland enables mustering, if necessary for management, to be less problematic	

Part D: Management

- Goal statement
- Management objectives
- Location Options for a Kaimanawa Wild Horse Range
- Evaluating the Appropriateness of each Horse Range Option
- The Horse Range Location Options
- The "Protected Area" Status of the Kaimanawa Wild Horses
- Strategies for Controlling the Population Growth Rate
- Criteria for Evaluating the Management Techniques/Options
- Determining a Threshold Level of Horses to Retain in a Southern Area
- Responses of Modified Tussock Grasslands to the Removal of Horses
- Operational and Performance Monitoring
- How and What to Measure
- Recommendations for Management

1. Goal statement

This plan seeks :

1. To ensure that the welfare of the horses is dealt with appropriately.
2. To promote the sustainability of the natural features and ecosystems of the Moawhango Ecological District, with respect to Kaimanawa wild horse impacts on these.
3. To manage the Kaimanawa wild horse herd at a sustainable level.

2. Management objectives

The Department of Conservation's objectives for the Moawhango Ecological District- Tussock Country are described in full in the Wanganui Conservancy Conservation Management Strategy, (Chapter 9). Kaimanawa wild horse impacts are identified among the "key issues" of concern in the district.

The following objectives provide the purposes of management of Kaimanawa wild horses. They are statements of what management intends to achieve. The ecological objectives are listed here first as it is these that bring urgency to the plan. Otherwise, the objectives are not ranked in an order of importance.

2.1 Ecological objectives

1. Ensure that nationally endangered and rare plants and a number of biogeographically significant plants are not adversely affected by Kaimanawa wild horses.
2. Prevent further degradation of the ecosystems of tussock grasslands, subalpine herbfields, wetlands and forest margins, by the Kaimanawa herd.
3. Prevent the Kaimanawa wild horses from spreading into the neighbouring Tongariro National Park and the Kaimanawa Forest Park.

2.2 Kaimanawa wild horse objectives

1. Retain a herd of (at least) a minimum effective population of Kaimanawa wild horses, in a generally free ranging existence.
2. Ensure that the Kaimanawa wild horse population is managed at a level which allows a safety margin in the biological tolerance of the area.
3. Ensure that treatment of Kaimanawa wild horses is humane.

4. Reduce conflict between Kaimanawa wild horses and other land uses and ecological values.
5. Improve public access to view the Kaimanawa wild horses.
6. Ensure public safety from roaming horses.

A guiding principle in all control options is that the vital interest of individual horses is respected, including the avoidance of unnecessary pain and/or stress. Effective control programmes which utilise the most humane methods available should be pursued, refer Appendix 5.

3. Location Options for a Kaimanawa Wild Horse Range

In order to meet the stated objectives of this plan, the working party considered options for the wild horse range, to analyse the likely success of meeting the objectives of this plan in different locations. The horse range options are

A. Population management in the current horse range.
B. Population management in a reduced southern or south western area of the current horse range.
C. Population management in a new area, (requires relocation).

These location options lead to different contexts for management, with different expected outcomes and may involve different requirements. However, the same or similar management techniques for reducing and controlling the horse population would ensue.

4. Evaluating the Appropriateness of each Horse Range Option

The working party has worked through the range of values associated with the Kaimanawa wild horses by considering contributions from the public and agreed on the following premises in order to guide decisions relevant to the location options for management.

1. Wild horses do have a place in New Zealand's history and could be chosen to be retained. This should not be at the expense of natural habitats and indigenous species.
2. Horses are not compatible with ecological values in the northern Moawhango District. Its fragile ecosystems make it very difficult to accurately manage horse impacts simply by manipulating horse numbers. As we cannot gamble with at-risk species the only long term solution is to remove all horses from the specified northern area.
3. The sustainability of maintaining a representative herd in a southern red tussockland area (e.g. the Argo and Home Valleys) of the current range is still unknown. It may be that a number could be managed with acceptable environmental outcomes; alternatively it may be that they can not be managed in a sustainable manner. It would be necessary to monitor the impacts of reduced horse densities to determine if a sustainablerelationship is possible. Factors for ecological sustainability need to be determined, as do indicators which measure performance in achieving the horse objectives, (e.g. is the number a sustainable viable population?).
4. The genetic/scientific value of these horses is no greater than that of other mixed-breed or wild horse herds.
5. Some of the other benefits, or positive values ascribed to the Kaimanawa wild horses (e.g. some of the cultural values) are universal to all wild horses and could be retained regardless of the herd or location. Likewise, aesthetic values could be enhanced with relocation because public access could be improved.

Since one of the objectives is to retain a representative herd of Kaimanawa wild horses, the following premises have been agreed by the working party :

6. The Kaimanawa herd does not have to be retained in its present range to maintain its intrinsic character.
7. A location as close as possible to the herd's current range is desirable to retain the historic link with the area and the character of the herd.
8. The Kaimanawa herd does have to be retained in as close to a free-ranging, "unhandled" state as possible to retain its character. The public have shown a willingness to cater for free-ranging horses generally, as they "have a right to exist".
9. As the Kaimanawa horses are not a distinct breed, the number needed to be retained is not 1,000 as suggested by the United Nations Food and Agriculture Committee. The working party accepts that 300 is a minimum effective population as advised by Anderson et al.
10. They do have to be called "Kaimanawa wild horses", no matter where they live, to retain their character.
11. It would be preferable if they were located in an open grassland / tussocklike environment.
12. It is essential that all handling / treatment is humane.

With these premises in mind the working party carried out an "objective-achievement analysis", for each of the horse range options. The results are shown in Table 5 (page 56) as an Objective-Achievement Matrix.

Table 5: objective - achievement matrix for the horse range options

ECOLOGY OBJECTIVES

1	Prevent effects on rare plants
2	Prevent degradation of ecosystems
3	Prevent migration into parks

HORSE OBJECTIVES

1	Ensure effects on rare plants
2	Ensure a sustainable relationship with ecosystems
3	Ensure humane treatment
4	Reduce conflict between horses and other values
5	Improve public access
6	Ensure public safety

HORSE RANGE OPTIONS

A	Population management in the current horse range
B	Population management in a reduced southern area of current range

C	Population management in a new area (relocation)

LEVEL OF ACHIEVEMENT

N	No - is not likely to achieve the objective
Y	Yes- is likely to achieve the objective (1,2 & 3 Likely success weightings)
?	Uncertainty. May or may not achieve the ojbective; needs testing

Horse Range	Ecology Objectives			Horse Objectives						Total
Options	1	2	3	1	2	3	4	5	6	
A	N	N	Y,1	Y,2	N	?	N	N	Y,1	4
B	?	?	Y,2	Y,1	?	?	N	N	Y,2	5
C	Y,1	Y,1	Y,3	Y	Y,1	?	Y,1	Y,1	Y,3	11

5. The Horse Range Location Options

Option A

Population Management throughout the Current Range

- The presence of horses in parts of the current protected area, threatening outstanding conservation values is an untenable position for the Department of Conservation given its role and responsibilities.
- Parts of the current horse range are not ideal sites for managing wild horses, due not only to their impacts on other conservation values, but also to the existence of management problems posed by :
    - Army land management objectives, as principal user of the land (e.g. unfenced area).
    - A number of land tenures with different land management objectives.
    - Restricted access to the range for both managers and the public.
    - Remote character of the horse range increasing uncertainty of the effectiveness of population control methods, thus increasing the time and money necessary for management.
- The current protected area does not easily provide for all the needs of the horses. For instance, they must consume large quantities of low nutritional value feed in order to survive. This gives rise to an apparent lack of energy and to the morphological characteristics of distended belly and sagging back noted of these horses. They carry a heavy parasite burden and show some mineral deficiencies.

Conclusion

Option A is not a preferred option.

All members of the working party agree that horses must be cleared from certain parts of the current range. However, specifying the extent of the zero density area was the cause of much debate.

Option B

Population Management in a Reduced Southern/South Western Area of the Current Range.

- This would serve to eliminate horse impacts on the outstanding ecological values of the northern sector. However, the southern sector does have conservation value as red tussocklands prevail in the south, and wetland areas are also located there. Horse grazing may be preventing the natural succession of tussocklands towards an increasingly woody element. Regeneration of red tussock would continue to be reduced if over-grazed. It is thought possible to manipulate horse numbers to an acceptable level of impact in parts of the southern area to enable the retention of the tussocklands.
- Heather threatens to invade the tussocklands; the possibility of horse grazing slowing this encroachment may be a positive quality. On the other hand horses may aid the spread of heather. Likewise, horses do preferentially graze the adventive exotic species; when grazing pressure is eased these species proliferate at the expense of the native, low stature, inter-tussock flora. It is also the case though, that horses directly aid the dispersal of adventive species and horse-modified habitats favour the spread of exotic species. The importance of the initial proliferation of adventives, (when grazing stops) in long term modification of the vegetation structure is thought to be minor, as regeneration of native tussocks restores the regime to a more natural state. It may be that some grazing in the red tussocklands could help to retain the dominant red tussockland system, if an objective is to suppress natural succession. Horse grazing does have negative impacts in the red tussocklands. Although, it is thought a threshold impact level could, in time, be determined.
- Therefore, if horses are to be retained and managed in a southern area, a "sustainable" relationship between horse numbers or density and the ecosystem will have to be determined in order to manage for both horse welfare concerns and environmental concerns. Achieving this will require determining impact thresholds, monitoring and adjusting the level of the various management techniques employed to achieve sustainability.
- Such a sustainable relationship must accommodate all issues of sustainability, including the vegetation regime's ability to regenerate while providing nutritional requirements for X number of horses. The ecosystem's ability to withstand other horse impacts, (trampling, tracking, dung piles, horse pads, etc) also needs to be included in that calculation, as would any impacts on native wildlife.
- The most modified areas, the Argo Valley and Home Valley have little conservation value. However, there is concern that horses cannot be confined easily to only these degraded areas. Continued monitoring of horse movement would be needed to ensure they did not migrate and cause further damage outside of the designated horse "refuge" areas. Currently one stallion dominates Home Valley, not allowing other bands to establish within his band's "home" range. The area could support more horses in feed terms, though not in social terms while this stallion is able to keep out other bands.
- Since army activity is concentrated in the south, horse welfare issues may not be best served by restricting the horses to areas of highest army activity.

Conclusion

It may be possible to retain a reduced herd in the south of the current horse range. In doing so it would be essential to determine if a sustainable relationship between the needs of the horse herd and its environment can be achieved.

Current Massey ecological research suggests that in the Argo Valley (616ha) the maximum number able to be supported, (throughout the year, in feed terms) is approximately 1 horse per 12 hectares, if management's only goal is to feed the horses. (Franklin et al). However, the Argo Valley is highly modified, so it would not be sustainable to allow this density of horses to remain in other areas of the Argo zone which support red-tussock, among other, ecosystems.

The Exmoor ponies (U.K.) are managed in a similar ecosystem at 1 horse/25 hectares, (Franklin et al.). If this horse density were to remain in the Argo zone, (18,000 ha) a maximum number of approximately 720 horses is calculated.

However, to find out if a reduced number of horses is sustainable in the tussocklands and to provide for a safety margin in the biological tolerance of the area, 720 horses is thought too many to retain in the zone. Furthermore, in order to achieve a buffer effect between the horse refuge areas and the cleared areas, the population density should be such as to reduce the likelihood of horses migrating outside of their refuge.

Taking into account the above factors, the population to remain in the Argo zone is between approximately 300 to 700 horses.

This option requires on-going performance monitoring of the effects of different horse numbers and density on the environment, (particularly on vegetation) and performance monitoring of the impacts of manipulation on the herd itself, (for instance, do the horses remain within the refuge areas? Are band structures or social behaviour affected?)

Option B is acceptable to a majority of the working party, if a sustainable relationship can be achieved. Royal Forest and Bird Preservation Society believe such a relationship between horse grazing and tussocklands is not possible, based on evidence of grazing impacts in South Island tussocklands. The Kaimanawa Wild Horse Preservation Society on the other hand, prefers this option and provides a case for seeking to determine if reduced numbers could coexist with ecological values in modified tussocklands.

Option C

Population Management in a New Area (relocation)

- Relocating the horses to a new area, providing it meets certain characteristics, would act to retain most positive values associated with them, while promoting the ecological values in the Moawhango Ecological District.
- Criteria for appriasing possible relocation sites. Ideally, a range area for Kaimanawa wild horses would have the following features :
    - Be located as close as possible to their current range.
    - Be located in an area similar in character to their present range.
    - Be a contiguous area large enough to accommodate a "sustainable herd" of horses (300+), both in food and social behaviour terms.
    - Retain the wild character of the herd as far as possible,
    - Exclude any areas of significant indigenous flora or fauna, and any natural habitats prone to degradation and modification by horse impacts.
    - Be able to be developed to accommodate management requirements, (e.g. roads, tracks, corrals, traps, yards).
    - Be accessible to an interested public.

- Be suitable given horse welfare considerations; for instance, not contain features likely to cause injury/stress, or bring the horses into conflict with other land uses or values.

Conclusion

Option C : Relocation is considered an important option by the majority of the working party.

The Kaimanawa Wild Horse Preservation Society prefers retaining the horses within the current range (option B), if a sustainable relationship, which achieves this plan's objectives, can be achieved.

While relocation appears to offer the best means of achieving the ecological objectives, some uncertainty does exist in relation to the horse objectives (e.g behaviour, social structure dynamics, disorientation (etc) caused by a mass relocation). There is concern also that some reduction of the herds wild and free character could occur if relocated to more developed land. By necessity the herd may be handled more intensively than in its current range and reducing the herd to farmed animals is considered unacceptable by some. Apart from these possible effects, on-going management is expected to be less problematic, if an area better suited to wild horse management can be found.

A new location which fits the criteria listed above needs to be found and a relocation of an effective population needs to proceed to determine if the horse objectives are able to be met.

Discussion

If a sustainable relationship is unable to be achieved in the southern sector of the current horse range, a choice must then be made between retention of a horse population or the improvement of the natural character of the tussocklands, in that area. If the choice is made in favour of the tussocklands the relocation must be successful or the horse objectives will fail. Such a failure should be anticipated and in that event this plan would need to be reviewed.

6. The "Protected Area" Status of the Kaimanawa Wild Horses

While developing possible solutions for achieving the objectives of this plan, it was recognised that on-going management of the Kaimanawa wild horse herd would require a change to the Schedule IV listing if horses were to be permanently excluded from parts of their current protected area. It became evident that an evaluation would have to be made of the purpose and function of a protected area Schedule IV listing, under Section 7(1) of the Wildlife Act 1953, as a management technique or tool, (refer Appendix 1).

Management of the Kaimanawa wild horses should act to reduce conflicts between the needs of the horses and other values in an area. The current protected area has, rather than provide protection for the horses, had the effect of bringing them into direct conflict with other values. Land managers have been unable to respond to problems early in their development. An assurance for Kaimanawa wild horse management needs to be that conflicts which act against the needs of the horses should be minimised.

The Wildlife Act 1953 anticipates changes will need to be made to the Schedules listings, hence Section 8, (refer Appendix I). The procedure has been deliberately made easy to allow these changes to be made. Changes do not require specific legislation, but an Order in Council. Over the years there have been many changes to the Schedules as some former "pests" gained respectability and some "respectables" became pests.

The working party asked, "had the initial listing served its purpose and did it continue to have a function in future management, given up-to-date information?"

The following questions have been raised in relation to retaining or removing a protected area :

a. Is the N.Z. public prepared to fund the retention and management of a viable population of Kaimanawa wild horses given the findings of recent research and the high costs likely to be incurred? Or, should those groups with specific interests in these horses fund such a programme? Perhaps a combination of the two is possible.
b. Is the Department of Conservation the best agency to manage these horses or could expert managers, overseen by specific interest groups take over management? Would that better serve the horses and the general public? If another agency was better able to undertake management, could public funding (through Department of Conservation) be sought?

Each working party member considered these questions from a particular point of view :

What is best for the horses? What is best for the ecology? What would the interest group I represent want to say about this? What is best for the public I am elected to represent? What is best for the agency I work for? What is the best way to provide for all of these perspectives?

There are those of the opinion that Department of Conservation funds are being mis-spent in conserving Kaimanawa wild horses. On the other hand, there are those who quote historic, aesthetic and cultural values, as well as biodiversity, as being the reasons for conservation action.

This plan makes proposals for the future protection of the Kaimanawa wild horses, which have arisen from these divergent views.

The location of the current Kaimanawa wild horse protected area is as much an historical accident, as a deliberate design. As other areas were developed, wild horses were eliminated. This isolated area, with the army restricting access, became a surrogate safe haven, which became official in 1981. This protected these horses from the development which threatened their wild status and which has eliminated wild horses from many other areas of the country.

Free-ranging horse herds are a part of New Zealand's cultural heritage. Some wild horses in nominated locations and at controlled levels, may be chosen to be retained.

This evaluation of providing a protected area for the Kaimanawa wild horses lists the purposes and effects of :

A. Having the Kaimanawa wild horses listed in Schedule IV (Wildlife Act 1953).
B. Removing the Kaimanawa wild horses from Schedule IV.

6.1 Having the Kaimanawa wild horses listed in Schedule IV (provide a protected area).

1. Assures that wild horses in a particular area or for a particular time can not be interfered with indiscriminately, as they can only be managed according to the Wildlife Act 1953, (S41, S53 and S54).

2. Suggests that a Kaimanawa herd will be retained. However, this is not certain (without management), as overpopulation could degrade an area so that it can not sustain horses and they could die off or the horses could move out of the protected area in search of food and could then be destroyed.
3. Places responsibility for management and funding with the Department of Conservation.
4. Implies that any management regime, takes into account the wider views and interests of the public as the Minister is responsible to the public for the Department's actions. A single land owner or interest group does not have this responsibility to consult with the wider public in its management decisions.
5. The protected area listing, in itself, has not instigated a management plan (hence the 14 years without a plan), but it has led to a Department of Conservation role in management. This has meant an appraisal of the public's views and an appraisal of the conservation value of the horse herd.

6.2 Removing the Kaimanawa wild horses from Schedule IV (no protected area provided)

1. The Department would not automatically have responsibility for controlling or managing the Kaimanawa wild horses, even if historic, cultural, intrinsic, aesthetic and other positive values deem these horses worthy of preservation.
2. The Department could choose to develop a plan to manage Kaimanawa wild horses regardless of a Schedule IV listing as they still come under the scope of the Wildlife Act 1953 (Section 41).
3. This would place these horses on the same level of protection provided other wild or feral horse populations in New Zealand. Animal welfare concerns (humane treatment) are covered by legislation, for all animals, (Animal Protection Act 1960).
4. Management could be in the hands of private groups, such as an incorporated society, a trust or a limited liability company, private property rights (trespass) would apply. A trust set up specifically to preserve Kaimanawa wild horses could provide better protection than a Schedule IV listing. A management agreement/contract could also be established, (refer Appendix I).

   The existence of specific interest groups such as the New Zealand Wild Horse Charity Trust (W.H.C.T.), which is active in the management of the Aupouri herd (in Northland) and the Kaimanawa Wild Horse Preservation Society, indicates that there could be public support for such an organisation. A Kaimanawa Wild Horse Trust could include academics and other specialist advisors as well as interested members of the public.

   Land Managers (e.g. Army Training Group, Batley Scenic Reserve & others) may choose to retain representative herds, which they would then have to manage sustainably.

5. An independent management dedicated to the welfare of the horses may be more able to respond to their management needs.
6. Any commercial opportunities relating to the retention and maintenance of the herd, (e.g. eco-tourism), could be better developed. Increased public access to view the horses may result.
7. It has been argued that the Department of Conservation is not the most suitable agency for the job of maintaining wild horses. An option could be

for government to transfer management to a more suitable group. The Department of Conservation could continue to have an advocacy role in Kaimanawa wild horse management.

8. Wild horse management decisions made in other situations in New Zealand do not illicit public reaction. Feral / wild horses are being managed sustainably without protected areas being provided.
9. By necessity the horse (equus) would have to be re-listed in Schedule V of the Wildlife Act 1953, as was the case prior to the amendment which listed horses known as Kaimanawa wild horses.
10. The herd would continue to be "owned" by the Crown if retained on army (crown) land. If moved off Crown land they could be sold (for a minimal amount) to the Kaimanawa Wild Horse Trust.

Conclusion

The current Schedule IV listing of the "protected area for the horses known as the Kaimanawa wild horses" is no longer serving the intended purpose of Section 7 (1) of the Wildlife Act 1953.

This population is not in need of protection, it is in need of management. Other mechanisms can be used to ensure a viable population of Kaimanawa wild horses is preserved; the positive values can be retained without the aid of a Schedule IV listing.

7. Strategies for Controlling the Population Growth Rate

Various approaches for controlling the population growth rate are possible, including altering the environment so that it can support fewer horses, increasing the mortality of the horses, or decreasing the fertility of the horses.

The most effective and humane approach is to decrease the fertility, (lower the birth rate). It has been found in trials conducted in the U.S.A. by Dr Kirkpatrick et al, that sterilising dominant stallions does not reduce the birth rate, as mares mate elsewhere, particularly when they have a long breeding season as in the Kaimanawas. In order to have a significant impact on fertility almost all the stallions would need to be sterilised. In the current horse range, this would be a difficult criterion to guarantee. The alternative is to target the mares.

Since mares between 6 and 10 yrs of age have greater reproductive success than mares outside that age group, it could be possible to target these mares. It is unclear at this stage what effect targeting only the most fertile mares would have on the population. A "compensatory effect" (Kirkpatrick 1990) might appear in the remaining mares and the end result might be no change in overall herd fertility. Furthermore, fertility control does not allow for natural selection caused by natural reproductive behaviour.

Kirkpatrick has run immunocontraception trials and successfully prevented pregnancy in mares on Assateague Island, (USA). This population of 150 feral horses is designated a cultural resource as the horses are descendants of horses left there in 1630 by Virginia colonists, (Kirkpatrick, 1991). The immunocontraception used is porcine zona pellucida (PZP), developed by Dr Liu, from the protein in pig ova. "When PZP was injected into the mare, their blood developed antibodies against that protein. The antibodies became attached to sperm receptor sites on the mares' eggs," (Kirkpatrick 1991). These are the sites that the sperm has to recognise and occupy at fertilization. Immunocontraception is reversible, a mare must be inoculated each year to prevent pregnancy. Kirkpatrick is currently working to extend the period of effectiveness, of the PZP vaccine, to longer than a single year and also to improve remote delivery systems for feral populations.

Problems of interference with natural reproduction (and reproductive behaviour) of the herd arise whether sterilizing the stallions or controlling the fertility of the mares. Decisions would need to be made about which and how many mares to immunise, for how many years, the number of foals (if any) that each mare would be allowed to have? etc. The Department has contracted Massey University to apply and research immunocontraception in the Kaimanawa wild horses. The trial was instigated in 1994 and will proceed until 1998.

Any population control method should have minimal effect on the social organisation or behaviour of the treated horses otherwise population dynamics are changed in unpredictable and possibly damaging ways. The impacts of fertility control on social behaviour must be collected during early trials to determine any adverse effects.

"Immunocontraception is a feasible management option, given an absence of any differences in fecundity between ecological zones and age groups", Claire Veltman (1994 Seminar). Current research shows fertility (foal-to-mare) variation between the different zones. It also shows foal mortality variation. Fecundity however, is not thought to be different between the zones, but does vary between age groups.

Immunocontraception may be better implemented in an area which is more uniform so that the selection of mares to target is more predictable.

If it is not possible to control the reproductive success of the horses, it will be necessary to manage the herd by culling, in which case the options considered by the working party for maintaining a specific herd size would be the same as those for reducing the herd size.

Figure 5 opposite, shows the possible choices for managing the wild horse population. Three main alternatives arise for controlling the population size: live mustering, shooting and immunocontraception.

Figure 5 : Management options for horse population control

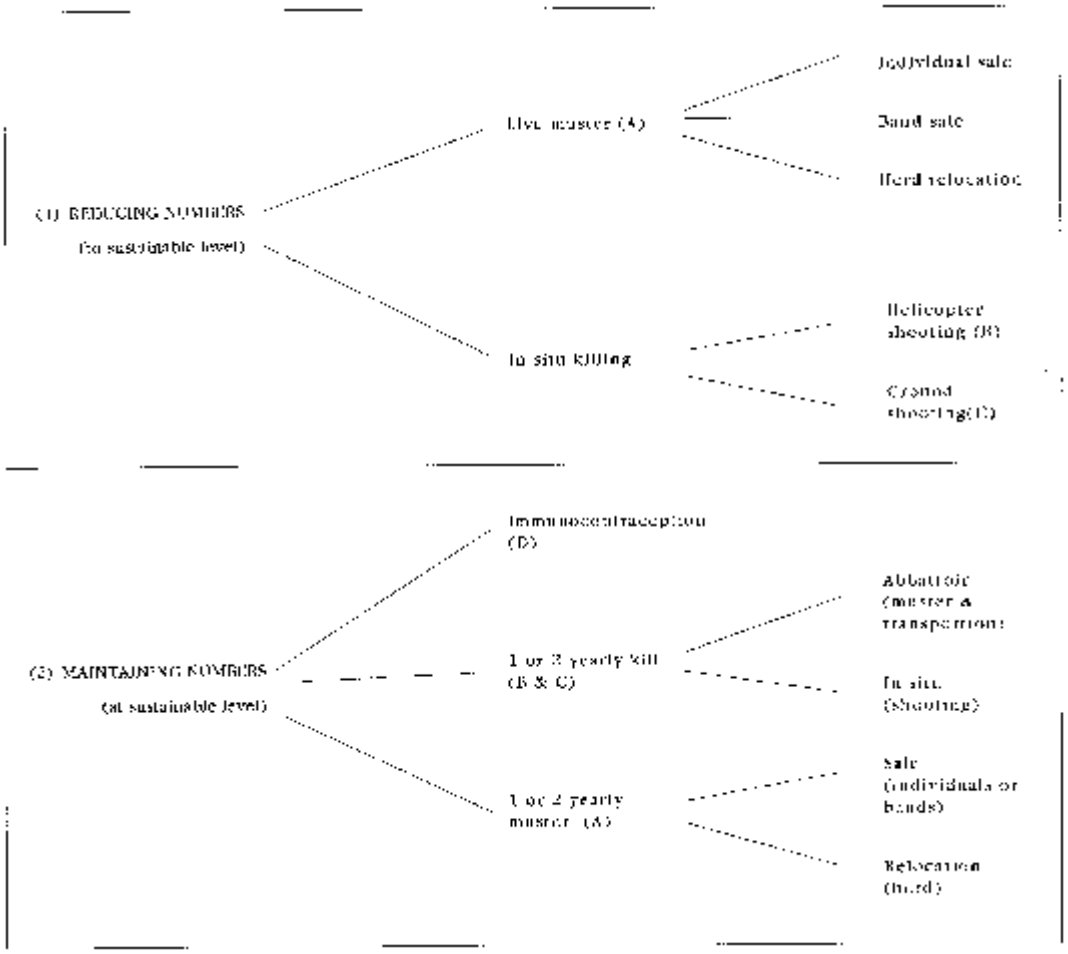


Table 6 (page 66) presents a summary of the relative advantages and disadvantages of the three main options. As considerable debate arises as to whether ground shooting or helicopter shooting is the more humane, the shooting option has been further subdivided.

CONTROL OPTIONS	ADVANTAGES	DISADVANTAGES
(a) Mustering	Live capture(relocation/sale possible) Public approval Trials show low stress on horses Few injuries Public able to see horses Research opportunities needing close proximity enhanced Bands taken in entirely Able to recover some costs Trials show technically	May need several yards over horse range Yards need vehicle access Helicopter & horses riders need experience and skill Relatively costly ($150/horse) Escapees hard to deal with Risk to participants Limited market for live animals Transportation from capture point to abattoir or to holding site (possible stress)

	feasible	Dependent on weather
(b) Shooting from helicopters	Access to most sites possible Australasian Vets Assoc. say best system Fast follow-up to ensure killing is completed quickly More able to ensure local eradication Helicopter able to remove carcass Relatively quick operation time	Some public opposition May be more stressful than ground shoot Outright kill may be more difficult from moving platform at a moving target Relatively costly compared to ground shoot Risk to operators Dependent on wether Skill shooters/markspeople required
(c) Shooting from ground	Relatively low cost Able to be selective No need for permanent structures (yards, traps, roads) May be less stressful than helicopter shooting	Difficult to follow-up if not killed outright Difficult to guarantee eradication in area Diminishing returns Carcass disposal problems Time consuming Skill shooters/markspeople required
(d) Immunocontraception	Humane Non-lethal Acts on birth rate not death rate Flexibility Wide public approval Possibility of low social distruption to horses	Unknown behavioural responses in band Possible compensatory reproduction Must target the most fecund mares to be effective on-going vaccinations are needed to ensure effectiveness Could require muster ($150/horse) and holding for 3 weeks in order to guarantee booster dose. Could prove an expensive option (+$25/dose of vaccine). Delivery systems in remote areas untried in N.Z. Any additions (births) need also be captured, and dosed.

Table 6 : Summary of Advantages and Disadvantages of Population Control Options

8. Criteria for Evaluating the Management Techniques/Options

The Working Party discussed techniques for reducing population numbers and then maintaining a certain number of horses. The following criteria were applied generally to each option in discussing which to use.

1. Horse Welfare Considerations: humaneness, health and social conditions.
2. Technical Considerations: what techniques are experimental/proven?
3. Logistic Considerations: resources (time and people)
4. Financial Consideration: How much will it cost, is it worth it?
5. Risk of Failure: Certainty that action will advance objectives?
6. Political Considerations: The values/views of interested groups.
7. Expected Outcomes: what is expected to happen as a result of the action?

It was concluded that a variety of methods will be required to reduce and control the population, therefore, rather than recommending specific programmes, criteria for for assessing the relative humaneness of techniques were developed. Refer to Appendix V.

9. Determining a Threshold Level of Horses to Retain in a Southern Area

The working party considered the following comments by Rogers (1994) and the recommendations from a number of other sources, including the Massey researchers and the army land manager to determine the number of horses to be retained in specified areas of the southern sector.

"A strategy of selective horse control is based on the premise that there is a population density below which the horses' undesirable effects are acceptable, i.e. a threshold level. A threshold population density is in turn linked to a threshold level of effect. Threshold levels of effects would be suitable performance standards for control operations, especially if they could be monitored using indicator species, vegetation stature or composition. For example, monitoring of vulnerable plant species is based on the assumption that, providing these key indicators are not being visibly or measurably damaged by horses, it is likely that the ecosystem as a whole will retain its integrity.

In practice, such thresholds have been experimentally confirmed for few feral populations. Present knowledge suggests that thresholds vary markedly between ecosystems and even individual communities. The linkage between threshold impact and population level is unlikely to be linear and therefore impact thresholds are difficult to calibrate. Once threshold population - impact levels are known, definite target densities can be set in different plant communities.

With present levels of understanding of ecosystem dynamics in N.Z., the only practicable approach to establishing impact thresholds would seem to be empirical monitoring of ecosystem responses to different horse population levels. Such an approach is of course long term and, in the case of critically threatened plant species and ecosystems, potentially very risky.

Thresholds are related to, but not the same as, vulnerability to horse damage. We can do vulnerability rankings on plant communities in the Moawhango from past environmental research. The more vulnerable the community, the lower the threshold number of horses allowed in order to protect the community.

10. Responses of Modified Tussock Grasslands to the Removal of Horses

It is anticipated that excluding horses from the modified tussock grasslands would lead to the following responses.

(All quotes below come from Rogers 1994)

In the Short Term (5 yrs) :

1. Slow the spread of weeds.
2. "A proliferation of exotic grasses, to probably dominate intertussock space, to the loss of prostrate native herbs".
3. "A small increase in native species diversity".
4. "An increased biomass and limited recruitment of both red and hard tussock".

In the Medium Term (15 yrs) :

5. "Biomass dominated by exotic grasses and red tussock".
6. "Continuing recruitment and canopy dominance of red tussock".
7. "Loss of hard tussock from all diameter classes because of competition from choking exotic grasses".
8. "Loss of prostrate native herbs, probably from intertussock dominance by exotic grasses".

Beyond 15 years :

"The cover and stature of red tussock is expected to increase further. Native shrubs may also appear, depending on local seed sources, topography, and humidity" (Rogers & Leathwick 1994).

"Even substantially modified red tussock / hard tussock grasslands have sufficient resilience to return to red tussock dominance with hares present but horses removed. The process would span at least four decades. Progressive loss of hard tussock would be an inevitable consequence of a return to taller red tussock in mixed grassland, even in the absence of exotic grasses. With or without exotic grasses, the process would see greater loss of hard tussock on sites optimal for red tussock, such as damp basins, than on more marginal sites such as dry rolling hill country," (Rogers 1994).

The rate of change in the ecosystems is difficult to estimate as the relationship between horse densities and the degree of horse modification is not well described.

"The biggest threat to the natural character of the area is the spread of heather into the tussocklands. Other potential ecosystem modifiers may continue to persist, but their effects are minor by comparison with those attributable to horses", (Rogers 1994).

11. Operational and Performance Monitoring

Operational monitoring is concerned with horse welfare and the success of the operation. Ground and aerial surveys would monitor and follow up any control operations.

Performance monitoring measures the outcomes, in terms of effectiveness, in achieving the objectives of the plan, which necessitated the control actions.

"Performance monitoring techniques cannot be fully standardised in this non-homogenous area. Ecological research in the region has shown that the

vegetation regimes of the horse range are in a high state of disequilibrium. The term "dynamic equilibrium" can be applied only to the beech forest islands. The rest of the vegetation is in a high state of natural flux, both retrogressive or progressive successional change. This makes horses one of several dynamic influences on the state of the vegetation and their removal then does not lend easily to an automatically predictable future state of the vegetation. Rogers has proposed a number of techniques for performance monitoring of horse control for conservation goals. It may take several years after horse control to show an improvement in environmental qualities being protected. This is because of the slow growth rates of vegetation and energy cycling within these high altitude ecosystems. Post control monitoring of effects of removal would be aided if an area subject to horse modification, was retained", (Rogers 1994). An argument could be made for a herd to be retained in tussockland to undertake long term ecological studies into quantifying horse impacts, for instance to see if they help to preserve a tussock state while cleared areas succumb to heather (and other adventive species), or succeed to shrubland.

Furthermore, "It may be very difficult to develop integrated predictive models of threshold impacts for each horse management sector because of :

1. The wide ecosystem variability of each sector.
2. The spatial and temporal variability of ecosystem processes and conditions.
3. Natural horse dispersal is difficult to predict. It varies daily seasonally and annually through environmental fluctuations.
4. The influence of army training on horses is difficult to predict."

12. How and What to Measure

The Department has established a number of monitoring programmes, which could be extended to monitor the effects of horse population control. The means would be to utilise exclusion plots, photo sites, cages and base points against which change can be quantified.

It would be possible to monitor boggy site changes, weed establishment, weed spread, water quality and stream recovery, vegetation composition and state. Environmental indicators would need to be established, particularly for monitoring the "sustainability" of any relationship between a continued horse presence and the environment.

13. Recommendations for Management

The Desired Future (Year 2000+)

- A sustainable Kaimanawa wild horse population/environment relationship exists.
- A minimum effective population (i.e 300 plus) of Kaimanawa wild horses is retained as a wild herd.
- A humane, effective and flexible population growth control programme is able to maintain both a healthy wild herd and a healthy habitat, wherever the herd is located.
- Opportunities for the public to appreciate the herd have been enhanced.
- Kaimanawa Wild Horse Trust management is dedicated to horse welfare issues and the horses are no longer in conflict with other values.
- The at risk conservation values in the Moawhango Ecological District are no longer threatened by the impacts of the Kaimanawa wild horses.
- The Department of Conservation continues to monitor the conservation values in the district and advocates for the preservation of outstanding conservation values.

- The army and other land managers continue to control other plant and animal threats to the natural ecosystem.

Some recommendations are provided with a page reference, to indicate where information/analysis leading to the recommendation can be found. The working party chose to limit the recommendations of this plan to matters of policy. Operational methods for implementing these policies are not prescribed. The stages should occur sequentially. Within each of the stages the recommendations should occur concurrently, except in Stage 1 where recommendation 6 will not occur until the other recommendations have been effected.

Stage 1

Strategic preparation (early 1996)

Administrative prerequisites and planning preparation is needed prior to most actions being taken. These recommendations should be completed during 1996.

1. Facilitate the establishment of a Kaimanawa Wild Horse Trust, by inviting interested parties to form a "Board of Trustees" and helping them establish a "Trust Deed".

- Refer to recommendation 17.
- The early identification of trustees will allow preparation to begin for a transfer of management if that were the recommendation after the three year monitoring period.
- It is envisaged that the Trust will provide advice to the Department and may take over management of any herd retained under the plan, but not located on army land.

2. Negotiate and establish an agreement to enter into a management contract with the Army Training Group

- Refer to recommendation 6.
- If after the performance review, a population of horses is retained on army land, the Department will transfer management of the herd to the army. The army will be bound to manage the herd in accordance with the objectives of this plan. The army would then be responsible for management and preservation of this population.

3. Appraise army grazing lease land to determine its suitability for relocation of a representative herd. (Refer to page 59 for criteria for a relocation site).

    - Refer to recommendation 10 and figure 6.
    - If these sites are unsuitable, the Trust will be responsible for seeking other sites for appraisal.

4. Prepare and establish performance monitoring programmes in the current wild horse range (Refer to page 69).

Monitoring is needed to establish the success or failure of the plan, Monitoring should...

1. Observe any changes in the vegetation and habitats, attributable to a release from horse grazing and the absence of horse activities in the zero density areas.
2. Determine the impacts and comparative differences between impacts, at different horse densities in those areas where horses remain, (i.e the degree of impact attributable to different horse densities), in order to indicate at what densities the relationship may be sustainable.
3. Seek to determine if the horses are affecting the spread of heather into the tussocklands, and if the preferential grazing of adventive grasses helps to retain the character of the modified tussocklands.
4. Record any changes in characteristics and social structure of the population. Determine if humane treatment specifications are being met in any management of the horses.
5. Determine if the reduced and relocated herds retain the positive values associated with the Kaimanawa wild horses.
6. Monitor the costs and benefits of all management activites in both locations.
7. The costs and benefits of management in both locations, are important requirements, for choosing which option will be pursued beyond Stage IV. This is particularly true if both options are found to be feasible.
8. Uncertainty as to what is sustainable necessitates on-going performance monitoring of environmental and herd responses to management actions. This requires programmes to have been established prior to the control operations. Vegetation and ecosystem monitoring is in place currently, but needs to be extended. Monitoring must differentiate between zero density areas and the impacts at different horse densities in areas where horses are retained.

5. Horse welfare issues must remain paramount in all handling of the horses. Ensure the principles that the working party developed for humaneness are adhered to at all times.

- Refer to Appendix V for the criteria for the assessment of humane treatment developed by the working party.

6. Remove the current protected area listing from Schedule IV, once it is certain that agreement between the Department of Conservation and the army can be successfully established to manage the horses in accordance with the objectives of this plan.

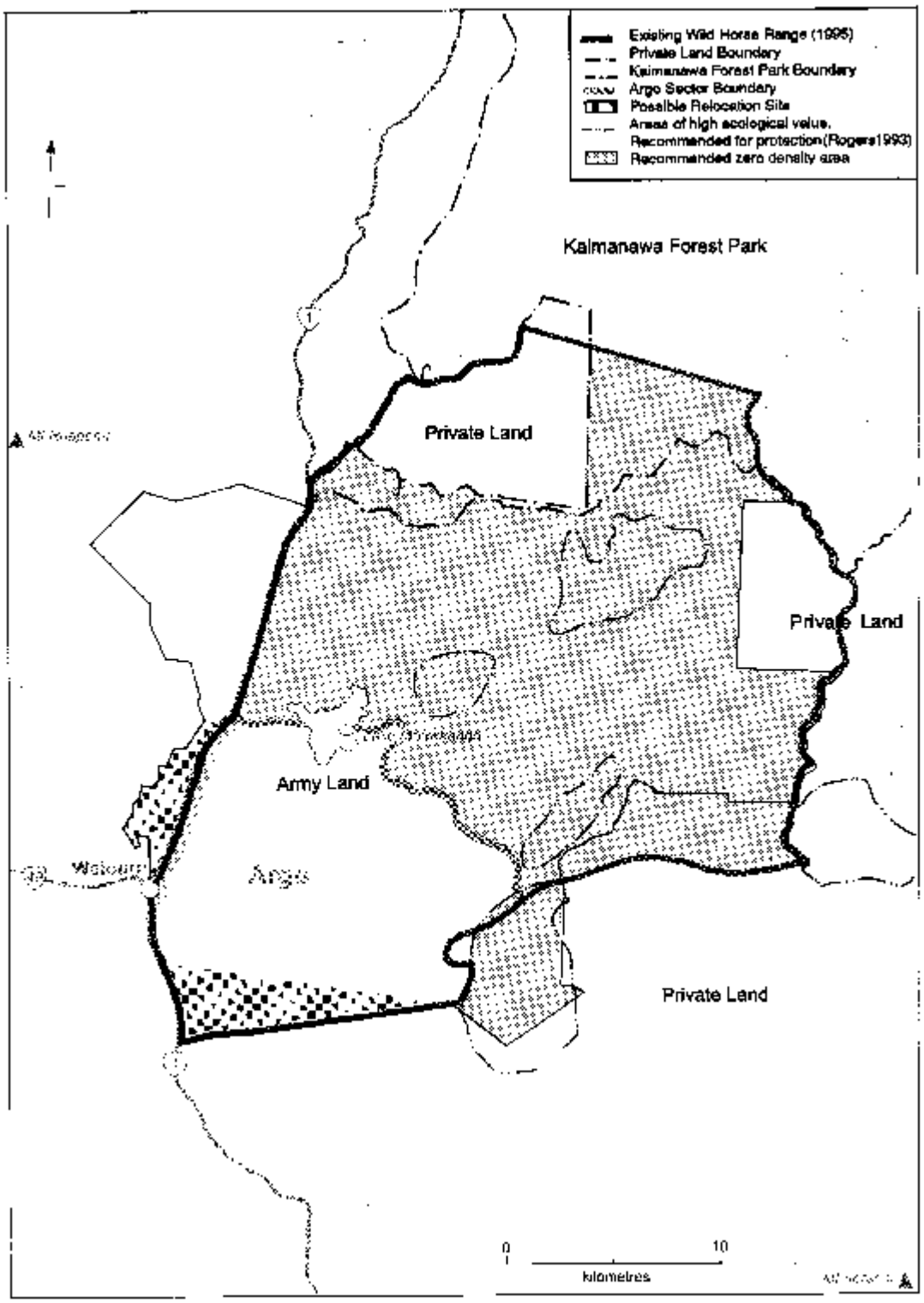
- This is necessary for the permanent removal of wild horses from parts of the current protected area. Long term management of this herd requires more flexibility than allowed by Sections 41, 53, and 54 of the Wildlife Act 1953. Refer pages 60-63.-
- The mechanisms for preserving a herd, found within this plan, will be activated on the removal of the listing, to take over the security provided by the listing.

Stage 2

MANAGEMENT Actions (BEGINNING IN 1996)

Refer to Figure 6 : "Management Areas" Page 73

figure 6 : Management areas



7. Remove all horses from the areas of highest conservation value; the Nga Waka a Kauae, Otokoro and Te Puta o Te Haki Zones, and also from the Awapatu and Motumatai Zones and manage these areas at zero horse density. (Refer to pages 45-48 & 54).

- Zero density areas are those areas where the goal is to clear horses in order to protect environmental values, however it is acknowledged that

some horses may, from time to time, temporarily move into these areas and that this will not necessarily require immediate intervention.

8. Negotiate with the owners of private lands, which have wild horses, to ensure the management of these horses is compatible with management of horses on adjoining army land.

- A reduction of horse numbers will be needed to ensure compatibility.
- Private landowners who wish to retain horses on their land would have to monitor horse movement and impacts on their land to achieve compatibility with adjoining areas.
- In order to ensure that population growth is controlled and to prevent migration back into the zero density areas, the Trust could have an interest in management (with landowners on the Board of Trustees) and the army will continue to monitor its land in the Motumatai zone to ensure horses are not re-establishing.

9. Retain approximately 500 horses in the Argo Zone for a period of at least 3 years to appraise the impacts of this reduced number of horses on the ecosystems and determine if, and at what numbers horses can be retained. Refer pages 57 and 67.

- The branded horses (for immunocontraception research) must be retained.

10. If recommendation 3 has been successful, relocate 300 horses to the approved relocation site. Refer to pages 59-60.

- No selection of these horses should be made; retain the original band and population structure (as mustered).
- Refer to recommendation 15.

11. Proceed with the immunocontraception research contracted to Massey University.

- This research is needed to determine the impacts and effectiveness of immunocontraception as an appropriate and feasible technique for reducing the natural population growth rate of horses.
- Refer to page 63-67 and Appendix 5.

Stage 3

Performance Monitoring 1996 to 1998 Inclusive

Appraisal must be made of the environment and the wild horse herd to determine the results of management actions. This is necessary to check if the objectives, which led to the actions, are being achieved.

12. Continue the performance monitoring programmes established in Recommendation 4.

- Performance monitoring must thoroughly appraise both in situ management, for three years after reducing horse densities, and relocation, for at least a year. Then it will be necessary finally to choose which option is most effective and efficient in achieving the objectives of this plan

13. Regular horse population censuses should be conducted.

14. Prevent population growth in the herd/s Refer to pages 37-39.

- Refer to Recommendation 5.
- Monitor annual increase in the total population and cull that percentage from the herd annually (or biennially). The immunocontraception trial may reduce the annual increase from 1996 onwards.
- Immunocontraception research could potentially reduce or eliminate the necessity to cull in future years, however results of the research will not be available until 1998.
- Culling operations should target entire bands at random, in order to minimise selectivity and human influence on the population structure and characteristics of the herd.

Stage 4

Review (after 3 years of performance monitoring)

After performance monitoring of both the relocation and in situ management and outcomes, a review is needed to analyse the successes and failures, costs and benefits of the two options. Comparison will enable a decision on which option to pursue. Refer to pages 53-55.

15. Decide which location option best achieves the objectives of this plan and choose the option that best achieves:

i. The ecological objectives,
ii. The Kaimanawa wild horse objectives,
iii. By comparison with the alternative option is better able to fulfil all the objectives of this plan.
iv. Is feasible, financiallly viable and practical, and
v. Ensures the long term security of the herd.

Notes

a. If in situ management is the preferred choice after review, the relocated herd may be sold, or a new group or the Trust could take over management. If neither of these is possible the relocated horses will have to be sold individually or slaughtered.
b. If a tolerable relationship is unable to be achieved in the southern sector of the current horse range, a choice must be made between the retention of a horse population or the improvement of the natural character of the tussocklands. If the choice is made in favour of the tussocklands, then relocation must be successful or the horse objectives will fail. Such a failure should be anticipated and in that event this plan would need to be reviewed.
c. If in-situ management is rejected then it would be necessary to remove all the horses from the tussocklands.

16. If immunocontraception is feasible, this option for controlling population growth should be pursued.

- Immunocontraception is currently considered the most humane population control method, refer to Appendix V.

17. Transfer management to the army if horses are retained on army land OR to the Kaimanawa Wild Horse Trust if the relocated herd is to be retained on non-army land.

- Kaimanawa wild horses are not considered a priority for conservation action by the Department of Conservation. Therefore the Department would not automatically continue to manage the Kaimanawa wild horse herd past the review stage, as its involvement in management of these horses is because of their current Schedule IV listing.
- If the horses are retained on army land the army will take over management. The Department of Conservation will review the effectiveness of army management, in consultation with the Trust. This relationship will be established in a contract/ agreement between the army and DoC and reflects the ongoing concern the public has for the horses welfare and preservation.
- If horses are retained on private land the Kaimanawa Wild Horse Trust could take over the management and preservation role. A contract/agreement between DoC and the Trust similar to that with the army, would ensure the herd is managed in accordance with the objectives of this plan.

figure 7 : summary of recommendations showing time frame & stages for implementation

Part E: References

Acknowledgements

Thank you all who have contributed to the preparation of this document, particularly the members of the working party who have invested considerable time in what was often a difficult process.

Many organisations, groups and individuals have contributed information, ideas and views, which have been taken into account during preparation. This includes members of the public who made comments to the 1995 "Draft Plan". Their input provided a comprehensive understanding of the values basis and issues which needed addressing in this document. These contributions are also acknowledged.

Glossary of Terms (in topic groups)

Feral is defined as wild; uncultivated; living in wild state after escape from captivity.

Free-ranging is defined as not under the control of another, given freedom of movement in seeking food.

Wild is defined as in original natural state, not civilised or domesticated or cultivated or populated.

NOTE: In this document wild is used when referring to the Kaimanawa wild horse herd. Feral is used as an adjective to describe escaped (free) horses and herds of untamed horses (other than the Kaimanawa herd), particularly where a reference has used this term.

Free-ranging is used occasionally as the term is generally accepted as unbiased, although not as respectable as wild, (as people associate the term "free-ranging"

with farmed chickens). The working party concluded that, while most literature referring to horse herds living similarly to the Kaimanawa herd are described as feral horses, the public is likely to see the use of this term as a down grading of the Kaimanawa herd's status. People approve of wild animals and disapprove of feral animals (pests). In New Zealand as horses are introduced, all animals are the prodigy of (once) domesticated stock, the lack of management for many generations has led to their now living in a wild (untamed and free) state.

Adventive is defined as arriving from outside; in contrast to native; for instance, a plant which grows in the wild but whose presence is directly or indirectly attributable to humans.

Endemic is defined as plant and animal species confined to New Zealand.

Ephermeral wetlands are defined as wetlands which have surface water for only part of the year, or which dry out in some years and not in others. Some species that use ephemeral wetlands do not occur in permanent wetlands.

Exotic is defined as introduced from abroad.

Native is defined as not known to have been introduced by human agency.

Seral is defined as being in a state of change or unstable stage in a process of change, not a stable form, (in relation to vegetation succession).

Stasis is defined as stopped changing, in stable form, dynamic equilibrium (in relation to vegetation succession).

Succession is defined as the process of change in the appearance, composition and structure of a community, usually over a number of years. Change may be due to biotic factors, or state factors or both. In this document, vegetation communities have been described as seral or in stasis.

Aesthetic value - Refer to Appendix I

Conservation - Refer to Appendix I

Intrinsic value - Refer to Appendix I

Preservation - Refer to Appendix I

Biogeography is defined as the study of the distribution in time and space of organisms.

Biogeographically significant is defined as the location (in time and space) of a plant species or community is unusual, rare or special.

Threatened species is defined by threat categories used by the Species Survival Commission of the International Union for Conservation of Nature (IUCN). These categories are: Extinct, Endangered, Vulnerable, Rare, Taxonomically Indeterminate, Insufficiently Known. Two additional categories are used, Critical (proposed by IUCN) & Local.

NOTE : The following definitions are provided by Cameron et. al. of the New Zealand Botanical Society.

Critical species is defined as to face an extremely high probability of extinction in the wild within the immediate future.

Endangered species is defined as species that are in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included are taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Extinct species is defined as no longer known to exist in the wild or in cultivation after repeated searches of the type localities and other known or likely places.

Insufficiently known is defined as taxa that are suspected but not definitely known to belong to any of the above categories because of a lack of information.

Local plant list (this is not an IUCN category) is defined as a list which acts as a `watchlist' for taxa which are sufficiently restricted to warrant noting and some monitoring.

Rare species is defined as taxa with small populations which are not endangered or vulnerable but are at risk. Usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. Rare plants are often endemics with a narrow distribution whereas vulnerable and endangered plants have often been formerly more widespread.

Vulnerable species is defined as species that are likely to move into the endangered category in the near future if the causal factors continue to operate. Included are taxa of which most or all the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance.

Allele is defined as one of a pair of alternative hereditary characters; gene which can occupy the same locus as another gene in a particular chromosome.

Gene is defined as a unit hereditary factor in the chromosome, controlling a particular inherited characteristic in an individual.

Genotype is defined as the genetic or factorial constitution of an individual.

Phenotype is defined as the characters of an organism due to the response of genotypic characters to the environment.

Fecundity is defined as the power of a species to multiply; capacity to form reproductive elements.

Fertility is defined as the capacity to produce living offspring; describes the number of births (as a rate in a population) in a given period. e.g Birth Rate.

Mortality is defined as being subject to death; describes the number of deaths (as a rate in a population) in a given period. e.g. Death Rate.

Natural attrition is defined as the gradual losses from a population due to natural deaths (or migration)

Ageing population is defined as a population which has a high proportion of older members by comparison to young. Such a population has the capacity to decline rapidly as older members die at a faster rate than they are being replaced by young.

Youthful population is defined as a population which has a high proportion of young members by comparison to older adults. Such a population has the capacity to grow rapidly if the birth rate remains high and if the death rate is low.

Anatomical is defined as that part of biology dealing with the structure of plants and animals (as determined by dissection).

Behavioural is defined as dealing with the way or manner in which an animal acts.

Ethogram is defined as a description of behaviour and character of a society (of horses). It is derived from Ethology - study of habits in relation to habitat; study of behaviour.

Physiological is defined as that part of biology dealing with functions and activities of organisms.

Bibliography

Kaimanawa wild horses & Moawhango Ecological District

Aitken V., Kroef P., Pearson A., Ricketts W. , April 1979, "Report on Observations of Feral Horses in the Southern Kaimanawas (Feb 1979) to the Kaimanawa Wild Horse Committee." Report Commissioned by N.Z. Forest Service.

Anderson, I.L., Halket R., Cothran E.G., Nov 1994, "Genetic Studies on the Kaimanawa Horses." Unpub. paper presented to public seminar in Palmerston North Nov. 1994.

Franklin A., Veltman C., Freeman D., 1993 "Population Biology of Kaimanawa Feral Horses." Interim report to Department of Conservation from Ecology Dept & Vet. Clinical Sciences. Massey Uni.

Franklin A., Freeman D., Stafford K., Veltman C. (Massey University Researchers, contracted by Department of Conservation - Investigation No. 1850 "Population dynamics and immuno-contraception in the Kaimanawa wild horses."), Jan 1995 "Ecology of Kaimanawa Feral Horses at Waiouru, New Zealand." Unpublished Report to Department of Conservation.

Department of Conservation, Aug,.1991, "Kaimanawa Wild Horse Herd : Draft Management Strategy."

Connell Wagner Rankine & Hill Ltd, June 1992, "Kaimanawa Wild Horse Herd : Draft Management Strategy : Analysis of Submissions." Unpub. Report to Department of Conservation.

Kirkpatrick Jay F., Jan 1994, "Kaimanawa Wild Horses : Report to the International League for the Protection of Horses."

Massey Focus (edit), 1994, "Kaimanawa Horses - Still at Home on the Range." "Massey Focus" Issue Number 1 1994

McQueen Dr D.R., Oct. 1972, "The Ecology of the Motumatai Block (Proposed Private Scenic Reserve) Progress Report." Botany Dept. Victoria University.

Rogers G.M. Nov. 1986, "Moawhango Ecological District, a biogeographic hot spot." "Forest & Bird" Volume 17 Number 4 Nov. 1986

Rogers G.M. July 1989 "Appraisal of the Place of Wild Horses in the Kaimanawa Mountains." Unpub. Report to Department of Conservation. (Workplan no. 1775) Forest Research Inst.

Rogers G.M., 1991 "Kaimanawa Feral Horses and their Environmental Impacts" "New Zealand Journal of Ecology", (1991) 15(1):49-64 Publ. by New Zealand Ecological Society.

Rogers G.M. 1993 "Moawhango Ecological Region : Survey Report for the Protected Natural Areas Programme". Pub. Department of Conservation.

Rogers G.M. 1994 "Appropriateness of Zoning Land in the Southern Kaimanawa Mountains for Horse Management". Unpub. Letter to the Department of Conservation from Landcare Research.

Rogers G.M., Aug. 1994, "Kaimanawa Feral Horses: Recent Environmental Impacts in their Northern Range." Unpub. Report to Department of Conservation from Landcare Research.

Wright V., 1989, "Wild Horses" "New Zealand Geographic" Number 1 Jan-March 1989

Feral horses in Australia

Dobbie W. & Berman J., June 1992, "Control of Brumbies in Central Australia." Report produced by Conservation Commission of The Northern Territory.

Dobbie W.R. & Berman D., Jan 1993, "Feral Horses : A National Management Strategy." Conservation Commission of the Northern Territory to Dept. of Primary Industries & Energy.

Report by the Senate Select Committee on Animal Welfare, June 1991, "Culling of Large Feral Animals in the Northern Territory." Senate Printing Unit, Canberra.

Walters B. & Hallam M., Oct. 1992, "Feral Horses in the Alps" (Report of a Workshop) Australian Alps Liaison Committee, Canberra.

Feral horses in the United States of America

Committee on Wild Horse and Burro Research, 1991, "Wild Horse Populations : Field Studies in Genetics and Fertility." National Academy Press, Washington D.C.

U.S. Department of the Interior : Bureau of Land Management, June 1992, "Strategic Plan for Management of Wild Horses and Burros on Public Lands."

Aerial census counts

Caughley G., 1974, "Bias in Aerial Survey." "Journal of Wildlife Management." 38(4):921-933

Frei M., Peterson S., & Ron Hall J., Jan 1979, "Aerial Census of Wild horses in Western Utah." "Journal of Range Management." 32(1), Jan 1979

Fertility & population growth in feral horses

Bomford M., 1990, "A Role for Fertility Control in Wildlife Management?" Bureau of Rural Resources Bulletin no. 7 Australian Govt. Pub. Service, Canberra.

Bomford Dr M. & Caughley Dr J. "Fertility Control : Is it an option for managing problem mammals and birds in Australia?" Pamphlet by the Bureau of Rural Resources.

Eberhardt L.L., Majorowicz A., Wilcox J., 1982, "Apparent Rates of Increase for Two Feral Horse Herds." "Journal of Wildlife Management." 46(2):1982

Garrot R.A., Siniff D.B., Tester J.R. & Plotka E.D., 1991, "Contraception as a Tool for Managing Feral Horse Populations in the Western United States." unpub draft.

Kirkpatrick J.F., Liu I.K.M., & Turner J.W., 1990, "Remotely-Delivered Immunocontraception in Feral Horses." "Wildlife Society Buttetin." 18:326-339, 1990.

Kirkpatrick J.F. & Turner W., 1991, "In My Experience ... new developments in feral horse contraception and their potential application to wildlife." "Wildlife Society Bulletin" 19:350-359,1991.

Kirkpatrick J.F., 1991, "Wildlife Contraception : A New Way of Looking at Wildlife Management." "Humane Society (US) News." Fall 1991

Mathews F., 1991, "Fertility Control in Wildlife: An Ethical Overview." "Habitat Australia" Feb 1991.

Tyndale-Biscoe Dr H. & Jackson R., "Viral Vectored Immuno-sterilisation : A new concept in biological control of wild animals." CSIRO Division of Wildlife & Ecology. Fertility Control in Wildlife Conference, Melbourne, Australia.

General background

Cameron E.K., de Lange P.J., Given D.R., Johnson P.N. Ogle C.C., 1995, "Threatened and Local Plant Lists (1994 Revision)." N.Z. Botanical Society.

(Commissioned by) Ministers of Conservation, Agriculture and Environment. April 1994. "South Island High Country Review : Final Report from the Working Party on Sustainable Land Management".

Department of Conservation, Oct 1994. "Setting Priorities for the Conservation of New Zealand's Threatened Plants and Animals."

Department of Conservation, Oct 1992, "Himalayan Thar Control Plan : Draft"

Elliot-Reep T., 1990, "Gathering Horse Power." "Pacific Way."

Gabites Porter Consultants & Department of Conservation, Dec 1993, "Himalayan Thar Control Plan Draft : Analysis of Public Submissions and Departmental Response" Pub. Department of Conservation.

Ministry of Agriculture & Fisheries, Oct. 1991, "Tentative Proposals for an Animal Welfare Bill" MAF Policy Paper 112.

Morrow H., 1975, "New Zealand Wild Horses", Millwood Press Ltd.

O'Conner K.F., 1982, "The Implications of Past Exploitation and Current Developments to the Conservation of South Island Tussock Grasslands". "New Zealand Journal of Ecology", 5:97-107"

Pilkington M. & Wilson G., Nov. 1990, "Welfare of Horses Being Transported." (WP/16/90) Canberra

Rogers G.M., June 1991, "Rates of Shrub Invasion of North Island Tussock Grasslands." Investigation No :P580, Forest Research Institute Report for Department of Conservation.

Standing Committee on Agriculture, Animal Health Committee, Sub-committee on Animal Welfare, Feb. 1992, "Australian Model Code of Practice for the Welfare of Animals : Land Transport of Horses."

Correspondence & discussion with

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Loague Peg (National President, R.N.Z.S.P.C.A.).

Ogle Colin (Conservation Advisory Scientist, Department of Conservation, Wanganui).

Mangos John (Land Manager, Waiouru Army Training Group).

McFarlane Elizabeth (International League for the Protection of Horses).

Shearer Sandra (International League for the Protection of Horses).

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Willis Mike (President, Rare Breeds Conservation Society).

Appendix 1

Overview of legislation relevant to the situation

1. Conservation Act 1987

This Act establishes the Department of Conservation's role to advocate the conservation of natural and historic resources on all lands.

SECTION 2 : Interpretation "Conservation" means the preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations.

"Nature conservation" means the preservation and protection of the natural resources of New Zealand, having regard to their intrinsic values and having special regard to indigenous flora and fauna, natural ecosystems, and landscape.

"Preservation" in relation to a resource, means the maintenance, so far as is practicable, of its intrinsic values.

"Protection" in relation to a resource, means its maintenance, so far as is practicable, in its current state; but includes -

a. Its restoration to some former state; and
b. Its augmentation, enhancement, or expansion.

SECTION 29 Management Agreements. The Minister may enter into any agreement, contract, or arrangement of any kind with any person on such terms and conditions as the Minister thinks fit ... to carry out the conservation of any natural or historic resource on or in any land owned or under the control of the person.

2. Wildlife Act 1953

NOTE : There is no provision for a public consultation process in preparing wildlife plans pursuant to Section 41 of the Wildlife Act 1953. The Minister chose to pursue a working party approach to develop this plan.

SECTION 7 Certain wildlife not protected - (1) the wildlife for the time being specified in the Fourth Schedule hereto is hereby declared to be unprotected throughout New Zealand, except where that Schedule otherwise provides:

Provided that, where the Minister considers that hunting by other persons is likely to interfere with studies and investigations of or campaigns against the wildlife specified in that schedule carried out by the Department, he may from time to

time in his discretion, by notification, declare that any wildlife for the time being specified in that Schedule may not be hunted or killed or had in possession in such area and during such period as are specified in the notification.

SECTION 8 Alteration of Schedules - (1) The Governor-General may from time to time, by Order in Council, declare -

b. any wildlife for the time being specified in any Schedule hereto to cease to be included in that Schedule and to be included in any other Schedule hereto:
c. Any wildlife for the time being specified in any Schedule hereto to cease to be included in any Schedule hereto, in which case the wildlife shall be deemed to be absolutely protected under this Act:

SECTION 41 Minister's general Powers (1) - The Minister may from time to time-

(a) Prepare and carry out wildlife surveys:

(aa) Acquire and dispose of land for the purposes of this Act:

(b) Use and develop land as a wildlife sanctuary, or as a wildlife refuge, or as a wildlife management reserve, etc for the purposes of this Act:

(c) Co-ordinate the policies and activities of Departments of State, acclimatisation societies, local authorities, and public bodies in relation to the Commercial value ($)

the protection, management, control and conservation of wildlife and the eradication of harmful species of wildlife:

(d) Conduct wildlife research work, and collect and disseminate wildlife information:

(e) Prepare and issue plans and publications for the advancement, conservation, management, and control of wildlife and the eradication of harmful species of wildlife:

(f) Make provision for the setting up of such advisory bodies as he thinks fit:

(g) Make provision generally for the administration of the Act.

(2) In the exercise of the powers conferred on him by subsection (1) of this section, the Minister may from time to time - -(d) enter into any contract or agreement.

SECTION 54 Secretary may authorise hunting or killing of wildlife causing damage.

(1) The Secretary, on being satisfied that injury or damage to any person or to any land or to any stock or crops or to any chattel or to other wildlife has arisen or is likely to arise through the presence on any land of any animals (whether absolutely protected or not), and whether or not the land is a Commercial value ($) wildlife refuge or a closed game area, may authorise in writing the occupier of the land, ...or the society for the district in which the land is situated, or any officer or servant of the Department, or any other person, to hunt or kill, or cause to be hunted or killed, or to catch alive for any specified purpose any such animals, or to take or destroy the eggs of any such animals, subject to such conditions and during such period as may be specified in the authority.
FOURTH SCHEDULE (WILDLIFE ACT 1953) Lists Wildlife not protected, except in areas and during periods specified in the minister's notification. Section 7 (1) states the conditions by which wildlife may be listed in the Fourth Schedule.

Schedule IV can be adjusted by an "Order in Council".

3. Animals Protection Act 1960

An Act to make provision for the protection of animals and the prevention of cruelty to animals.

4. Resource Management Act 1991

SECTION 2 defines :

INTRINSIC VALUE - refers to ecosystems and their parts having value in their own right, including their biological and genetic diversity and the essential characteristics that determine an ecosystem's integrity, form, functioning and resilience.

This can be thought of as a right to exist, without the prejudicial values of current generations and the perception of worthiness. Intrinsic value applies to horses, indigenous flora and fauna and to the Moawhango ecosystems.

AESTHETIC, CULTURAL AND HISTORICAL VALUES - Tussock grasslands are part of the cultural identity of many New Zealanders and are visually appealing landscapes to many more. They have been reduced to less than 10% of the area of grassland that was present in 1840. Similarly, wetland habitats hold these values, and have received increasing emphasis for protection, as the remaining wetlands represent a fraction of New Zealands natural wetland area. The Kaimanawa wild horses also have aesthetic, cultural and historical values.

SECTION 5 Purpose - (1) The purpose of this Act is to promote the sustainable management of natural and physical resources.

SECTION 6 Matters of national importance.

SECTION 17 Duty to avoid, remedy, or mitigate adverse effects.

5. Kaimanawa Forest Park Management Plan 1991

This plan provides the following policy statement:

a. To monitor the population of wild horses within the park.
b. To work towards the removal of wild horses from the park and to remove the park from the protected range of the horses.
c. To implement control measures of wild horses in accordance with the Kaimanawa Wild Horse Management Strategy.

6. World heritage convention and biodiversity convention

These conventions have been ratified by New Zealand. Therefore we are obliged to follow the principles of these conventions, in any considerations we undertake on matters relevant to either convention.

Appendix 2

Nationally endangered, threatened, vulnerable, and local species within the wild horses range

WILDLIFE			
National Species	Common Name	Local Abundance	Conservation Status
Bowdleria punctata vealeae	North Island fernbird	very rare	threatened (regionally)

Hymenolaimus malacorhynchos	blue duck	very rare	threatened
Falco novaeseelandiae	New Zealand falcon	rare	threatened
Gharadrius bicinctus bicinctus	banded dotterel	local	threatened
Nestor meridionalis septentrionalis	North Island kaka	rare	threatened
Eudynamys taitensis	long-tailed cukoo	rare	occasional seasonally
Botaurus stellaris poiciloptilus	Australasian bittern	very rare	threatened
Logania depressa	a small herb	unknown	extinct
Amphibromus fluitans	wetland grass	very rare	critical
Pterostylis micromega	swamp orchid	rare	endangered
Alepis flavida	a mistletoe	unknown	vulnerable
Deschampsia caespitosa	a tussock grass	very rare	vulnerable
Myosotis sp. "Volanic Plateau" (aff. M. pygmesa)	forget-me-not	rare	vulnerable
Peraxilla tetrapetala	a mistletoe	very local	vulnerable
Ranunculus recens var.	a buttercup	very rare	vulnerable
Tupeia antarctica	a mistletoe	unkdown	rare
Libertia peregrinans	sand iris	possibly locally extinct	insufficiently known
Myosotis sp. (M.pygmaera var. glauca)	a grey forget-me-not	very rare	rere
Pimelea aridula	a native daphne	rare	insufficiently known
Carex uncifolia	a small sedge	possibly locally extinct	vulnerable
Oremyrrhis "delicatula"	a small herb	frequent	insufficiently known
Uncinia strictissima	a tall hook grass	possibly locally extinct	insufficiently known
Prasophyllum patens	an orchid	unknown	vulnerable

References:

Rogers G.M. 1993 "Moawhango Ecological Region : Survey Report for the Protected Natural Areas Programme." Department of Conservation, Wanganui.

Cameron et al. 1995 "Threatened and Local Plant Lists (1995 Revision)" New Zealand Botanical Society.

Bell, B.D. 1986 "The Conservation Status of New Zealand wildlife." Occasional Publication No. 12, New Zealand Wildlife Service.

NOTE : For definitions of the categories of threats, refer to the glossary.

Appendix 3

Plant species with unusual and rare distribution that occur in the wild horse range

SPECIES NAME	PLANT TYPE	BIOGEOGRAPH SICNIFICANCE	HABITAT	RARITY	FRAGILITY(& THREATS) *	ECOLOGICAL VIABILITY
Logania depressa	a creeping herb	local endemic	wet depression	possibly extinct		
Carex astonii	a small tussock-sedge	cNI endemic-sthn limit	wet depression & river terrace	frequent	low(he)	doubtful
Myosotis sp. (unnamed "Volcanic Plateau")	a creeping forget-me-not	cNI endemic	wet tussocklan d	rare	high(h, he)	doubtful
Raoulia sp. (R australis "north" of Ward 1982)	a mat plant	cNI endemic-sthn limit	erosion area in tussocklan d	rare	low(he)	doubtful
Anahalis sp (aff. A keriensis)	an everlasting daisy	wider cNI endemic-sthn limit	cliff	frequent	low	high
Prasophyllum sp (aff. P patens)	an orchid	wider cNI endemic-sthn limit	mire	rare	low(he)	doubtful
Ranunculus nivicola	Egmont buttercup	wider cNI endemic-sthn limit	tussocklan d & alpine	frequent	low(he)	high
Acaena inermis	a bidibid	Moawhango disjunct	gravefield	rare	medium(f, he)	low
Agrostis imbecilla	a small grass	Moawhango disjunct	wet depression	v.rare	high(he, A)	low

Carex berggrenii	a small tufted sedge	Moawhango disjunct	riparian terrace	v.rare	v.high	doubtful
Gnaphaliu m ensifer	a small daisy	Moawhango disjunct	mire	v.rare	v.high(h, he, A)	low
Hypericum (unnamed) aff. H. japonicum	a small herb	Moawhango disjunct	wet depression	rare	v.high(h, he)	low
Koelaria sp. (K. novozeland ica agg. (K kurzii)	a small grass	Moawhango disjunct	wet depression in tussocklan d	v.rare	v.high(h, f, he)	low
Luzula sp. (L rufa var. albicomans	a wood-rush	Moawhango disjunct	gravel levee	v.rare	v.high(h, f, he)	low
Myosotis sp. (M pygmaea var. glauca)	a small grey forget-me-not	Moawhango disjunct	gravel levee	v.rare	v.high(h, f, e)	low
Nertera sp. (aff. N. balfouriana)	a creeping herb	Moawhango disjunct	wet depression	rare	v.high(h, a)	low
Acaena microphyll a	a bidibid	cNI disjunct, sthn limit	tussocklan d	freque nt	low	fairly assured
Carex rubicunda	a small tufted sedge	cNI disjunct, sthn limit	mire	possib ly extinct	v.high(h, f, he)	low
Carex uncifolia	a small tufted sedge	cNI disjunct, sthn limit	mire	freque nt	v.high(h, f, he)	low
Coprosoma petriei	a creeping shrub	cNI disjunct, sthn limit	erosion surface in tussocklan d	freque nt	medium	fairly assured
Deschamp sia novae-zelandiae	a tussock grass	cNI disjunct, sthn limit	damp hollows/alp ine	freque nt	medium	doubtful

* Species survival threats: h-horses; f-fire; he-heather; A-Army operations
Adapted from: (a) GM Rogers, 1989 "Appraisal of the Place of Wild Horses in the Kaimanawa Mountains". Workplan No. 1175 Forest Research Institute, Rotorua. (b) GM Rogers, 1994 "The Moawhango Ecological District : Survey Report for the Recommended Areas for Protection Programme" Published by Department of Conservation

Appendix 4

Scientific (genetic) value of the kaimanawa horses

The Department of Conservation sought advice on the genetic and scientific value of the Kaimanawa horses from Dr Anderson, Equine Blood Typing and Research Centre (Massey University). Anderson consulted with other researchers of Kaimanawa horse genetics, Rebecca Halkett (Massey) and Dr Cothran (University of Kentucky).He also consulted with Dr Hugh Blair, associate Professor in Animal Sciences at Massey University.

The issues, under discussion in the working party, which needed clarification are listed below along with Anderson's response made in February 1995.

The Department asked, from your interpretation of the genetic analysis arising from blood sampling carried out over the last few years, could you please :

1. Advise on the uniqueness, if any, of the Kaimanawa horses in terms of genetic characteristics.

"Almost any distinct population could be considered unique, especially one which has evolved from a mixture of ancestral breeds. Not surprisingly, the genetic findings from the 4 groups studied indicate them to be different to other horse populations studied in New Zealand. Genetic distance studies indicate that the Kaimanawa horses show highest genetic similarity to Thoroughbred and Thoroughbred cross types of breeds (perhaps reflecting contributions from released army horses?). The genetic differences observed are however, not great and apart from the presence of one rare protease inhibitor variant (J), the Kaimanawa horses do not appear to be genetically of great interest."

2. Advise on the "value" (scientific or otherwise) of the horses as a genetic resource.

"This is without doubt the most important issue to be addressed relative to the development of a management strategy for the Kaimanawa horses. I am advised that there are in general terms, 4 reasons advanced for the preservation and conservation of feral animal populations. These are as follows :

a. Genetic "insurance". (The target population contains unique genetic material which could serve as a potential source of such if required at some time in the future).

Based on the observed genetic profile determined in this laboratory, there is little evidence to support the retention of this population solely on the basis of "genetic insurance". The previously thought relationship between the Kaimanawa horses and the Exmoor has not been confirmed by Dr Cothran in his analyses of data from the groups captured in 1994.

b. Scientific value. (The target population represents a scientifically valuable resource obviously scientific value encompasses more than genetic value).

From a genetic standpoint, the Kaimanawa horses represent an interesting population with at least one rare protease inhibitor variant. However, as indicated in response to item 1. above, genetically, this population is of limited scientific value. One would say they are of more interest than importance.

c. Future value and use. (The target population may be of some, as yet undefined, use or importance).

This is a wider issue which as a group we do not feel we can offer an opinion on.

d. Historical / aesthetic / sentimental value.

This area is clearly the most difficult to decide upon and is in my opinion the only real reason for the retention of the Kaimanawa horses in their present environment. Any value the horses may have must be considered in conjunction with possible deleterious effects they may be exerting on their environment.

Based on the results of our genetic studies, I believe the Kaimanawa horses represent an interesting, novel, equine population which is however of limited scientific and genetic importance. The relatively large sample numbers included in the 4 groups studied in 1993-94, have enabled us to obtain a very clear picture of the genetic makeup of this herd. Dr Cothran has compared the genetic profile obtained in this laboratory for the Kaimanawa horses with similar profiles for a large number of domestic and feral breeds of horses worldwide."

3. Suggest what would be the minimum viable population required to ensure any unique genetic characteristics and/or other values (as above), are retained :

a. in a closed herd with no management other than population control?
b. with new bloodline being introduced periodically?

"In effect, a population size of about 300 horses should be able to maintain an "effective population size" of in excess of 50, thus ensuring minimal loss of genetic variation. There does not appear currently, to be widespread support for the periodic introduction of new bloodlines into feral populations as a means of ensuring genetic diversity."

4. Describe any differences between horses captured from different areas of the horse range and comment on the significance of any such differences.

"While there were some minor genetic differences detected among these 4 groups, the genetic variability for these groups was similar (observed heterozygosity range 34.6% for RO group to 37.6% for the NE group). The variants detected in the NE group which had not been observed in the previous 3 groups, may as Dr Cothran suggests, reflect an isolated population that has retained variation lost from the rest of the population or one which has had an introduction of maybe only one individual which has brought in the variants not seen in the other groups. The "new" variants detected in the NE group (Ka, Xk S, Tf O) are commonly observed in most other horse breeds in New Zealand."

Appendix 5

Criteria for Humane Treatment of Kaimanawa Wild Horses

Objective

A key objective of the plan is to ensure that the treatment of the Kaimanawa horses is humane. Manipulations of the horses, including those causing the death of the animal, must be able to achieve the objectives of the Kaimanawa Wild Horse Plan without the horses experiencing undue physical and behavioural trauma.

There is no single technique that is without disadvantages. Therefore, a range of methods must be available so that the most appropriate method can be used for each situation. Issues such as public perception, practicality and cost, while secondary to humaneness, must be considered. The following principles have been developed to allow objective comparisons of the techniques.

Principles

1. Consideration for the animal is the paramount test for humaneness, i.e., the outcome for the animal is more important than the human perception of the action.
2. Each manipulation will be under the control of one person who may delegate individual responsibilities to those involved.
3. Where the animal is to be killed, the method should reliably bring about the death of the animal in as short a time as possible with minimal trauma to it or other horses.
4. Where animals are not to be killed, the risk of injury to the animal or disruption of any "normal" social behavioural patterns of individuals and bands should be minimised.
5. Where the animals are removed for sale or ex-situ management, they should be treated according to the principles.
6. Whatever method is used should be timed to minimise the risk of causing abortion or orphaning unweaned foals.
7. Protocols shall be developed for each method detailing all aspects of the procedure to be used including checks to ensure that death has occurred where planned. Protocols may be revised at any time to incorporate amendments arising from research and/or experience.
8. Any protocol must comply with animal welfare legislation.
9. Principles may be amended by the Minister of Conservation in light of experience and new information .

Application of Principles to Methods for Limiting or Reducing Horse Numbers

Method 1.

Ground shooting.

Description:

A group of experienced shooters approaches a band of horses on foot with the intention of culling all animals in the band.

- The intended outcome is an "instantaneous" death. However, there is a risk that a "clean kill" may not occur and effecting a rapid follow-up may be difficult due to the shooters' lack of mobility.
- Unless all horses in the band are able to be targeted it is possible that the band structure will be disrupted. The ability to effectively target all animals in the band at the same time decreases as the band.

Recommendation:

Ground shooting should only be used on small bands when all animals in the band can be targeted and a rapid follow-up can be conducted if necessary. Safety considerations limit the areas where this technique can be used due to the risk from stray bullets.

Method 2.

Aerial shooting.

Description:

Helicopter(s) carrying experienced shooters approaches a band of horses with the intention of culling all animals in the band.

- The intended outcome is an "instantaneous" death. There is a slight risk that a "clean kill" may not occur but effecting a rapid follow-up is easy due to the high mobility of the shooters.
- As aerial shooting allows all horses in the band to be targeted, there is little possibility that the other horses will suffer trauma.

Recommendation:

Aerial shooting is preferable over ground shooting due to the shooters ability to target all members of the band and conduct rapid follow-up if necessary. There is little risk of stray bullets using this method due to the angle of shooting.

Method 3.

Mustering for Transport to Slaughter

Description:

Bands of horses are mustered to holding yards from where they are transported to an abattoir for slaughter.

- The intended outcome is a humane death for all nominated animals.
- There is a risk of injury to the horses. However, mustering operations conducted since 1993 have resulted in injury to only one animal, indicating that this risk is very low.
- Mustering, holding and transporting the horses will result in some short-term behavioural trauma. This disruption is minimised if entire bands are mustered and if the period in which they are held before slaughter is minimised.

Recommendation:

If this method is used, the protocol must ensure that entire bands are mustered and the risk of injury to the animals is minimised. Also, the number of horses transported to an abattoir must not exceed that which can be slaughtered in one day.

Method 4.

Mustering for transport to sale

Description:

Bands of horses are mustered to holding yards from where "marketable" horses are transported to sale and non-marketable horses are transported to an abattoir.

- The intended outcome is for some horses to be relocated while the majority will be humanely killed.
- As with Method 3, there is a risk to the horses of physical and behavioural trauma. This risk is greater than for Method 3 as some horses have to be transported twice and held longer.
- Experiences from previous sales indicate that the market for Kaimanawa horses is small and very few horses can be successfully relocated.
- It is difficult to ensure that horses that are sold are not introduced into a stressful or impoverished situation. While the outcome for foals sold after recent musters has usually been good, the outcome has been less satisfactory for some adults.

Recommendation:

As with Method 3, if this method is used, the protocol must ensure that entire bands are mustered and the risk of injury to the animals is minimised.

Method 5.

Immunocontraception

Description:

Horse numbers are controlled around a set level by delivering a contraceptive to a percentage of the breeding females to decrease the birth rate.

- The intended outcome is that the horses will remain "in situ" with a low risk of experiencing physical trauma.
- The technique may require the mustering and holding horses for inoculation. If so, the comments in Method 3 regarding the protocol also apply to this method.

Recommendation:

There is no data yet available on the effect of immunocontraception on the behavioural patterns of either individual horses or bands in this population. Until such data is available, the widespread use of immunocontraception is not recommended.