

Sustainable Land Management Strategy for Waiouru Military Training Area

New Zealand Army
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Acknowledgements

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FOREWORD

The primary purpose of the Waiouru Military Training Area (WMTA) is to allow the New Zealand Defence Force, in particular the Army, to train for operations. Waiouru's unique landscape makes it an outstanding training area and as military activities do have an impact on the environment, the land must be sustainably managed to maintain its high training value. The Army will commit significant resources to ensuring that this training area continues to be managed responsibly.

This sustainable land management strategy represents a significant step in Army's land management programme. The Strategy formalises a number of specific land management practices already carried out at Waiouru, including appropriate constraints on military training activities. This is particularly evident in the policies for the recommended areas for protection (RAP's), where Army recognises the importance of preserving indigenous ecological and landscape features.

This Strategy clearly demonstrates Army's continued commitment, as steward of a large tract of Crown land, to preserving Waiouru for future New Zealanders.

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1. INTRODUCTION

1.1 Purpose of Strategy

This Sustainable Land Management Strategy for the Waiouru Military Training Area (WMTA) serves a number of purposes.

First, and foremost, it provides a vehicle for promoting the *sustainable management** of the natural and physical resources of the WMTA upon which the New Zealand Army depends for the continuance of its military training activities. The Strategy provides an overview of existing and possible future military training activities and current land management operations. It identifies key land management issues and the objectives, policies and methods that have been adopted to address them.**

Secondly, the Strategy provides a means by which the New Zealand Army can achieve a degree of *co-ordination* between its own objectives and policies and the objectives and policies of resource management agencies such as the Manawatu-Wanganui Regional Council (horizons. mw.) and the Department of Conservation.

Thirdly, the Strategy will promote *continuity* of management. Army personnel tend to be posted regularly. The existence of a written Strategy will help to achieve some consistency and continuity in the management of the WMTA land.

Fourth, it is intended that the Strategy will have a valuable *education function* by bringing together, in one document, relevant information relating to the natural resource base of the WMTA and the rationale for the adoption of specific land management practices and necessary constraints on military training activities. The Strategy incorporates information and recommendations from the Land Use Impact Study (ATG 1992) compiled by Landcare Research New Zealand, the Manawatu-Wanganui Regional Council, the Department of Conservation and the NZ Defence Force.

Fifth, the Strategy can be viewed as an important means of improving the *accountability* of the New Zealand Army, to Ministers and the public, for the management of the large tract of Crown land which constitutes the WMTA.

1.2 Location and General Description of the WMTA

The Waiouru Military Training Area (WMTA) encompasses approximately 750 km² (63,000 ha) of New Zealand Defence Force (NZDF) land in the sub-alpine plateaux of the central North Island to the southeast of Tongariro National Park (Figures 1 and 2). Approximately two thirds of the land has an altitude of over 1000 metres.

* Refer glossary for definition of “sustainable management”.

** Environmental issues not covered in the Strategy, which the Army is addressing independently, include management of solid waste and contaminated sites, consultation protocols with external agencies and levels of environmental awareness within the Army.

The WMTA is located in the Moawhango Ecological Region, a highly distinctive montane-subalpine area characterised by undulating and plateau topography and extensive red tussock grassland and mixed shrublands (Rogers 1993).



Manuka shrubland associated with steep terrain above Argo Valley.

The ecological and landscape features of the WMTA are described in section 2 of the Strategy.

1.3 History of the WMTA

Prior to the arrival of humans, about 1000 years BP, the Moawhango Region was mostly forested, the only exception being peat-bogs and frost-prone basins and valley floors which supported non-forest vegetation (Rogers 1993).

Although natural lightning-strike fires played a role in the early deforestation of the region, by far the greatest deforestation occurred in the early Maori era (ATG 1992). The timing and geographical extent of Maori forest clearance is well understood in the Moawhango Ecological Region, with major fires being dated at c.570 yrs BP and c.430 yrs BP. Recurrent burning by prehistoric Maori of the secondary vegetation that replaced the forest induced 165, 000 ha of seral tussock grassland (Rogers 1993).

During the first 100 years or so following the arrival of Europeans the area currently occupied by the WMTA, particularly in the southern sector, was extensively grazed and periodically burnt for sheep and cattle farming purposes, generally resulting in the degradation of tussock grassland and invasion of adventive grass species and weeds.



Moawhango valley from near Couzens Range. Imjin Camp at centre right

The eastern Murimotu unit, a pastoral farming property, which included much of what is now the Waiouru Training Area, changed hands frequently in the 1920s and 1930s and inadequate farming conditions finally led to Crown intervention. In 1939 the majority of the run was taken back by the Crown and assigned to military purposes, with the remainder acquired in 1942.

Land acquisition since World War II has turned the WMTA into an extremely valuable and well used training area. The increase in size of the area has been eastwards towards the Rangitikei River. This has been partly due to the comparative inflexibility of the WMTA borders to the west, north and south with the Karioi State Forest, the Tongariro National Park, the Kaimanawa State Forest Park and the Hihitahi State Forest.

Over the past 30 years the Army has adopted a proactive approach to range management within the WMTA, with significant resources being allocated to weed and pest control.

1.4 Agency Responsibilities

A number of agencies have statutory responsibilities that relate to management of WMTA land.

1.4.1 New Zealand Army

The WMTA is Crown Land held by the NZDF for defence purposes.

The New Zealand Army, as the occupier and primary user of the WMTA, is responsible for day to day management of the land and associated resources.

The Army is in close contact with other management agencies and attempts to ensure that its military training and land management activities are consistent with, and where appropriate comply with, their plans and strategies.

Within the Army, the Waiouru Property Management Section has primacy with regards to resource management issues in the Army's military training areas, except where such primacy adversely affects achievement of the Army's operational and training outputs. In those situations where an issue cannot be resolved at HQ ATG/local property management level, the Director Property Management (DPM) advises what effect the activity is having on the integrity and sustainability of the training area and a decision is made by the Chief of General Staff (CGS) whether the activity should continue or not. (reference CGS Directive 07/99).

1.4.2 Manawatu-Wanganui Regional Council ([horizons.mw](#))

The Manawatu-Wanganui Regional Council has statutory responsibilities for aspects of land management under the Resource Management Act 1991 (RMA) and for plant and animal pest control under the Biosecurity Act 1993.

The functions of regional councils under the RMA are set out in S30 of the Act and include control of the *use* of land for the purposes of soil conservation, water quality management, the avoidance or mitigation of natural hazards and the prevention or mitigation of any adverse effects of the storage, use, disposal or transportation of hazardous substances. They are also responsible for controlling the taking, use, damming and diversion of water; control of the discharge of contaminants into or onto land, air or water; and discharges of water into water.

Regional policy statements and regional plans govern the use, development and protection of natural and physical resources. Plans may contain rules stating the activities that are allowed (permitted) as of right and those which require consents from the Council. Consent applications are assessed against the provisions of Part II of the Act (purpose, matters of national importance, other matters and the Treaty of Waitangi), the relevant objectives and policies of plans, and the extent of effects on the environment of allowing the activity.

The Manawatu-Wanganui Regional Council has published the following policy statements and plans relevant to management of the WMTA:

- the Regional Policy Statement for Manawatu-Wanganui (Operative)
- the Regional Air Plan (Operative)
- the Proposed Regional Plan for Beds of Rivers and Lakes and Associated Activities
- the Proposed Land and Water Regional Plan.

The NZDF obtains resource consents, pursuant to the requirements of the RMA and the Manawatu-Wanganui Regional Council's resource management plans, for certain activities involving land disturbance and other environmental effects within the WMTA.

In addition to its resource management responsibilities under the RMA, the Council is responsible for the control of plant and animal pests under S13 of the Biosecurity Act 1993. The Council has prepared a Regional Plant Pest Management Strategy 1996 (RPPMS) and a Regional Animal Pest Management Strategy 1996 (RAPMS) under S79F of the Act to provide a framework for efficient and effective pest management in the Region. Under the strategies, the Council has an increased monitoring and advocacy role for pest control within the Region and the Council is ultimately responsible for ensuring that the strategies achieve their purposes. However, significant responsibilities are assigned to "stakeholders", that is persons bound by the provisions of the Strategy and contributing to its funding. Stakeholders include private land occupiers and Crown agencies that have agreed to be bound by the Strategy.* Stakeholders are required to control plant pests on land that they are responsible for, pursuant to any rule prescribed in Part Two (Pest Management Programmes) of the strategies.

In Part Two of the RPPMS, *Pinus Contorta* (*Pinus contorta*) and Heather (*Calluna vulgaris*), two of the main plant pest species within the WMTA, are identified as plants warranting "regional intervention". Some other species having a relatively minor presence within the WMTA (eg blackberry, broom) are also identified as warranting regional intervention. Part Two of the RAPMS identifies possums (*Trichosurus vulpecula*) and rabbits (*Oryctolagus cuniculus*) as pests for which regional intervention is appropriate. The strategies set out control methods, including rules, for each pest species (see sections 4.2.4 and 4.2.5 of this Strategy).

The NZDF is in broad agreement with the RPPMS and RAPMS and contributes to the cost of their implementation by way of payment of a pest levy included in its rates assessment. However, in the case of the WMTA, the NZDF is not bound by the provisions of the strategies where pests have no effect on adjacent land. While the NZDF endeavours to comply with the requirements of the strategies, the details of the control programme for specific pest species within the WMTA are the subject of discussion and negotiations between itself and the Council.

1.4.3 Ruapehu District Council

Under the RMA (S31), the Ruapehu District Council also has functions that relate to land management, including control of the effects of use, development or protection of land and associated natural and physical resources; subdivision; noise emissions, and the effects of activities on the surface of rivers and lakes.

District plans can contain rules that restrict the use of land providing those rules are consistent with the Council's functions. Under S9(1) of the Act, no person may use any

* The Biosecurity Act 1993 is binding on the Crown (section 5) save for Regional Pest Management Strategies (RPMS). Where RPMS are developed, the Governor-General may by Order in Council approve the application of the strategy [see section 87(2)]. However, by Cabinet decision [CAB CIE (95) m14/5] the government has agreed that the Crown should be bound by RPMSs unless the Crown land is managed "... such that pests on it would have no effect on adjacent land."

land in a manner that contravenes a rule in a district plan or proposed district plan unless the activity is expressly allowed by a resource consent granted by the territorial authority responsible for the plans, or is an existing use allowed by sections 10 or 10A of the Act.

In the Ruapehu District Plan, the WMTA is designated as being for “defence purposes” and therefore, irrespective of rules in the District Plan, the Army is not required to obtain resource consents from the District Council for land use activities that are provided for in the designation.

1.4.4 Department of Conservation

The Department of Conservation (DOC) is an advocate for the conservation of natural areas and native flora and fauna and is responsible for the preservation of all indigenous freshwater fisheries, protection of recreational freshwater fisheries and freshwater fish habitats under the Conservation Act 1987. DOC is also responsible for the protection of wildlife and certain reserves under the provisions of the Wildlife Act 1953 and Reserves Act 1977 respectively.

The WMTA straddles two DOC conservancy districts – the Wanganui Conservancy and the Tongariro/Taupo Conservancy. The latter has specific responsibility for management of sports fisheries in Lake Moawhango and its catchment.

The Conservation Act 1987 provides the mandate for DOC activities, including the preparation of Conservation Management Strategies (CMS). These strategies establish objectives and general policies for the integrated management of natural and physical resources managed by each regional conservancy of DOC. They also establish the basis for DOC’s conservation advocacy role in respect of areas outside of the Conservation Estate.*

DOC administers the Protected Natural Areas Programme (PNAP) established in 1983 to identify and protect examples of the full range of indigenous biological and landscape features in New Zealand. A PNAP report has been produced for the Moawhango Ecological Region (Rogers 1993) and some areas within the WMTA have been recommended for protection (see section 4.3 of this Strategy).

DOC currently manages wild horses, which range over parts of the WMTA, in accordance with the Kaimanawa Wild Horses Plan (1995) (see section 4.2.6).

1.5 Approach to Preparation of Strategy

It is important to understand the thinking behind the approach that the Army has adopted to the preparation of this Strategy.

* The CMS for the Wanganui Conservancy (p96, Volume1) states a commitment to working with New Zealand Defence Force to protect four areas within the WMTA (see section 4.3.1 of this Strategy).

1.5.1 Sustainable management

The WMTA is a substantial piece of Crown land. The New Zealand Army recognises that as the occupier of the land, and notwithstanding the primary military use of the land, it has an obligation to manage its activities in a way which is generally consistent with the “sustainable management” purpose of the Resource Management Act 1991 and the Government’s Sustainable Land Management Strategy for New Zealand.

Sustainable management places an emphasis on safeguarding the functioning of natural ecosystems (including the protection of soil and water values), protecting outstanding natural features and landscapes and areas of significant indigenous vegetation and habitats, and generally avoiding or mitigating the adverse effects of activities on the environment.

In addition to being concerned with protection of the resource base, sustainable management is also concerned with managing the use and development of natural and physical resources [see Glossary]. “Natural and physical resources” are defined by the Act to include land, water, air, soil, minerals and energy, all forms of plants and animals (whether native to New Zealand or introduced), and all structures.

1.5.2 Integration of military and conservation objectives

The Army acknowledges that military activities impact on vegetation and soils within the WMTA but it does not view military objectives and conservation objectives as being incompatible or mutually exclusive. In fact, it is the WMTA’s combination of natural assets – the landforms, soils, climate and vegetation – that render it an outstanding training area. The Army therefore wishes to retain the natural values of the area. It has come to see itself as part of the ecosystem – both affecting it and being dependent upon it. Consequently, the Army places a high premium on understanding the functioning of the ecosystem(s) and the actions that it needs to take to avoid or minimise adverse effects on natural values.

1.5.3 Focus on vegetation management

Much of the Strategy relates to vegetation management – be it the control of grazing pressure (animal pests, wild horses, domestic animals), weed control, fire control or the control of military activities with the potential to damage vegetation (off-road use of vehicles, shelling activity). The reason for this emphasis is two-fold. First, the volcanic soils of the WMTA are fragile and the climate/altitude is generally inhospitable to plant growth. The close cropping or destruction of vegetative cover exposes the fragile soils to frost and/or wind action and hence erosion. Erosion is not only destructive of natural and aesthetic values, and generally inconsistent with precepts of sustainable management, it also leaves the land unsuitable for ongoing military training activities. Second, the removal of natural vegetation facilitates the encroachment of invasive plant species which, in addition to impacting the natural values of the area, detracts from the value of the area for military training purposes.

1.5.4 Risk management perspectives

The Army considers that the key to sustainable management of the WMTA lies in the identification and prioritisation of environmental risks (potential adverse effects) associated with military activities and other anthropogenic effects (eg invasion by introduced plant and animal pests) and the putting in place of policies and methods aimed at minimising the risks while having regard to the particular physical and biological characteristics of different areas or operational zones within the WMTA. For example, if fire is a major source of environmental risk in terms of its potential to lead to erosion and/or to facilitate encroachment of plant pests, and certain types of vegetation are more prone to fire than others, it makes sense to avoid live firing (shelling) into areas with that type of vegetation, if it is possible to do so.

A recent assessment of the environmental effects of shelling activities on the WMTA (Kingett Mitchell & Associates 1999) develops a Geographical Information System (GIS)-based “risk model” and advocates a risk management approach to the future conduct of shelling activities. Some of the recommendations of the report have been incorporated in this Strategy (section 4.2.2).

More generally, the Army sees itself as being involved in a process of developing risk management perspectives on all of its military training and land management activities within the WMTA. Policies and methods will be gradually refined as the results of monitoring and further scientific studies become available.

1.5.5 Heritage and cultural values

The NZDF recognises that heritage and cultural values, which often relate to the built environment, are a significant aspect of facilities management. Accordingly, these values are being managed outside of this Strategy, which principally addresses ecological values. The NZDF is currently developing an over-arching policy to manage areas of cultural heritage. Additionally, the NZDF is undertaking a heritage assessment of the main camps and bases. Those sites and areas in the Waipoua camp and training area identified as having heritage values will be incorporated into facility/property management practices, as guided by the NZDF heritage policy.

1.5.6 Treaty of Waitangi claims

It is understood that there are a number of Treaty-related claims in respect of parts of the ATG, however the extent of those claims is not currently known to the NZDF. The NZDF supports the principles of the Treaty of Waitangi and continues to work alongside the Government agencies responsible for the management of the settlement process (principally the Office of Treaty Settlements and the Crown Law office). Given the processes that these lead agencies have developed over the past years, it is appropriate that the NZDF manage any settlement claims within those existing structures. For that reason this Strategy does not address Treaty matters further. However, when statutory acknowledgments are entered into between the NZDF and particular iwi, the NZDF will incorporate matters that affect ecological values and land management into the Strategy.

1.6 Implementation of Strategy

The policies in this Strategy will be implemented, in the main, through the requirements and provisions of

- The Army Training Group (ATG) Range Standing Orders, and
- The Five Year Land Management Operational Plan.

Reference is made to these documents as appropriate in the “methods” sections of Chapters 4 and 5 of this Strategy.

2. THE RESOURCE BASE

2.1 Altitude and Climate

The Moawhango Ecological Region, including the WMTA, experiences a sub-continental climate marked by seasonal extremes in temperature, rainfall and sunshine hours.

Total annual rainfall at Waiouru (1096mm) is unusually low for a high altitude site and, correspondingly, sunshine hours are atypically high. Rain shadows from the Ruapehu and Kaimanawa uplands generate these effects which render the region fire prone in dry summers, particularly in summers with sustained dry westerly winds. December is consistently the wettest month and February the driest. There is a steep rainfall gradient from north-west to south-west reflecting the influence of both the Tongariro volcanoes and the Kaimanawa Mountains.

Most winds are from the west or north-west sector (35% frequency). East and north-east winds have a 21% frequency. Southerly winds are infrequent and about 23.5% of days at Waiouru are calm.

Winters are cold and summers moderately warm. Ground frosts are recorded on average for 97 days/year (27%) and can occur in any month of the year (ATG 1992).

2.2 Geology

The WMTA is unusual in that it is within a geologically stable part of the North Island. The wide basins and rounded ridges of the original marine topography are still apparent.

The northern and north-eastern parts of the WMTA comprise undulating to steep greywacke ridges and basins. The greywacke formations were once covered with deposits of softer sedimentary rock, such as sandstone, mudstone, siltstone and limestone. However, these sediments have been progressively eroded away following uplift.

The southern part of the WMTA is characterised by block plateaux with intervening deep valleys composed of sedimentary rock, mainly massive sandstones and siltstones, with lenses of limestone. In some southern parts of the region, marine sediments are thicker and the underlying greywacke rock has not yet been exposed. The deep wide valleys through the sandstone and siltstone of the southern area were formed by a combination of faulting and downcutting by rivers.

Numerous volcanic eruptions over the past 14,000 years on the central volcanic plateau and in the Bay of Plenty region, have deposited 2-3 metres of unconsolidated tephra, interbedded with layers of lapilli, on top of basement rocks.



*Greywacke ridges and basins in Wairakatoke Stream catchment.
Note effects of frost inversion, limiting the distribution of woody plants on
valley floor.*

2.3 Soils and their Erosion Potential

The soils in the WMTA are largely volcanic in origin (derived almost exclusively from tephra parent material), and tend to be deep and lack the differentiation into horizons typical of older soils.

A combination of the topography, parent materials, and climate combine to make most of the soils of the WMTA naturally highly susceptible to wind erosion, sheet erosion or both. Accelerated erosion has occurred in the WMTA as a result of deliberate or accidental burning of vegetation, vehicle use, and grazing pressure from domestic and feral animals. The potential for erosion in different parts of the WMTA is illustrated on Map 1 appended to this report (Appendix 2).

Five tephra deposits of varying degrees of thickness form the parent material for soils in the WMTA.

The Land Use Impact Study of the Area (ATG 1992) recognised three broad soil categories on the basis of topography and parent material.



Sheet erosion in Koroteti Stream headwaters.

(a) Soils of the northern greywacke steeplands

The soils of the northern greywacke steeplands are composed of several different tephra formations in a thin layer over the greywacke bedrock. These soils occur on the steep slopes of the dissected mountainlands and are well drained, nutrient deficient, and strongly leached. They are also weakly weathered and have weakly developed structures, making them *very susceptible to erosion*; this is indicated by the occurrence of exposed, unweathered greywacke on some steep slopes.

(b) Soils of the northern greywacke on gentle relief

The soils of the northern greywacke which occur on gentle relief are composed of deep layers of Tufa Trig Formation, then Taupo Pumice, both of which are deposited over the greywacke basement. These soils occur on broad flat to rolling surfaces and are moderately to poorly drained (occurring as peat bogs), or excessively well drained (occurring as pumice terraces in basins). These soils are limited by both nutrient and aeration deficiencies and by low soil temperatures. They have a loose to friable consistency and are very susceptible to erosion if vegetation cover is lacking.

(c) Soils of the southern sedimentary plateaux

The soils of the southern sedimentary plateaux are made up of a thin layer of Tufa Trig Formation tephras and a thick layer of older tephras over sedimentary bedrock. These southern soils are moderately to well drained, and are limited by low soil

temperatures. Erosion on these soils is limited to the escarpment slopes only, as they are deeper and have better structure and moisture retention capabilities than the northern soils.



Frost heave destabilising soil surface.

2.4 Vegetation

Much of the WMTA is situated within the Moawhango Ecological Region and the vegetation cover occurs in a natural or semi-natural state.

The Moawhango Ecological Region has an unusually large number of plant species which are nationally threatened, are rare or local, or have unusual distributions. The northern Moawhango Region is considered to possess the highest concentration of biogeographically significant plants in New Zealand. Most of the special plants are species of non-forest vegetation, their current distributions reflecting the pre-human pattern of vegetation characterised by the existence of areas inimicable to the development of forest by virtue of physical factors eg. frost inversion basins, cold air drainage and elevated water tables. Most of these species have highly specific habitat needs and have not spread from genuine non-forest sites into the secondary tussock grasslands created by human-induced deforestation.

The WMTA encompasses approximately 79% of the remaining red tussock grassland in the Moawhango Ecological Region. Tussock grasslands are considered to be mainly an artefact of burning, replacing the once extensive forests burnt by Maori 600-400 years ago (ATG 1992).

Vegetation comprises tussock grassland (on the basin floors and plateaux), tussock-shrubland associations containing manuka and a variety of subalpine shrubs, and

remnant pockets of mountain/red/silver beech forest. Herbfields containing a diverse flora of high conservation value are present in wetland areas featuring a mosaic of depression bogs, string bogs, seepages and flushes in valley basins and areas of impeded drainage.

The location and extent of these vegetation associations within the WMTA are illustrated in Map 2.



Red Tussock grassland.



Depression Bog Mosaics.



Manuka shrubland.



Mixed subalpine shrubland/tussock grassland.

Introduced vegetation is more prevalent in the southern and western areas of the WMTA which have been degraded by burning, grazing, and military exercises, to the extent that tussock grassland vegetation is being significantly encroached upon by the adventive hawkweed *Hieracium pilosella* and other weed species such as *Pinus contorta* and heather. Other plant pest species having a relatively minor presence within the WMTA include blackberry, broom, gorse, nodding thistle and ragwort.

2.5 Animal Life

The variety of landforms and vegetation types within the WMTA provides an extensive range of habitats for native and introduced bird, reptilian and invertebrate life.

The beech and kaikawaka forest remnants and small associated areas of manuka scrub within the WMTA are recorded in a DOC Register as *Sites of Special Biological Interest*. The bird populations reflect the high altitude monotypic nature of these

forests. Several species, for instance tui, pigeon and fantail, have been recorded mainly in the more diverse upland conifer forests of the south. Other native birds recorded in these areas include grey warbler, bellbird, pied tit, rifleman, silver-eye, whitehead, long-tailed cuckoo, morepork, and the New Zealand falcon. The falcon however tends to favour the shrub covered escarpments within the gorges.



Hieracium pilosella (Mouse-ear hawkweed) colonising bare ground.

Wetlands provide habitat for a wide range of birdlife including black and little shags, pipits, welcome swallows, fernbird, the Australasian bittern (Ogle and Clerk 1988) paradise shelduck, Canada geese and black-backed gulls.

There are records of blue duck being sighted on the Moawhango River.

The open tussock grassland is favoured habitat for harrier hawks, spur winged plovers and introduced feral animals, notably the Kaimanawa wild horses, rabbits, hares and ferrets. Possums and stoats tend to occur throughout the WMTA usually within or in close proximity to the forest remnant and shrubland areas. Red deer and Sika deer are also present in bush areas.

The common gecko, common skink and large native snails are also recorded within the WMTA.

2.6 Water Resources

Most of the WMTA is located within the catchment of the Rangitikei River. Part of the western WMTA falls within the catchment of the Whangaehu River and a small area of the WMTA in the north (Rangipo Desert) drains into the Tongariro River.

Rangitikei River Catchment

The Rangitikei River and its tributaries – the Mangamaire, Makomiko and Otamateanui Streams – form the north-eastern boundary and the Rangitikei itself the eastern boundary of the WMTA (Figure 1). A National Water Conservation Order protects parts of the upper* and middle part of the Catchment. The Order aims to protect the outstanding wild and scenic characteristics and the outstanding recreational, fisheries and wildlife habitat features of the upper river.



*River meanders and red tussock grassland – Moawhango headwaters.
(Photo:DOC)*

The Moawhango River, a tributary of the Rangitikei River, is the major watercourse within the WMTA. Its headwaters are in the Kaimanawa Ranges. The upper Moawhango River is largely unmodified and has very high wild and scenic values, with spectacular gorges. The river is dammed north-east of Waipoua forming an artificial lake, Lake Moawhango, to enable diversion of water to the Tongariro Power Development (TPD) Scheme. Water also flows into the lake from the Mangaio Stream

* The Order defines the Upper Catchment as including the Rangitikei River itself from its source to its confluence with the Makahikatea Stream and all rivers and streams contributing water to the Rangitikei River upstream of that Confluence.

(north side) and from twenty-two small tributaries of the Whangaehu catchment diverted via the Waihanoa Aquaduct. The lower Moawhango River, below the lake, is reduced to a trickle at most times as a result of the diversion of water from the lake to the TPD Scheme. Floodwaters pass over a spillway into the lower river which exits the WMTA in the south-eastern corner.

The Hautapu River, which arises from the Hihitahi feature immediately south of Waipoua, flows through tussock grassland in the south-western part of the WMTA, joining the Rangitikei River south of Utiku. A Local Water Conservation Notice protects the Hautapu River, and its tributaries (the Waipoua and Irirangi Streams), in recognition of its status as a recreational brown trout fishery of regional significance.

Whangaehu River Catchment

The Whangaehu River arises at the Crater Lake on Mt Ruapehu and as a result is heavily mineralised and periodically acidic. There is a major lahar hazard associated with the Whangaehu Valley as a result of potential for overflow from the crater lake on Mt Ruapehu.

The Whangaehu River enters the WMTA in the north-west and flows to the west of SH1 before leaving the WMTA adjacent to the Waipoua Airfield. The Upper Whangaehu and its tributaries drain the Rangipo Desert.

The Waitangi Stream, a tributary of the Whangaehu, drains land in the vicinity of the Carbuncle Track, SH1, and the Waipoua Airfield. Within this catchment are the Waipoua Camp landfill and the emergency water supply for the Camp (sourced just downstream from where the Stream passes under SH1), and the outfall of the Waipoua Sewage Treatment Plant.

Groundwater

Very little is known about groundwater resources within the WMTA. No groundwater bores have been drilled within the area.

Water Quality

Water quality in the upper Rangitikei River and the upper Moawhango River is very high with clear* well oxygenated waters ranging in temperatures from 12.5°C - 15°C during low flows, relatively low conductivity, moderate hardness, low chlorides, moderately alkaline pH and low faecal coliform bacteria counts (ATG 1992). Concentrations of nutrients (dissolved inorganic nitrogen and phosphorous) are recorded as being very low in the upper Moawhango River (Tonkin & Taylor 1997).

This high water quality reflects the geology of the catchments, the relative lack of agricultural or urban land use and the generally good condition of riparian vegetation.

Reduced flows downstream of the Moawhango Dam result in higher water temperatures and increased conductivity in the lower Moawhango River.

* Low suspended solids most of the time.

Water quality in the Waiouru Stream and Hautapu River is high but with a deterioration of quality in the Waiouru Stream downstream of Waiouru due to urban run-off and stock access to land south of Waiouru.

Further information pertaining to water quality within the WMTA is to be found in ATG (1992), Tonkin & Taylor (1997) and Kingett Mitchell & Associates (1999).

Aquatic Life

The generally high water quality of waterbodies within the WMTA is reflected in healthy aquatic communities.

The invertebrate fauna is dominated by species characteristic of upland streams with high water quality.

Five species of fish have been recorded from the Moawhango River and its tributaries: the native longfinned eel and upland bully, and the introduced brown trout, rainbow trout and brook trout.

No rare or endangered invertebrate or fish species have been reported at sites within the WMTA.

Kingett Mitchell & Associates (1999) summarise available information on the aquatic life associated with the Moawhango River.

2.7 Landscape

The landforms of the Moawhango Ecological District rate as its most distinctive and diagnostic natural feature. Most striking are the remnants of greywacke peneplains in the far north and the montane block plateaux of younger marine sediments throughout the central and southern districts (Rogers 1993).

The distinctive landforms coupled with the natural or semi-natural vegetation and relative absence of built structures, combine to create high wild and scenic landscape values over much of the WMTA. There are outstanding scenic vistas across tussock-covered plateaux, concave basins and deeply incised river valleys. Landscape values are particularly high in the northern and north-eastern sections of the WMTA.

The Manawatu-Wanganui Regional Policy Statement identifies the Rangitikei River and river valley from its source near Ngapuketerua to Putorino as a regionally significant natural feature and landscape.

Landscape values are high in the upper Moawhango River area where basins and deeply-incised river gorges and hanging valleys are superimposed on the old-generation greywacke surface (peneplain). Basin topography is best developed in the Moawhango River headwaters in the Ngawakaakauae and Moawhango West catchments. The Mount Azim Gorge, across the northern Three Kings Range, has been identified as the most spectacular superimposed river gorge in the Moawhango Ecological District (Rogers 1993). It is listed in the New Zealand Geopreservation Inventory, a computer database

that has been compiled by the Joint Earth Science Societies Working Group. The inventory includes a list of significant landform features occurring within New Zealand.



Headwaters of Koroteti Stream. Inglis and Wilder Bush flank the peak of Butts No. 2 in the background.

The Moawhango River Valley, immediately downstream of Lake Moawhango, has high scenic values owing to its very deep and narrow gorge, in places up to 40 m deep but only a few metres wide.

3. CURRENT AND FUTURE USE OF THE WMTA

3.1 Military Uses

3.1.1 Existing use/operational requirements

The WMTA is extremely valuable to the New Zealand Defence Force (NZ Army and Royal New Zealand Air Force, and Royal New Zealand Navy to a lesser extent) as a training area. Waiouru is now the only land that the NZDF can use to conduct a significant amount of live firing, because of the size of the area and its distance from neighbours.

For training purposes, the WMTA is sub-divided into zones, each zone being used for a specific activity or range of training activities, including live firing and detonations, driving, navigation, and construction. Current operational activities and their effects are summarised in Table 1.

Part of the military activity currently undertaken in the WMTA involves a contingent of the Singaporean Armed Forces (SAF) that trains in the WMTA on an annual basis. Training exercises include the firing of Extended Range Ammunition (ERA) into a specified impact area within the WMTA.

3.1.2 Future use/operational requirements

The future is likely to see increased use of the WMTA and potential for greater land use impacts, for the following reasons

- the NZ Army has, over recent years and for a variety of reasons, lost access to a number of areas outside the WMTA that it has traditionally used for training purposes
- there is a trend towards greater use of wheeled (as opposed to tracked) vehicles which will result in a requirement for more vehicles to use the area. The new wheeled vehicles may have greater potential to disturb soil than tracked vehicles
- new weaponry will require larger operational areas (ie extended “danger areas”) which will force other activities into areas not currently used
- the intended upgrading of the track system (partly for environmental reasons and partly to accommodate the greater level of activity) will result in better access to more remote areas
- the Singaporean Armed Forces may require an increased firing intensity of up to 3 times existing levels.

Policies outlined in sections 4 and 5 of this Strategy are aimed at minimising the potential for an increased level of activity to result in an increased level of adverse effects on the soil and water and other natural values associated with the WMTA.

Table 1: Operational Activities Currently Conducted within the Waiouru Military Training Area (as at November 1999)

Activity	Effect	Examples
Detonation of explosives, including incendiary munitions.	Ground disturbance, potential fires.	Artillery fire, engineering cratering, demolitions, mortars, anti-armour weapons, RNZAF Bus, CRV-7 rockets, smoke and tracer rounds, pyrotechnic devices.
Driving of tracked vehicles.	Ground disturbance.	Multiple vehicles and turning points, engineering plant courses and activities, APC training.
Driving of wheeled vehicles.	Ground disturbance if multiple on same surface.	Cross country/all terrain travel on formed tracks/roads, fording of rivers etc.
Construction (structures).	Ground disturbance.	Training and actual; actual construction is tied to building consents.
Defensive positions.	Ground disturbance.	Digging of trenches, including anti tank ditches. Potentially large scale for full battalion.
Small scale activities.	Localized disturbance but potential for significant or cumulative effects depending on scale; eg. tracking through wetlands.	Small arms fires, small detonations (battle simulations) vehicle tracks, foot tracks, stores areas, POL points, field toilet pits.

3.2 Non Military Uses

3.2.1 Recreational use/sponsored field trips

There is currently limited recreational use of the WMTA due to the requirements of the Occupiers Liability Act 1982 and the Health and Safety in Employment Act 1992 and the potential for military activity to conflict with public safety. However, under certain circumstances, the Army does permit access to parts of the WMTA providing specific criteria are met (see section 4.7 of this Strategy).

During the summer Headquarters ATG sponsors the Department of Conservation's guided tour along the Argo Road, providing the public with the opportunity to experience the WMTA at first hand. Other interest groups, including The Kaimanawa Wild Horses Preservation Society, are also periodically granted access to the WMTA.

3.2.2 Hydro-generation

Water from the Upper Moawhango River is diverted via Lake Moawhango into the Tongariro Power Development Scheme (Eastern Diversions). Water also flows into the lake from the Whangaehu catchment, diverted via the Waihiana Aquaduct. Water from the lake is diverted into the underground Rangipo Power Station to generate electricity. From Rangipo, the waters enter the Tongariro River and join waters from the western diversions to generate power at the Tokaanu Station near Turangi. The diversion reduces river flows downstream of Lake Moawhango.



Lake Moawhango from Edinburgh Castle. The dam is situated at the top left of the picture.

Genesis Power Ltd controls the diversion of water from the Moawhango River and hence water levels in Lake Moawhango and the residual flow below the Dam.

3.2.3 Nature Conservation

Parts of the WMTA have very high conservation values associated with them in terms of landscape values, and the plant and animal species present. As noted earlier in section 2.4, the WMTA is located within the Moawhango Ecological Region.

Recommended areas for protection

The natural values of the Moawhango Ecological Region are fully described in the report “Moawhango Ecological Region Survey Report for the Protected Natural Areas Programme” (Rogers 1993). Notwithstanding the high natural values associated with the WMTA, there are no legally protected areas within it. The aim of the PNA Programme is 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 (Technical Advisory Group, PNA Programme 1986). Of the nine recommended areas for protection (RAPs) identified in the PNA report referred to above, three (and part of a fourth) are within the WMTA. These are, from north to south, Ngawaakauae, Pleasant’s Bush, Three Kings and Te Rei. The special features of these areas are described in section 4.3.1 of this Strategy, and their extent defined on Map 3 (Appendix 2).

Forest remnants

Twenty-seven forest remnants and small associated areas of manuka scrub within the WMTA are recorded by DOC as Sites of Special Biological Interest. Their bird population reflects the high altitude, monotypic, nature of the forests. Several species, for instance, tui, pigeon and fantail, have been recorded mainly in the diverse upland conifer forests of the south. Other native birds recorded are grey warbler, bellbird, pied tit, rifleman, silver-eye, whitehead, long-tailed cuckoo, morepork, and the New Zealand falcon.

Wetland habitat

The WMTA contains a number of wetland areas (swamps, bogs, flushes) many of which have high value for nature conservation due to the relative scarcity of this type of habitat and the specialised plants and animals that they support. Some of the wetlands occur within RAPs but others do not.

The Ngamatea Swamp, which does not have PNA or RAP status, is the largest area of wetland within the WMTA. It lies immediately to the south of Waiouru and flows into the Hautapu River.

The wetlands provide habitat for a wide range of birdlife including black and little shags, pipits, welcome swallows, fernbird, Australasian bittern, paradise shelduck, Canada geese and black-backed gulls. Wetlands in the Rangipo Desert, the Moawhango Basin and the Ngawakaakauae Basins are breeding sites for the rare banded dotterel.

Rare species

The WMTA is home to a number of rare plant and animal species, some of which occur outside of RAPs (see Appendix 1).



*Seedheads of the critically endangered wetland grass *Amphibromus fluitans*.*



*Seedheads of the sedge, *Carex capillacea* found in 1996 in the upper Moawhango valley, its sole North Island location.*



*The Moawhango buttercup, *Ranunculus recens* is confined to the Moawhango Ecological District.*

(Photographs: DOC)



*The threatened forget-me-not, *Myosotis* "Volcanic Plateau". Grows in peat channels under tussock in the Upper Moawhango River.*

3.2.4 Stock grazing

The NZDF licences approximately 3200 hectares of the WMTA for grazing. Most licences are issued on an annual basis, with no right of renewal, at the discretion of the Property Manager. Monitoring and administration is carried out by the Property Management Section, Waiouru. The licenced areas are a mixture of exotic pasture and native grasslands.

4. MANAGEMENT ISSUES AND RESPONSES

4.1 Introduction

This section identifies the key management issues pertaining to the maintenance of the military training and conservation values associated with the WMTA, and the Army's response to those issues.

As noted in section 1.5.3, many of the issues revolve around vegetation management and prevention of erosion.

Another important issue is the measures that need to be put in place to avoid or minimise adverse effects on areas of significant conservation value.

Many of the issues are linked, illustrating the well known ecosystem management principle that "everything is inter-connected".

4.2 Vegetation Management and Erosion Control

A combination of soil type, climate, altitude and topography make most of the soils in the WMTA particularly vulnerable to erosion (section 2).

Erosion occurs naturally but *accelerated* erosion has occurred in the WMTA as a result of deliberate or accidental burning of vegetation, vehicle tracking, shelling activity and grazing pressure from domestic and feral animals. Of these agents, fire probably has the potential to do the most damage to soil and water values as its effects can be expansive and lasting.

The ash soils in the WMTA generally lack structure and cohesive strength. A loss or deterioration of vegetative cover exposes the fragile soils to the erosive forces of rain, frost and wind action. This can lead to the formation of extensive erosion scars or ablation surfaces.

In addition to degrading soil and water values, erosion leads to a loss of conservation values because indigenous vegetation is slow to recolonize and is usually out-competed by exotic weed species. Erosion can also lead to a loss of landscape values.

Soil erosion is best prevented by maintaining an intact and healthy vegetation cover. The policies in this section are aimed at achieving this.

4.2.1 Fire management

Fire has been used as a management tool in the past for the control of weeds and wildfires. However, the proliferation of weed species competing with the tussock grassland and the consequential deterioration of open rangeland values, as a result of

regular fires, has led to a change in management practices and fire is now seen as a risk to be minimised* (ATG 1992).

The comprehensive burning of vegetation cover can kill off the root systems of plants which may be the only impediment to erosion of the soil. If a fire is brought under control quickly, damage to vegetation and to the soil may be restricted. The fire will not have the opportunity to burn away the layer of organic matter on the soil surface. The retention of this layer protects the surface of the soil and the underlying seed bank from wind and sheet erosion (Kingett Mitchell & Associates 1999).



Three year old fire damage in short tussock/shrubland vegetation.

There are several examples of erosion scars within the WMTA that appear to have occurred following fire damage; the vegetation in these areas is still undergoing recovery.

Fires close to streams, in particular within the riparian zone, have the potential to adversely affect water quality and stream ecology.

The risk of fires arising from military activity (eg. live firing, incendiary devices, accidents) depends on factors such as preceding weather (eg. drought), existing weather (eg. wind strength), the types of activity being conducted and the type of vegetation in the area being used. The Army manages these risks by incorporating precautionary and fire mitigation procedures in the ATG Range Standing Orders.

* Somewhat ironically the tussock grasslands are considered to be mainly fire-induced (section 2.4) and it is acknowledged that the maintenance of open tussock grasslands may ultimately depend on the occasional deliberate use of fire as a management tool.

Objective: To minimise the risk of fire damage to vegetative cover within the WMTA.

Policy: Fire is not to be used as a technique for vegetation management within the WMTA, unless authorised by the Chief of General Staff.

Policy: To take all appropriate steps to minimise the risk of fire within the WMTA.

Explanation: As noted above, fire is no longer considered an appropriate technique for vegetation management, other than on the rare occasion when its use may be deemed necessary to maintain open tussock grasslands. A number of steps can be taken to minimise the risk of fire damage associated with military training activities.

Method:

- Inclusion of appropriate rules in the ATG Range Standing Orders (RSO) governing fire orders, the lighting of fires, live firing activities, the carrying of fire extinguishers in vehicles, action in event of fire, restricted fire seasons and other fire risk and damage reduction measures (RSO, Parts 2, 3, 6).

4.2.2 Shelling activity

Shelling activity has the potential to damage vegetation as a result of direct impact or by starting fires. Although the direct effects of shelling are generally limited, it has the potential to cause significant erosion damage, depending on site characteristics.



Example of shell impact crater in seepage area.

A study of the effects of shelling activity in three zones of the WMTA (Kingett Mitchell and Associates 1999) identified 7 key factors influencing the risk of impact or fire damage to a particular site:

- Soil type (erosion potential): Some soils within the WMTA are more erosion prone than others.
- Vegetation type: The likelihood and severity of fire is related to vegetation type, with tussock-shrubland and scrub types being highly fire prone and most likely to develop into ash ablation pavements if burnt.
- Ecological values: Some areas have particularly high ecological values associated with them, increasing the risk of damage.
- Altitude: The potential for damage increases with altitude due to the effect of climate extremes and less well developed soil profiles on erosion and the ability of vegetation to re-establish itself.
- Slope: Steep slopes are more prone to erosion due to gravity effects and thinner and less structured soils.
- Aspect: Sites with a north-west aspect are at a greater risk from wind erosion.
- Proximity to waterways: The destruction of riparian vegetation by fire or shell impact increases the potential for ecological damage.



Six month old shell impact craters in short tussock grassland.

By using GIS analysis of these factors, Kingett Mitchell identified a “low risk” (Group 01) area suitable for high intensity shelling activity in Zone 11 (refer Map 4, Appendix 2). They also found that continued shelling within Zone 10 west of the Three Kings Track is sustainable providing shelling is managed within specified guidelines. Some of the recommendations of the Kingett Mitchell report have been incorporated into the following policies.

Objective: To minimise the risk of fire and impact damage arising from shelling activity within the WMTA.

Policy: To:

(a) *Avoid the targeting of:*

- areas of ecological significance including RAPs, forest remnants, wetlands, relatively unmodified sites and areas where rare or endangered species (eg blue duck) have been sighted.
- fire-prone vegetation including scrub, shrubland, and tussock shrubland (where possible, shelling should be confined to tussock grassland vegetation).
- sites with significant erosion potential (due to soil type, slope, altitude, exposure to wind or frost action or a combination of these factors), and

(b) *Maintain appropriate fire fighting personnel and equipment on standby during shelling activities.*

Policy: In addition to the above general policy, the following special measures are to be applied to Zone 10 west of the Three Kings Track.

- The level of shelling activity shall be restricted to essential operations and kept to the minimum level practicable.
- Shelling is to be dispersed to increase the likelihood of indigenous vegetation eventually re-invading crater sites, and to minimise erosion potential.

Explanation: The policies above are consistent with the findings and recommendations of the Kingett Mitchell Report. Dispersal of shelling over a wider area reduces the risk of creating a large scale ash ablation pavement and is likely to create resistance to the long term establishment and spread of hawkweed populations.

The Kingett Mitchell Report was based on an assessment of the impact of shelling activity within three zones of the WMTA. As further information becomes available it may be necessary to apply the second policy to other zones.

Policy: To develop a greater understanding of the factors affecting the risks associated with shelling (and other military training activities) in different areas of the WMTA.

Policy: To develop a greater understanding of the long term effects of shelling activities on vegetation and the rate of recovery of vegetation from fire or impact damage, within the WMTA.

Explanation: These policies are largely self explanatory and, again, consistent with the Kingett-Mitchell Report. Kingett-Mitchell found that the initial stages of colonization of craters is almost exclusively dominated by the hawkweed *Hieracium* and postulated that the revegetation of craters is likely to take up to 20 years at some sites. It is not known whether indigenous tussock or shrubland vegetation is able to reclaim sites dominated by hawkweeds.

Methods:

- Inclusion of appropriate rules in ATG Range Standing Orders relating to live firing activities and fire precautions, protection of vegetation and soils, and specific zone provisions (RSO, Parts 2, 3 and 6).
- Further development of the GIS-based approach to risk assessment of military activities, including shelling, within the WMTA (see section 5.1 of this Strategy).
- Development of a database of fire sites and conditions at the time of shelling.
- Implementation of appropriate monitoring systems, including monitoring of crater impacts and fire sites to more accurately determine the rate and nature of vegetation recolonization in different terrains [see section 5 of Strategy].

4.2.3 Off-road vehicle use, tracking and roading

Off-road vehicle use within the WMTA has the potential to destroy or damage vegetative cover (leading to erosion) and to adversely affect conservation and landscape values.



Off road tracking across red tussock grassland on Three Kings Range.

As with shelling activities, some parts of the WMTA are more vulnerable to the adverse effects of off-road vehicle use than others, depending on factors such as soil type, drainage (water table level), altitude, slope and the conservation and landscape values present.

As stated in section 3.1.2, the future is likely to see greater potential for vegetation disturbance by vehicles due to generally increased use of the WMTA and the trend towards use of wheeled vehicles.

Objective: *To minimise the potential for off-road vehicle use and tracking and roading activities to damage vegetation and/or to adversely effect conservation or landscape values.*

Policy: *To direct the off-road use of vehicles away from areas which are at risk in terms of the potential for erosion or adverse effects on conservation or landscape values.*

Explanation: This policy is consistent with the Army's "risk management" approach to the conduct of training activities within the WMTA. It is aimed at avoiding or mitigating adverse effects.

Methods:

- Inclusion of appropriate rules in ATG Range Standing Orders either prohibiting the movement of vehicles, restricting vehicle movement to existing formed roads or tracks, or restricting movements to operational manoeuvres, depending on the risk profile of the area or zone concerned (RSO, Part 2 and 6).
- Further development of the GIS-based risk management system referred to in section 4.2.2.

Policy: *To monitor the effects of off-road vehicle use within the WMTA and to take remedial action when and where it becomes apparent that the activity is causing erosion or having a significant adverse effect on conservation or landscape values.*

Explanation: The impacts of off-road vehicle use within the WMTA are most apparent where there has been a concentration of activity (eg. in the vicinity of some of the satellite camps or in the driver training area adjacent to SH1 north of Waiouru), or where activity has taken place on wet or boggy ground.

Methods:

- Regular ground inspection and photographic monitoring of training areas.
- Retirement of training areas from vehicle use where such activities are causing erosion or having a significant adverse effect on conservation or landscape values.
- Rotation of training areas to disperse impacts.

- Trials to determine ways of re-vegetating areas that have suffered damage as a result of vehicle movement.

Policy: *No new roads or tracks to be formed or existing roads or tracks modified, without the authority of the Director of Property Management in consultation with Commander ATG (officer in charge of the Defence Area).*

Policy: *All proposals for new roads are to be fully justified and, if appropriate, subject to environmental impact assessment.*

Explanation: Formation of new roads in new areas within the WMTA is a potentially important means of dispersing the impacts of training activities and allowing the rotational use of areas. However, there is potential for new roads to have a significant impact on the natural or landscape values of the areas that they traverse and/or the areas that they open up for increased training activity. It is therefore important that roading proposals are subject to careful scrutiny, impact assessment, and alternatives properly evaluated.

Methods:

- Seek advice from relevant agencies, including DOC, on proposals for new roads within the WMTA.
- Preparation of Environmental Impact Assessments.

Policy: *Achievement of a high standard of planning, design and engineering in the construction of new roads and the upgrade of existing roads.*

Explanation: This policy is particularly relevant to an area known to be erosion prone and subject to climatic extremes, including high intensity rainfall. The Army has an ongoing programme of upgrading existing roads and is also intending to progressively metal the main tank tracks within the WMTA.

Methods:

- Preparation and regular update of a Road and Track Management Plan for the WMTA, the content to include:
 - design guides for new road location and construction
 - a prioritized programme for the upgrade of existing roads and tracks
 - provision for upgrade of roads/tracks well in advance of projected increases in use
 - the metalling of areas of heavy use and sensitive areas

- the formation of cut-offs and watertables (particularly over stream crossing points).
- Inclusion of aspects of the Road and Track Management Plan in the Five Year Land Management Operational Plan, as appropriate.

4.2.4 Plant pest control

Plant pest control is an important aspect of land management within the WMTA because the encroachment of plant pest species on tussock grasslands threatens the open rangeland conditions most suitable for military training activities and because some of the plant pests represent a greater fire hazard than native vegetation. The encroachment of exotic plants also threatens the conservation values of the area.

The invasion of plant pests or weed species is most prevalent in the southern and western parts of the WMTA where native vegetation communities have been most degraded by fires, grazing and military activities.

Objective: *To control the spread of weed species within the WMTA.*

Policy: *To conduct plant pest control activities within the WMTA in general accordance with the Manawatu-Wanganui Regional Council's Regional Plant Pest Management Strategy.*

Policy: *To maintain the native tussock grassland communities within the WMTA in as healthy condition as possible to minimise their vulnerability to invasion by exotic weed species.*

Explanation: The first policy is aimed at achieving consistency between the Army's plant pest control activities and the objectives of the Regional Council's Plant Pest Management Strategy.

Plant pest infestation is considered to be a symptom of a degraded tussock community rather than an initial cause of degradation. It is therefore important to maintain the vegetation in a healthy condition in order to maximise its resistance to weed invasion.

Methods:

- Exercise appropriate control over fire, shelling activity, animal pests and horse grazing (see sections 4.2.1, 4.2.2, 4.2.5 and 4.2.6 of this Strategy, respectively).
- Implementation of a vegetation monitoring programme including monitoring of the condition of native tussock grassland communities and the spread of key weed species within the WMTA (see section 5 of this Strategy).
- Education of military personnel in respect of pest control issues within the WMTA.
- Liase with DOC regarding plant pest control issues, in particular, cross boundary management.

The specific policies that have been adopted for each weed species, below, reflect the current extent of infestation and the feasibility of eradication as opposed to containment. The policies conform, as a minimum standard, to the requirements of the Manawatu-Wanganui Regional Council's Regional Plant Pest Management Strategy (see section 1.4.2 of this Strategy).

Heather *Calluna vulgaris*

The management of heather is a major environmental issue not only in the WMTA, but throughout all central North Island tussock grasslands.

Heather is aggressively invasive, particularly where native vegetation has been destroyed or damaged by fire. As the heather matures it becomes difficult to walk and drive through. It represents a major threat to the military training values of the area.

Heather currently affects approximately 10,000ha of the WMTA and is most prevalent in the southern and western part of the WMTA in the vicinity of the Desert Road. A spraying programme has been in place for several years.

Policy: *To endeavour to prevent the spread of heather outside its existing area of distribution.*

Explanation: This is a containment policy. It is not realistic or possible to eliminate heather or even to make significant inroads into areas of heavy infestation, given currently available control methods. A biological control agent, the heather beetle, was released into the WMTA in the late 1990s.

Methods:

- Management of the vulnerable tussock grassland for closed or intact canopies; minimise vegetation damage.
- Continuation of biological control programme, including monitoring of its effects.
- Adoption of techniques and procedures aimed at minimizing the spread of heather seeds during and following NZDF activities (training and land management) in heather-dominant areas (RSO, Parts 2 and 6).
- Include in Five Year Land Management Operational Plan a strategy for containing the spread of heather by way of a selective spraying programme.

The extent of the aerial and spot spraying programmes and location of the biological control release sites is illustrated on Map 5.

Pinus contorta* *Pinus contorta

Pinus contorta is widespread within the WMTA. Plants begin to produce seeds at five years of age. It is extremely invasive and has the capacity to replace tussock grassland and shrubland with dense pine forest. It has spread into the WMTA from pine

plantations in the Karioi area to the west of the WMTA and is most prevalent in the middle Moawhango Catchment.

Policy: *To eliminate *Pinus contorta* from the WMTA.*

Explanation:

The Army has, since 1972, pursued a policy of active eradication of *Pinus contorta* from the WMTA. Considerable resources have been committed to the implementation of this policy, on an annual basis. Unlike heather, *Pinus contorta* is considered to be “under control” and total eradication is a realistic goal. The WMTA falls within the Waiouru Ward of the Regional Council’s Pinus Contorta Control Strategy, within which the Council’s objective is to eliminate *Pinus contorta* within 10 years. This objective is not realistic for the WMTA and a realistic time frame for elimination of the species will be negotiated between NZDF and the Council.

Methods:

- Implementation of hand cutting and spraying programmes, focusing on main areas of infestation.
- Development of a 4 year cutting cycle to minimise the spread of seeds.
- Work with adjacent landowners to maximise the cost-effectiveness of control programmes.
- Inclusion of a *Pinus contorta* control programme in the Five Year Operational Plan.

The location and extent of the control methods employed within the WMTA are highlighted on Map 6.



Sprayed Contorta pine on Couzens Range. Moawhango River in foreground.

Hawkweed *Hieracium pilosella*

Hawkweed is a prostrate hairy composite herb that forms dense closed carpets amidst low stature vegetation. It spreads both vegetatively and by seed and benefits from

disturbance of incumbent vegetation, including grazing and burning. Hawkweed distribution is correlated with areas of degraded tussock grassland and within the WMTA has become locally common or dominant in areas with a history of severe modification by burning, pastoral use and heavy artillery activities (Kingett Mitchell & Associates 1999).

Studies have shown that the most favourable sites for hawkweed establishment are in areas of short open vegetation, shallow litter and bare soil (Rose and Frampton 1999).

Hawkweed represents a significant threat to the ecology of the tussock grasslands.

Policy: *To control the spread of *Hieracium* within the WMTA by maintaining tussock grasslands in a healthy condition.*

Explanation: There is currently no effective method for controlling the spread of *Hieracium*, other than by maintaining the integrity of the tussock community by minimising disturbance. However, some biological control agents show promise as management tools and the rust *Puccinia hieracii van piloselloidarum* has recently been released within the WMTA. The effectiveness of other biological controls (eg; the hieracium plume moth and the gall wasp *Aulacidea subterminalis* from Europe) is currently being trialed by the Hieracium Control Trust and Landcare in the South Island.

Methods:

- Minimisation of vegetation disturbance and management of tussock grasslands for closed or intact canopies.
- The use of biological controls as they become available.

Gorse

Gorse is an armed woody shrub that forms dense stands and is able to grow on most sites. The seeds are viable in the ground for many years. If left to spread the plant will form dense stands that are an extreme fire hazard and an impediment to training.

Policy: *To eradicate gorse from the WMTA.*

Method:

- Continue control programme to eradicate.
- Maintain a boundary clearance of 20m.

Broom

Broom is a perennial, unpalatable, shrub prevalent in riverbeds and extensively grazed areas. The seeds spread explosively from the plant and remain viable for many years. Broom is not prominent in the WMTA.

If left to spread the plant would form dense large communities that would impede military training and present extreme fire hazard conditions at all times of the year.

Policy: *To eradicate broom from the WMTA.*

Methods:

- Spray and re-spray isolated plants until eradicated.
- Spray larger areas around the perimeter of infested areas annually, before or at flowering, to contain the spread and then progressively eradicate.
- Maintain a boundary clearance of 20m.

Nodding Thistle

Nodding Thistle is a spiny-leaved annual to biennial plant, spread as seed on animals, in hay and by wind. It is a grassland weed which can form quite dense communities and is unpleasant to walk through. Few plants are found each year and most are confined to the western or southern areas of the WMTA.

Policy: *To eradicate nodding thistle from the WMTA.*

Methods:

- Spray or grub all thistles to prevent plants from flowering (also meets obligation to maintain a boundary clearance of 50m).
- The sites where plants are found are to be kept under surveillance for at least 5 years.
- Make use of biological control as available.

Ragwort

Ragwort is a biennial to perennial herb with readily visible yellow flowers. Seeds are spread by wind, water, hay, and stock and if left unchecked ragwort will become dominant. The seed is suspected of retaining its viability for some years. This plant is not considered to be a weed in sheep country because they graze it down, but it is toxic to most other stock. Ragwort will readily establish itself in the WMTA.

Policy: *To eradicate ragwort from the WMTA.*

Methods:

- Spray annually to control.
- Maintain a 20m strip clear of ragwort on the boundary.

- Make use of the biological control as it becomes available.

New Weed Species

There is potential for loss of military training and/or conservation values as a result of invasion of the WMTA by new weed species. For example, grey willow, marram grass, and silver birch have made relatively recent appearances within the WMTA.

Policy: *To take all reasonable steps to prevent new weed species being introduced to the WMTA and, if they are introduced, to detect and control or eradicate them.*

Methods:

- Cleaning of Army vehicles that have been used in other parts of New Zealand, before they are transported to the WMTA.
- Monitor for the appearance of new weed species.
- Control any new plant pest species in accordance with the Manawatu-Wanganui Plant Pest Management Strategy.

4.2.5 Animal pest control

Animal pest control is an important aspect of land management within the WMTA because of the potential of the animals concerned – rabbits, hares, possums, deer, wild cattle, goats, pigs – to damage vegetative cover (facilitating erosion and weed encroachment) and to adversely affect conservation and landscape values.

The rationale for animal control also relates to the national campaign to prevent the spread of bovine tuberculosis. Bovine tuberculosis is spread by possums, deer, wild cattle and possibly other species such as goats, pigs and ferrets. The WMTA is an endemic area for bovine tuberculosis and the Animal Health Board has established, as part of its National Pest Management Strategy for Bovine Tb, the so-called “Taihape Tb Buffer Zone” (which covers parts of the WMTA) to help prevent the spread of tuberculosis southwards from the Turangi area by feral animals.

Objective: *To exercise an adequate level of control over animal pest species within the WMTA, particularly those that have been implicated in the spread of bovine tuberculosis.*

Policy: *To conduct animal pest control activities within the WMTA in accordance with the Manawatu-Wanganui Regional Council’s Regional Animal Pest Management Strategy and the Animal Health Board’s National Pest Management Strategy for Bovine Tb.*

Explanation: The policy is aimed at achieving consistency between the Army’s pest control activities and the objectives of the two pest management agencies referred to. The Regional Animal Pest Management Strategy recognises four species, three of which occur within the WMTA (possum, rabbit,

goat), as warranting regional intervention. The Council's Strategy is focused on possum control from an ecological perspective whereas the Health Board's Strategy focuses on possum control from an animal health perspective.

Methods:

- Implementation of an animal pest monitoring programme (see section 5 of this Strategy).

Rabbits

The light soils of the Ruapehu District are amongst the Region's most rabbit prone areas (Manawatu-Wanganui Regional Council 1996). Rabbits favour dryland areas of open short-cropped vegetation (pneumonia is thought to be a natural control mechanism in the wetter conditions associated with rank vegetation). Rabbits have been a problem in the past within the WMTA when the land was extensively grazed and burnt but the population is now maintained at a low level by control programs (see Map 7, Appendix 2). Rabbits are now generally confined to the lower altitude and more degraded grasslands.

Policy: *To control rabbits within the WMTA at a level below Level 4 on the McLean and Gibbs Scales of Rabbit Infestation.*

Policy: *To closely monitor rabbit populations within the WMTA and if necessary intensify control programmes.*

Explanation: The McLean and Gibbs Scales of Rabbit Infestation have been adopted by the Manawatu-Wanganui Regional Council as indices of rabbit density and a rule in the Animal Pest Management Strategy requires occupiers to carry out rabbit control to ensure that rabbit infestation levels are maintained below Level 4 as shown on the McLean and Gibbs Scale (Rabbit levels within the WMTA are currently at < level 2 on the scale).

Methods:

- Implementation of a rabbit poisoning and shooting programme (see Five Year Land Management Operational Plan).
- Management of the grasslands for a closed cover of tussocks as a means of natural rabbit control.
- Visual monitoring of rabbit numbers, droppings and browse damage.

Hares

Hares are common within the WMTA. They occupy a more diverse range of habitat types (tussock, shrubland, swamps, riverbeds) than rabbits and are more common than rabbits in the higher altitude areas of the WMTA.

Hares are generally considered to be less harmful than rabbits because they do not graze the tussock as closely, burrow, or live in dense communities. However, hares may inhibit the regeneration of tussock following fire (by browsing the new shoots) and this could have significant long term impacts in terms of loss of vegetation cover (Kingett Mitchell & Associates 1999).

Policy: *To maintain an ongoing programme of hare population control within the WMTA particularly in high altitude areas.*

Policy: *To closely monitor hare populations within the WMTA and if necessary intensify control programmes.*

Explanation: In the past hare populations have been largely controlled as a by-product of rabbit control operations. However, the control of rabbit and horse grazing appears to be improving the habitat for hares and there is potential for them to do significant damage to vegetation, particularly in high altitude areas where vegetation growth rates are slow.

Methods:

- Control by shooting.
- Implementation of a hare control programme (see Five Year Land Management Operational Plan).
- Visual monitoring of hare numbers, droppings and browse damage.

Map 7 identifies the areas within the WMTA that are subject to annual ground and aerial rabbit and hare control operations.

Possoms

Possoms are present in relatively low numbers in the open range country of the WMTA, above 1000m, due to unsuitable habitat and food sources. However, they represent an ongoing threat to the health and regeneration of forest remnants, and indigenous vegetation generally, within the WMTA. As noted above, they are also potential vectors of bovine tuberculosis.

Policy: *To maintain an ongoing possum control programme within the WMTA, in consultation with the Manawatu-Wanganui Regional Council.*

Explanation:

The Army currently conducts an extensive possum control programme within the WMTA in part for vegetation management reasons and in part as its contribution to maintenance of the Taihape Tb Buffer Zone. The Regional Animal Pest Management Strategy requires land occupiers to carry out possum control to the extent and timing directed by an authorized person of the Regional Council.

Methods:

- Maintenance of poisoning programme/bait stations as appropriate (see Five Year Land Management Operational Plan).
- Maintain liaison with pest management staff of the Manawatu-Wanganui Regional Council.

Map 8 identifies the areas within the WMTA that are subject to possum control measures.

Deer

Red deer and sika deer are present within the WMTA in low numbers. Their numbers need to be controlled because of the damaging effect that their grazing has on forest understorey (and hence regeneration) and because they are potential vectors of bovine tuberculosis.

Policy: *To monitor deer numbers within the WMTA and, if necessary, implement a control programme.*

Methods:

- Visual monitoring of deer numbers, droppings and browse damage.
- Implementation of a control programme if necessary.

Wild Cattle

There are a small number of wild cattle in the southern area of the WMTA. These derive either from the adjoining stations (Ngamatea, Maunganui, Ohinewairua) or from NZDF lands that are leased for grazing.

Policy: *Elimination of all wild cattle from the WMTA.*

Explanation:

Wild cattle are a potential vector of bovine tuberculosis and will be destroyed in the interests of adjoining landholders and lessees.

Methods:

- Army personnel in field to report sightings of cattle to Operations Branch for forwarding to the Waiouru Property Manager.
- Property Manager to be responsible for the culling of wild cattle and/or the return of strayed stock to their owners.

Other Tb Vectors

Other species such as goats, pigs and ferrets may be vectors of bovine tuberculosis.

Policy: To meet the requirements for control of other vectors as specified in the National Pest Management Strategy for Bovine Tuberculosis.

Methods:

- Liaison with the Animal Health Board in respect of the latest information regarding bovine Tb vectors and the requirements of the National Strategy.
- Examination of carcasses for signs of bovine tuberculosis and, where there is doubt, have them checked by Ministry of Agriculture veterinarians.

4.2.6 Wild horse management

Feral horses have inhabited the central North Island since the 1870s, with herds attaining large sizes in the early and middle 1900s. By 1979, numbers had dropped to 174 in the Southern Kaimanawa Area, largely as a result of hunting.

In 1981, a “Protected Area for the Kaimanawa Wild Horses” was established, under the Wildlife Act 1953, in response to public concern that the decline in the numbers of horses would lead to their complete loss from the area. The protected area embraced much of the WMTA.

Rogers (1991) published “Kaimanawa Feral Horses and their Environmental Impacts”, undertaking a follow-up study in 1994. He documented the biogeographic values of the area and found that through the wide basins and plateaux of the northern part of the area horse grazing and trampling was seriously compromising floristic values, rare plant habitat (eg. swamp, peat bog), landscape and nature conservation values.*

By 1994 the horse population had grown to 1,576, about ten times the 1979 population, and it was apparent this population level could not be sustained without significant adverse effects on conservation values.

In October 1994 the Kaimanawa Wild Horses Working Party was convened by DOC “to facilitate the development of an optimal management strategy” for the horses.

After extensive consultation, the Minister of Conservation released the Kaimanawa Wild Horses Plan in May 1996, under the provisions of the Wildlife Act 1953. The Plan provides, *inter alia*, for:-

- The removal of all horses from the northern areas of highest conservation value and their management as “zero density areas”, amounting to a reduction in their previous range of about 70%. The location of the zero density area is shown on Map 9.
- A significant reduction in population size in the remaining area, resulting in the retention of approximately 500 horses in the lower altitude, more modified,**

* The values and effects are summarized in the *Kaimanawa Wild Horses Plan*.

** Rogers (1991) found that the impact of horses in areas that are already highly modified is low due to the development of “disturbance-tolerant vegetation” in response to frequent disturbance.

southern Argo Basin part of the WMTA, for at least 3 years. The location of the Argo Management Area is shown on Map 9.

- The establishment of a 3 year monitoring and research programme to appraise the impact of this reduced number of horses on the ecosystems and to decide if, and at what numbers, horses can be retained (ie sustainability research).



*Horses grazing in Argo Valley, 1997.
Note extent of heavily modified grassland (Photo: DOC).*

- DOC to be responsible for controlling the population of the herd and for the monitoring/research programme during the 3 year period, and
- A post-research review to select the best location option (population management over the full range, in the Argo Basin area, or at a different location).

The Plan notes that the Kaimanawa Wild Horses are not considered a priority for conservation by DOC and therefore DOC would not automatically continue to manage them past the review stage. It states that if the horses are retained within the WMTA, the Army should take over their management under a contract/agreement with DOC, with DOC reviewing the effectiveness of Army management with a proposed Kaimanawa Wild Horses Trust (this body was also identified as taking over the management of the horses if they were relocated away from Army land).

In the event, there has not yet been a report on the sustainability issue and the Trust has not been formed (an Advisory Group was formed in lieu of a Trust). There has therefore been no resolution of the long term location and management arrangements for the wild horses.

Objective: To ensure that the Kaimanawa Wild Horses are managed in a way which is consistent with the protection of conservation values within the WMTA.

Policy: The Army will continue to support DOC in its efforts to manage the Kaimanawa Wild Horses, in accordance with the Kaimanawa Wild Horses Plan, until such time as the future location and management responsibility for the horses has been resolved.

Policy: The Army will advocate that the Department of Conservation, or some other agency, retain primary responsibility for the management of the Kaimanawa Wild Horses if they remain within the WMTA.

Explanation: The current position is that DOC has primary responsibility for management of the horses and the Army has a *secondary* management function in terms of a memorandum of understanding between DOC, the NZ Police and the Army in respect of the Army's role in helping to keep horses away from SH1 in the interests of public safety. The Army also has an agreement with DOC and the NZSPCA in respect of the treatment of horses with life-threatening injuries or illnesses. Notwithstanding the Working Group's recommendations, the Army does not see itself as assuming primary responsibility for managing the horses. It does not possess the relevant scientific understanding or expertise and it considers that the horses are being managed mainly to achieve conservation objectives. For these reasons, primary responsibility for their management should remain with DOC in terms of its Kaimanawa Wild Horses Plan.



Grazing damage as evidenced by uprooted *Carex berggrenii*.
(Photo: DOC)



Hoof pugging in boggy turf of flush zone, beside Awapetu River.
(Photo: DOC)

4.3 Areas of Significant Conservation Value

The conservation values within the WMTA are outlined in section 3.2.3 above.

Objective: *Protection of areas of significant conservation value within the WMTA in a manner which allows the land to continue to be used for Army training or other defence purposes.*

4.3.1 Recommended Areas for Protection (RAPs)

As noted in section 3.2.3, the Department of Conservation has recommended protection for four areas within the WMTA. The conservation values associated with these areas are summarised below. Details are provided in Rogers (1993).

Under new military training zones which came into effect on 1 December 1999, three of the RAPs have been given their own zones – Ngawakaakauae (Zone 7), Pleasant’s Bush (Zone 5) and Te Rei (Zone 13). The Army has agreed with DOC that these areas will be referred to as “zones with special use criteria” which will be protected in terms of the rules in the Range Standing Orders pursuant to Defence Regulations. The Three Kings RAP does not have its own zone but will nonetheless receive protection under Range Standing Orders.

Ngawakaakauae (Zone 7)

This area covers the major intermontane basin in the North Island where landscape history has provided refugia for a number of plant species recorded only there in the North Island and that were probably more widespread in the late Tertiary Period. The diversity of biogeographically special plants and their habitats reflects the unusual combination of primary physical factors regulating the environment, namely the undulating greywacke landforms, the remnant marine sediment strata, frost inversion at high altitude and a summer-dry climate. No other PNA or RAP has a closely similar mix of physical and biological natural features. There are ten sedge, grass and herb species substantially or completely restricted to this area (Rogers 1993, DOC 1997). The upper part of the superimposed Mt Azim gorge is included for landform representativeness, as is the upper Moawhango River Gorge (Rogers 1993). The Ngawakaakauae area is a “zero density area” for horses under the Kaimanawa Wild Horses Plan.

Policy: *To exclude off-road use of vehicles, live firing and any further development, including roading, in the Ngawakaakauae Zone (7).*

Policy: *To monitor plant species and physical attributes for disturbance.*

Explanation: The first policy is aimed at protecting the rare plant communities and species that are restricted to the zone. The purpose of the second policy is self-evident and relates to the particularly high conservation values associated with this area of the WMTA.

Methods:

- Inclusion of appropriate rules in the ATG Range Standing Orders (RSO Ch2, section 5; Ch 3, Zone 7).
- Refer to section 5 of the Strategy for implementation of the second policy above.

Pleasants Bush (Zone 5)

This area contains two significant ecological units unrepresented in PNAs.

Mountain beech-red beech-silver beech forest on hard rock landforms is not represented elsewhere in the district. Pleasants Bush and Ngamotu a te Ahimaire Bush are beech forest remnants located on south-east aspects of the Moawhango River Gorge and Kaimakuku Stream, respectively.



Pleasants Bush above upper Moawhango Valley. Awapatu Catchment in background.

A periodically inundated tarn or seasonal wetland, associated with the lower reaches of the Kaimakuku Stream, where it drains across an elevated hard rock terrace in the Awapatu Basin, provides a unique habitat for some biogeographically special plants, including one endangered plant species. The tarn is hydrologically special for its seasonal fluctuations, water levels and apparently high fertility. Fernbirds occur in the adjoining manuka shrubland. There are several small wetlands in the area, some of which have been modified by horse trampling (Rogers 1993).

Policy: To conduct only low impact military activities in the forest area and no military activity in the wetland areas in the Pleasants Bush Zone (5).

Policy: No further roading activity is to be undertaken within the Pleasants Bush Zone other than ongoing improvements of the existing road.

Explanation: Both of these policies are aimed at protecting the natural values associated with the remnant beech forests.

Methods

- Inclusion of appropriate rules in the ATG Range Standing Orders (RSO, Parts 2 and 6).

Te Rei / Westlawn (Zone 13)

The Te Rei RAP has extensive red beech and mountain beech forest with scattered emergent rimu in soft rock landforms. Approximately half of the RAP falls in the Waipoua Training Area. It is fenced off from adjacent grasslands. At Westlawn, there are a number of red mistletoe plants *Peraxilla tetrapetala* present on silver beech trees.

With rehabilitation of forest in the valley, the Te Rei/Westlawn area offers potential as an extensive landscape of beech forest, which is not represented elsewhere in the Waipoua Training Area.

This area receives only light military impact. Mounganui Station holds a grazing lease over part of the adjacent area. Feral horses infrequently graze the Moawhango Valley but often graze the secondary vegetation between Te Rei Bush and the Moawhango Valley escarpment.

Policy: *To conduct only low impact military activities in the Te Rei area.*

Policy: *To prevent domestic stock from entering Te Rei Bush.*

Explanation: These policies are aimed at maintaining the conservation values of the red and mountain beech forest in the area.

Methods:

- Inclusion of appropriate rules in the ATG Range Standing Orders (RSO, Parts 2 and 6).
- Maintenance of the fence along the western escarpment of the Moawhango Valley, to ensure that stock are confined to the leased area of the Valley.

Three Kings

The Three Kings Range has scattered isolated mountain beech trees and areas of peat bog. This area is recommended for protection because of the high scientific values in the topogenous and ombrogenous peat bogs. A record of the effects of vulcanism, climate change, and burning on vegetation during the last 11000 years was obtained from these peats. The peat bogs are also important because of their rarity, comparative intactness and representativeness (Rogers 1993). Both topogenous and ombrogenous peats are included because they are entirely different ecosystems and they respond differently to climate changes. The area also offers the potential for a reconstitution of

the original treeline forests of mountain toatoa in the long term absence of burning. There is currently a well-developed road through the area.

Policy: *To exclude off road vehicle use across peat surfaces, invasive military activities (such as digging in) and any further road developments in the Three Kings Peat Bog Area.*

Policy: *To limit heavy use and sensitive areas, and to give high priority to the maintenance of roads in the Three Kings Peat Bog area.*



Low fertility tarn on Three Kings Range.

Explanation: The policies are aimed at preventing the further loss of peat bog area and associated values.

Methods:

- Inclusion of appropriate rules in the ATG Range Standing Orders (RSO, Parts 2 and 6).

4.3.2 Forest remnants

The 26 native forest remnants throughout the WMTA contain important botanical values and provide habitat for native bird species including tui, pigeon, fantail, grey warbler, bellbird, pied tit, rifle-man, silvereye, whitehead, long-tailed cuckoo and

morepork. Continued viability of this habitat is threatened by fire, localised Army training activity, and the browsing of animal pests.

Policy: *To minimise the use of explosives or pyrotechnic devices in or near native forest areas.*

Policy: *To avoid the removal or cutting of vegetation in forest areas.*

Policy: *To control deer and possum numbers.*

Explanation: The policies are aimed at protecting conservation values associated with forest remnants whilst not precluding the use of some of these areas for military training purposes.

Methods:

- Inclusion of appropriate rules in the ATG Range Standing Orders (RSO, Parts 2 and 6).
- Inclusion of appropriate provisions for pest control in the 5 Year Operational Plan; see also Animal Pest Control, section 4.2.5 of this document.

4.3.3 Wetlands

Wetland values are threatened by drainage, disturbance by vehicles, fire, and grazing and trampling by wild or domestic animals.

Some of the more valuable wetland areas in the WMTA are contained in the RAPs referred to in section 4.3.1 but some (eg. Ngamatea Swamp) are not.

The Ngamatea Swamp is the largest area of wetland within the Waiouru Training Area. It has been modified by fire, grazing, exotic plants and drainage, particularly in the northern half. Ngamatea is almost entirely a low-fertility bog, dominated by native plant species. Notable vegetation types, in the southern part, include patches of *Olearia virgata* scrub, monoao-umbrella fern-wire rush shrubland, and *Baumea* sedge land which contains the local species, *B.arthrophylla* (Ogle and Clerk 1998). Ngamatea is probably the southern limit in the North Island for this last-named sedge. It is the only known area containing populations of the Australasian bittern in the WMTA.

Policy: *To avoid or minimise the effects of Army activities on wetland areas within the WMTA.*

Policy: *To minimise the amount of wild and domestic animal grazing and trampling of wetland areas within the WMTA.*

Policy: *To protect and enhance the natural values associated with the Ngamatea Swamp.*

Explanation: The first two policies are general policies applying to all wetlands within the WMTA. The third policy is aimed at maintaining and, if possible, rehabilitating the natural values associated with the degraded Ngamatea Swamp.

Methods:

- Inclusion of appropriate rules in the ATG Range Standing Orders relating to maintenance of vegetation and soil values, activities within zones, fire precautions and animal control (RSO, Parts 2 and 6).
- In respect of the Ngamatea Swamp, block internal drains, maintain present water levels, exclude livestock and control Pinus contorta.

4.4 Land Leases / Pastoral Grazing

The NZDF licences for grazing approximately 3200 hectares in four different localities of the Waiouru Training Area. The licences are let on a short-term (normally annual) basis, with no right of renewal, at the discretion of the Property Manager. The Property Manager, Waiouru, carries out monitoring and administration. The licenced areas are a mixture of exotic pasture and native grassland. The grazed areas are a valued component of the WMTA.

Policy: *To ensure that licence grazing areas within the WMTA are managed in accordance with sustainable land management principles and in a way which does not diminish their actual or potential value for military training purposes*

Explanation: Inappropriate land use practices such as over-grazing, repeated burning, or inadequate weed control can lead to land degradation and/or reduction in the value of the land for primary production or military training.

Methods:

- Inclusion of appropriate land management constraints or requirements on licence agreements.
- Monitoring of licence conditions by the Property Manager.

4.5 Management of Lake Moawhango

Lake Moawhango is a man-made hydro lake in the middle of the Moawhango River Catchment (section 3.2.2). The Lake and its environs are used for a variety of military training purposes.

Severe lake level fluctuations contribute to wind erosion of the lakeshore threatening the integrity of the existing access road. They can also make it difficult to access the lake for operational purposes.

Policy: *To endeavour to prevent or remediate adverse environmental effects that impact on operational capability, including access for NZDF activities*

Explanation: Genesis Power Ltd owns the Moawhango Dam and diverts water northward from Lake Moawhango to the Rangipo Power Station. Genesis has agreed to monitor and establish the extent of erosion.



Shoreline erosion near Moawhango Dam.

Methods:

- Ongoing liaison with Genesis Power.
- Submissions on resource consent applications by Genesis Power.

4.6 Recreational Use

Although the WMTA offers considerable potential for recreation use by 4WD enthusiasts, anglers, hunters etc, the potential for conflict between recreational use and NZDF activities means that recreational use can only be permitted on a restricted basis.

Under the Occupiers Liability Act 1982 and the Health and Safety in Employment Act 1992 the NZDF owes a duty of care to all visitors to the WMTA to ensure their safety and wellbeing.

Policy: To only allow recreational use of the WMTA by groups* of people on application to the Army and then only if:-

- (a) The area or zone in question is not being used for operational or “work-related” activities
- (b) The zone permits the proposed recreational activity (refer Range Standing Orders)
- (c) The leader of the group is able to show competence in:
 - map reading and navigation
 - first aid
 - basic mountain survival
 - unexploded ammunition recognition and associated procedures, and
- (d) A permit has been issued by Operations Branch.

Explanation: This policy reflects both the potential for conflict between recreational use and military training activities, and the requirements of the Occupier’s Liability Act 1982.

Methods:

- Persons wishing to gain access to the WMTA for purposes of recreational use should apply to Operations Branch, HQ Army Training Group, Private Bag 1702, Waiouru.

*“Groups” being defined as more than one person.

5. MONITORING AND REPORTING

5.1 Introduction

Army property managers require information on the effects of military training activities and the effectiveness of land management operations in order to determine whether land management objectives are being met.

Objective: *To design and implement the types of monitoring, information storage and retrieval systems that will enable the Army to:*

- (a) *assess the effects of military activities on vegetative cover, soil erosion, conservation and landscape values*
- (b) *assess spatial and temporal trends in vegetation patterns within the WMTA*
- (c) *assess the effectiveness of land management operations, including plant and animal pest control programmes*
- (d) *refine a GIS-based Risk Management Model for the WMTA.*

Explanation:

Monitoring of the effects of military activities on vegetative cover, soil erosion, conservation and landscape values is consistent with the effects-based approach of the Resource Management Act 1991 and the Manawatu-Wanganui Regional Council's regional plans.

The key to the successful integration of military and conservation objectives and indeed the long term viability of the WMTA as a military training ground, is seen to lie in the successful management of vegetative cover (section 1.5.3). Consequently, it is important that monitoring systems collect "big picture" information relating to spatial and temporal trends in vegetation patterns so that, if necessary, management policies or programmes can be adjusted.

The Army intends to develop a Risk Management Model to cover the entire WMTA, as an extension of the Kingett Mitchell work referred to in section 4.2.2 of this Strategy. The purpose of the model will be to assess the suitability of different types of terrain for different types of military training activities having regard to risk factors (eg. soil type, vegetation type, ecological values, altitude, slope, aspect, proximity to waterways) and, if necessary, direct certain activities away from sensitive areas in the interests of sustainable land management. Information relating to the effects of current activities and rates of recovery (eg. from fire or impact damage) will help to refine the Risk Management Model.

5.2 Army Monitoring Activities

Policy: *To formalise a range of monitoring activities within the WMTA, consistent with the above objective.*

Monitoring may cover:

- *the effects of military training activities (eg. live firing, off-road use of vehicles, tracking) on vegetative cover, soil and water, nature conservation and landscape values*
- *the rate and nature of vegetation recovery following shell impact, fire, or vehicle disturbance*
- *the condition of tussock grassland communities*
- *the spread of plant pests*
- *the density of animal pests*
- *trends in vegetative cover and vegetation patterns.*

Monitoring techniques may include:

- *visual inspections/photographic records*
- *transect/quadrat monitoring*
- *exclusion plots (inside/outside comparisons)*
- *fixed photo-point monitoring*
- *aerial photography*
- *high resolution satellite imagery*
- *other methods, as appropriate.*

Explanation:

In the past a range of monitoring activities have been carried out on a routine but more or less informal basis. For example, *Pinus cortorta* numbers in plots are counted at regular intervals to assess the kill rate after spraying, and rabbit and hare numbers are monitored. The Army acknowledges the need to formalise and justify monitoring activities by way of a written Monitoring Plan.

There is an obvious but important distinction between *what* is to be monitored and *how* it is to be monitored. The policy makes this distinction but is not prescriptive as to what or how. This detail will be developed in the Monitoring Plan.

Methods:

- Development of a written Land Management Monitoring Plan by the Waipoua Property Manager in consultation with Commander ATG by 1 April 2000, and its incorporation in the Five Year Land Management Operational Plan.
- Implementation of the Land Management Monitoring Plan.

5.3 Monitoring and Research by Other Agencies

Policy: *To permit other agencies to undertake monitoring and research activities within the WMTA, providing the research is relevant to the NZDFs sustainable land management objectives.*

Explanation: Monitoring of plant species diversity and condition is currently carried out by DOC throughout the WMTA. It also monitors populations of the native land snail *Powelliophanta marchanti* at Otamateanui Stream. The NZ Army supports this type of work and will encourage and facilitate it in the future.



An enclosure near Argo Road showing recovery of inter-tussock grasses in the absence of grazing.

Methods:

- Allow DOC and other agencies access to the WMTA to undertake monitoring and research activities.
- Support research students and universities in long term studies of the WMTA.

- Reporting of results to the Property Management Section, Waiouru and HQ ATG as a condition of all research projects.

5.4 Storage and Retrieval of Monitoring Information

Policy: *To store monitoring information on a GIS-type Monitoring Database designed to enable easy access and retrieval, and the application of data to the Risk Management Model.*

Explanation: As noted above, the rationale for monitoring is to provide ready access to information that will assist in promoting sustainable land management. The Risk Management Model will be a major tool for promoting sustainable management of the WMTA (see above).

Methods:

- The Property Manager will develop an appropriate Monitoring Database for the WMTA by 1 July 2000.
- Incorporation of results of Army monitoring into the Database.
- Incorporation of monitoring and research results of other agencies into the Database.

5.5 Monitoring Reports

Policy: *To prepare Annual Monitoring Reports for the WMTA summarizing the results of monitoring programmes and making management recommendations as appropriate.*

Policy: *To prepare Five Year Trend Reports, summarizing analyses and predictions of long term trends in vegetation patterns and erosion within the WMTA, and making management recommendations as appropriate.*

Explanation: To maximize its utility, monitoring information needs to be regularly reviewed. If necessary, monitoring reports should recommend desirable constraints on military activities, mitigation or remediation measures and/or adjustments to land management operations, in the interests of promoting sustainable land management.

Methods:

- The Waiouru Property Manager will be responsible for preparing Annual Monitoring Reports and Five Year Trend reports and submitting them to the Director of Property Management, Commander ATG and the Land Commander by 1 April each year.

6. REVIEW OF THE STRATEGY

This Strategy is subject to review every five years. This does not preclude earlier modification of the Strategy or its specific policies should the Army believe that changing circumstances justify this. Any such modification will be subject to the approval of the Chief of General Staff.

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Abbreviations

ATG	Army Training Group
BP	Before Present
CGS	Chief of General Staff
CMS	Conservation Management Strategy
DOC	Department of Conservation
DPM	Director Property Management
GIS	Geographic Information System
HQ	Head Quarters
LUIS	Land Use Impact Study
NZDF	New Zealand Defence Force
PNAP	Protected Natural Areas Programme
RAP	Recommended Area for Protection (PNAP)
RAPMS	Regional Animal Pest Management Strategy
RPPMS	Regional Plant Pest Management Strategy
RSO	Range Standing Orders
SAF	Singaporean Armed Forces
TPD	Tongariro Power Development
WMTA	Waiouru Military Training Area.

Glossary of Scientific Terms

ablation pavement: a surface covering of stone, gravel or coarse particles that develops after wind, sheet or rill erosion removes the fine soil.

biogeography: the study of the distribution in time and space of organisms.

ecological district: a local part of New Zealand where geological, topographic, climatic and biological features and processes, including the broad cultural pattern, interrelate to produce a characteristic landscape and range of biological communities. New Zealand has been subdivided into 268 such districts. It represents the level for assessing the representativeness of major ecosystem types in the national network of Protected Natural Areas.

ecological region: a group of adjacent ecological districts with very closely related ecological characteristics, or, in some cases, a single very distinctive ecological district. New Zealand has been subdivided into 85 such regions.

endemic: plant and animal species confined to New Zealand. It includes bird species that breed only in New Zealand, but which may disperse to other countries in the non-breeding season or as sub-adults (Bell 1986).

exotic: introduced from abroad.

greywacke: a hard grey sandstone, which is the most abundant rock in New Zealand.

habitat: the part of the environment in which a plant or animal lives. An organism usually has adaptations which allow it to live in that particular part of the environment, and it may be more or less restricted to that habitat.

indigenous: native to, and occurring naturally in New Zealand. All those features which in the aggregate originally gave New Zealand its own distinctive character. It is important at the regional, district and species level.

landform: all the physical, recognisable, naturally formed features of land, having a characteristic shape, eg; hill, valley, or alluvial fan. In the PNA Programme, classification of a landform emphasises its ecological significance rather than its geomorphological or geological significance.

lapilli: small rock fragments ejected from a volcano; they are smaller than volcanic bombs, but larger than volcanic ash, being generally considered to vary in size from peas to walnuts.

loess: buff to light-yellowish or yellowish-brown coloured, unstratified deposits of loosely arranged angular grains of silt deposited by the wind. Loess is wind-blown dust, of Quaternary age, carried from alluvial valleys and outwash plains

monotypic: usually applied to a genus with only one species.

native: not known to have been introduced by human agency.

naturalness: an assessment of how closely the physical and biotic components of an area reflect the condition before human occupation (in New Zealand, approximately pre-AD 700).

ombrogenous peat: a blanket or capping peat that occurs on convex surfaces and dependant for development entirely on rainfall and cool temperatures; c.f. topogenous peat.

Pleistocene: the period 2,000,000 – 10,000 years ago on the geological timescale. The Pleistocene Period was characterised by marked fluctuations in climate which resulted in the occurrence of several episodes of mountain glaciation.

Protected Natural Area (PNA): a legally protected area, characterised by indigenous species or ecosystems, in which the principle purpose of management is retention of the indigenous state. The term may also be applied to areas legally protected for their soil, geological and/or landform values.

Recommended Area for Protection (RAP): an area identified as priority for protection because it contains the best example or examples of its type or class of natural ecosystem and/or landscape in an ecological district.

A RAP is intended to be the basis for a proposal for a new protected natural area that would supplement the existing system of protected natural areas and make it more fully representative of New Zealand's ecological diversity. Seven selection criteria are used for identifying Recommended Areas for Protection in the PNA Programme; representativeness, diversity and pattern, rarity and special features, naturalness, long-term ecological viability, size and shape, buffering and surrounding landscape.

representativeness: an assessment of how well an area (eg; a RAP) shows the overall characteristics of a larger area (eg; a land system or ecological district)

riparian: of or on a river-bank.

seral: types of plant and animal communities associated with various stages of primary or secondary succession.

sustainable management: means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well being and for their health and safety while-

- (a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations
- (b) safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
- (c) avoiding, remedying or mitigating any adverse effects of activities on the environment.

(Definition from S5(2) of Resource Management Act 1991)

succession: 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 abiotic factors, or both.

tephra: a term applied to all the finer solid materials (ash, cinders, etc) ejected from a volcano during an eruption.

Tertiary: the period 65 to 2 million years ago on the geological timescale. The Tertiary period was marked initially by sea transgression until, about 25 million years ago, renewed uplift caused the seas to retreat.

topogenous peat: topogenous peats develop from poor drainage in concave depressions; c.f. ombrogenous, blanket or capping peat.

Appendix 1: Rare Plant and Animal Species Recorded from Waipoua Military Training Area

Species	Area
The Hook-sedge <i>Uncinia strictissima</i>	In tussock grassland, escarpment slopes of Hihitahi, Hautapu Stream Catchment.
Sand Iris <i>Libertia peregrinans</i>	Along Hautapu Stream margins.
A Prostrate Herb <i>Mazus radicans</i>	Banks of Hautapu Stream near Waipoua stream confluence
Red mistletoe <i>Peraxilla tetrapetala</i>	Westlawn
Common Gecko <i>Hoplodactylus maculatus</i>	Greywacke outcrops, also reported from Stowman Range
Common Skink <i>Oligosoma nigriplantare polychroma</i>	Tussock grasslands
Small-scaled Skink <i>Oligosoma microlepis</i>	Rock outcrops
Native Land Snail <i>Powelliaphanta marchanti</i> (protected species)	NE part of WMTA, Rangipo Bush and other forest remnants and Otamateanui Stream.
Blue Duck <i>Hymenolaimus malacorhynchus</i>	Junction of Otokoru Stream and Moawhanga River
Kaka <i>Nestor meridionalis</i>	Forest remnants
New Zealand Falcon <i>Falco novaeseelandiae</i>	Rocky gorges and forest
Fernbird <i>Bowdleria punctata</i>	Swamps, wet shrublands
Australasian Bittern <i>Botaurus poiciloptilus</i>	Swamps (Ngamatea West Swamp)
Banded Dotterel <i>Charadrius bicinctus</i>	Open gravel and pumice flats (Rangipo Desert, Ngawhakaakauae)
Long-tailed Cuckoo <i>Eudynamys taitensis</i>	Forests

Appendix 2: Maps

Map 4: Image Identifying Preferred Area for Impact