Tiniroto, Waihua, Mahia and Matawai Ecological Districts

Survey Report for the Protected Natural Areas Programme

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The survey area in microcosm. Kowhai flowering against a backdrop of Te Reinga (RAP TIN 90, see p. 188), a culturally modified mixture of primary and secondary indigenous vegetation on complex terrain around the Wairoa River, set in a wider landscape of predominant pastoral farming and plantation forestry.

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Foreword

The Tiniroto, Waihua, Mahia and Matawai Ecological Districts – broadly the hinterland and flanking coasts of Wairoa and the hill country west of Gisborne – were surveyed for the Protected Natural Areas Programme in 1995-97. This report presents the results of that survey, carried out by staff of Manaaki Whenua – Landcare Research on contract to the Department of Conservation.

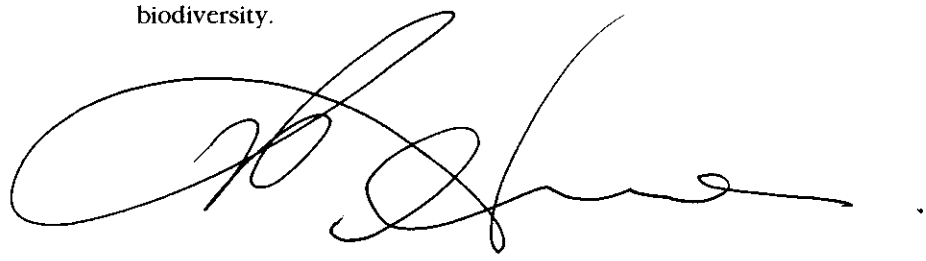
Financial contributions in support of the survey from the Hawke's Bay Regional Council, Gisborne District Council and Wairoa District Council were very helpful, and I gratefully acknowledge them here.

The survey has improved understanding of the ecological character of this large area of almost half a million hectares. It has led to the recognition of a new Matawai Ecological District, substantially refining the classification and mapping of ecological districts, first established in the 1980s on the basis of the more limited knowledge then available. The survey has documented the overall ecological character of the area: for example, the generally small remnants of the original primary forests, the larger areas of still developing secondary forest and scrub that are now the repository of much of the area's indigenous biodiversity, and the strong modification of the comparatively few surviving wetlands.

The report presents a set of Recommended Areas for Protection (RAPs). Collectively, the RAPs represent the best of the range of natural ecological diversity that has survived outside the rather limited set of existing protected natural areas. Protection of the RAPs is important for a sustainable future that retains the most significant areas of indigenous biodiversity. An appendix also describes briefly all the other natural areas.

Taking the next steps towards providing practical and legal protection of these areas is the important part. Landowners, runanga, trusts and committees on behalf of the owners of Maori land, local regional and central government, independent bodies such as the QEII National Trust and Nga Whenua Rahui Committee, and the broader community all have something to contribute to the process. The landowners are of course the key players, and the Department of Conservation would welcome opportunities to discuss with them any contribution it might make.

This report contains much general and specific ecological information on the four ecological districts. As such it is a significant reference work as well as a guide to conservation priorities. I commend it to all those with an interest in the land and its biodiversity.



Peter Williamson
Conservator
East Coast Hawke's Bay Conservancy

Abstract

The Tiniroto, Waihua and Mahia Ecological Districts, comprising the Wairoa Ecological Region, and the southern half of the Matawai Ecological District, were surveyed for the Protected Natural Areas Programme. The Matawai Ecological District is recognised and described here for the first time. It is an ecologically distinctive district with its own recognisable character, replacing parts of the Waiapu, Motu, Waioeka, Waikaremoana and Tiniroto Ecological Districts as previously mapped. A total area of 489 200 ha was surveyed to assess the representativeness of existing Protected Natural Areas (PNAs) and to recommend additional areas for protection. 871 sites containing approximately 64 545 ha were surveyed and their ecological character described; 449 sites in Tiniroto, 242 sites in Waihua, 93 sites in Mahia and 87 in the southern half of the Matawai Ecological District.

Existing protected natural areas comprise 20 610 ha or 4.3% of the total study area; 12 567 ha or 4.3 % of Tiniroto, 2067 ha or 1.6% of Waihua, 432 ha or 2.5% of Mahia and 5490 ha or 10.7% of the part Matawai Ecological District surveyed. In most cases the protected areas are strongly biased towards high-altitude sites in the north and west of the study area. Protected areas at lower altitudes and closer to the coast are generally small, or dominated by secondary vegetation. The major exceptions are Waingake Waterworks Bush, Morere and Mahia Peninsula Scenic Reserves and several areas in the Waihua Ecological District featuring coastal lagoons.

246 sites, covering 33 385 ha or 6.8% of the total study area, have been identified as Recommended Areas for Protection (RAPs); 143 RAPs covering 25 398 ha or 8.7% of Tiniroto, 56 RAPs covering 4955 ha or 3.9% of Waihua, 25 RAPs covering 1469 ha or 8.6% of Mahia and 22 RAPs covering 1568 ha or 3.1% of the southern half of Matawai Ecological District. The RAPs are described and mapped in the report. They encompass a much wider range of ecosystems than the existing protected areas in each district do and include cliffs, freshwater wetlands, lakes, estuaries and dunelands, in addition to areas of scrub and secondary and primary forest. The selection process has been guided by the principles of attempting to represent the full range of indigenous ecosystems on different land forms throughout each of the Ecological Districts.

Brief descriptions of the ecological character of the other study sites not identified as RAPs are provided in an appendix.

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1 Introduction

The Protected Natural Areas Programme (PNAP) was established to facilitate the protection of a network of areas which represent the full range of New Zealand's natural diversity as embodied in the Reserves Act 1977 (Section 3 (1) (b)). This identifies the need for:

"The preservation of representative samples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character."

Through the programme, natural vegetation and landscape values of each of the 268 ecological districts in New Zealand are identified, by a process of field survey and evaluation. Recommended Areas for Protection (RAPs) are selected from these surveyed sites, on the basis of their ranking using a set of sound ecologically-based criteria.

The study area covered in this report (Fig. 1) consists of the three contiguous ecological districts: Tiniroto, Waihua and Mahia which lie within the Wairoa Ecological Region as shown on the third edition maps of Ecological Districts and Regions of New Zealand (McEwen 1987). The present study also recognises a new ecological district, 'Matawai Ecological District', that incorporates the northern corner of the Tiniroto Ecological District of McEwen (1987); parts of the Waioeka and Waikaremoana Ecological Districts to the west; together with part of the Motu catchment to the north (Motu Ecological District); and an area of Waiapu Ecological District included in the Waiapu PNAP survey (Leathwick *et al.* 1995). Formal adjustments of the ecological district boundaries are proposed as a result of this survey.

This PNAP survey was structured into four main phases:

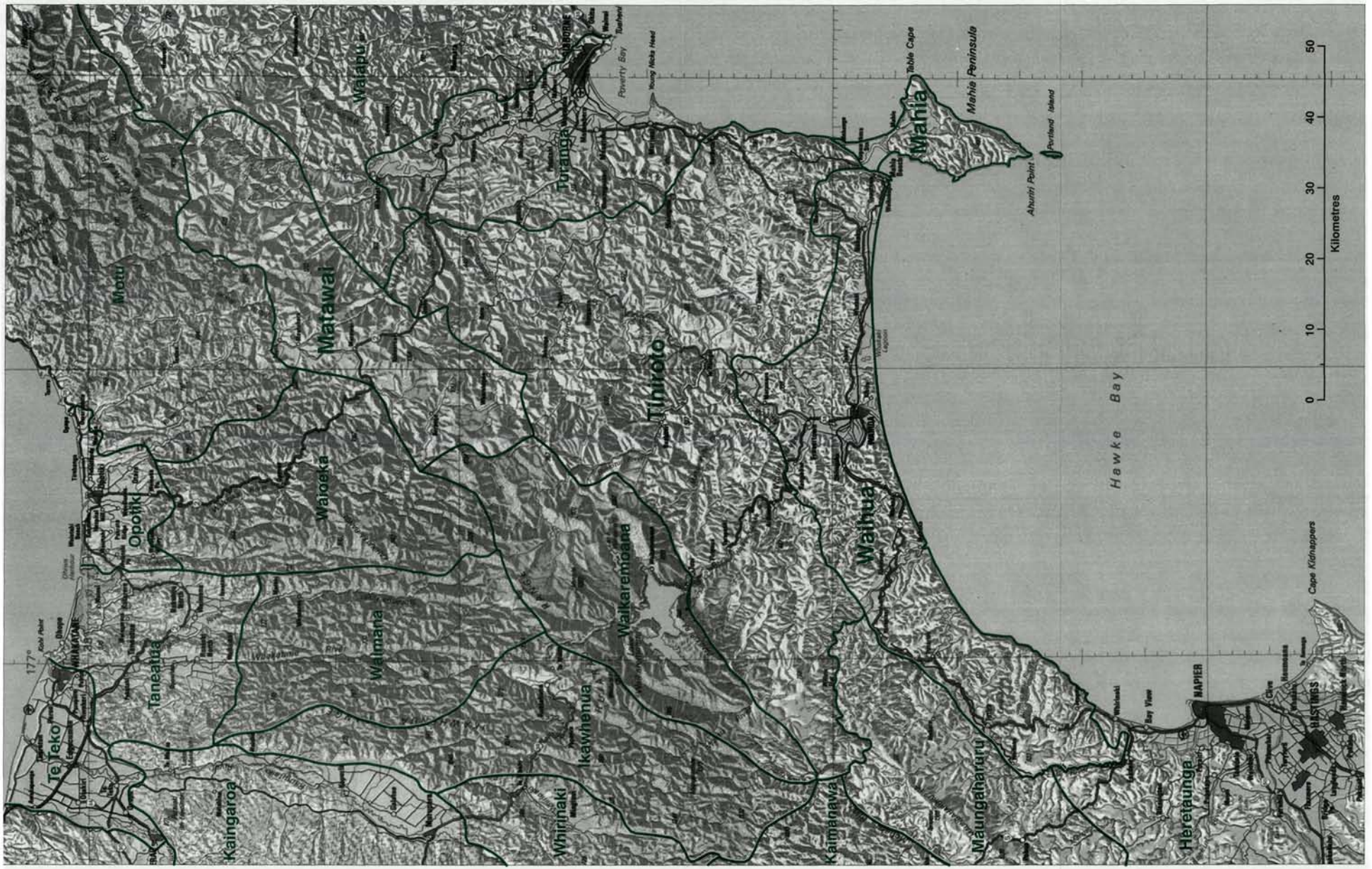
(i) a description of the ecological character of each district was built up from a review of existing publications, unpublished information, data from the survey, and expert knowledge - see Chapter 2;

(ii) remnants of natural vegetation were identified, visited, and described - methods for this phase are described in Chapter 3 and results summarised in Chapter 4;

(iii) information from the first two phases was then used to assess the adequacy with which the existing Protected Natural Areas (PNAs) encapsulated the character of the Ecological District - see Chapter 5; and

(iv) areas of high conservation value for which some form of protection is desirable were then identified as Recommended Areas for Protection - see Chapter 6.

FIGURE 1: LOCATION OF THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS.



2 Ecological Character of the Tiniroto, Waihua, Mahia and Matawai Ecological Districts

2.1 TINIROTO ECOLOGICAL DISTRICT

2.1.1 Location and setting

Tiniroto Ecological District covers approximately 292 800 ha; the district as defined by McEwen (1987) was originally 314 000 ha, but 20 000 ha of this in the north now contributes to the new Matawai Ecological District (Fig. 1). The district is almost triangular in shape. It has a broad base of interior hill country lying between the Waikaremoana and Matawai Ecological Districts and the more coastal/lowland Waihua and Turanga Ecological Districts; and a narrow band of elevated hill country extending to an apex at the coast and the Wharerata Hills north of Mahia Peninsula.

The main central part of the district drains to Hawke Bay via the Wairoa River and its many tributaries - the Waiau, Mangaaruhe, Ruakituri, Hangaroa and Mangapoike Rivers. The southwestern corner is drained by the Te Hoe and Mohaka Rivers. The northeastern edge is drained by western tributaries of the Waipaoa River which flows into Poverty Bay. The southeastern corner has several small coastal catchments including the Nuhaka River and Kopuawhara Stream.

Little is left of the original coastal and semi-coastal vegetation of the district. Almost all the large tracts of indigenous primary and secondary vegetation that remain lie towards the north and west where the cooler wetter climate and steeper topography meant forests was less easily cleared and cleared areas have regenerated well. Many of these large tracts are Crown-owned and administered by the Department of Conservation, e.g. Wharekopae, Mangatahae, Painga and Mangaone Conservation Areas, and Erepiti and Ruakituri Scenic Reserves. The only exception to the pattern of remaining large forest tracts is the 1104 ha Waingake Waterworks Bush which lies in the headwaters of the Te Arai River in the eastern corner of the district.

2.1.2 Geology and landforms

The district is underlain primarily by young sedimentary rocks mainly of late Tertiary (Miocene, Pliocene) age, especially sandstone, siltstone and mudstone with localised bands of limestone (notably Whakapunake, a dipping slab of limestone and the Mangaone Caves Scenic Reserve). It is structurally simple, dominated by great thicknesses of layered rocks dipping to the southeast on the northwest side of the district and dipping to the west on the eastern side of the district. Where thick layers of erosion-resistant sandstone or limestone alternate with softer rocks, scarps and many regular planar dip-slopes are prominent.

Hill summits are generally 300-500 m through the centre of the district, rising to 700-900m towards the northwestern edge and 700 m in the southeast, with Whakapunake, an isolated limestone massif standing above the centre of the district, the high point at 961 m.

Three clusters of lakes, at Tuai, Putere and Tiniroto, are associated with huge ancient landslides. There are other areas of deep seated landslides, but generally, although the rocks are very young and the hill-slopes are generally steep, erosion is less severe than that experienced in the deforested areas in the neighbouring Waiapu Ecological District, e.g. in the Waipaoa River catchment.

Valleys tend to be rather narrow and deeply entrenched, so that alluvial terraces and flood plains are narrow discontinuous strips occurring only in the larger valleys.

2.1.3 Climate

The Tiniroto District can be divided into four climatic 'regions'. The northeastern corner is a relatively dry zone lying in something of a rainshadow in respect of southwesterly and southerly winds, with a climate akin to that in the Turanga Ecological District. It has hot summers, dry northwesterly winds and moderate winters with annual rainfall between 1100-1500 mm. The upland area in the south-east including Mt Whakapunake and the Wharerata Ranges, has a cooler wetter climate, with more reliable and heavier rainfall from the southwest and southeast and a high annual rainfall of between 1500-2600 mm. Inland of this area towards the Waikaremoana Ecological District is lowland hillcountry also with elevated annual rainfall ranging from 1600-2200 mm, receiving spillover rain from the northwest as well as from the southerly quarter. The southwestern end of the district has a similar climate dominated by the gradient of elevation, temperatures and rainfall between the coastal and the inland ranges, but with less rainfall from the southwest and annual rainfall generally of 1400-1800 mm.

In addition to the four climatic 'regions' described above, there are four bioclimatic zones represented within the district. The coastal zone comprises the narrow zone extending up to 1 km inland from the coast, where the vegetation is often exposed to salt-laden winds and is characterised by low scrub of tauhinu, manuka and kanuka, and coastal forest dominated by karaka, ngaio, titoki and kohekohe. Inland of this is a narrow semi-coastal zone, featuring a number of species with a strong coastal affinity like kohekohe, kiekie and karaka. The bulk of the rest of the inland district lies within the lowland bioclimatic zone, extending from the semi-coastal zone to c. 700-800 m a.s.l. Small areas of the montane zone lie above these altitudes, with most of them lying near the northwestern upland edge of the district, except for a small area in the middle of the district centred on Mt Whakapunake.

2.1.4 Soils

The district has a complex of steepland soils from Tertiary rocks on steep slopes, formed from siltstone and hard sandstone; those on siltstone are moderately fertile, with those on sandstone less fertile and subject to shallow slips which heal slowly. Moderately to strongly leached and podzolised volcanic ash soils, formed from young coarse-textured banded rhyolitic ashes (Taupo Tephra, 1850 ± 10 yrs; Waimihia Tephra, 3280 ± 20 yrs) occur on stable sites. On terrace, rolling and hilly land, soils range from moderately to strongly leached. They podzolise in wetter areas where podocarps are common.

On the eastern side of the district sandstone is widespread, with rhyolitic tephra occurring on stable sites. Above 550 to 600 m a.s.l Humic Podzols (podzols) occur, while Typic Orthic Allophanic soils (yellow-brown loams) are present at lower elevations. The soils derived from sandstone, where annual rainfall is above 1500 to

1600 mm, are Orthic Brown soils (yellow-brown earths); and Immature Pallic soils (intergrades between yellow-grey earths and yellow-brown earths) occur in areas with lower annual rainfall. Orthic Recent soils (steepland soils), generally of low fertility, occur on steep slopes.

Tephra thickens towards central areas of the district, with Orthic Pumice soils (yellow-brown pumice soils) and Orthic Allophanic soils (yellow-brown loams) occurring on rolling and hilly slopes. Although these soils are not 'fertile' they do have good physical properties, allowing tree roots to penetrate deeply and thus stabilise the landscape.

Siltstones, mudstones and sandstones occur on steep and very steep slopes with Orthic Recent and Orthic Raw soils (steepland soils). Allophanic and pumice soils occur on flattish ridges, with Orthic Brown soils (yellow-brown earths) on other stable parts of the landscape. The least fertile soils occur on sandstone where slips heal slowly. The most fertile soils are those formed on mudstone and siltstone.

North of the Hangaroa River, towards Waikaremoana at elevations above 550 to 600m, Orthic Podzols (podzols) are formed particularly on young rhyolitic tephra on stable parts of the landscape (Rijkse 1978; 1979b). Podzolisation is a result of strong leaching conditions and acid litter-forming tree species such as rimu or beech. Shallower profiles on steep slopes are formed from banded sandstones and siltstones, mudstones and some sandstones form Orthic Recent soils (steepland soils), with Orthic Brown soils (yellow-brown earths) on stable parts of the landscape.

2.1.5 Historical vegetation cover

Little information is available on the original vegetation of the Tiniroto Ecological District, especially the inland portion. In contrast to Poverty Bay and Hawke's Bay, few early botanists appear to have spent much time there, with difficult access one of the major factors restricting early expeditions. Colenso's 1838 visit to Poverty Bay and Lake Waikaremoana via inland Tiniroto was the first recorded visit, during which he characterised a number of species which are an integral part of the district's flora, e.g. *Pittosporum ralphii* (Kirk 1896).

We can, however, extrapolate the broad vegetation pattern from early sketch and survey maps (c. 1868/69, Binney 1995), recent accounts (Grant 1996), existing forest remnants and from our knowledge of the autecology of the major species. Before Maori arrival most of the district was forested, except for those sites that had experienced natural disturbance (e.g. fire, erosion, wind throw), or had poor soils that supported only scrub (e.g. wetland margins, high altitude sites with leached soils). Extensive areas in the southern and central parts of the district and towards Waikaremoana were burnt by the Maori, to allow access into the interior and provide living and cultivation sites. By the time of European arrival in the district the most extensive tracts of original vegetation remained in the north around the upper Hangaroa River; in the west around the foothills of the southern Urewera; in the southwest around Putere and in towards the confluence of the Te Hoe and Mohaka Rivers; and in the wetter upland areas in the east between Mt Whakapunake and Wharerata.

The primary forests of the coastal lowlands, which form the eastern boundary of the district, had titoki, kohekohe, karaka, ngaio, tawa, puka, pukatea and nikau as common components. Karaka was locally dominant in the narrow coastal strip, occurring along with puriri, a tree now lost from the district. The commonest emergent tree was rewarewa, with emergent podocarps largely absent.

With distance from the coast kohekohe, karaka and nikau gradually became less common, disappearing around 300-350 m a.s.l. Lowland forests were dominated by tawa, with emergent rimu, matai, local totara, rewarewa, northern rata and kahikatea. Titoki, pukatea, kamahi and tawari (at higher altitudes particularly in the northwest/west) were also present in the canopy. Black beech was prevalent on the drier and less fertile ridges and spurs in the semi-coastal and lowland zones. The lowland forests towards the district's western boundary were a mosaic of rimu/tawa and rimu-matai/hardwood forest (Nicholls 1976).

With increasing altitude the lowland forests merged into rimu/tawa-beech forest, rimu/beech forest, and finally to pure red beech-silver beech forest in the cooler, wetter areas at highest altitudes, e.g. Mt Whakapunake. Species associated with this higher altitude forest included miro, Hall's totara, tanekaha, tawari, kamahi, mountain cabbage tree, broadleaf, mahoe wao and tree fuchsia. The understoreys were dominated by small-leaved and broadleaved shrubs (e.g. *Coprosma tenuifolia*, *Dracophyllum traversii*, haumakaroa, kanono, prickly mingimingi, *Pseudopanax anomalus* and young beech) and crownfern.

Many of the alluvial terraces in the major river valleys supported tall podocarp-rich forests, dominated by kahikatea, matai and totara. Pokaka, kowhai, narrow-leaved lacebark, houhere, black maire and titoki were also usually present in the canopy. Beneath these occurred a diverse array of small-leaved and divaricating trees and shrubs including heart-leaved kohuhu, young pokaka, turepo, shrubby mahoe, poataniwha, rohutu, kaikomako, weeping mapou, and *Teucridium parvifolium*.

There were no saline wetlands within the Tiniroto Ecological District. However freshwater swamp and wetland vegetation occurred around the numerous small lakes and wetlands. The lakes were clustered around Tiniroto (where there are more than 10), Tuai (where there are a number of spring-fed lakes lying around the margin of the slip that formed Lake Waikaremoana) and Putere (Lakes Rotoroa, Rotongaio, and Rotonuiaha), with small lakes, seepages and wetlands present throughout the district. The vegetation within and around the wetlands included sedgeland and rushland (with purei, *Carex geminata*, *Carex maorica*, *Carex virgata*, *Baumea rubiginosa*, sharp spiked-sedge, *Eleocharis gracilenta*, *Isolepis prolifer* and *Juncus procerus*) and raupo reedlands. Many of the wetlands and lakes also supported manuka/sphagnum scrub around their margins and on low hummocks amongst them (with swamp kiokio, forked sundew and tangle fern), and kahikatea-dominated swamp forests, with tall buttressed pukatea.

The coastal cliff faces in the east would have had a mosaic of low scrub, dominated by tauhinu and manuka scrub, shrubland, flaxland and coastal forest (dominated by karaka and ngaio). Vegetation would have been sparse in the less stable areas, with taller vegetation on the more stable gentler sites. The cliff vegetation would have merged into coastal forest on the slopes behind (as described above). The rocky slopes in the splash zone supported coastal herbfields that included sea primrose, *Senecio banksii*, shore lobelia and *Apium australe*. The sand binders pingao and spinifex; and sand stabilisers sand convovulus (*Calystegia soldanella*), pohuehue (*Muehlenbeckia complexa*), sand pimelea (*Pimelea arenaria*) and sand sedge (*Carex pumila*) may have been present on the narrow strips of sandy and rocky beaches along the base of the coastal hills and cliffs.

Secondary vegetation and scrub was originally (pre-Maori) far less important in the vegetation pattern of the district than now, occurring only on naturally disturbed (e.g.

burnt, or eroded) sites, or those of very low fertility, or on colder upland areas. Kanuka dominated secondary vegetation in the warmer and more fertile lowland areas of moderate rainfall, with manuka dominating on the stressed or less fertile and wetter sites, and at higher altitudes.

2.1.6 Flora

General

At least 409 native vascular plant species are known to occur in the district, all of which are listed in Appendix 3. This list has been constructed from the records of this survey, species lists of other botanists, and records from Auckland Museum (AK), FRI (NZFRI), and Landcare Research (NZCHR) herbaria. In some parts of the district the flora is quite well known, e.g. Hangaroa River valley, and Mt Whakapunake, with comprehensive species lists compiled for them by the late A.P. Druce, and by B.D. & B.R. Clarkson and others.

Threatened plants

Eight species on the latest threatened and uncommon plant species list (de Lange *et al.* 1999) are present within the Tiniroto Ecological District . All of these species are threatened as a result of habitat destruction/modification, and/or, because they are highly palatable to browsing by possums, goats, deer and stock. At present only kakabeak and *Hebe tairawhiti* lie within protected natural areas with the remaining species in sites now recommended for protection (RAPs). Substantial new populations of *Hebe tairawhiti* and the mistletoe *Tupeia antarctica* were discovered during this survey.

	SPECIES	COMMENTS
THREATENED		
CRITICALLY ENDANGERED	*Clianthus puniceus* (kakabeak)	an endemic shrub with showy red flowers that is common in cultivation but now rare in the wild. Recorded on cliffs in the Ruakituri Scenic Reserve and in RAP TIN 60.
ENDANGERED	*Mazus novae-zeelandiae*	a small rosette herb that occurs in open alluvial kahikatea forest in the upper Waikura River valley (Clarkson & Clarkson 1991b).
VULNERABLE	*Coprosma pedicellata*	a newly described shrub or small tree (Molloy *et al.* 1999) confined to wetland margins and in old clearings on alluvial terraces in the Waikura River Valley (Clarkson & Clarkson 1991b), where it was referred to as *C.* sp. (*v*) of Eagle 1986).
DECLINING	*Teucridium parvifolium*	a small-leaved shrub that has been recorded in several sites in the Waikura River valley beneath kahikatea swamp forest (including RAP TIN 32). Highly palatable to introduced browsing animals, it now has a very restricted distribution within the district.
	Hebe tairawhiti	a newly described shrub (Clarkson & Garnock-Jones 1996). Four new populations of this plant were recorded in the district during the present survey, the largest of which lies within Waingake Waterworks Bush.
	Tupeia antarctica	probably the most threatened mistletoe species in the DoC East Coast Hawkes Bay Conservancy, it was recorded at 2 sites within the district during this survey; on tree lucerne and five finger in regenerating forest near Tiniroto in the centre of the district (RAP TIN 42 & 43).
	Ileostylus micranthus	a leafy mistletoe which occurs in a small population at Otoko, growing on a range of native and exotic hosts including silver poplar, tree lucerne, London plane, liquidambar, and mapou.
RECOVERING		
CONSERVATION DEPENDENT	*Pittosporum obcordatum* (heart-leaved kohuhu)	a tall shrub or small tree, it has been recorded in kahikatea-matai forest on alluvial terraces in the Waikura River valley.
Distributional limits	tawari (*Ixerba brexioides*)	a sub-canopy tree of leached soils that reaches it southern limit on the East Coast in the Tiniroto Ecological District, in forest in the headwaters of the Tukipapa Stream, a true left tributary of the Mohaka River.

2.1.7 *Fauna*

Forest clearance, and predation and browsing by introduced mammals, have caused huge losses of wildlife in this district, as in most others in New Zealand. Of forest birds historically present, the huia, stitchbird, tieke (saddleback) and kakapo have all disappeared in the last century; the first two are extinct and the others are now confined to offshore islands.

Rasch (1989) lists 116 sites of special wildlife interest in the Tiniroto Ecological District, of which 16 have 'moderate-high' ranking and four have 'high'. Two of the four 'high' ranking sites (Waiparapara Stack and Mahanga Stack) are coastal breeding sites for grey-faced petrel. The third is a aggregation of the Tiniroto lakes (of which there are 10) and associated ponds and wetlands, that are used by a wide range of waterbirds, including NZ dabchick, Australian coot and spotless crake. The final highly ranked site is the large Te Hoe Gorge forest (comprised of RAP TIN 141 and 142, and a QEII covenant), a mosaic of primary, partly logged regenerating forest and secondary scrub which held kiwi at the time of ranking.

All bird species present in the district are listed in Appendix 5. There are five 'endangered' or 'vulnerable' species (Collar *et al.* 1994): North Island brown kiwi, NZ dabchick, Australasian bittern, whio, NZ dotterel and North Island kaka. Kiwi were relatively widespread in many forest and scrub areas up until 15-25 years ago. They are now confined to the upper Mohaka catchment (J. McLennan pers. comm.). Whio were recorded by Rasch (1989) in the Papatu Scenic Reserve and the Nuhaka River, at their eastern limit but have not been recorded in recent years. All of these species occur as relict populations struggling against the double-edged sword of large-scale habitat change and predation. Weka were quite widespread in the district until recently (1982), occurring throughout the north, and extending to Bartletts and Te Reinga in the south. Since that time their numbers have declined, leaving only small scattered populations around Rakauroa and north of Motu township (Matawai Ecological District). Reasons for this decline include drought, habitat degradation, predation (especially by ferrets and cats) and the loss of wildlife corridors (Beauchamp 1997). They vanished from most of the North Island between 1890 and 1925.

Common forest birds such as bellbird, tui, grey warbler, silvereye, kingfisher and fantail occur in most forest remnants (Shaw 1989). Whitehead, tomtit, kereru, NZ falcon and rifleman are present in larger, more intact forest blocks (Rasch 1989). Rarer wetland birds present include NZ dabchick, white heron, Australasian bittern, spotless crake and fernbird. There is also the usual suite of introduced birds present within the district, like song thrush, starling, blackbird, sparrow, myna, Californian quail and Australian magpie.

Mammals, amphibia, fish and molluscs recorded from the district are in Appendix 6. There are records of long-tailed bats, the only native mammal, from scattered localities in the district (King 1995) often associated with forest remnants that contain old podocarps along the major river valleys (e.g. Hangaroa River). Introduced mammals are abundant and widespread in this district, as in most others and many forest remnants are still grazed by sheep and cattle. Among wild mammals, possums, red deer and feral goats in particular have had major effects on native vegetation. Possums are present throughout, red deer are more abundant in the wetter areas in the northwest and feral goats are common almost throughout the district except where locally controlled. Together they selectively browse palatable species at all levels of the

forests and scrub they inhabit. In the worst case they reduce vegetation in lower tiers to a suite of unpalatable species such as lowland and mountain horopito and crown fern. Possums browse is most obvious on palatable species such as tree fuchsia, mahoe, northern rata and mamaku. Their impact on the vegetation has been far-reaching, with many palatable species now uncommon or entirely absent in some areas. They also prey directly on birds and their eggs and on large invertebrates. Several populations of feral sheep exist in the Mohaka River valley, but the damage they inflict on natural areas is likely to be similar to that of domestic sheep in the area.

2.1.8 Landuse

Clearance of forested areas for pastoral farming began in the district during the 1870s, with a period of extensive clearance between 1880-1920. Pastoral farming is now the predominant landuse (semi-extensive sheep and cattle). However there has been a notable expansion of exotic forestry in recent times. Early plantings (1960-70s) tended to be in hill country areas of low fertility that were marginal for pastoral farming, but in recent years a wider variety of more fertile accessible hill country has been planted. Large tracts of exotic forests are well established at Wharerata and north of Raupunga near the Mohaka River.

2.1.9 Relation to adjoining districts

Seven ecological districts abut the Tiniroto Ecological District, including the newly delineated Matawai Ecological District, as follows.

Turanga to the northeast has lower hill country and wide-floored tributary valleys clustered around the central feature of the Waipaoa River's extensive alluvial/coastal plain, which dramatically contrasts with Tiniroto. Turanga is warmer and has a lower and less reliable rainfall compared with Tiniroto, as it is more sheltered from the northwest and southwest. It has far fewer and smaller areas of indigenous vegetation remaining and more intensive landuse. The ecological district boundary is delineated after Clarkson & Clarkson (1991c), a slight modification from McEwen (1987).

Waiapu to the northeast includes similar soft-rock hill country, that is mainly deforested, in the rainshadow of main ranges in respect to northwesterly weather. Waiapu however, compared to Tiniroto, has a wider range of rock types, particularly those that are older and weaker, and consequently less stable and subject to severe erosion. Waiapu gets little rain from the the southwest and is more drought prone compared with Tiniroto in general. The specific boundary line along the Waikohu River valley is essentially arbitrary.

Matawai to the north has a different topographic style compared to Tiniroto: broad valleys with gentle to moderate slopes and extensive terraces and alluvial flats at quite high elevation, that are separated by bold massifs of relatively erosion resistant rocks e.g. Maungatapere. The climate is cooler with a higher and more consistent rainfall than the adjoining part of Tiniroto as it receives substantial rainfall from the north-westerly quarter. Consequently silver beech is a prominent feature of the original vegetation down to the valley floors, unlike Tiniroto and kanuka is essentially absent from secondary vegetation. Matawai Ecological District and its boundary to Tiniroto were not previously recognised. McEwen (1987) has Tiniroto abutting directly against Waioeka Ecological District.

Waikaremoana to the west is a continuation of similar geological pattern to the northwestern part of Tiniroto into slightly older Tertiary sedimentary rocks, but it has

substantially higher relief and altitude, with bolder topography and large lakes (Lakes Waikaremoana and Waikareiti). Waikaremoana is also cooler with higher rainfall (generally 2000-2500 mm p.a.) and less fertile soils compared with the nearby parts of Tiniroto, which made it less attractive for clearance for farming and it therefore retains most of its primary forest. Several of the major rivers of the Tiniroto Ecological District, the Hangaroa, Ruakituri, Mangaaruhe and Waiau, have their headwaters in the Waikaremoana Ecological District.

Kaimanawa Ecological District abuts Tiniroto for c. 2 km in its southwestern corner, west of Te Kooti's Lookout. The district is in total contrast to Tiniroto with its mainly continuous steepland greywacke hillcountry and extensive areas of continuous primary forest.

Maungaharuru to the southwest across the Mohaka River is a continuation of the geological and topographical pattern of the northwestern edge of Tiniroto, but is simpler, dominated by the single very large scarp and dip-slope of the Maungaharuru Range. This rises to a much higher altitude (1308 m) compared with the hills in Tiniroto, with extensive areas above 900 m, and consequently higher rainfall and rainshadow effects. There are also thicker deposits of Taupo-derived volcanic tephra, close to source.

Waihua to the south is a closely related district that lies towards the Hawke Bay coast, but which has lower altitude hills, wider alluvial valleys and a warmer drier climate with greater coastal influences compared with Tiniroto. The boundary has been substantially re-aligned and simplified from that of McEwen (1987), in order to consistently separate the warmer more coastally influenced Waihua Ecological District from the 'interior' character prominent in Tiniroto. Where Waihua abuts the semi-coastal zone at the southeastern corner of Tiniroto Ecological District, the boundary is placed along the drainage divide between those streams flowing south to Hawke Bay and those flowing east to the more abrupt eastern coast.

Mahia to the southeast is a former island now joined to the mainland by a narrow isthmus of sand dunes, alluvium and estuarine sediments. The extensive coastal terraces and dominant coastal influence of the Mahia Ecological District contrast with Tiniroto, with its coastal zone of very limited extent and with high hills falling directly to the sea.

2.2 WAIHUA ECOLOGICAL DISTRICT

2.2.1 Location and setting

Waihua Ecological District, with an area of c. 128 300ha, consists of the lowlands of the northern Hawke's Bay (Fig. 1). It extends from Tangoio and Esk in the south, to Waikokopu in the east. The population of the district is centred on Wairoa.

The district essentially covers a zone extending for the most part c. 15 km inland from northern Hawke Bay, that includes lowland and coastal hillcountry, broad fluvial valleys, cliffs and coastal lagoons. It is crossed by many small rivers and streams in coastal catchments, and a few larger ones that have their origins in inland districts, e.g. the Esk, Waikari, Mohaka, Waihua, Wairoa and Nuhaka Rivers. The Wairoa River in the central portion of the district is the largest of these.

Primary forest and wetlands, both coastal and inland, now occupy only a small percentage of their original extent in the district and are diminished in quality. Burning, clearance, logging, drainage and the impacts of introduced mammals have all contributed to the loss of much of the district's natural features.

2.2.2 *Geology and landforms*

The Waihua Ecological District is underlain by uplifted, gently dipping, marine sedimentary rocks of late Pliocene and early Pleistocene sediments (i.e. very young rocks mainly 1-3 million years old). In the central and eastern part of the district siltstone and mudstone are predominant, on which moderate to steep hill-slopes have formed. In the southwest interlayered limestone, mudstone and sandstone underlie a varied topography, with broad undulating tephra-covered ridges and steep-sided valleys with limestone bluffs.

The major rivers of the Waihua Ecological District are as mentioned the Nuhaka, Wairoa, Waihua, Waikari, Mohaka and Esk. The Esk River forms the southern boundary of the Ecological District. The rivers in the northeast reach the coast via alluvial flood plains, with lagoons at their mouths (e.g. Wairoa and Nuhaka Rivers); in the south the rivers and stream are deeply incised and emerge from the hills between steep and erodible coastal cliffs.

A barrier beach has been thrown up by the sea against most of the low lying coast between Opoutama and the Wairoa River mouth/Whakamahi Lagoon. The Wairoa and Nuhaka Rivers flow through this barrier, but elsewhere extensive lagoons and wetlands, partially infilled by alluvial silt, have been trapped behind. Most of the wetlands have been drained, but ten brackish or freshwater lagoons, Whakaki being the largest, have survived modification. Isolated hills between the lagoons emerge from the coastal plain, and reach the coast at several points.

West of Whakamahi Lagoon the coast is almost continuously steep to the sea with smoothly truncated ridge systems generally 100-200 m high. The young mudstones and siltstones are actively eroded and cliffed by the sea in some places. Elsewhere, narrow fringes of beach sand give sufficient protection for the steep faces to have stabilised and become vegetated. The Mohaka River, and the much smaller Waihua and Waikari Rivers, cut dramatically through these hills and sets of higher alluvial terraces to reach the sea very abruptly. The Mohaka River, which drains an extensive area of the main axial ranges, carries a heavy bed load of mainly greywacke gravel. The resulting dark gravels and coarse sand dominate the beaches of northern Hawke's Bay (Fromont 1990).

South of the Waikari River the hills are somewhat higher at 300-500 m a.s.l. The coast becomes even more abrupt with coastal cliffs over 200 m high, interrupted with narrow incised river valleys, including those of the Aropaoanui and Moeangiangi Rivers. Large scale collapse of sections of these cliffs during the 1931 Napier earthquake has been followed by re-cliffing of the fallen debris.

2.2.3 *Climate*

The Waihua Ecological District has a generally warm climate with moderate rainfall. It can be divided into three climatic regions; the southern between Esk and Putorino; the central between Kotemaori and Whakaki; and the eastern between Whakaki and Opoutama. There is a marked rainfall gradient from south to east: the southern region

is the driest (average annual rainfall 1100-1900 mm), the central region intermediate (average annual rainfall 1400-1900 mm), with the eastern region having the highest and most reliable rainfall (average annual rainfall 1500-2200 mm). All zones occasionally experience very heavy rainfall from the southeast quarter. However, the more common southwesterly rainfall events following cold fronts generally bypass the southern zone and concentrate most on the eastern zone. Humidity follows the same pattern as rainfall, averaging 63-66% in the south, 66-70% in the centre and 70-73% in the east. The months of October and November record the lowest humidity figures in the district, with the maximum around July during mid-winter (Fromont 1990). The lower average rainfall and humidity in the southern region of the district relates to the degree of rainshadow and fohn wind effect from northwesterly winds over the high/ extra barrier of the Maungaharuru Range, compared with regions further northeast.

Winds tend to be channelled down river valleys, as is the case in Wairoa which has a large percentage of northerlies. The appearance of cyclonic storms makes the overall rainfall of the district more variable than that of most ecological districts in New Zealand. The maximum rainfall in all regions is in winter, with minimums occurring in either spring or summer.

In addition to the three climatic regions described above, there are three bioclimatic zones represented within the district. The coastal zone comprises a narrow zone extending up to 1 km inland, where there is a strong maritime influence on the vegetation (exposure to salt, moderation of temperature extremes by the sea's proximity). Karaka, kohekohe, nikau, ngaio, wharangi, titoki and kiekie are indicative forest species of this zone. Inland of this is a band of semi-coastal zone featuring a number of species with a strong coastal affinity like kohekohe, kiekie and karaka. In the southern part of the district (from about Raupunga), however, kohekohe is completely absent from the coastal and semi-coastal vegetation. The rest of the district, in the north and southwest (around and south of Lake Tutira), lies within the lowland bioclimatic zone. It has a slight growing season moisture deficit (Fromont 1990).

2.2.4 Soils

The soils of the Waihua Ecological District are moderately leached hill and steepland soils on hill country from mudstone and banded sandstone and conglomerates with thin, variable ash cover; deep well drained volcanic ash soils on terrace and rolling land from young, sandy rhyolitic ashes (Taupo, Waimihia) over brown sandy ashes; alluvial soils on river flats, mainly with poor drainage; and excessively drained sandy soils on coastal dunes.

The dune landscape east of Wairoa consist of a complex of excessively drained sandy Brown soils (yellow-brown sands) on the dunes and poorly to imperfectly drained Sandy Gley soils (gley soils) in swales (Rijkse 1979a). Organic soils occur in wetlands west and around the Whakaki Lagoon.

Alluvial plains occur extensively along the Wairoa and Nuhaka Rivers (Rijkse 1980), and inland of the dunes. Well drained Typical Fluvial Recent soils (recent soils) occur adjacent to the stream beds and flood frequently. Older Weathered Fluvial Recent soils (Recent soils) occur on narrow levees and are well drained. Imperfectly to poorly drained Fluvial Gley soils (gley soils) occur further away from the levee and occupy the greatest proportion of the alluvial plains.

Higher terraces flank the alluvial plains and occur along the Waihua, Mohaka and Waikari Rivers. Soils of these terraces are imperfectly to poorly drained Typic Orthic Gley soils (gley soils) derived from rhyolitic tephra. Large flat surfaces in the Nuhaka catchment are well drained Orthic Pumice soils (composite yellow-brown pumice soils on yellow-brown loams) derived from shallow Waimihia Tephra overlying weathered rhyolitic tephra and loess. These soils are characterised by high phosphate retention.

The soils on the hill and steepland country in central and northern parts of the district are formed from fine and coarse sandstone, siltstone and mudstones, with tephra (Taupo Tephra and Waimihia Tephra) only on stable parts. Much of the area has eroded with Orthic Recent and Raw soils (steepland soils) predominant. Generally the sandstones are less fertile and produce slips that heal slowly compared to those on soils from mudstone and siltstone. Pallic Orthic Brown (near the coast) and Typic Orthic Brown soils (yellow-brown earths) occur on ridges and spurs. Large slumps, mapped in Pakarae series (Rijkse 1979a), occur locally.

2.2.5 Historical vegetation cover

Natural fires, caused by volcanic activity and lightning, have occurred sporadically in this part of the country for thousands of years. Periods between these events would generally have been sufficient to permit normal succession back to forest (Wardle 1991). However, following human arrival the frequency with which fire struck the forests and shrublands increased substantially. The effects of fires in the eastern region of the North Island were more marked than in places west of the ranges (Newsome 1987). The 'rainshadow' effect of the ranges on this area meant that the forests regularly became tinder dry on the drought-prone hills and plains. Repeated fires raced through them and, as a consequence, forest was eliminated from much of the lowlands of northern Hawke's Bay well before the arrival of Europeans.

Originally all land in the ecological district, except for minor areas (waterways, slips, coastal scarps, and beaches) was forested. By the time of European settlement, the primary forest of the coastal hills and much of the inland hills had largely been replaced by fire-induced secondary shrubland, fernland and grassland (Smale 1994). European settlers continued the trend, burning scrub and fernland to establish pasture. These latter fires continued to encroach on remaining tracts of forest further reducing their extent. They also logged remaining tracts, which by the early 1900s had been exploited for local timber use and building materials.

The original coastal forests were a mosaic of karaka, tawa, kohekohe, nikau, ngaio, wharangi and titoki with scattered emergent rewarewa on the hillslopes, with kahikatea and matai dominant on fertile alluvial terraces, moist stream side slopes (e.g. Waipatiki Domain), and lagoon (e.g. Whakaki Lagoon) and wetland margins. Hill-slopes in the semi-coastal and lowland bioclimatic zones supported tawa-dominated forest, with emergent rimu, matai, miro, kahikatea, northern rata and occasional totara (Guthrie-Smith 1953). Pukatea, white maire, hinau and titoki were also present amongst the canopy, along with epiphytic *Astelia* spp., ferns, orchids and puka. The semi-coastal forest (from 1 km inland) also contained a number of species with coastal affinities e.g. kiekie, karaka, nikau and kohekohe, although kohekohe was absent from semi-coastal forests in the southern part of the district, from about Raupunga (see 2.2.6 *Distributional limits* below). All these forests would have had a diversity of lianes (including native jasmine, supplejack, kohia, bush lawyer, *Metrosideros colensoi*, *Metrosideros diffusa* and kiekie closer to the coast), ferns, shrubs and seedlings in their understoreys.

Black beech occurred on dry ridges and spurs amongst the lowland forest. Relict stands indicate that the species was formerly more widespread in the district, especially in the central and eastern areas amongst the rimu/tawa forest. It is the only beech species able to withstand the climatic conditions that occur within the district (e.g. low humidity). Totara also dominated ridges in places.

The alluvial terraces and flood plains of the Nuhaka, Wairoa and Mohaka River valleys supported podocarp rich forests of kahikatea, matai, rimu and totara. Kahikatea dominated on the wetter and most fertile sites, with matai on better drained fertile sites, and totara and rimu on drier sites and on older terraces where the soil was more leached (Fromont 1990). Black maire, titoki, pukatea and occasional tawa were also present amongst the tall podocarp canopy. Only disturbed sites (e.g. canopy gaps) had the high concentrations of even-aged kahikatea now seen in some remnants. Beneath this occurred a diverse assemblage of divaricate shrubs, including turepo, shrubby mahoe, poataniwha, rohutu, pokaka and the now rare heart-leaved kohuhu.

The vegetation along river gorges and steep stream sides in the district were characterised by scattered broadleaved shrubland, fernland, flaxland and podocarp-dominated forest where it was most stable. *Pittosporum ralphii*, kohuhu, tuhara, whaririki, kiokio, New Zealand broom, kowhai, tutu, houhere, toetoe, *Chionochloa fulvida* and koromiko were all abundant. Kakabeak, a species now lost from the district, was also present (Guthrie-Smith 1953). Damp seepage areas had an array of herbaceous species including *Jovellana sinclairii*, puatea, NZ eyebright, native oxalis, tuhara, *Gunnera monoica*, *Mazus novae-zeelandiae*, *Nertera depressa*, panakenake and *Laginifera pumila* (Guthrie-Smith 1953). Cliffs along the coast supported low shrubland, and flaxland with hangehange, kawakawa, pohuehue (*Muehlenbeckia complexa*), *Hebe tairawhiti*, karamu, common maidenhair, *Chionochloa flavicans*, whau, whaririki, taupata, *Hebe stricta* var. *macroura* and *Senecio banksii*.

Sand dunes and gravel beaches, which were largely confined to the coast west of Wairoa supported typical beach vegetation. On the more dynamic foredunes the sand binders spinifex and pingao would have dominated. The back dunes, which tend to be more stable, supported a range of sand stabilisers including sand convolvulus (*Calystegia soldanella*), pohuehue (*Muehlenbeckia complexa*), sand pimelea (*Pimelea arenaria*), coastal scabweed (*Raoulia australis*), sand sedge (*Carex pumila*) and sand coprosma (*Coprosma acerosa*). Dune hollows, closer to the water table, allowed the formation of dune slacks which supported a range of turf or wetland plants (e.g. *Selliera radicans*, *Leptocarpus similis*, zoysia and *Lilaeopsis novae-zelandiae*). The beaches of coarsest gravels and pebbles would have had only low beach ridges, built by storm waves (Partridge 1992). The vegetation would have been more sparse, with only a few of the species which occur on sand dunes present, e.g. sand sedge and sand convolvulus.

Extensive lagoons like Whakaki (predominantly freshwater) and Whakamahi (saline) would have once been forested on their inland margins by kahikatea-dominated swamp forests. The freshwater lagoons also contained extensive flaxlands that originally supported a flax harvesting industry that began in the 1830s. The margins of the lagoons were dominated by sea rush rushland often in monoculture with saltmarsh ribbonwood along the outer margins, raupo reedland, and turffield of sea primrose, bachelors button, selliera, glasswort, *Lilaeopsis novae-zelandiae* and zoysia.

Inland (lowland) freshwater wetlands, of which there are few now remaining in the district, had an array of species including swamp kiokio, *Juncus novae-zelandiae*, *Juncus planifolius*, *Carex maorica*, purei, giant umbrella sedge, bamboo spiked-sedge, burr-reed, raupo and harakeke. Lakes, e.g. Lake Tutira, had a similar suite of species around their margins, including raupo reedland and harakeke flaxland.

Secondary vegetation was present where natural disturbance (e.g. fires, erosion) had occurred. Bracken fernland and manuka scrub were often the early colonisers on these sites, particularly in the driest southern parts of the district (Guthrie-Smith 1953), with kanuka often the next dominant in the succession. However, in the moister more fertile sites, particularly in the central and eastern parts of the district, kanuka often colonised first. Other species amongst the scrub were tauhinu, mingimingi, red-fruited karamu, Strathmore weed, *Pimelea tomentosa*, dwarf pomaderris, spoon-leaved sundew and the orchids *Microtis uniflora* and *Thelymitra longifolia*.

2.2.6 *Flora*

General

A total of 260 native vascular plant species have been recorded in the Waihua Ecological District (Appendix 3). This includes those species recorded during this survey, and records from the FRI (NZFRI), Auckland Museum (AK), and Landcare Research (NZCHR) herbaria. Historical records come from Guthrie-Smith (1953).

Threatened plants

The latest threatened and local plant list of New Zealand (de Lange *et al.* 1999) includes seven vascular plant species that occur within the Waihua Ecological District. Most of the species are threatened because either their habitat has been or continues to be destroyed or degraded, or because they are palatable to introduced mammals (e.g. feral goats, possums, sheep and cattle). Only one of these species, heart-leaved kohuhu, lies within a formally protected natural area; Huramua Nature Reserve, with all but pingao now within RAPs. *Mazus novae-zeelandiae* had not previously been recorded in the district prior to this survey.

	SPECIES	COMMENTS
THREATENED		
ENDANGERED	*Mazus novae-zeelandiae*	a small perennial rosette herb found around the margins of Ohuia and Little Ohuia lagoons (RAPs WAH 14 & 15) during this survey .
DECLINING	*Hebe tairawhiti*	a newly described shrub (Clarkson & Garnock-Jones, 1996), it occurs in several populations in the east of the district including RAP WAH 2.
	Pimelea tomentosa	a small coastal shrub with local distribution, that was recorded in RAP WAH 1.
	Tupeia antarctica	this leafy mistletoe, probably the most threatened mistletoe species in the DoC East Coast Hawke's Bay Conservancy, has been recorded in 'The Hanger' (RAP WAH 52) on Tutira Station. Possums continue to threaten this small population.
RECOVERING		
CONSERVATION DEPENDENT	*Dactylanthus taylorii*	a root parasite that has been significantly reduced in its distribution and abundance in many parts of New Zealand by habitat destruction and introduced mammal browse. Only one population of this plant is known to occur within district, in RAP WAH 20.
	Desmoschoenus spiralis (pingao)	one of our native sand binders, it is known to occur in the district only in a small populations on sand dunes near Nuhaka.
	Pittosporum obcordatum (heart-leaved kohuhu)	a divaricating shrub with a disjunct distribution. In the Waihua Ecological District it occurs naturally only within Huramua Nature Reserve.
Distributional limits Three species reach their distributional limits within the Waihua Ecological District:		
	Raoulia australis (coastal scabweed)	a low growing cushion plant, occurs at its northern limit in sand dunes south of the Whakaki Lagoon (Partridge 1992). This is the only recorded occurrence of this plant within the district.
	Dysoxylum spectabile (kohekohe)	a tall forest tree, reaches its southern limit in Hawke's Bay at the Mohaka River, just east of Raupunga. It is not found again on the eastern North Island until southern Wairarapa (Fromont 1990). This species may always have been absent from this area, perhaps because of the stressful environmental conditions; very low humidity and severe soil moisture deficits.
	Hebe tairawhiti	reaches its western limit, just west of Wairoa township.

2.2.7 *Fauna*

Waihua Ecological District has suffered extensive loss and modification of its natural areas, especially forests, and this is reflected in the depauperate fauna that now inhabits the remainder. Only those native forest bird species which still enjoy relatively widespread distribution in northern lowland New Zealand are present in the district, including kereru, tui, bellbird, grey warbler, fantail, shining cuckoo, long-tailed cuckoo, morepork and kingfisher (Rasch 1989, Appendix 5). There is also the usual suite of introduced birds like song thrush, starling, blackbird, sparrow, myna, Californian quail and Australian magpie.

Kokako, tieke (saddleback), robin, whio, weka, kaka and falcon were all abundant in the district in pre-European time, "long before the inroads of settlement" (Guthrie-Smith 1953). By the mid-late 1800s, however, habitat destruction and the gradual spread and increase of introduced mammals had ensured that most were locally extinct.

Rasch (1989) lists 26 sites of special wildlife interest (SSWIs) in the district[1], of which eight are ranked moderate-high and two are ranked high. Only three forest sites (Morere Scenic Reserve, Tutaekuri Forest, and Raupunga Water Reserve) are among these. The other seven are coastal lagoons or river mouths. Although these have also suffered human modification, what remains are especially important as wildlife habitats, supporting a diverse range of migrant and resident bird species. These include spotless crake, Australasian shoveler, NZ scaup, grey teal, grey duck, fernbird, NZ dabchick, Australasian bittern, royal spoonbill, pied shag, wrybill, and pied stilt. Their associated beaches, coastal outcrops and dunelands also support many important birds such as variable oystercatcher, reef heron, Australasian gannet, banded dotterel, NZ dotterel and various gulls and terns (Rasch 1989, Appendix 5). The northern subspecies of the NZ dotterel reaches its southern limit within the district.

Mammals, amphibia, and freshwater fish known from the district are listed in Appendix 6. Only the long-tailed bat is definitely known to occur within the district, with records from the Morere and Waiatai valley areas (Fromont 1990). Many of the freshwater fish present are migratory. Eels, grey mullet, lamprey, smelt, inanga and other galaxiids all move between salt and fresh water at some stage in their life cycle.

Introduced mammals are widespread and catastrophic pests in this district, as elsewhere. Possums are ubiquitous. Their selective browsing of palatable species, particularly in the canopy and sub-canopy, has reduced the abundance of many characteristic lowland species (e.g. wharangi) in remaining forests and impaired the health of others that remain (e.g. kohekohe). Feral goats browse the understorey and subcanopy of the forests, leaving only a suite of the least palatable species. This has undoubtedly altered the natural successions in many natural areas by reducing the regeneration of many tree, shrub, fern and herb species. Some highly palatable species such as whau, NZ broom and *Libertia grandiflora* are now threatened in the district. Even vegetation on steep cliffs and bluffs is not immune from damage, since goats can negotiate the most steep and difficult terrain. This browse and trampling has also accelerated erosion on these steeper sites. Only those few native forests that have been well-fenced, and subjected to frequent goat control, show signs of recovery from their destructive influence.

[1] Rasch (1989) covers natural areas in that part of the ecological district that lies within the Wairoa District boundary, therefore those areas southwest of the Waikari River are not included.

2.2.8 *Landuse*

Today the Waihua Ecological District is largely modified; long-term burning, logging and clearance has removed much of the original vegetation and drainage has destroyed or severely modified many of the wetlands and lagoons. Pastoral farming, mainly of drystock, is the most widespread landuse. However, extensive areas of the district now support exotic forestry, with new plantations currently being established. There are also small areas of intensive horticulture, and minor cropping on fertile alluvial terraces (e.g. around the Wairoa River and Whakaki Lagoons).

2.2.9 *Relation to adjoining districts*

Four other ecological districts abut the Waihua Ecological District (McEwen 1987), as follows.

Mahia in the east is a former island now joined to the mainland by a narrow isthmus of sand dunes, alluvium and estuarine sediments. It shares much of its coastal character with Waihua, but being a narrow peninsula the coastal influences on it are far stronger, e.g. milder winters and a drier windier climate. Unlike Waihua, Mahia has extensive elevated marine terraces, though the isthmus's dune-lagoon alluvium is analogous to the coastal plains east of Wairoa. Most of the peninsula is farmed, with only isolated remnants of the original coastal forest remaining.

Tiniroto to the north is closely related to Waihua. It is an inland continuation of similar hillcountry landforms, but has narrower valleys with more limited alluvial terraces, higher steeper hills, higher more reliable rainfall, and cooler temperatures especially in the winter. The Waihua and Tiniroto Ecological Districts are largely divided on the basis of soil moisture status, which is strongly related to altitude, temperature and rainfall. The boundary has been substantially re-aligned and simplified from that of McEwen (1987), in order to consistently separate the warmer more coastally influenced Waihua Ecological District from the 'interior' character prominent in Tiniroto. At its eastern end, where Waihua abuts the semi-coastal zone of the Tiniroto Ecological District, the boundary is placed along the drainage divide between those streams flowing south to the Hawke Bay coast and those flowing east to the more abrupt eastern coast.

Maungaharuru, inland of the south-western end of Waihua, is away from coastal influences and reaches much higher altitudes (to 1308 m a.s.l. in the Mangaharuru Ranges). It has a simpler topography with seaward tilted dip-slopes of sandstone/ limestone beds, higher rainfall and a generally cooler climate compared with Waihua. The boundary between the two districts lies along the topographic trough that separates the coastal hills from the interior. Mangaharuru is strongly influenced by easterly and southerly winds as well as receiving substantial rainfall from the north-west, with calm periods relatively rare (Fromont & Walls 1988).

Heretaunga to the south has a much more subdued topography of coastal and alluvial plains and low hills compared with Waihua. Its rainfall is markedly lower than in Waihua, as it lies in the rainshadow of the high ranges to the northwest, and coastal hills to the south. Intensive agricultural and horticultural development has extensively modified almost all of this ecological district, with only about 3% of the land now covered in native vegetation (Fromont & Walls 1988).

2.3 MAHIA ECOLOGICAL DISTRICT

2.3.1 Location and setting

The Mahia Ecological District covers c. 17 100 ha, encompassing Mahia Peninsula, the narrow isthmus which connects it to the mainland and Portland Island which lies c. 1.5 km from the southern tip of the peninsula. The peninsula is c. 19 km long, and c. 12 km at its widest point. Mahia Beach is the district's main settlement, with smaller communities at Mahanga and Mahia (on the eastern side).

The peninsula lacks any major river system but 25 streams drain the peninsula to the west (including from north to south the Kopuni, Huruhurunui, Mangatea, Ahimanawa, Te Muka, Otunua, Waipapa and Turanganui) and many small streams, with quite steeply incised channels drain the peninsula to the east. The centre of the peninsula, including the northern half of the eastern plateau, is drained by the Urumatui and Whangawehi Streams that flow into the sea at Putiki Point. The rest of the plateau is drained by a series of smaller streams including the Wainui, Waiwhara, Rarohenga and Taiporutu. Kopuawhara Stream, which originates in the Tiniroto Ecological District, flows out across the isthmus and into the Maungawhio Lagoon (RAP MAH 2).

The original vegetation on the peninsula has been reduced, through burning, clearance and logging to fragments of less that 60 ha, with the exception of Mahia Peninsula Scenic Reserve (371 ha). Secondary scrub is widespread, particularly in the southern half of the peninsula, with kanuka and tauhinu the dominant species.

The district has had a long history of human occupation. Numerous well preserved pa sites, middens, ovens, pits and terraces provide visible evidence of much of the Maori history on Mahia Peninsula and it features prominently in stories which tell the history of Maori occupation. Europeans have been there since the 1830s.

2.3.2 Geology and landforms

Mahia Peninsula consists of a block of low hills that was once an island, but is now connected to the mainland by a narrow isthmus (tombolo) of Holocene fixed dunes. About half the district is steep hill country dissected by many short streams. The interior of the isthmus, between the dune ridges in the northeast and southwest coast, has been infilled by alluvium from the Kopuawhara Stream, but leaving the tidal estuary of Maungawhio Lagoon and numerous fresh water wetlands among the dunes. Underlying parent materials are mainly Miocene and Pliocene silty sandstone and mudstone, marl (calcareous mudstone) and limestone.

Late Pleistocene marine terraces at 40-180 m a.s.l. are very prominent around the western and southern coasts and most extensively in the northeast. This plateau-like landform is prominent from the sea hence the name 'Table Cape' given by James Cook to Kahutara Point. Portland Island is also dominated by a tilted marine terrace surface. A discontinuous narrow coastal bench lies at the foot of steep slopes on much of the northern and eastern sides, uplifted a few metres from the sea by successive earthquakes in the last few thousand years. Intertidal rock platforms are extensive around much of the peninsula, with frequent scattered offshore reefs beyond. Elsewhere Mahia's coastline is mainly steep or cliffed mudstones and siltstones, with significant limestone areas (e.g. Long Point).

Portland Island (Waikawa), off the southern tip of the peninsula, is the largest offshore island in the study area and the only one within the Mahia Ecological District. A sandspit extends from the island towards the mainland.

2.3.3 Climate

The Mahia Ecological District has only two bioclimatic zones, coastal and semi-coastal, with the entire district influenced by its close proximity to the coast. It has a moderate coastal climate, with very warm windy dry summers. Day temperatures occasionally exceed 30°C during the summer, with dry foehn northwesterly winds. Annual rainfall ranges from 1000-2000 mm p.a. (av. c. 1000 mm around the coast, rising to 1600-2000 mm in the central hills), with a marked decrease in the amount and reliability of rainfall in spring and summer. Winter temperatures are moderate (av. winter minimum of 6.3-9°C), with maximum rainfall in this season.

2.3.4 Soils

The soils of Mahia Peninsula are related to landform and parent materials (Rijkse 1979a). The flat to undulating/rolling terraces in the southwest and northeast parts of the peninsula are mantled with rhyolitic tephra (Waimihia Tephra, Rotoma Tephra, Waiohau Tephra, Kawakawa Tephra) and loess. They have formed well drained soils that are classed Typic Allophanic soils and Orthic Pumice soils (yellow-brown loams and yellow-brown pumice soils).

Central parts of the peninsula, and gullies in the northeast and east are strongly dissected and formed from fine hard sandstone, siltstone and mudstone. They are classed Orthic Recent soils and Orthic Raw soils (steepland soils related to yellow-brown earths and intergrades). The steep cliffs on the edges of the peninsula have Raw soils, where the topsoil has eroded off.

A veneer of tephra (Waimihia Tephra) remains only on stable parts of the hillcountry landscape, such as spurs and ridges, in particular in the southwest and southeast. Limestone outcrops in the western part do not form soils directly, but material eroded from them influences the properties of soils downslope and downstream.

Much of the soil of the isthmus is formed from wind-blown sand. They are excessively drained except in poorly drained small swale areas and are classed as Sandy Brown soils and Sandy Raw soils (yellow-brown sands). Alluvial deposits in the central part of the isthmus, laid down by the Kopuawhara Stream, are imperfectly to poorly drained Fluvial Gley soils (gley soils).

2.3.5 Historical vegetation cover

Little information exists about the original vegetation cover of Mahia Peninsula. A long history of human habitation and modification has reduced natural vegetation to scattered fragments. From these, and the Mahia Peninsula Scenic Reserve, which at 371 ha is the largest area of indigenous vegetation left in the district, we can make deductions about the past vegetation cover.

Prior to human habitation Mahia Peninsula was largely forested (Phillips 1948). Non-forest habitat occurred around the wetlands, along the steep coastal faces and dunelands, and in disturbed sites. Coastal forest (within 1 km of the coast), of which very little remains, had a mixed canopy of titoki, tawa (less common or absent on coastal faces), karaka, nikau, ngaio, pukatea and lemonwood. Kohekohe, wharangi,

whau, and mahoe dominated the sub-canopy. Karaka, titoki and ngaio were more common on the slopes with the most direct coastal influence, e.g. salt laden winds.

The semi-coastal forest in the interior of the peninsula (> 1 km from the coast) was tawa-dominated, with kohekohe the major sub-canopy species. Rimu, kahikatea (lower slopes), matai, northern rata and rewarewa were emergent. Other species in the canopy included pukatea, karaka, hinau and titoki. Puriri, only one individual of which now remains in the district, may also have been an important canopy component on fertile sites. The sub-canopy and understorey was lush with abundant nikau, ferns, broadleaved trees and shrubs. Lianes and epiphytes proliferated including aka, *Metrosideros diffusa*, *M. colensoi*, *Clematis* spp., kiekie, kohia, supplejack, *Astelia* spp., easter orchid, hanging tree orchid and *Winika cunninghamii*.

The bluffs and cliffs in the district supported various mixtures of whariki, common maidenhair, *Senecio banksii*, tauhinu, kiokio, *Pittosporum ralphii*, NZ broom, whau, rangiora, hangehange, hound's tongue, ngaio, karaka and *Libertia grandiflora*. Shore lobelia, sea primrose, *Senecio banksii*, common maidenhair, tauhinu and whariki occurred on seepage areas along the coastal faces and cliffs of the peninsula and Portland Island.

The dunelands on the isthmus connecting the peninsula to the mainland and on the northern end of Portland Island, were dominated by populations of the sandbinders pingao, spinifex and sand tussock *(Austofestuca littoralis)*. The inner dunes had a sparse mix of sand pimelea, sand convolvulus, jointed wire rush, sand sedge, *Coprosma acerosa*, pohuehue (*Muehlenbeckia complexa*) and zoysia.

Several sizeable freshwater wetlands or lakes occurred within the district, most of them on the isthmus in the inner dune system, e.g. Opoutama wetland (RAP MAH 3). Those on the peninsula have now almost all been drained, with trampling and grazing by domestic stock. The original wetland vegetation was a mosaic of raupo reedland, and sedge-rush-flaxland including *Baumea juncea*, *Isolepis prolifer*, jointed twig-rush, sharp spiked-sedge, harakeke, and lake clubrush. Other species included swamp kiokio, purei and *Carex dissita*. Manuka scrub, harakeke and cabbage tree occurred around the margins, and on hummocks and small low islands throughout. Limited areas of kahikatea swamp forest occurred on the margins of the wetlands, very little of which now remains (most lies within RAP MAH 11).

Both Maungawhio Lagoon, at the southern end of the isthmus, and Whangawehi Estuary had saline wetland communities, with the larger lagoon supporting the bulk of it. Sea rush rushland dominated the tidal estuary edges (middle to upper marsh of Wardle 1991), with knobby clubrush, bands of jointed wire rush, and sea primrose-selliera-glasswort turffield. The inner margins that were completely submerged at high tide supported populations of salt-tolerant three-square and patches of raupo reedland. The dry outer edges of the lagoon had low patchy shrubland flaxland of saltmarsh ribbonwood, pohuehue, bracken, harakeke and cabbage trees.

Secondary vegetation and scrub was originally restricted to sites modified by natural disturbances, e.g. slip faces, mobile cliffs, and areas subject to fires, but became extensive following Maori settlement. Tauhinu, kanuka (more fertile sites) and manuka (drier, wet, poorer soils) dominated, with bracken initially common in burnt areas.

2.3.6 *Flora*

General

A total of 147 native vascular plant species have been recorded within the Mahia Ecological District (Appendix 3), most noted during the present survey with additional records from the Auckland Museum (AK), FRI (NZFRI), and Landcare Research (NZCHR) herbaria.

Threatened plants

Many plants within the Mahia Ecological District can be considered locally threatened e.g. *Dianella nigra*, hen and chicken fern, *Libertia grandiflora*, New Zealand broom, northern rata, wharangi and whau. Habitat destruction, feral goat and possum browse and domestic stock grazing have confined many palatable species to inaccessible slopes or the trunks/crowns of trees. Two nationally threatened and two recovering but conservation dependent plant species (de Lange *et al.* 1999) are known to occur within Mahia Ecological District. *Hebe tairawhiti* is the only one of these that lies within a protected natural area: Mahia Peninsula Scenic Reserve. The other three species lie within areas now recommended for protection (RAPs).

	SPECIES	COMMENTS
THREATENED		
DECLINING	*Austrofestuca littoralis* (sand tussock)	a sand binder that grows in discrete tussocks on the lower foredune of beaches. Healthy populations were recorded on Onenui Beach (RAP MAH 24) and Portland Island (RAP MAH 25).
	Hebe tairawhiti	a recently described shrub (Clarkson & Garnock-Jones, 1996). Two populations of it are present on Mahia Peninsula; one is protected within the Mahia Peninsula Scenic Reserve, the other occurs on a roadside bank on the eastern coast. This species had not been recorded in this district prior to this survey.
RECOVERING		
CONSERVATION DEPENDENT	*Desmoschoenus spiralis* (pingao)	a native sand binder that occurs in several small populations along Pukenui Beach (RAP MAH 2). Pingao would probably once have been more extensive in the isthmus dune systems, with its decline caused by a combination of habitat destruction, competition from marram and browsing and trampling by introduced mammals.
	Zoysia minima (zoysia)	a small coastal creeping grass, found in dune hollows along Pukenui Beach and in patches around the margin of Maungawhio Lagoon (RAP MAH 2).

Distributional limits

Two species reach their distributional limits within the Mahia Ecological District:

Vitex lucens (puriri)	a large coastal tree, occurs as a single tree on Mahia Peninsula in a small remnant of semi-coastal forest treeland (RAP MAH 16). It is the southern most occurrence of this species on the East Coast, and the only occurrence of it within the districts covered by this survey. Earlier records (Kirk 1896) suggest that puriri was once more widely distributed in coastal forest on Mahia Peninsula, and along the coast north towards Gisborne (in the Tiniroto Ecological District).
Hebe tairawhiti	also reaches its southern limit on Mahia Peninsula, with several new populations recorded during this survey.

2.3.7 *Fauna*

Mahia's long history of human habitation, habitat destruction and isolation from sizeable areas of indigenous forest habitat (apart from Mahia Peninsula Scenic Reserve) have contributed to the paucity of indigenous forest, scrub and open country birds which remain. Only those which still enjoy relatively widespread distribution in northern lowland New Zealand are found within the district, including silvereye, kereru, tui, fantail, grey warbler, bellbird, shining cuckoo, kingfisher and morepork. There is also the usual suite of introduced birds like song thrush, starling, blackbird, sparrow, myna, Californian quail and Australian magpie. Peacock have long been naturalised on the peninsula, with the initial introduction made by early whalers over 100 years ago. A number have been shot over the years. However, several populations were recorded during this survey. A full list of bird species present in the district is given in Appendix 5.

Phillips (1948) records that up until the late 1940s kereru, tui, long tailed and shining cuckoo and even kaka were abundant in the larger tracts of forest on the peninsula, with the highest concentrations in the vicinity of Moutere Bush (or Mahia Peninsula Scenic Reserve as it is now known). Up until 1907 weka were also particularly abundant in several localities, but they declined rapidly until the 1940s when they were considered locally extinct. No record of kiwi ever having been on Mahia Peninsula exists (Phillips 1948).

Its extensive coastline provides a home for a number of permanent or migratory sea birds, including white-faced storm petrel, red and black billed gulls, blue penguin, reef heron and Caspian and white fronted terns. Portland Island is important as a site of sea bird breeding colonies, including black-winged petrel and Australasian gannet. Maungawhio Lagoon and the beaches in the district provide habitats for a number of bird species including pied oystercatcher, variable oystercatcher, pied stilt, threatened New Zealand dotterel, banded rail and banded dotterel.

Most of the freshwater wetlands and ponds on the peninsula are now highly modified by drainage, stock and weed invasion. A number of them, however, still contribute to the wetland habitats in the district, e.g. for mallard, pukeko, grey duck and black shag. The freshwater wetlands on the isthmus, which have also suffered modification, support these birds along with several species of threatened wetland birds including the Australasian bittern, spotless crake, grey teal, fernbird and Australasian shoveler.

The estuarine and freshwater wetlands on the isthmus were collectively given an SSWI ranking of 'high'(Rasch 1989), indicating their interrelatedness and importance as wildlife habitats. There were a further nine SSWIs identified within the district: Portland Island is the only other site with a 'high' ranking, Mahia Peninsula Scenic Reserve and a small wetland along Burma Rd rank ranked 'moderate'; with the remaining six ranked sites 'potential' (Rasch 1989).

The district is also home to a number of introduced mammals (possums, feral cats, feral goats, feral pigs, sheep and cattle), lagomorphs (rabbits and hares), mustelids (weasels, ferrets and stoats), and rodents (ship and Norway rats, and mice) (King 1990). Most have been in the district since the late 1800s to early 1900s.

Feral goats are one of the greatest threats to the long term viability of the forest remnants on Mahia Peninsula. They are almost ubiquitous, reducing the understoreys in most of the remnants to a small suite of browse resistant shrubs and ferns, exotic herbs and grasses. Sheep and cattle also have a substantial impact on forest understoreys, contributing to the loss of diversity of shrubs, seedlings, ferns, and lianes. All three also cause physical damage to trunks, trampling plants and root systems, and compacting the soil. The trampling also affects the margins of streams and wetlands. As a result of these pressures a number of palatable species now survive in the district only on inaccessible bluffs, or epiphytically in tree branches and crowns.

Possums are also widespread in the district. Their selective browsing of palatable species has also had a marked effect on the composition and diversity of the vegetation.

Records of invertebrates, lizards, frogs and fish within the district are patchy. Existing records can be found in Appendix 6, however this list is definitely not comprehensive.

2.3.8 *Landuse*

Most of the original forest vegetation of the Mahia Ecological District has now been cleared for agriculture: semi-extensive sheep and cattle farming. Exotic forestry is still a relatively minor landuse. Tourism and residential landuses are becoming more significant, with settlements on the Mahia isthmus: at Mahia, Opoutama, Mahanga and Oraka Beaches. Recreation in the district focuses on marine opportunities, including diving, swimming, surfing, boating and fishing. Commercial crayfishing is also based at Mahia at the Whangawehi River mouth.

2.3.9 *Relation to adjoining districts*

Two other ecological districts abut the Mahia Ecological District, as follows:

Waihua to the west has a weaker coastal character compared with Mahia, as it is only exposed to cooler coastal influences from the south, whereas Mahia is island-like with coastal influences strong from all directions except the northwest (from which dry warm winds come from the Waihua and Tiniroto interiors). They share coastal lagoons and flatlands, but the extensive elevated marine terraces are unique to Mahia. Both districts have suffered extensive human modification, with coastal forest and that on arable land greatly reduced in extent.

Tiniroto to the north encompasses the hill country between Poverty Bay and the mountainous landscape of the Waikaremoana Ecological District. The part of Tiniroto adjacent to Mahia has higher rainfall, high hills extending to the sea, and an exclusively

steep coastline with a more limited coastal zone and coastal influence compared with Mahia.

2.4 MATAWAI ECOLOGICAL DISTRICT

2.4.1 Location and setting

Matawai Ecological District covers c. 104 200 ha. Named after Matawai township, the largest settlement in the district, which lies near its centre, this new ecological district has been defined on the basis of its distinctive climate, geology, landforms and vegetation. The southwestern half of the district totalling c. 51 100 ha was covered during the present survey, with c. 53 100 ha included in the survey of the Waiapu Ecological District (Leathwick *et al.* 1995).

The district is made up of parts of five previously recognised ecological districts (McEwen 1987): 23 900 ha from Waioeka, 21 200 ha from Tiniroto, 5900 ha from Waikaremoana, 37 200 ha from Waiapu, and 16 000 ha from the Motu Ecological District. That part of the Matawai Ecological District which once lay within the inland Motu and Waiapu Ecological Districts, and a small corner of the Waioeka Ecological District, were included in the Waiapu PNAP survey (Leathwick *et al.* 1995).

The district straddles the drainage divide between rivers flowing north to the Bay of Plenty (the Koranga-Waioeka and Motu Rivers), and those flowing southeast to the east coast (the Hangaroa - which is a major tributary of the Wairoa River and the Wharekopae, Waikohu and numerous other tributaries of the Waipaoa River).

In comparison with the other ecological districts described in this report, Matawai still retains a substantial proportion of its original vegetation cover; the five largest tracts of indigenous forest are mainly primary, and extend over c. 11 000 ha. However, the bulk of the remaining indigenous vegetation is in the upper lowland and montane bioclimatic zones, with little left in the lowland zone, especially in the drier north-eastern and central southern areas.

2.4.2 Geology and landforms

Matawai Ecological District has a complex geological and landform pattern. The geology is based on Cretaceous rocks of the Matawai Group - somewhat younger and weaker versions of the Urewera Group greywacke-sandstones dominating the districts to the northwest. This is overlain by extensive areas of Late Cretaceous to Early Tertiary Whangai and Mangatu Formations - very weak sedimentary rocks on which hummocky slopes of moderate gradient are characteristic, prone to slumping and earthflow and locally gullying, though many slopes have been stable since the end of the Pleistocene glacial age climates.

These in turn are overlain by younger Tertiary sedimentary rocks, now mainly along the central southeastern edge of the district, which culminate in thick bands of strong erosion-resistant Miocene greensand, sandstone and limestone.

The resulting topography features extensive broad valleys, at distinctly high elevation (about 400-600 m) due to the inland location in the headwaters of long rivers. There is extensive moderate hill country terrain on rocks of low to moderate strength. This is interspersed with bold massifs based on erosion-resistent Miocene rocks, notably Maungatapere, Dome, Matawai (Mt Misery) and Maungahaumi and its many outliers.

Except on less stable and steeper sites, the topography is mantled by volcanic tephra from the Taupo Volcanic Zone.

2.4.3 *Climate*

The Matawai Ecological District receives rainfall from both northwesterly and southeasterly weather systems, hence it has relatively frequent reliable rainfall and is noticeably less drought-prone that those districts to the southeast. Three bioclimatic zones are present within the district; the lowland zone extending from 200-700/750 m, the montane zone extending from 700/750-1200 m, and a small area of subalpine zone above 1200 m, centred around Maungahaumi (1213 m) the district's highest point. Annual rainfall ranges between 1500-2300 mm in the lowland bioclimatic zone and 1800-2700 mm in the upland montane and subalpine zones.

Temperatures are subject to wide fluctuations, with summer temperatures in the high 20s not unusual. In the montane and subalpine areas winters are cool with characteristic frequent frosts and fog. In the lowland areas, particularly in the north-east, winters are milder with fewer frosts except in the broad valley bottoms where they can be severe. Snow fall occurs in most years above 500 m a.s.l.

2.4.4 *Soils* [2]

A distinctive soil boundary lies c. 3 km south of the northern boundary of Mangâtu Forest, in the northern part of the district. Higher annual rainfall and increased elevations north of the boundary and into the Raukumara Ranges are expressed in Humic Podzols (podzols) where rhyolitic tephra is more than 30 cm thick. Such podzols are formed under strong leaching conditions and acid litter-forming vegetation such as beech forest. Tephra has eroded off steeper slopes where on greywacke and argillite, shallow soils classed as Recent soils and Raw soils (steepland soils) occur.

South of this boundary on stable parts of the landscape there are well drained Orthic Allophanic soils (yellow-brown loams) on remnants of rhyolitic tephra and Orthic Brown soils (yellow-brown earths). On steep and unstable slopes the soils are Orthic Recent and Raw soils (steepland soils) derived from greywacke or argillite. The soils are well drained except on the often stony toes of fans.

A similar pattern occurs in central and southern parts of the district; at elevations above 550 to 600 m a.s.l., where annual rainfall generally is more than 1800 to 2000 mm, Orthic Podzols occur on young rhyolitic tephra which increases in thickness towards the north. Brown soils occur on other parts of the landscape, with Orthic Recent and Raw soils on unstable hilly and steep slopes. Below this elevation (<550m), generally south of Matawai, tephra is thinner and Orthic Brown soils are dominant on stable slopes, with Orthic Recent soils on steep slopes.

2.4.5 *Historical vegetation cover*

Large tracts of forest still remain in the upland areas of Matawai Ecological District, providing good examples of the original vegetation. However, the drier, gentler lowlands have less original vegetation left, with only scattered remnants creating an impression of the original pattern.

[2] The description of the soils within the Matawai Ecological District relates to the whole district, and not just that part covered in this survey.

The forests of the lowland hill country in the south and northeast of the district were dominated by tawa. Scattered rimu, kahikatea, totara, miro, matai and rewarewa were emergent over a tawa-dominated canopy that also included northern rata, hinau, titoki, pukatea, tawari (further inland), and kamahi.

With increasing altitude a transition occurred, first to conifer/tawa-beech forest with emergent rimu and miro, then to red beech-silver beech-tawari forest with scattered Hall's totara, then silver beech-red beech-tawari forest, and finally to silver beech-tawari forest. Hard beech (only in northeastern part of the district) and toatoa occurred locally at lower altitudes, particularly on more sharply defined ridges. Kahikatea-dominant stands, sometimes containing red and silver beech associations, were present on areas of flat terrace-like topography and in some valleys in the southern and central areas.

Not all forest at high altitudes was dominated by beech. South of the Maungahaumi summit the montane forest consisted of kaikawaka and pink pine emergent over divaricate and broadleaved shrubs and small trees. Kaikawaka and mountain toatoa occurred locally on poorly drained areas on main ridge crests. Small areas of tree fuchsia-dominant forest occurred at high altitudes on limestone substrates. Subalpine scrub dominated by tupare occurred in small pockets on and immediately north of the Maungahaumi summit, above the treeline.

Steep bluffs and cliffs had a variable assemblage of species including *Chionochloa flavicans, Craspedia viscosa, Hebe* sp. (*Veronica arborea*), kohuhu, koromiko, kowhai, *Pimelea longifolia, Pittosporum ralphii*, prickly mingimingi, tuhara, tutu and whaririki.

Lowland wetlands occurred mainly along the alluvial terraces of the Motu River and Moanui Stream valleys. Manuka/sphagnum swamp, and purei-toetoe sedgeland dominated the margins of these wetlands with scattered cabbage trees. Raupo reedland (lesser in extent than currently in the remaining wetlands that have suffered increased sedimentation and nitrification) and harakeke flaxland would have occurred in the wetter areas. The wetlands merged into kahikatea swamp forest with matai, miro, black maire, pukatea (lower altitudes) and red and silver beech as associates. The wetlands in the montane bioclimatic zone, as on the western side of Maungatapere, were dominated by *Carex* spp. (e.g. *Carex dipsacea* and *C. secta*).

Secondary and scrub vegetation in the original vegetation of the district was restricted to naturally disturbed sites (e.g. those subject to fires, eroded sites and slip faces) and stressed/low fertility areas (e.g. wetland margins). Manuka was the dominant early sucessional species of secondary vegetation at lower altitudes in most of the district, with broadleaved species at higher altitudes and under higher rainfall. Bracken may have also been important in some early successions under higher rainfall. Kanuka is essentially absent, except on the drier southeastern fringe of the district.

2.4.6 Flora

General

The list of native vascular plant species list for the Matawai Ecological District, which contains 268 species (Appendix 3), is a collation of records from the present survey and that of the "Waiapu Ecological District" (Leathwick *et al.* 1995) and from a species list for Maungatapere (Clarkson & Clarkson 1991a).

Threatened plants

Three threatened and one naturally uncommon plant species from the latest threatened and uncommon vascular plants list of New Zealand (de Lange *et al.* 1999) are known to occur within the Matawai Ecological District. Of these species, all except for *Ileostylus micranthus* are either within protected areas, or in areas now recommended for protection (RAPs). No new threatened plant records were recorded during this survey.

	SPECIES	COMMENTS
THREATENED		
DECLINING	*Peraxilla colensoi* (scarlet mistletoe)	the most host specific of the beech mistletoes has been noted growing on silver beech in both the Matawai (Clarkson & Clarkson 1991a) and Moanui Conservation Areas (this survey).
	Hebe tairawhiti	a newly described shrub, is proposed to be ranked as rare by its determiners (Clarkson & Garnock-Jones, 1996). It has only been recorded from the north-eastern part of the district, within RAP MAT 9 (ex WAI 145 Appendix 2; Leathwick *et al.* 1995).
	Ileostylus micranthus	a small population of this leafy mistletoe occurs in the district, growing on mapou just south of Rakauroa.
NATURALLY UNCOMMON		
RANGE RESTRICTED	*Coriaria pottsiana* (Hikurangi tutu)	a small prostrate herb that has been recorded in herbfields on the summit of Maungatapere (Tapere Kawenata) c. 15 km south of Matawai (Clarkson & Clarkson 1991a).

2.4.7 *Fauna*

The Matawai Ecological District is characterised by a number of large forest tracts. There are numerous rivers but natural wetlands are rare with most of those remaining now highly modified. Wildlife in the district has suffered hugely from forest clearance, and predation and browse by introduced mammals. Most forest was cleared during the late 19th to early 20th centuries but forest fauna is still declining inside the remaining forest blocks due to the impacts of some successful introduced pests, especially possums, ship rats, mustelids, red deer and feral goats.

Many forest birds originally present are now extinct, including huia, laughing owl, bush wren and piopio. Piopio were once common in forest from Waikaremoana north to the East Cape (Sopp 1957). Kokako were recorded in Motu Bush in 1959, but were apparently gone by 1963 and are now extinct in the district (MacDonald 1966). Kiwi, kaka, kakariki and NZ falcon are all still present but uncommon (Rasch 1989, Appendix 5). Kereru, whitehead, rifleman, tomtit, grey warbler, tui, bellbird and fantail are still widespread and common. There is also the usual suite of introduced birds like song thrush, starling, blackbird, sparrow, myna, Californian quail and Australian magpie present in the district.

The district is now on the edge of the main stronghold of the dwindling East Coast weka population, which is centred north of Motu settlement. Once found as far south as Bartletts and Te Reinga (Beauchamp 1997), weka have been reduced by many factors including drought, habitat degradation, predation (especially by ferrets and cats) and loss of wildlife corridors.

Rasch (1989) lists 33 sites of special wildlife interest in the Matawai Ecological District, of which three have a moderate-high ranking (Matawai Conservation Area, Tarndale Bush RAP MAT 2 (ex-WAI 139); Tuanuiotekahakaha Parts One and Two, RAPs MAT 3 & 4 (ex-WAI 140 & 141), Leathwick *et al.* 1995; refer Appendix 2), and one has a 'high' ranking (Maungahaumi Bush). Maungahaumi Bush is an extensive (7452 ha) and diverse area, containing a wide range of predominantly primary vegetation types and landforms, with kaka, falcon, kereru, whitehead, rifleman and weka all recorded within it (RAP MAT 13, ex-WAI 151, Leathwick *et al.* 1995; refer Appendix 2).

Mammals, amphibia, and freshwater fish known from the district are listed in Appendix 6. Introduced browsing (possum, red deer, feral goat) and predatory (possum, ship rat, Norway rat, mouse, ferret, stoat, weasel) mammals are widespread and continue to affect the native forest systems in ways that are still barely understood. Feral goat numbers are significantly lower in the Matawai Ecological District compared with the other districts described in this report, perhaps because of the moist and cool climate of the remaining - primarily upland - forests. Many forest remnants and margins are still grazed by cattle.

2.4.8 *Landuse*

In the southern portion of the district, where rainfall is high and quite evenly distributed, pastoral farming is the predominant landuse, with sheep and beef cattle farming most extensive. In the northeast exotic forestry dominates, with Mangatu Forest covering c. 12 000 ha. Planting of Mangatu Forest began in the 1960s with its main objective to combat the serious accelerated erosion in the area (Allsop 1973). Matawai is the only sizeable settlement in the district, with the rest of the population spread sparsely throughout.

2.4.9 *Relation to adjoining Ecological Districts*

Five other ecological districts abut the Matawai Ecological District as follows.

Motu to the north has predominantly older harder greywacke sandstones, with consistently steep topography in very regular patterns, and narrow valleys that lack extensive terraces or floodplains. The higher hills and exposure to rain-bearing winds from the northerly quarter mean higher rainfall compared with that in Matawai. Most of the district supports continuous forest, with clearance around the coast and in lowland areas to the north. The vegetation sequence goes from podocarp/tawa-hard beech forest at lower altitudes through podocarp-red beech-silver beech forest and red beech-silver beech forest at middle altitudes, to silver beech forest with kaikawaka towards the treeline.

Waioeka to the west is similar in geology, topography, climate and vegetation to Motu but lacks extensive hard beech forests and coastal areas. That part of the Matawai district covered by this survey has a long boundary abutting against Waioeka. The boundary represents a change to generally higher and consistently steeper hills of harder Urewera Group greywacke, with higher rainfall in Waioeka.

Waikaremoana to the southwest lies in a similar climatic position along the dividing ranges as does Matawai, with similarly bold and varied topography on mainly Tertiary rocks. However, the base elevations of the valleys are higher, as are the mountains and consequently the rainfall. The district has very limited areas of forest clearance, with large tracts of continuous indigenous primary forest retained.

Tiniroto to the south is a large and complex ecological district. It contains Tertiary soft-rock hillcountry without the wide valley floors characteristic of Matawai, with generally lower elevation, lower rainfall and a greater tendency for dry summers and drought (in the area adjoining the Matawai Ecological District). Extensive tracts of primary forest are absent compared with Matawai, with the lowland and semi-coastal areas most modified. Climate and soil changes across the boundary zone are reflected in the change from broadleaved and manuka-dominated secondary vegetation in Matawai, to kanuka-dominated secondary vegetation in Tiniroto.

Waiapu to the east has a similar relationship to Matawai as does Tiniroto (described above), but Waiapu has more a more varied climate and terrain/geology; the terrain is commonly less stable in Waiapu compared with that in Tiniroto, and the rainfall unreliability is greater. The Waiapu district is therefore more prone to flooding and droughts. The climate is warmer and drier than that of the Matawai Ecological District (Leathwick *et al.* 1995).

3 Outline of Survey Methodology

3.1 COLLECTION OF FIELD DATA

Methods used for the field survey component of this study (described in more detail in Appendix 7) were based largely on the standardised methods of Myers *et al.* (1987). Potential survey targets were identified using topographical maps, aerial photographs and SSWI records. In the case of the Waihua Ecological District, a phase one survey report was also available to aid in target identification (Fromont 1990).

No minimum area criteria was applied to the selection of sites, especially in the Waihua and Mahia Ecological Districts and dry northeastern zone of Tiniroto Ecological District where so little of the original vegetation remains that all predominantly indigenous remnants have some intrinsic natural value. Existing protected areas were also targeted, with most given a full survey. In some cases however, existing information was such that a full survey was not required.

Sites were visited systematically over two summer seasons (1995/96 and 1996/97). The great majority of sites were given a full survey, once permission had been obtained from the landowner. At each site information was collected on its location, environmental factors, vegetation composition and condition. Site and vegetation boundaries were drawn directly onto topographic maps in the field, with checks made later against aerial photographs. Bird species were recorded when heard or sighted but no attempt was made to specifically survey for them. The collected data was entered into a Paradox database, with boundaries digitised into Terrasoft, and transferred into ArcView (both Geographical Information Systems) to facilitate subsequent analysis.

3.2 RAP SELECTION

Each of the sites surveyed was evaluated in the context of the ecological district in which it occurred using a two-stage selection process (described in more detail in Appendix 8); each was assigned a ranking score based in its size and shape (perimeter index), fragmentation, number of ecological units, and percentage of primary vegetation. This was effectively a 'first cut' that objectively highlighted the most outstanding areas. This was followed by a more subjective analysis, using standard PNAP criteria like representativeness, naturalness, and threatened species occurrence. From this structured process of comparative evaluation, RAPs were identified, and assigned Priority rankings of 1 (highest), 2, or 3 that indicated their overall conservation value in the context of each ecological district as a whole.

In selecting the RAPs a strong emphasis was placed on correcting the imbalances of the existing PNA network, i.e. where vegetation/landform classes were absent or under-represented.

4 Summary of Indigenous Vegetation

In total, 871 sites were identified and described during the field survey, covering around 64 545 ha or 13.2 % of the total study area (489 200 ha) and accounting for the bulk of the indigenous vegetation present.

The total area of primary vegetation present within the study area will be only slightly greater than the area of primary vegetation surveyed because, with few exceptions, all but very small areas of primary vegetation were surveyed in the study sites. The same can not be said for the secondary indigenous vegetation and wetlands, as a greater proportion of these sites were not surveyed because they were either too small, discontinuous, 'straggly' or too degraded for inclusion. The total area of each vegetation type indicated for each district, then, is the sum of that type within the areas identified during this survey and is not an absolute figure for the whole district.

In all of the ecological districts most of the land clearance for agricultural purposes has occurred on the most productive land (Land Use Capability Classes 1-6). This is reflected in the amount of indigenous vegetation these land classes now support - all less than 20%. The steeper and more erosion prone land (LUC 7 and 8) however, retains a greater proportion of its indigenous cover - ranging from 9.2% to 65%.

4.1 TINIROTO ECOLOGICAL DISTRICT

449 study sites were identified and described in the Tiniroto Ecological District, covering 44 253 ha of indigenous vegetation and wetlands, or 15.1% of the total district area (292 800 ha). The majority of study sites were relatively small, with 67% <25 ha in extent and only 9% >300 ha.

Primary forest accounted for 35% of the indigenous vegetation surveyed, or 5.3% of the ecological district. Beech forest, conifer/beech forest, conifer/tawa-beech forest, conifer/tawa, and logged tawa forest accounted for the bulk of it (90%) (Table 1). Most primary forest lies on stable and only mildly erosion-prone, moderate to steep slopes, and moderate to steep erodible land (94%) (Land Use Capability Classes 6 and 7 respectively - Fig. 2) in the west/northwest of the district, on Mt Whakapunake and in Waingake Waterworks Bush.

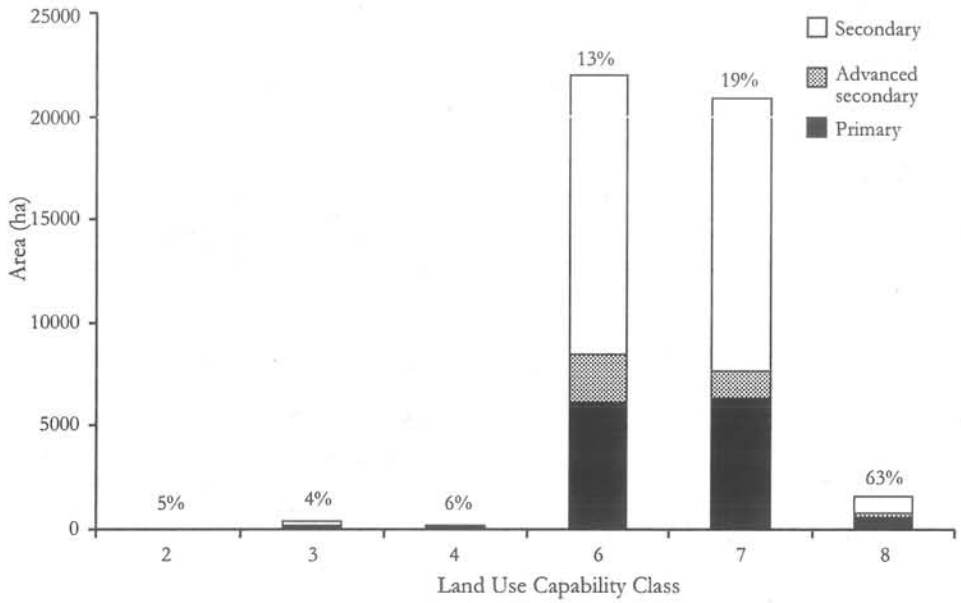
Advanced secondary forest accounts for a much smaller percentage (8.6%). Most is a mosaic of young emergent podocarps and rewarewa, broadleaved trees and shrubs (kohuhu, mahoe, houhere, mamaku, wineberry, pigeonwood, titoki, young tawa) and tall kanuka, with the mix dependent on site characteristics and modification histories. It is comprised of conifer/broadleaved forest, broadleaved forest, conifer/kanuka forest, and kanuka-broadleaved forest. Almost all of it (93%) lies on Land Use Capability Classes 6 and 7 (Fig. 2).

Secondary forest and scrub/shrubland makes up 56% of indigenous vegetation present, with numerous large tracts of it throughout the district. From Ruakaka Rd south, and in the dry northeastern corner of the district the secondary vegetation is kanuka-dominated, with manuka dominating in the wetter northwest and southeast.

Tauhinu-dominated scrub occurs on the coastal cliffs and faces. Almost all of it (96%) lies on Land Use Capability Classes 6 and 7 (Fig. 2).

Freshwater wetlands and lakes and cliff vegetation make up the remainder, with 0.5%, and 0.1% respectively. The wetlands and lakes include a series of small lakes around Tiniroto, several small wetlands in the Waikura River valley, the hydro and seepage lakes around Tuai and small lakes north of Putere. Cliff vegetation occurs sparsely throughout, with a significant proportion of it along the coast in the southeast. The amount of 'cliff vegetation' is likely to be understated as some was placed in other vegetation classes e.g. manuka scrub, tauhinu scrub, broadleaved scrub-shrubland.

FIGURE 2: DISTRIBUTION OF PRIMARY, ADVANCED SECONDARY, AND SECONDARY VEGETATION BY LAND USE CAPABILITY CLASS IN THE TINIROTO ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by surveyed indigenous vegetation.

TABLE 1: AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION/LANDFORM CLASSES IN ALL STUDY SITES (INCLUDING PROTECTED NATURAL AREAS), IN THE TINIROTO ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	% OF TOTAL STUDY SITE AREA	% OF ECOLOGICAL DISTRICT
Primary/logged primary			
beech forest	1939	4.4	0.7
conifer/beech forest	816	1.8	0.3
conifer/broadleaved-beech forest	162	0.4	0.1
broadleaved/beech forest	36	0.08	0.001
conifer/tawa-beech forest	3714	8.4	1.3
conifer/broadleaved forest	264	0.6	0.1
tawa-beech forest	156	0.4	0.1
conifer/tawa forest	3289	7.4	1.1
conifer/tawa-titoki forest	30	0.07	0.01
conifer/tawa-kohekohe forest	54	0.1	0.02
tawa forest	4072	9.2	1.4
tawa/kohekohe forest	237	0.5	0.1
tawa-titoki/kohekohe forest	0.8	0.002	0.0003
tawa-titoki forest	159	0.4	0.1
conifer forest	497	1.1	0.1
Advanced secondary			
conifer/broadleaved forest	69	0.2	0.02
conifer/kanuka-broadleaved forest	243	0.6	0.1
conifer/kanuka forest	886	2.0	0.3
broadleaved forest	1081	2.4	0.4
kanuka-broadleaved forest	1514	3.4	0.5
Secondary forest/scrub/shrubland			
kanuka forest	9571	21.6	3.3
conifer/small-leaved scrub	15	0.03	0.01
kanuka scrub	2273	5.1	0.8
manuka scrub	2090	4.7	0.7
manuka-kanuka scrub	6898	15.6	2.4
tauhinu scrub-shrubland	83	0.2	0.03
broadleaved/small-leaved scrub	3182	7.2	1.1
broadleaved scrub-shrubland	646	1.5	0.2
Cliff vegetation	54	0.1	0.02
Freshwater wetlands and lakes	222	0.5	0.1
TOTAL	44 253	100	15.4

4.2 WAIHUA ECOLOGICAL DISTRICT

242 study sites were identified and described in the Waihua Ecological District, covering 8845 ha of indigenous vegetation and wetlands, or 6.9 % of the total district area (128 300 ha). The majority of study sites were small, with 80% less than 25 ha, and only 6 areas over 300 ha.

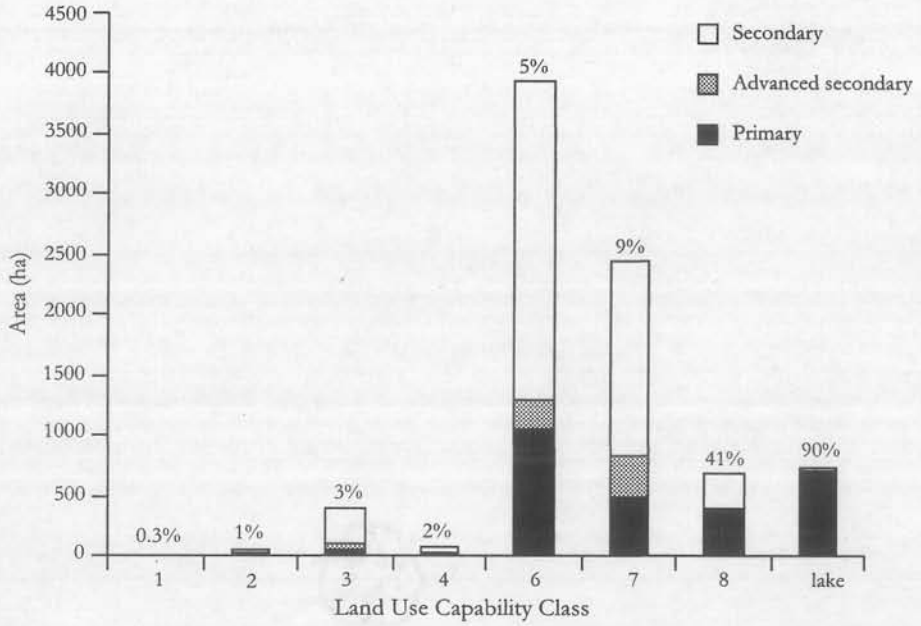
The district is highly modified with only 1.3% of it now supporting primary forest, and primary forest making up only 18% of the indigenous vegetation surveyed. The bulk of the primary forest (97%) is tawa-dominated variants (including conifer/tawa forest, logged tawa forest, tawa/kohekohe forest, and tawa-titoki forest), with only small amounts of black beech forest, and conifer-dominated alluvial forest (small patches in the valleys of the Wairoa and Aropaoanui Rivers, and Waipatiki Stream) (Table 2). Kohekohe, titoki and karaka are more important structural species in the coastal/ semi-coastal bioclimatic zone. Only a small proportion of the primary forest is unlogged. Most of the primary vegetation survives on south-facing slopes, on Land Use Capability Classes 6, 7, and 8 (95%), those areas least suited to arable land use and farming (Fig. 3).

Advanced secondary vegetation makes up only 8% of the indigenous vegetation surveyed, with kanuka, mahoe, titoki, kohuhu, houhere, wineberry, putaputaweta, tawa, kohekohe, rimu, totara, kahikatea and matai the most abundant species. Virtually all (91%) of it lies on Land Use Capability Classes 6 and 7 (Fig. 3).

A large proportion of the surveyed vegetation (55%) is secondary forest and scrub/ shrubland. Kanuka is the dominant species in most of the sites, with tauhinu scrub dominant along the coastal cliffs and coastal faces in the south, and manuka dominating on the harshest sites. Other common species include mingimingi, red-fruited karamu, bracken, mahoe, putaputaweta, cabbage tree, kohuhu, totara and kahikatea. Apart from a cluster of large areas of secondary vegetation just northeast of Raupunga and one north of Opoutama, the rest of the secondary vegetation is scattered in small patches throughout the district. Most (79%) of the secondary vegetation lies on Land Use Capability Classes 6 and 7, but with a noteworthy proportion on Class 3 (flat to gentle rolling land) (Fig. 3).

Saltwater (brackish) wetlands and lagoons, all of which lie around and east of the Wairoa River mouth, make up 10% of the total area of study sites. Dunelands, freshwater wetlands, and cliff vegetation make up the remainder with 3.7%, 2.7%, and 2.6% respectively. Most of the dunes lie east of Wairoa, while the bulk of the cliff vegetation is on coastal cliffs west of Wairoa and east of Nuhaka.

FIGURE 3: DISTRIBUTION OF PRIMARY, ADVANCED SECONDARY, AND SECONDARY VEGETATION BY LAND USE CAPABILITY CLASS IN THE WAIHUA ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by surveyed indigenous vegetation.

TABLE 2: AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION/LANDFORM CLASSES IN ALL STUDY SITES (INCLUDING PROTECTED NATURAL AREAS), IN THE WAIHUA ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	% OF TOTAL STUDY SITE AREA	% OF ECOLOGICAL DISTRICT
Primary/logged primary			
beech forest	13.5	0.2	0.01
conifer/tawa forest	129	1.5	0.1
conifer/tawa-titoki forest	6.0	0.1	0.005
conifer/tawa-kohekohe forest	289	3.3	0.23
tawa forest	735	8.3	0.6
tawa/kohekohe forest	222	2.5	0.2
tawa-titoki forest	124	1.4	0.1
tawa-titoki/kohekohe forest	63	0.7	0.05
conifer forest	26	0.3	0.02
Advanced secondary			
conifer/broadleaved forest	84	0.9	0.07
conifer/kanuka forest	32	0.4	0.02
conifer/kanuka-kohekohe forest	4.0	0.05	0.003
broadleaved forest	377	4.3	0.3
kanuka-broadleaved forest	209	2.4	0.16
Secondary forest/scrub/shrubland			
kanuka forest	1436	16.2	1.1
conifer/small-leaved scrub	25	0.3	0.02
kanuka scrub	854	9.7	0.7
manuka scrub	276	3.1	0.22
manuka-kanuka scrub	2013	23	1.6
tauhinu scrub-shrubland	160	1.8	0.12
broadleaved/small-leaved scrub	43	0.5	0.03
broadleaved scrub-shrubland	24	0.3	0.02
Cliff vegetation	231	2.6	0.2
Freshwater wetlands and lakes	237	2.7	0.2
Saltwater wetlands/lagoons	909	10.2	0.7
Duneland	324	3.7	0.25
TOTAL	8845	100	7.03

4.3 MAHIA ECOLOGICAL DISTRICT

93 study sites were identified and described in the Mahia Ecological District, covering 2445 ha of indigenous vegetation and wetlands, or 14.3 % of the total district (17 100 ha). Almost all the study sites were 25 ha or less (86%), with only three sites over 300 ha.

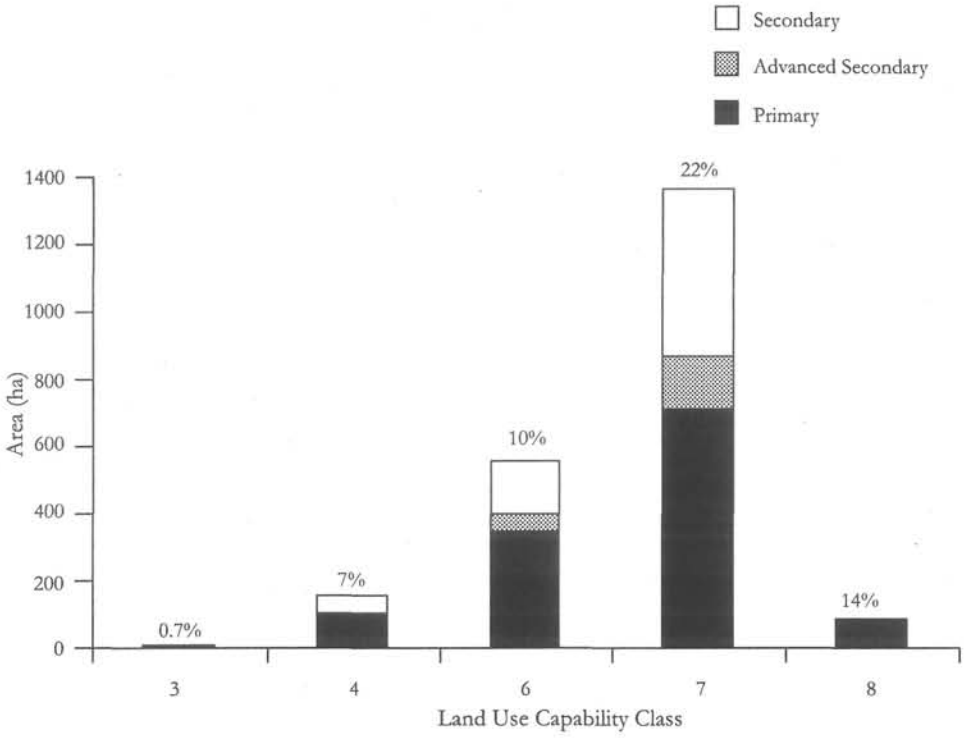
Primary forest, much of which has been logged and further degraded (e.g. by stock, feral goats, possums), makes up 42% of the indigenous vegetation surveyed in the district. All is tawa-dominated, in association with kohekohe, titoki, karaka, nikau and pukatea. Only a small proportion of unmodified rimu/tawa forest remains, most of which (86%) lies within the Mahia Peninsula Scenic Reserve. Most of the primary forest (91%) is on Land Use Capability Classes 6, 7, and 8 (Fig. 4), however, there is a notable area of 102 ha on the terrace downlands of Class 4.

Only 3.6% of the indigenous vegetation in the district is advanced secondary forest: conifer/broadleaved forest, broadleaved forest, and kanuka-broadleaved forest. Most of it lies within the coastal bioclimatic zone (63%), with mahoe, pigeonwood, kohekohe, tall kanuka, mapou, young tawa, lemonwood, heketara, lancewood and treeferns as dominant components. Almost all of it lies on Land Use Capability Classes 6 and 7 (Table 3).

Secondary forest, scrub and shrubland accounts for about a third (27%) of the indigenous vegetation, with 91% of it occurring on Land Use Capability Class 6 and 7. Almost all of it (88%) is composed of either pure kanuka, or mixtures of kanuka, manuka and tauhinu, with mingimingi and red-fruited karamu. There are only a few scattered pockets of secondary vegetation in the eastern parts of the district, with most of it (71%) on the steeper western half.

Dunelands, on the isthmus and at the southeastern end of the peninsula and saltwater wetlands, all of which are on the isthmus, make up the bulk of the remainder of the vegetation classes (covering 18.2%, and 6.5% respectively). Freshwater wetlands, most of which also lie inland on the isthmus make up 2.3%, with cliff vegetation, along the coast and in bluffy sites inland, contributing 0.3%.

FIGURE 4 : DISTRIBUTION OF PRIMARY, ADVANCED SECONDARY, AND SECONDARY VEGETATION BY LAND USE CAPABILITY CLASS IN THE MAHIA ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by surveyed indigenous vegetation.

TABLE 3: AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN ALL STUDY SITES (INCLUDING PROTECTED NATURAL AREAS) IN THE MAHIA ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	% OF TOTAL STUDY SITE AREA	% OF ECOLOGICAL DISTRICT
Primary/logged primary			
conifer/tawa-kohekohe forest	400	16.4	2.3
tawa forest	37	1.5	0.2
tawa/kohekohe forest	512	20.9	3.0
tawa-titoki forest	12	0.5	0.1
tawa-titoki/kohekohe forest	62	2.5	0.4
Advanced secondary			
conifer/broadleaved forest	1.8	0.1	0.01
broadleaved forest	65	3.0	0.4
kanuka-broadleaved forest	21	0.9	0.1
Secondary forest/scrub/shrubland			
kanuka forest	198	8.1	1.2
kanuka scrub	253	10.3	1.5
manuka scrub	2.8	0.1	0.02
tauhinu scrub-shrubland	37	1.5	0.2
manuka-kanuka scrub	139	5.7	0.8
broadleaved/small-leaved scrub	15.8	0.6	0.09
broadleaved scrub-shrubland	19	0.8	0.1
Cliff vegetation	7.8	0.3	0.05
Freshwater wetlands and lakes	57	2.3	0.3
Saltwater wetlands/lagoons	159	6.5	0.9
Duneland	446	18.2	2.6
TOTAL	2445	100	14.3

4.4 MATAWAI ECOLOGICAL DISTRICT

Only that vegetation in the southwestern half of the Matawai Ecological District, which was surveyed during this study, is considered in this section. The remainder is summarised in the Waiapu Ecological District PNAP survey report (Leathwick *et al.* 1995).

A total of 87 study sites were identified and described in the southwestern half of the District, covering 9002 ha of indigenous vegetation and wetlands, or 17.6 % of the part-district surveyed (51 100 ha) (Table 4). Over half (66 %) of the sites surveyed were small (<25 ha), with only five sites over 300 ha (i.e. Te Wera Bush and Matawai Conservation Area, Rakauroa Scenic Reserve, Maungatapere Kawenata, and Moanui Forest).

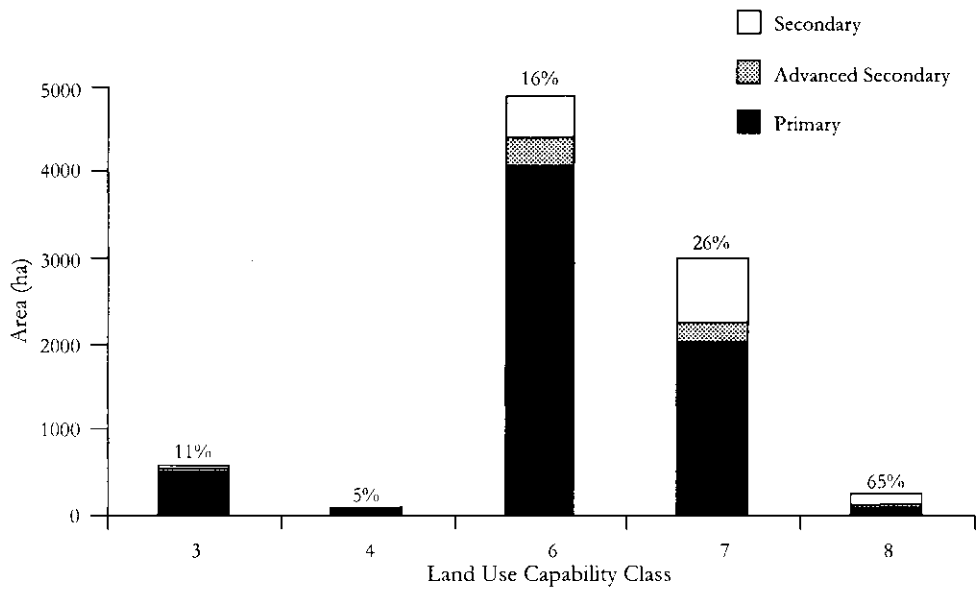
Primary and logged primary vegetation accounted by area for c. 80 % of the surveyed vegetation in the district, most of it being higher altitude forest in the upper lowland and montane bioclimatic zones; conifer/tawa forest, conifer/tawa-beech forest, beech forest, and their logged variants. Much of it occurs in large tracts within the three Conservation Areas (as above), Matawai Conservation Area, Rakauroa Scenic Reserve, and Maungatapere Kawenata. Most of the primary vegetation (89%) survives on Land Use Capability Classes 6 and 7 (Fig. 5); Class 6 being stable and mildly erosion-prone moderate to steep slopes, and Class 7 being steep and often erodible hill country. There is also a substantial area (533 ha or 8%) of primary forest in Matawai Conservation Area on Land Use Capability Class 3; Class 3 being flat to very gentle rolling land.

Advanced secondary vegetation accounts for only 8 % of the indigenous vegetation present within the district, occurring predominantly on Land Use Class 6 and 7 (90%) (Fig. 5). It is distributed throughout the survey area, predominantly at lower to mid altitudes (77 % is in the lowland bioclimatic zone). All of it is either conifer/broadleaved or broadleaved forest, with tawari, tree fuchsia, kamahi, heketara, mountain horopito, broadleaf, pate, wineberry, and Hall's totara, rimu and matai as dominant components; tawa is absent or infrequent.

The bulk of the remaining surveyed indigenous vegetation within the district is secondary scrub and shrubland (12%), much of which occurs in the lowland bioclimatic zone (81 %). Over half of it (54%) lies on Land Use Class 7, the most erodible and least productive steep hill country. Manuka is the dominant species of the youngest scrub, with mountain horopito, *Coprosma* sp. (*t*), heketara, kohuhu, mahoe wao and mingimingi dominating the older, and higher altitude broadleaved scrub shrubland.

Freshwater wetlands account for only 0.2 % of the areas surveyed within the district (Table 4). Most lie either in the Moanui or Motu River valleys, with one recorded in the montane bioclimatic zone on Maungatapere.

FIGURE 5 : DISTRIBUTION OF PRIMARY, ADVANCED SECONDARY, AND SECONDARY VEGETATION BY LAND USE CAPABILITY CLASS IN THE MATAWAI ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by indigenous vegetation.

TABLE 4 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION/LANDFORM CLASSES IN ALL STUDY SITES (INCLUDING PROTECTED NATURAL AREAS), IN THE SOUTHERN HALF OF MATAWAI ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	% OF TOTAL STUDY SITE AREA	% OF ECOLOGICAL DISTRICT (PART)
Primary/logged primary			
beech forest	1466	16	2.9
conifer/beech forest	2001	22	3.9
conifer/broadleaved-beech forest	789	8.8	1.5
conifer/tawa-beech forest	995	11	1.9
tawa-beech forest	77	0.9	0.2
conifer/tawa forest	379	4.2	0.7
tawa forest	1404	16	2.7
conifer forest	89	1.0	0.2
Advanced secondary			
conifer/broadleaved forest	162	1.8	0.3
broadleaved forest	541	6	1.1
Secondary scrub/shrubland			
manuka scrub	416	4.6	0.8
broadleaved/small-leaved scrub	494	5.5	1.0
broadleaved scrub-shrubland	173	2	0.3
Freshwater wetland	16	0.2	0.03
TOTAL	9002	100	17.6

5 Existing Protected Natural Areas

Most of the 100 Protected Natural Areas (PNAs) within the Tiniroto, Waihua, Mahia, and Matawai Ecological Districts are administered by the Department of Conservation as either Scenic Reserves, Conservation Areas, Nature Reserve, or National Park. Most of the remainder are either subject to Open Space Covenants (OSC) with Queen Elizabeth II National Trust, Nga Whenua Rahui Kawenata, or other conservation covenants. Together the PNAs cover 20 610 ha or 4.2% of the total study area.

Several areas have a degree of legal protection as Marginal Strips under the Conservation Act, but for the purposes of this study and report they have not been treated as PNAs.

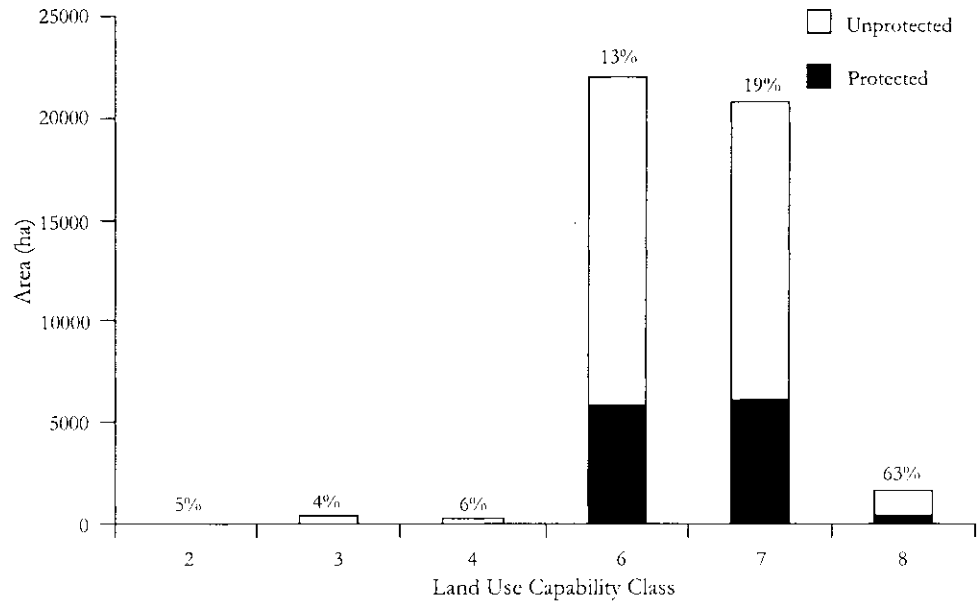
The PNAs of each ecological district in the study area are described in the following sections.

5.1 TINIROTO ECOLOGICAL DISTRICT

Existing PNAs within the Tiniroto Ecological District total c. 12 567 ha, or 28 % of the total indigenous vegetation surveyed and 4.3% of the total district. The proportions of vegetation/landform classes represented in protected areas range from 0% (with nine classes absent from the PNAs), to 73% (conifer/beech forest most of which lies within the Panekiri, Miromiro, and Mangatahae Conservation Areas) (Table 5). Of the vegetation that is protected 48% is primary forest, 6.4% is advanced secondary forest, 45% is secondary vegetation, and 0.2% is freshwater wetlands and lakes.

Protected areas occur throughout the district. However, most of the sizeable areas lie near the district's western boundary and are strongly concentrated on the steeper hill country; 99% lie on Land Use Capability Classes 6, 7, and 8. Waingake Waterworks Bush, Kumi Conservation Area and Anewa Reserve are the only large protected areas in the southeast part of the district. Other smaller PNAs occur along the major river courses of the district, e.g. the Hangaroa and Waikura River valleys where there are a number of small podocarp-dominated reserves. Overall the PNAs do not represent the full range of ecological diversity within the district, particularly the vegetation classes in the lowland, semi-coastal and coastal (where there is no protected vegetation) bioclimatic zones.

FIGURE 6 : DISTRIBUTION OF PROTECTED NATURAL AREAS (PNAS) AND UNPROTECTED INDIGENOUS VEGETATION IN RELATION TO LAND USE CAPABILITY CLASSES IN THE TINIROTO ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by surveyed indigenous vegetation.

TABLE 5 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN PROTECTED NATURAL AREAS AND IN ALL UNPROTECTED STUDY SITES, IN THE TINIROTO ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	PROTECTED (HA)	(%)	UNPROTECTED (HA)	TOTAL (HA)
Primary/logged primary				
beech forest	6.9	0.4	1932	1939
conifer/beech forest	592	73	224	816
conifer/broadleaved-beech forest	133	82	29	162
broadleaved-beech forest	36	100	0	36
conifer/tawa-beech forest	2523	68	1191	3714
conifer/broadleaved forest	38	14	226	264
tawa-beech forest	15	9.6	141	156
conifer/tawa forest	1570	48	1719	3289
conifer/tawa-titoki forest	0	0	30	30
conifer/tawa-kohekohe forest	0	0	54	54
tawa forest	990	24	3082	4072
tawa/kohekohe forest	14	6	223	237
tawa-titoki/kohekohe forest	0	0	0.8	0.8
tawa-titoki forest	6.7	4.2	152.3	159
conifer forest	101	20	396	497
Advanced secondary				
conifer/broadleaved forest	38	55	31	69
conifer/kanuka-broadleaved forest	0	0	243	243
conifer/kanuka forest	0	0	886	886
broadleaved forest	38	3.5	1043	1081
kanuka-broadleaved forest	735	49	779	1514
Secondary forest/scrub/shrubland				
kanuka forest	2929	31	6642	9571
conifer/small-leaved scrub	0	0	15	15
kanuka scrub	425	19	1848	2273
manuka scrub	0	0	2090	2090
manuka-kanuka scrub	1559	23	5339	6898
tauhinu scrub-shrubland	0	0	83	83
broadleaved/small-leaved scrub	769	24	2413	3182
broadleaved scrub-shrubland	22	3.4	624	646
Cliff vegetation	0	0	54	54
Freshwater wetlands and lakes	26	11.7	196	222
TOTAL	12567	28.4	31 686	44 253

The following are brief descriptions of the PNAs within the Tiniroto Ecological District. The numbering follows that in Fig. 10.

15. Wharekopae Conservation Area. Most (c. 706 ha) of this 954 ha Conservation Area lies in the Tiniroto Ecological District, the balance (c. 248 ha) in the Matawai Ecological District. The Conservation Area covers moderate to steep upper slopes and stream gullies of the Mokonuiarangi Range, in the lowland to montane bioclimatic zones (c. 440–855 m a.s.l.). Some of the steep valley sides have bluffs, incised into south-east dip-slopes, with scarps in hill-slopes on the northwestern side. It contains a number of tributaries that drain east-southeast into the Hangaroa River, including the Papokika Stream. West flowing streams drain into the Mutuera Stream. Parts have been subject to logging, clearance, and repeated burnings with the last fire occurring c. 1967 (Shaw 1989). This disturbance has resulted in a complex mosaic of vegetation types at varying stages of succession. The bulk of the upper slopes have secondary manuka-broadleaved scrub-shrubland, with scattered young beech and podocarps throughout. Wilding pines are scattered in patches. There are several sizeable pockets of primary rimu-miro-northern rata/tawa-kamahi-beech forest, and at the highest altitudes pure beech forest. Small areas on the midslopes have logged tawa-broadleaved forest. There is an old Forest Service record of hard beech within this area, but none was seen during this survey. It seems more likely that this record was a mis-identification of red beech, as they look very similar. The area is significant as a wildlife habitat with silvereye, tui, bellbird, Australasian harrier, grey warbler, fantail, kingfisher and long-tail cuckoo all recorded (Shaw 1989).

16. Devine Covenant (8.7 ha OSC) consists of two separate areas, both of which are continuous with RAP TIN 2. One has a small block of primary podocarp/tawa forest surrounded by kanuka forest, along the RAP's south-eastern margin (4.2 ha; 320-380 m a.s.l.). It also includes a small raupo swamp. The other lies on narrow riparian terraces, moderate slopes and steep faces on the true right of the Waikohu River (4.5 ha; 100-160 m a.s.l.). It contains a substantial area of primary tawa-dominated forest, with a number of large podocarps along the river margin, and kanuka-broadleaved forest on the upper slopes.

17. Otoko Scenic Reserve (34.4 ha) and **Otoko Walkway** (part) has kanuka-kowhai forest on river terraces and steep slopes which can be viewed from SH2 (120–200 m a.s.l.). Houhere, mamaku, mahoe and titoki are local amongst the canopy. The Scenic Reserve has associations with the historic Otoko railway (operating 1912-59), and is continuous with the walkway. Fauna recorded in the reserve include weka, kereru, fantail, grey warbler and tui.

18. Makaretu Scenic Reserve (5.3 ha) forms a scenic backdrop to the Rere 'rockslide' upstream of Rere Falls, a much utilised summer recreation area on the Wharekopae River. The reserve covers steep and moderate slopes (200–300 m a.s.l.) on the true left of the river, which support advanced secondary tawa-titoki-(kowhai) forest. *Pittosporum ralphii*, kamahi, mamaku, putaputaweta, kohuhu and wineberry are also present. The reserve has a 'moderate' botanical conservation ranking (Beadel 1989).

19. Tahungatawa Scenic Reserve (6.6 ha) lies on south-southwest facing moderate slopes and ridges beside Bushy Knoll Road (400-480 m a.s.l.). A small stream which flows through the reserve is part of the upper reaches of the Tahungatawa Stream catchment. The ridges have narrow strips of black beech forest, with rewarewa/tawa forest on the hillslopes and kahikatea/broadleaved mosaic along

the lower slopes and beside the stream. Domestic stock have access to the reserve with animal damage noted throughout. Household rubbish has also been dumped in it.

20. Strathblane Scenic Reserve (4.8 ha) is in two parts. Both lie on alluvial terraces; the larger area on true right terraces of the Hangaroa River (c. 190 m a.s.l.), the smaller area beside the Mangatumari Stream 1 km to the northwest (200 m a.s.l.). The vegetation of both is lowland kahikatea forest with matai and totara. Hinau, black maire, pokaka and narrow-leaved lacebark are also present within the canopy. Small-leaved shrubs dominate the understorey with shrubby mahoe, *Coprosma areolata*, *C. rotundifolia*, *C.*sp. (t), and poataniwha all common. This is one of the few remaining examples of this vegetation type within the district. The major threats to the reserve come from invasive weeds; old man's beard is present in the area beside the Hangaroa River, with sweet briar, ivy, barberry, wild strawberry, blackberry and sycamore all present in the smaller area.

21. Awapapa Covenant (4.9 ha OSC) lies on the true right banks of the Mangawehi Stream, near its confluence with the Hangaroa River, in the lowland bioclimatic zone (180–240 m a.s.l.). Exotics have been planted on the central ridge and slopes above the covenant. The lower to mid-slopes support podocarp-rich kahikatea-(totara-matai) forest, with young kahikatea-matai/kohuhu-kowhai low forest on the steep upper slopes. A number of invasive weeds are present within the covenant, including cotoneaster, wilding pines, old man's beard and tree privet. Domestic stock also appear to have access across the stream, with stock tracks evident in the understorey.

22. Doneraille Park Recreation Reserve (c. 28.5 ha) lies on alluvial terraces (true right), moderate to steep slopes, narrow ridges, and steep bluffs (true left) on either side of the Hangaroa River, c. 4 km north of Tiniroto. It covers an altitudinal gradient of 260 m, from 140–400 m a.s.l. The alluvial terraces on the true right support kahikatea-totara-matai treeland with scattered large kanuka. The understorey is dominated by exotic grasses, with occasional rohutu, mahoe, houhere, poataniwha and cabbage tree in the sub-canopy. The narrow terraces on the true left have a band of primary totara-kahikatea forest with matai. This terrace suffers regular erosion with tree roots exposed along its edges. The terrace forest merges into logged primary kahikatea/tawa forest on the lower to mid-slopes, with occasional rimu and titoki. The upper true left slopes have a young advanced secondary broadleaved mosaic of kowhai, rewarewa, titoki, young totara, pigeonwood, *Pittosporum ralphii* and mahoe. The reserve is valuable as a popular camping and swimming spot during the summer. It also has significant conservation and botanical values, as an integral part of a semi-continuous chain of indigenous vegetation along the Hangaroa River valley.

23. Hangaroa Scenic Reserve (23.8 ha) lies in a horseshoe bend on alluvial terraces and terrace risers (100-200 m a.s.l.) on the true left of the Hangaroa River, c. 7 km north of Te Reinga. It is a riparian strip (50-350 m wide) of primary forest with high numbers of large emergent kahikatea, some of which are over 50 m tall. They, along with large matai, rimu and totara, are emergent over a tawa-dominated canopy. The understorey is dense in places with small-leaved shrubs, including turepo, rohutu, mingimingi, *Coprosma rotundifolia* and *Pseudopanax anomalus*. Partially logged in the past, old logging tracks and stumps are still evident within the reserve. It is now fully fenced and buffered by exotic forestry on the upper slopes. The reserve has a high botanical conservation values (Beadel 1989a) and is also a significant wildlife habitat with an SSWI ranking of 'moderate' (Rasch 1989).

24. Berry Covenant (4.3 ha OSC) lies on an old terrace in the upper reaches of the Mangamate Stream, a true left tributary of the Hangaroa River, 4 km west of Tiniroto (180-220 m a.s.l.). It is enclosed by an arm of RAP TIN 40. The vegetation is predominantly kahikatea-(rimu)/tawa forest, with scattered emergent matai and miro. Fencing c. 1991 has allowed the understorey to recover well, with abundant seedlings, saplings, ferns and herbs. The terrace is dissected by an old meandering stream course, whose banks are clothed in ferns and hook sedge. The forest is the only area of terrace forest with a relatively intact understorey in this part of the Hangaroa River valley.

25. Waingake Waterworks Bush (1104 ha OSC) extends over a wide altitudinal gradient (from 200 m a.s.l. beside the Te Arai Stream it rises to 718 m (Te Rimuomaru trig) on the southern boundary) and extends from the semi-coastal to lowland bioclimatic zones. It is the largest and perhaps the most diverse piece of primary lowland forest remaining in the eastern soft-rock lowlands of the North Island; there is no other comparable piece of lowland podocarp-broadleaved-beech forest of such size and intactness. The Bush is also an important wildlife habitat with a SSWI ranking of 'moderate-high'; past surveys have recorded kereru, grey warbler, rifleman, tui, bellbird, tomtit, whitehead, shining cuckoo and silvereye (Shaw 1989). The lower slopes support rimu-(totara-matai-kahikatea) /tawa-(pukatea) forest, with scattered large nikau and rewarewa. Black beech forest occurs on the ridges and spurs. There are abundant epiphytes and liana, including rata, *Astelia* spp., orchids, ferns, supplejack and kiekie. Rimu/tawa forest also dominates at higher altitudes, but with red and silver beech occurring on the ridges, along with large totara, hinau, miro and rewarewa. Some clearance and burning has occurred on some sections of the margins in the past. Here the vegetation is advanced secondary rewarewa-rimu-hinau/tawa forest, with high numbers of young podocarps.

26. Wharerata Hill Scenic Reserve (18.7 ha) lies in a narrow incised stream gully beside SH2, in the upper reaches of the Tarakihinui Stream (300-460 m a.s.l.). The east-southeast facing slopes have primary rewarewa/tawa-(pukatea)/(kohekohe-mahoe) forest, with scattered hinau. The understorey is diverse with kohekohe and mahoe most abundant. The north-northwest facing slopes have an advanced secondary mosaic of rewarewa/broadleaved trees. The head of the gully contains the youngest vegetation; secondary five finger-kanuka scrub shrubland with tutu, wineberry, tree fuchsia, koromiko and mahoe. The reserve has botanical significance as one of only very few remnants remaining in the semi-coastal bioclimatic zone of the district.

27. Waimarie Covenant (4.8 ha OSC) consists of two small remnants of semi-coastal logged primary tawa-dominated forest on moderate slopes in the upper catchment of a true right tributary of the Kopuawhara Stream (180-240 m a.s.l.). The forest also has nikau, rimu, hinau, karaka and rewarewa amongst the canopy, with kohekohe dominating the sub-canopy/understorey.

28. Mangaone Caves Scenic Reserve (2.0 ha) includes access to the cave through farmland and the entrance to Mangaone Cave itself, 6 km inland from Nuhaka (320-420 m a.s.l.). The steep slopes/bluffs around the cave mouth support a mixture of shrub, fern and liane species; including hangehange, mahoe, karo (*Pittosporum crassifolium*), tree fuchsia, *Metrosideros colensoi* and *Adiantum cunninghamii*. Shrub species have also been planted in the fenced of area around the mouth. Ferns and liverworts are the only plants that extend any distance into the cave itself

(*Adiantum cunninghamii*, hound's tongue and nini). The caves are extensive and have karst type features that are typical of other caves in the Nuhaka area: stalactites, stalagmites, tomos and calcite wall coverings. Vegetation like that which surrounds the cave mouth is no longer widespread in the district.

29. Kumi Conservation Area (264.3 ha) lies in the upper catchment of a tributary stream of the Tahaenui River. The topography varies from steep to gentle slopes, with narrow dry ridges and deeply incised streams. It lies in the lowland bioclimatic zone (c. 140-400 m a.s.l.). Tomos within the area are part of the end of the local limestone formation. The vegetation is dominated by kanuka scrub-forest, with small areas of logged primary tawa-dominated forest. The bird life is abundant and diverse, with kereru, tui, bellbird, NZ kingfisher, shining cuckoo, fantail, grey warbler, pipit and silvereye all recorded during this survey.

30. Anewa Reserve (c. 266 ha) is a Maori reserve protected through Nga Whenua Rahui, located 14 km northeast of Wairoa and continuous with the Kumi Conservation Area (described above). The western side, covering the headwaters of Mangaone Stream has a mosaic of two vegetation types; primary (rimu)/tawa forest restricted to the moister sites close to the stream, and kanuka forest on the drier sites. On the eastern side, which covers part of a tributary of the Makaretu Stream, tawa forest dominates the steep east facing upper slopes of a prominent scarp and gentler mid-slopes of the valley side, with rewarewa locally dominant on drier ridges and kanuka forest on the gentle slopes. Ngaio and kowhai occur on the scarp crest. This fades to younger scrub and grassy clearings. Fire, selective logging and browsing by domestic stock and goats have all influenced the present vegetation patterns of the covenant.

31. Waiparere Covenant (69.9 ha OSC) consists of three areas in the upper catchment of Mangaone Stream, c. 14 km northeast of Wairoa (100-240 m a.s.l.). The largest area contains stream gullies which support remnants of primary logged/ secondary advanced tawa-dominated forest, with titoki, pukatea, young kahikatea, matai, rewarewa and tall kanuka. The gullies are surrounded by younger secondary kanuka-dominated scrub-forest. It also contains a series of small wetlands in the gullies to the west, which are diverse and support predominantly native vegetation around their margins. The other two smaller areas both contain lakes, with the southernmost one the largest. The smaller lake has the most diverse tall vegetation around its margin and on the slopes to the east, which include older kanuka forest with young tawa, houhere, silver fern, putaputaweta, mahoe and kohuhu amongst the canopy. The understorey is thick with divaricating shrubs and seedlings and saplings of broadleaved tree species. The covenant has significant wildlife habitat values, with 42 bird species recorded in the area; including tomtit, kereru, tui, bellbird, pukeko, morepork and Australasian harrier.

32. Te Reinga Scenic Reserve (15.7 ha) ranging from 40-140 m a.s.l., surrounds the Te Reinga Falls, a 35 m high waterfall on the Wairoa River just below the confluence of the Hangaroa and Ruakituri Rivers. The falls are carved from sandstone, with the limestone bluffs surrounding them a prominent feature. The limestone is continuous with the dip-slope of Mt Whakapunake. All of the vegetation within the reserve is secondary, ranging from kanuka scrub forest, to kanuka forest with a mosaic of broadleaved trees and shrubs. The most mature advanced secondary vegetation lies on the true left of the falls, with tall rewarewa and scattered conical kahikatea over a canopy of kanuka, tawa and kowhai. The reserve has scenic and cultural significance. It incorporates a historic track and nearby urupa, and has associations with nineteenth

century Maori settlement and the New Zealand Wars. Problem weeds within the reserve include Japanese honeysuckle, hawthorn, scattered wilding pines, buddleia, willows, poplars and wisteria. RAP TIN 90, which is continuous with the reserve, identifies the landform features and significant areas of primary forest and other diverse vegetation in the vicinity that are not already protected within the reserve.

33. Bushy Knoll Road Conservation Area (20.8 ha) lies at the end of Bushy Knoll Rd, c. 15 km northwest of Tiniroto, and c. 2 km to the east of Mangatahae Conservation Area (730–832 m a.s.l.). The core of the Conservation Area is logged rimu/beech forest which merges to secondary broadleaved shrubland-forest at the margins with mountain horopito, mingimingi, lancewood and big patches of treeferns. Bird species recorded within it during this survey include kereru, whitehead, rifleman, tui, tomtit and silvereye.

34. Mangatahae Conservation Area (499.1 ha) covers the upper catchments of the Mangapapa, Mangatahae and Mangapikopiko Streams. It covers a wide altitudinal gradient from 480-829 m a.s.l. Past logging and burning have created a mosaic of primary and secondary vegetation. Those areas logged have reverted to broadleaved scrub shrubland on the lower slopes, with mingimingi, mountain horopito and crownfern dominating at higher altitudes. The primary forest at lower altitudes is rimu-northern rata/tawa forest with beeches on the ridges and spurs. Hinau and rewarewa are also present in the canopy. At higher altitudes, above the altitudinal limit of tawa, the forest becomes red and silver beech-dominated with rimu emergent to c. 800 m (Beadel 1989a). The bird life within the Conservation Area is abundant and diverse with 19 indigenous species recorded there; including rifleman, whitehead, kereru, bellbird, grey warbler, NZ pipit, NZ falcon, fantail, NI robin, and North Island brown kiwi.

35. Waikareiti Conservation Area. A small part (c. 58 ha) of this 4307 ha Conservation Area lies within the Tiniroto Ecological District, the balance within the Waikaremoana Ecological District. The Tiniroto portion of the conservation area extends from streamside to ridge (340-575 m a.s.l.) on moderate slopes on the true left of Waipaoa Stream. The vegetation is predominantly rimu/tawa forest, with kamahi, tawari, miro, hinau, rewarewa and local rata. It is adjacent to the northwestern corner of Ruakituri Scenic Reserve (described below).

36. Ruakituri Scenic Reserve (248.7 ha) lies close to the boundary between the Tiniroto and Waikaremoana Ecological districts, 2.5 km north of the Erepiti Scenic Reserve. It covers an altitudinal range from 360–738 m a.s.l., on alluvial terraces and northeasterly facing steep slopes and bluffs on the true right of the Ruakituri River and Waipaoa Stream. The alluvial terrace supports young kahikatea-dominant podocarp forest, with totara, rimu and matai. Tawa, titoki, kowhai and hinau are locally common within the canopy. The core of the reserve is primary rimu/tawa forest, with pukatea in the damp gullies and scattered emergent matai, miro and northern rata. Hinau is locally common. The rest of the forest on the lower slopes has been logged, leaving tawa forest with only scattered podocarps. The upper slopes are steep with kowhai abundant amongst a low tawa canopy. These upper steep slopes are also home to populations of the 'critically endangered' (de Lange *et al.* 1999) shrub kakabeak.

37. Waipaoa 5C Maori Reserve (32.8 ha) is contiguous with Erepiti Scenic Reserve at its upstream end, and is a continuation of the same ecological pattern (200-360 m a.s.l.). Previously damaged by stock grazing, the reserve was fenced to exclude stock in 1991.

38. Erepeti Scenic Reserve (313.0 ha) covers terraces, steep slopes and bluffs, from 160–736 m a.s.l., on the true right of the Ruakituri River, 15 km east of Lake Waikaremoana. The terraces and lower slopes of the reserve support primary kahikatea-dominated forest, with totara and matai. Titoki, pukatea and tawa are also components of the canopy, with kowhai becoming more prevalent on the steep terrace risers. In several places along the river there is a narrow fringe of 150-200 year old red beech (Grant 1996). Forests on the lower to mid slopes have a high density of very large rimu over a canopy dominated by tawa with locally common hinau, and pukatea. Totara, matai, miro, and black beech (on ridges) are also present but less frequent. The upper slopes are steep, with slips and grassy open faces evident. These steep slopes have low patchy forest of tawa and kowhai, with scattered emergent rimu and kahikatea. The bird fauna of the reserve is diverse, with kereru, bellbird, tui, grey warbler, Australasian harrier, NZ pipit, fantail and silvereye all recorded. Goats are the main threat to the vegetation's integrity. Ngaio and nikau, usually of more coastal habit, are also present (Beadel 1989a).

39. Te Urewera National Park. Only a small part (c. 41 ha) of this 212 673 ha PNA lies within Tiniroto Ecological District, the balance in Waikaremoana Ecological District and beyond. At two places along its southeastern boundary the National Park extends over the ecological district boundary from the long dip-slopes of the Ngamoko Range in the Waikaremoana Ecological District into the Tiniroto Ecological District. These areas are continuous with RAP TIN 118. The vegetation there is predominantly secondary, with some logged tawa forest in towards the foothills of the Ngamoko Range.

40. Painga Conservation Area (270.5 ha) (also known informally as Ngamoko Forest) lies c. 13 km east of Lake Waikaremoana on gentle to moderate hill country (300–556 m a.s.l.) in the headwaters of the Mangaaruhe River. The bulk of the conservation area is primary rimu-(matai)/tawa forest, with emergent matai and totara. The lower slopes to the south and upper slopes to the north have been partially logged. The forest which remains is dominated by tawa, with only scattered old and very young podocarps. Hinau, rewarewa, maire and kamahi are locally common. Old logging tracks are regenerating with dense wineberry and young broadleaved trees. Along the western boundary there are two small patches of kahikatea forest around several small wetlands. The Conservation Area is significant as it contains one of the largest remnants of primary rimu-(matai)/broadleaved forest remaining in the district. It is also a valuable wildlife habitat with an SSWI ranking of 'moderate-high': kereru, tui, bellbird, grey warbler, Australasian harrier, fantail, tomtit, rifleman, kingfisher and NZ pipit have all been recorded in the area, with long-tail bats probably present too.

41. Te Raupo Scenic Reserve (40.2 ha) runs in a band (100-600 m wide) along the Mangaaruhe River and one of its major tributaries. It extends from narrow alluvial terraces to ridge top (120–260 m a.s.l.), and is dissected by Okare Road. All the vegetation within the reserve is secondary; young kahikatea and totara are emergent over kowhai and a mosaic of five finger, lancewood, houhere and titoki. Kahikatea and exotic willows dominate the narrow alluvial terraces. Japanese honeysuckle, hawthorn and blackberry are the most conspicuous weed species.

42. Bayley Covenant (5.2 ha OSC) lies in two pieces on moderate slopes (240-320 m.a.s.l.) in small tributary catchments of the Mangaaruhe River and lower Mangapouri Stream, c. 1.5 km south of Ohuka. The covenant, registered in 1987, supports primary tawa-dominated forest with titoki, matai, kahikatea and rewarewa. Kereru, bellbird, tui and fantail have all been recorded there.

43. Monteith Covenant (4.5 ha OSC) lies on moderate to steep south-facing slopes in the mid-reaches of the Oruatipoki Stream c. 3 km west of Ohuka (200-290 m a.s.l.) It contains tawa-dominated forest with totara, kahikatea, titoki, ngaio, hinau, rewarewa and five finger also present. The covenant was registered in 1989.

44. Longman Covenant (8.6 ha OSC) lies c. 4 km southwest of Ohuka, and contains selectively logged (rimu)/tawa forest (400-440 m a.s.l.). A number of large emergent rimu are still present, with titoki, ngaio, hinau, rewarewa and pukatea present in the canopy. The covenant was registered in 1988. Kereru and common forest birds have been recorded.

45. Ross Covenant (7.9 ha OSC) lies c. 4.5 km southwest of Ohuka, just off Ohuka Road. Pine plantations bound the covenant along its northwestern and southeastern margins (400-450 m a.s.l.). The covenant contains a remnant of primary rimu/tawa forest, with emergent rewarewa, kahikatea and matai. Pukatea, titoki and hinau are also present in the canopy. Kereru, tui, bellbird, greywarbler and fantail have all been recorded in the covenant.

46. Ohuka Conservation Covenant (145.9 ha) lies in the centre of RAP TIN 118 c. 4 km east of Tuai, in the headwaters of the Oruatipoki Stream. It lies in the lowland bioclimatic zone, covering an altitudinal range from 440-666 m a.s.l. The vegetation in the centre of the covenant is predominantly tawa-beech forest, with tawa dominating the stream gullies and black beech on the ridges. Scattered pole rimu, kahikatea and rewarewa occur amongst the tawa in the gullies. The primary forest merges to younger secondary broadleaved forest and manuka scrub around its margins.

47. Onepoto Conservation Area. Part (136 ha) of this 205 ha Conservation Area 1 km west of Tuai, lies within Tiniroto Ecological District. This part of the Conservation Area lies on mid-slopes (400-580 m a.s.l.) of the landslide debris, on part of the landslip that originally formed Lake Waikaremoana. The upper slopes of the Conservation Area are included within Waikaremoana Ecological District. The vegetation is dominated by broadleaved scrub and secondary forest, manuka and localised kanuka scrub/forest. A small lake (Hikaka) is included. Kereru and common bush birds including tui, fantail, rifleman and tomtit have been recorded.

48. Tutaemaro Conservation Area (627.8 ha) lies 2.5 km southwest of Tuai, and includes extensive faces and gullies to the north and south of the prominent ridge through Tutaemaro (300-722 m a.s.l.). Most of the area is manuka and kanuka-manuka-treefern scrub-low forest, with several gullies of kanuka-broadleaved forest, and rimu-tawa-beech forest. At its southern corner it is contiguous with the Waihi Stream Covenant, through which it is linked to Miromiro and Panekirikiri Conservation Areas. Threats include feral goats, stock, deer, pigs and scattered wilding pines.

49. Waihi Stream Conservation Covenant (83 ha) covers moderate to steep riparian slopes and small areas of alluvial terrace along Waihi Stream, c. 6 km south of Tuai (260-420 m a.s.l.). It is continuous with Tutaemaro Conservation Area to the north (described above) and Miromiro Conservation Area upstream to the west (described below). Most of the vegetation within the covenant is secondary. The riparian vegetation is a variable mix of manuka, kanuka, kowhai (most abundant on the steeper faces), kohuhu, mamaku, totara, black beech, and tawa (in several small pockets). There are also a few small stands of pole kahikatea forest on the alluvial terraces. The upper slopes are predominantly young manuka shrubland-scrub and bracken fernland.

50. Miromiro Conservation Area. Most (717 ha) of this 795 ha PNA lies within the Tiniroto Ecological District, the balance in Waikaremoana Ecological District. It extends from outlying foothills of the Panekiri Range (up to 809 m) to Waihi Stream (365 m). Most of the vegetation within the Conservation Area has been lightly logged (Shaw 1987), with the bulk of the area (lower slopes) cut-over rimu/tawa-black beech forest. The upper slopes support a mix of vegetation types, dominated by red and silver beech, with kamahi, tawari, mountain horopito, treeferns and areas of scrub of various ages throughout. There is a lake at the Conservation Area's southeastern edge with scattered beech, young podocarps and broadleaved trees around parts of its margin, along with raupo reedland and assorted rushes and sedges. It appears to have high water quality. Kakariki, kaka and kereru have all been recorded within the Conservation Area.

51. Panekirikiri Conservation Area. Most (1646 ha) of this 1908 ha PNA lies within the Tiniroto Ecological District, the balance in the Waikaremoana Ecological District. It is extensive, extending from the moderate to steep foothills of the Panekiri Range to the hillcountry further to the east (440-849 ha a.s.l.). It covers the headwaters of Waihi Stream and part of the upper catchment Mangaone Stream. The vegetation at lower altitudes is rimu-tawa-beech forest, some of which has little rimu remaining, either through selective logging or crown fires. Red and silver beech forest are present on the ridges. At mid-altitudes (above the altitudinal limit of tawa) and closer in towards the ecological district boundary the forest is rimu-broadleaved-beeches (Nicholls Class I18) with frequent red and silver beech, kamahi, tawari, occasional rimu, miro, Hall's totara and toatoa. At higher altitudes (above c. 800-850 m) the forest is dominated mainly by red beech, with lesser silver beech, kamahi, tawari and tawheowheo. It has an SSWI ranking of 'outstanding'. Whio, kaka, kakariki, kereru, robin, tomtit, whitehead, fantail and grey warbler have all been recorded there, with bats and kiwi reported.

52. Mangaone Conservation Area. Most (2651 ha) of this 3897.8 ha PNA lies within the Tiniroto Ecological District, the balance in Waikaremoana Ecological District. It is an expansive area (c. 160-722 m a.s.l.) of predominantly rolling-moderate terrain and old kanuka forest which abuts Te Urewera National Park . Emergent rewarewa, matai, kahikatea and rimu are scattered throughout, with kowhai common in steeper areas. There are local patches of the original tawa forest with emergent rimu, matai and kahikatea. The Waiau River, with steep riparian slopes, runs along the area's southern and western boundaries.

53. Waihi North Conservation Covenant (20 ha) lies on moderate south-facing slopes in the mid to lower reaches of a small true left tributary of Waihi Stream, c. 6 km south of Tuai (240-390 m a.s.l.). It contains a compact remnant of primary (rimu)-(kahikatea)/tawa forest with numerous large emergent rimu, kahikatea, but fewer totara and matai. There are also occasional hinau and kamahi in the canopy. Past grazing has left the understorey bare in places but it is now recovering well.

54. Waihi South Conservation Area (365.7 ha) lies c.7 km south of Tuai (c. 300–476 m a.s.l.). It contains secondary lowland forest, (which is predominantly rewarewa emergent over a variable canopy of broadleaved shrubs, kanuka and treeferns) manuka-kanuka scrub, small areas of exotic pine forest and several small wetlands which support raupo reedland, herbfield and sedgeland. The wetland areas are botanically significant, as there are few remaining in the lowland bioclimatic zone of the district.

55. Ruapapa Conservation Covenant (444 ha) contains three discrete areas immediately west of Patunamu Forest. The largest (418 ha) drains north to Waihi Stream and south to Lake Ruapapa (a hydro-dam) (160-476 m a.s.l.). The vegetation within it is dominated by kanuka and ranges from young scrub to older and more diverse kanuka-broadleaved forest with abundant pole podocarps. The smallest area (1.9 ha) contains a wetland (390 m a.s.l.), which has open water with a band of wetland vegetation around its margin. This vegetation includes *Eleocharis sphacelata* sedgeland, *Carex sinclairii* sedgeland, *Eleocharis acuta* sedgeland and low turf communities dominated by *Pratia perpusilla* and *Myriophyllum propinquum* (Beadel 1989b). The wetland is surrounded by manuka-kanuka scrub, and is fully fenced. This small wetland has 'very high' botanical conservation values (Beadel 1989b). The third area (25 ha), which lies 400 m to the southeast of the lake, lies in the upper catchment of a stream which also drains into Lake Ruapapa (220-380 m a.s.l.). The vegetation is also dominated by kanuka, with treeferns abundant in the gullies. The kanuka forest is diverse with abundant regeneration.

56. Lower Waiau Conservation Area (1.3 ha) is a small reserve (60-90 m a.s.l.) on riparian slopes with forest and grassand beside the Waiau River, near the powerhouse for the Lake Ruapapa hydro-dam. The track to the powerhouse bounds the Conservation Area along its upper edge.

57. Mangaone Stream Conservation Area (184.2 ha) is a long and mostly narrow band of vegetation which extends c. 6 km along the true left bank of the Mangaone Stream (120-300 m a.s.l.) (Waiau River tributary). The riparian slopes are steep, with a number of bluffs and mainly secondary or young successional vegetation that is a mosaic of different aged kanuka scrub and forest with scattered broadleaved species (including putaputaweta, kowhai, kohuhu) and young totara amongst the canopy. Primary forest occurs on some more stable sites, including a broad area of moderate south-facing slopes extending almost 1 km back from the stream. This is tawa forest, with emergent rimu, kahikatea, matai and totara. Some of the kahikatea are very tall, reaching almost 60 m in height. This forest is typical of what would have been widespread on easy fertile slopes in the area.

58. Waiau River Conservation Area (7.0 ha) lies c. 3 km north of Putere, on riparian and moderate south-facing slopes on the true left of the Waiau River. The eastern half of the reserve is in pasture, while the western half supports regenerating manuka-kanuka scrub with small pockets of mature podocarps and broadleaved low forest. Common forest birds, wading birds and waterfowl have all been recorded there.

59. Dixon and McCallum Covenant (146 ha OSC) lies c. 22 km northwest of Raupunga near the end of Putere Rd, on steep sandstone bluffs and moderate to steep slopes (340-660 m a.s.l.) on the northern side of Te Ihuorurumaioterangi. Much of the vegetation within the covenant is modified primary rimu-matai/broadleaved forest, with scattered emergent kahikatea, miro and local totara. The canopy is a mosaic of tawa, kamahi, hinau, rewarewa, maire and tawari. This forest merges into rewarewa/kanuka scrub-low forest and logged primary tawa forest towards Putere Rd. The steeper upper slopes have a mixed forest of beech with tawa, kamahi and tawari.

60. Putere Scenic Reserve (47.8 ha) covers steep slopes, a radial ridge, and north-facing cliffs above Putere Rd, that range from 460-755 m a.s.l. The reserve is a mosaic of mostly secondary vegetation with small areas of primary rimu/tawa forest on the northeasterly facing steep slopes. The older secondary vegetation is dominated by

broadleaved species (houhere, ngaio, kowhai, mahoe), with younger kanuka forest and manuka scrub amongst it.

61. Lake Rotoroa and Lake Rotongaio Conservation Area (21.3 ha) includes the margins and lake bed of Lake Rotongaio (400 m a.s.l.) and half the lake bed of Lake Rotoroa (320 m a.s.l.) at Putere. The lakes were formed by a large landslide c. 6500 years ago (Soons & Selby 1992). The lakes vary in depth from 5-19 m. Raupo reedland is the dominant vegetation around the lake margins, with scattered manuka scrub. Birds recorded on the lakes include the NZ dabchick, spotless crake, NZ scaup and Australasian bittern. There is a pa site near the edge of Lake Rotongaio, and the area has high cultural significance as a traditional eeling area.

62. Rawhiti Scenic Reserve (9.0 ha) is a small reserve on gentle slopes on the boundary with the Waihua Ecological District, containing lowland (240–290 m a.s.l.) primary rimu-matai/tawa forest, and a small area of secondary vegetation. The reserve has probably been lightly logged (Beadel 1989a), however it is one of few remaining examples of this formerly widespread vegetation type. It has abundant bird life with common bush birds and kereru present. Threats include the taking of treeferns.

63. Tutumaru Stream Conservation Covenant (43 ha) lies on moderate to steep slopes in the mid to lower reaches of the Tutumaru Stream, and on moderate slopes around its confluence with the Mohaka River (140-280 m a.s.l.). The core of the covenant is tawa forest, with emergent rewarewa and kahikatea, and titoki, hinau and pukatea present in the canopy. The upper slopes and ridges support kanuka forest, with scattered broadleaved trees and shrubs. The covenant is continuous with RAP WAH 37 along its southern boundary.

64. Pihanui Conservation Area (726.2 ha) bounds the Mohaka River and contains lowland (60–433 m a.s.l.) predominantly kanuka forest with emergent rewarewa. Other canopy species include titoki, kowhai, houhere and pole kahikatea. A 15-20 ha area of primary tawa-dominated forest with scattered emergent podocarps occupies easy south-facing slopes in the core of the areas. It also includes two wetlands with raupo reedland, sedgeland and herbfield in good condition. Common bush birds are present in addition to the fernbird and at least until recently kiwi. The topographic map of this area (NZMS 260 W19, first edition 1989,1994 - see also Map 25) is in error in showing an extensive area of the northern part of the Conservation Area to be pine plantation.

65. Fraser's Bush Scenic Reserve (64.3 ha) is a triangular area of mostly primary forest on moderate to steep slopes above the Mohaka River (80–376 m a.s.l.). The steep faces and bluffs above the Waiwai Creek form the area's western boundary. Kahikatea and matai are emergent over a tawa canopy on the lower slopes, with broadleaved forest/shrubland on the upper slopes with abundant kanuka, kowhai etc. Selective logging of the primary forest has occurred in the past.

66. Pioneer Bush (188 ha OSC) covers moderate to steep slopes(200-568 m a.s.l.), rocky bluffs and outcrops in the catchment of the deeply incised Whakamarino Stream, which is a true left tributary of the Te Hoe River. The bulk of the covenant supports impressive unlogged primary podocarp forest, with more modified advanced secondary forest on the north-northeasterly facing slopes around Te Ipuohape (568 m). The primary forest contains huge totara, kahikatea, tanekaha, rimu and matai , with black and red beech throughout and dominating the spurs and ridges. The advanced secondary forest also contains abundant beech, kamahi, young totara, kahikatea, rimu, groves of young tanekaha (particularly on gentler slopes in the

mid reaches of the Whakamarino Stream) and kanuka. The covenant and surrounding indigenous forests (which are included within RAPs TIN 141, 142 and 143) have important wildlife habitat values, with an SSWI ranking of 'high'. In the 1980s kiwi, kaka and kakariki were all present. However, they were then in decline and few of these are likely to be present now (J. McLennan pers. comm.). Other forest birds including kereru, bellbird, tomtit, rifleman, whitehead, robin and fantail are still abundant.

5.2 WAIHUA ECOLOGICAL DISTRICT

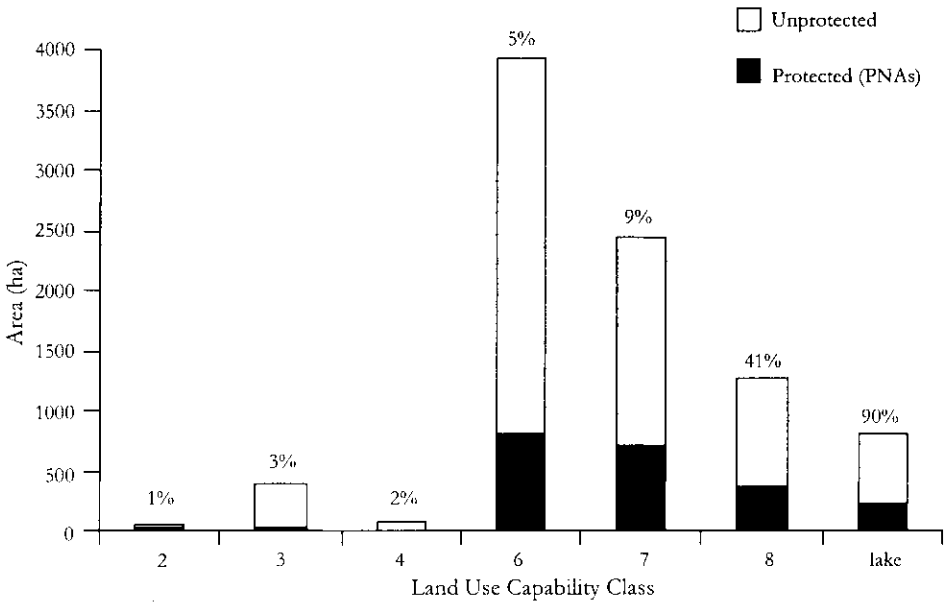
Existing Protected Natural Areas (PNAs) within the Waihua Ecological District total 2067 ha, or 23% of the total indigenous vegetation surveyed and only 1.6% of the total district. The proportions of the vegetation/landform classes represented within the protected areas range from 0% (i.e. conifer/kanuka-kohekohe forest, conifer/small-leaved forest, broadleaved-small-leaved scrub, and broadleaved scrub shrubland), to 100% in the case of black beech forest all of which lies within the Morere Scenic Reserve (Table 6)[5]. Of the primary forest surveyed 37% lies in protected areas, along with 23% of advanced secondary and 15% of secondary vegetation, and 45 % of cliff vegetation (much of which lies within Earthquake Slip and Pittar's Conservation Areas).

Little of the protected vegetation lies on Land Use Capability Classes 1-4, the most productive land, with most (91%) of it on Land Use Capability Classes 6, 7 and 8. Most of the protected areas within the coastal bioclimatic zone are saline wetlands or coastal cliffs, with only a small area of primary coastal forest contained within the Waipatiki Domain.

In the very modified southern portion of the district a great proportion of the remaining primary and advanced secondary vegetation is already protected (i.e. within the Waipatiki, White Pine Bush and Mangapukahu Scenic Reserves, Waipatiki Domain, Earthquake Slip and Awatotara Conservation Areas, and Tutira Domain). The central portion of the district, between Raupunga and Wairoa, has a number of sizeable protected areas dominated by secondary vegetation, with primary tawa-dominated forest amongst it (i.e. Raupunga Scenic Reserve, and Tutaekuri and Maulder's Conservation Areas). In the east most of the protected areas are small scattered QEII covenants, with Morere Scenic Reserve (363.6 ha) the only one over 140 ha.

[5] A small pocket of black beech forest was also present on a ridge within RAP WAH 1 but this was too small to map at 1:50 000 scale.

FIGURE 7 : DISTRIBUTION OF PNAS AND UNPROTECTED INDIGENOUS VEGETATION IN RELATION TO LAND USE CAPABILITY CLASSES IN THE WAIHUA ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by surveyed indigenous vegetation.

TABLE 6 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN PROTECTED NATURAL AREAS AND IN ALL UNPROTECTED STUDY SITES IN THE WAIHUA ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	PROTECTED (HA)	(%)	UNPROTECTED (HA)	TOTAL (HA)
Primary/logged primary				
beech forest	13.5	100	0	13.5
conifer/tawa forest	64	49.6	65	129
conifer/tawa-titoki forest	2.0	33	4	6.0
conifer/tawa-kohekohe forest	226	78	63	289
tawa forest	264	36	471	735
tawa/kohekohe forest	15	7.0	207	222
tawa-titoki forest	4.8	3.9	119	124
tawa-titoki/kohekohe forest	4.9	7.8	58	63
conifer forest	7.7	30	18	26
Advanced secondary				
conifer/broadleaved forest	57	68	27	84
conifer/kanuka forest	1.5	4.7	30.5	32
conifer/kanuka-kohekohe forest	0	0	4	4.0
broadleaved forest	48	12.7	329	377
kanuka-broadleaved forest	55	26	154	209
Secondary forest/scrub/shrubland				
kanuka forest	499	34.7	937	1436
conifer/small-leaved scrub	0	0	25	25
kanuka scrub	41	4.8	813	854
manuka scrub	16	5.8	260	276
manuka-kanuka scrub	57	2.8	1956	2013
tauhinu scrub-shrubland	121	76	39	160
broadleaved/small-leaved scrub	0	0	43	43
broadleaved scrub-shrubland	0	0	24	24
Cliff vegetation	103	45	128	231
Freshwater wetlands and lakes	219	92	18	237
Saltwater wetlands/lagoons	220	24	689	909
Duneland	28	8.6	296	324
TOTAL	2067	23.4	6778	8845

The following are brief descriptions of the PNAs within the Waihua Ecological District. The numbering follows that in Fig. 10.

67. Morere Springs Scenic Reserve (363.6 ha) contains the entire catchment and flanking ridges of the Mangakawa Stream, a small tributary of Tunanui Stream, which feeds the Nuhaka River. It lies in the semi-coastal bioclimatic zone (20–340 m a.s.l.). The core of the reserve is primary forest with large emergent matai, miro and rimu over a tawa canopy, with karaka and abundant nikau in the sub-canopy. Black beech forest dominates the drier ridges. It is the largest, most diverse and intact remnant of this forest type in the Waihua Ecological District. The upper eastern third of the area is secondary forest of kanuka-manuka-broadleaved composition, reverting after earlier clearance of the primary forest. Past high goat numbers have had a substantial impact on the understorey, which is now showing signs of recovery following control programmes. Sixteen forest bird species have been recorded within the reserve including kereru, tui, kingfisher and morepork. Hot springs by the streams are tapped and piped to a complex of developed hot pools.

68. Prickett Covenant (9.5 ha OSC) lies on alluvial terraces and gentle to moderate slopes (70-110 m a.s.l.) beside the Nuhaka River, c. 7 km north of Nuhaka settlement. The vegetation within it is primary logged semi-coastal tawa-(pukatea) forest, with scattered emergent kahikatea and rewarewa. The understorey shows obvious signs of browsing, but is still diverse with kaikomako, kawakawa, putaputaweta, *Coprosma areolata*, turepo, rasp fern, hen and chicken fern, common maidenhair and nini. The forest on the terrace has a more broken canopy, with pools of standing water surrounded by young kahikatea, pukatea, putaputaweta, rush and sedge species. The covenant is the only sizeable and largely primary remnant of semi-coastal forest remaining in the Nuhaka River valley.

69. Clark Covenant (2.9 ha OSC) lies on gentle hill-slopes (60-100 m a.s.l.) in the upper catchment of a small true right tributary of the Nuhaka River c. 5 km north of Nuhaka. The remnant of primary tawa-pukatea/kohekohe forest is fully fenced and has been covenanted since 1992. Karaka and titoki also present in the canopy, with mahoe, pigeonwood, kiekie, supplejack, mapou and pate in the sub-canopy. The covenant is showing signs of strong recovery following stock exclusion with a diverse range of ferns and shrubs in the understorey. Around the stream at the bottom of the slope the understorey is thick with divaricating shrubs including turepo, kaikomako and *Coprosma areolata*. It is one of the most intact and diverse semi-coastal forest remnants remaining in the lower Nuhaka River valley.

70. Hickling & Dean Covenants (5.6 ha & 5.7 ha OSC) are contiguous areas lying in a stream gully (100-260 m a.s.l.) in the upper catchment of an unnamed true left tributary of the Tahaenui River. Primary semi-coastal tawa-(titoki-kohekohe-karaka) forest occurs on the lower slopes and stream sides, with pukatea, nikau and rewarewa. The forest merges into kanuka forest on the surrounding hillslopes and ridge, with pockets of primary trees in the gullies. The understorey is showing signs of recovery following fencing several years ago. Stock trespass and feral goats in the covenants however are still affecting regeneration.

71. Taylor Covenant (18.8 ha OSC) lies in three moderate southwesterly facing stream gullies (160-220 m a.s.l.) in the upper catchment of the Kauhauroa Stream c. 11 km northeast of Wairoa. The vegetation in the stream gullies is logged primary tawa-titoki forest with pukatea, and scattered emergent totara, rimu, rewarewa, and kahikatea (towards the bottom of the slope). The ridges and spurs separating them

have younger advanced secondary vegetation dominated by tall kanuka and totara, with occasional emergent rewarewa, ngaio and young rimu. The end of the ridges fade to grassy open young manuka-(totara) scrub. Completely fenced in the mid-1990s the forest understorey is showing some sign of recovery, however feral goat trespass is still a threat to the integrity of the covenant.

72. Munro Covenant (8.6 ha OSC) lies c. 5 km northeast of Wairoa township, in the upper catchment of the Rotoparu Stream (80-160 m a.s.l.), which runs through the centre of it. The south-facing slopes support primary tawa-dominant forest, with tall pukatea, hinau, scattered titoki and young matai. The forest on the north-facing slopes is younger and more modified, with titoki more abundant in the canopy, along with tawa, kohekohe, mahoe and tall kanuka. The covenant also has wharangi, a coastal tree now uncommon in the Waihua Ecological District. There is also a zone of rank pasture surrounding the remnant. Once grazed, the forest was completely fenced in the early 1990s and covenanted in 1995. The understorey is now showing signs of recovery; with large numbers of canopy tree seedlings, ferns, young supplejack and kiekie establishing.

73. Waiatai Scenic Reserve (0.4 ha) is a small coastal forest remnant that lies beside Waiatai Rd, c. 2 km northeast of Wairoa (10–20 m a.s.l.). It was originally the 'house' bush on the farm. The forest is largely indigenous, with kahikatea, karaka and titoki the dominant canopy species. The reserve also includes an arboretum which includes a number of exotic trees (e.g. sycamore, crab apple, jacaranda) interplanted with the native trees. Of note is a very large puka (*Meryta sinclairii*), which was apparently planted here in the 19th century.

74. Wairau Lagoon (Robinson Covenant) (104.2 ha OSC) lies c. 7 km east of Wairoa. It is one of a series of coastal lagoons that extend from the mouth of the Wairoa River, to the mouth of the Nuhaka River. Stop banks form the lagoon's northern and western boundaries. The water levels within the lagoon are variable, with freshwater inflow and seepage outflow. There is very little if any saltwater washover, which is in contrast to the predominantly saltwater, or frequently inundated lagoons nearby (RAPs WAH 4, 13, 14 and 15). Discontinuous bands of raupo reedland occur around part of the lagoon's margin, with *Isolepis prolifer* amongst the raupo stems in the deeper water and Mercer grass amongst it closer to the shore. There are also mats of solely *Isolepis prolifer* and patches of marsh clubrush extending from the margin and out around raupo reedland. Swards of *Isolepis prolifer* and patches of raupo extend up a drain in northwestern corner. Up until recently the lagoon was grazed to its margin, however it is now completely fenced, with manuka, harakeke, toetoe, cabbage tree, tauhinu and tree lucerne being planted around the margin as part of a restoration plan. The lagoon is significant as a wildlife habitat with an SSWI ranking of 'moderate'. This value will be enhanced with the recovery of the lagoon margins.

75. Ngamotu Wildlife Management Reserve (101.3 ha) is a shallow saline lagoon connecting with the mouth of the Wairoa River, and includes a seaward spit of unconsolidated coarse sand and fine gravel (Partridge 1992). The lagoon and wider beach area have some of the most pristine and intact vegetation of all the lagoons along the Wairoa coastline. Fringing the lagoon is a mosaic of extensive areas of salt marsh with sea rush, *Bolboschoenus medianus*, three-square, glasswort and sea primrose. The dunes support grasslands/sandfields dominated by spinifex and sand sedge (*Carex pumila*), with isolated clumps of marram.

76. Whakamahi Wildlife Management Reserve (139.3 ha) is situated directly seaward of Wairoa and is part of the coastal estuarine system of the Wairoa River mouth. It includes a dune system along its seaward side, with zones of various typical estuarine plant communities around it margins. Whakamahi Rd bounds the conservation area to the north. The dune vegetation is dominated by spinifex, with sand convolvulus, harestail, sand sedge, pohuehue (*Muehlenbeckia complexa*) and exotic grasses. The estuarine vegetation includes sea rush rushland, *Bolboschoenus/* glasswort herbfield, *Bolboschoenus* sedgeland and small areas of raupo reedland (Beadel 1989a). The lagoon is significant as a wildlife habitat with an SSWI ranking of 'high'. Australasian bittern, fernbird, wrybill, and spotless crake and banded dotterel have all been recorded within the area.

77. Huramua Nature Reserve (0.25 ha) is a small area forest on an alluvial terrace (10 m a.s.l.) beside the Wairoa River, c. 3 km northwest of Wairoa. The forest canopy is dominated by kahikatea, with matai, pokaka and titoki scattered amongst it. The understorey is thick with small-leaved shrubs, including shrubby mahoe, turepo, heart-leaved kohuhu, *Melicope simplex* and rohutu. The reserve was created and given its high protection status as a nature reserve to protect one of the very few populations of the 'rare' heart-leaved kohuhu, but in the last decade many additional sites have been located in the Wairoa Ecological Region and beyond. The reserve remains significant as the only occurrence of the species known in the Waihua Ecological District. There is also little of this forest type left in the district with most cleared for agricultural purposes. A number of invasive weeds threaten the integrity of the small remnant, including Japanese honeysuckle, Chinese privet, hawthorn and blackberry.

78. Tutaekuri Conservation Area (77.1 ha) contains lowland (140-335 m a.s.l.) primary tawa-dominated forest in the main stream gullies and mid-slopes, and secondary manuka-kanuka-kohuhu forest with cabbage trees on the upper slopes and ridges. The main stream within the conservation area lies in a steep limestone gorge. The Conservation Area has a 'moderate' SSWI ranking with kereru and common bush birds present.

79. Waitangi Covenant (9.2 ha OSC) lies on moderate to steep slopes in the semi-coastal bioclimatic zone (80-188 m a.s.l.), c. 4 km northeast of Waihua. The covenant is fully fenced and surrounded by a newly planted pine plantation. The vegetation within the covenant is primary semi-coastal broadleaved forest, with tawa, titoki, kohekohe and karaka all abundant in the canopy. The understorey is showing strong signs of recovery following the exclusion of stock and control of feral goats and possums. It has high numbers of ferns and seedlings in the understorey including hen and chicken fern, *Asplenium hookerianum*, gully fern, shaking brake, kawakawa, tree fuchsia, mahoe, kohekohe and putaputaweta. It is one of the most diverse areas of semi-coastal forest in the central part of the Waihua Ecological District.

80. Maulders Conservation Area (355 ha - of which c. 40 ha on eastern faces fronting Waihua Valley Rd is farmland subject to a grazing lease) lies c. 6 km east of Raupunga, in the semi-coastal bioclimatic zone (100-285 m a.s.l.). Primary logged tawa-dominated forest covers 10-15% of the area, mainly in the core southern tributary. Sparsely vegetated bluffs formed in the stronger layers of this rock are a feature of the slopes close to the main Ngamahanga Stream. Kowhai are characteristic along the bluff edges. About 50-60 m above the stream are a set of dramatic terraces, mainly in grass cover. Other smaller grass areas occur on the upper faces and ridges, the largest is about 8 ha on the southeastern edge of the area. Most of these smaller grassland areas have scattered scrub cover of manuka and kanuka, and kanuka-

manuka mixed scrub transitional to the main kanuka forest areas. This is a significant vegetation type of recently reverted areas. There are no serious weed problems.

81. Raupunga Scenic Reserve (229.8 ha) lies just north of Raupunga in the lowland bioclimate zone (160–340 m a.s.l.). It contains secondary kanuka forest with scattered rimu, tawa and rewarewa, and regenerating tawa-broadleaved forest in the stream gullies. The catchment area within the reserve is important as a water reservoir. It has a 'moderate-high' SSWI ranking with kereru, fantail, tui, bellbird, tomtit, whitehead and possibly kiwi present.

82. Mangawharangi Scenic Reserve (62.0 ha) covers moderate to steep slopes and cliffs (20–200 m a.s.l.) on the true left of a wide bend of the Mohaka River, c. 2 km upstream of the Mohaka Viaduct. The upstream half of the reserve is primary podocarp/tawa forest, with scattered emergent rimu, matai and rewarewa. Downstream the forest merges into secondary kanuka-broadleaved scrub low forest, with kowhai, kohuhu, mahoe, *Pittosporum ralphii*, houhere, tutu and scattered primary tawa and titoki, then scattered scrub among pasture grasses above a cliff. The reserve is one of the best examples of primary riparian forest in the Waihua Ecological District. There is a pa site located within this reserve. Feral goat and domestic stock trespass are the major threats to the integrity of the reserve.

83. Mohaka River Scenic Reserve (16.2 ha) comprises a strip of forest on narrow alluvial terraces and moderate to steep slopes (40–140 m a.s.l.) on the true left of the Mohaka River. It lies immediately upstream of the Mohaka Viaduct, c. 2 km northwest of Raupunga. The core of the reserve has modified primary tawa-dominated forest that is buffered by kanuka scrub-forest along its upper margins. It has significance as one of the better remaining remnants of this type of riparian forest in the district. The reserve also has significant scenic values, as it can be viewed from SH2 and the Mohaka Viaduct.

84. Pittar's Conservation Area (50 ha) covers coastal cliffs/escarpments and debris fans 2-4 km northeast of the mouth of the Mohaka River (from 5–210 m a.s.l.). The Te Awaawa Stream forms its southern boundary, with mature pine plantations along the upper cliff edges to the north-northwest. The debris fans and more stable slopes have secondary tauhinu-manuka scrub-shrubland amongst grassland and hard fern. There are also scattered pockets of tuhara, whaririki, kiokio and *Hebe* sp. in moister areas inaccessible to feral goats. The cliffs and upper slopes are very mobile with almost constant fresh erosion and deposition of debris, continuing on from major movements initiated by the 1931 Napier earthquake.

85. Begley's Fill Scenic Reserve (3 ha) lies c. 3 km south of Kotemaori on SH2, beside the Napier-Gisborne railway line (200–230 m a.s.l.). It is a small area of broadleaved scrub, with bracken fern and swards of blackberry and pampas, on either side of a small stream. The dominant canopy species are kanuka, mahoe, pate, karamu, five finger and koromiko.

86. Haliburton Covenant (39.1 ha OSC) lies on moderate to steep hill-slopes (200–300 m a.s.l.) in the upper catchment of a small tributary of the Waikari River, c. 3 km south of Kotemaori. It has been fenced and stock free since the early 1990s. Much of the covenant is primary kahikatea-(rimu)/tawa-(titoki) forest, with scattered hinau and rewarewa. Pigeonwood, mahoe and silver fern are most abundant in the sub-canopy. The vegetation merges into younger rewarewa/tawa-titoki forest up the stream gully to the northwest. The stream banks are deeply incised in parts, with *Jovellana sinclairii*, tree fuchsia, filmy ferns, nini, kiokio, forest oat grass and hook

sedge clothing them. The understorey is showing strong sign of recovery with palatable saplings common including tree fuchsia, supplejack, hen and chicken fern, hangehange, pate, kanono and karaka. Past modification has included selective logging and grazing.

87. Awatotara Conservation Area (23.2 ha) covers part of the southern banks of the Pohatanui and Waikari Stream gorges just west of Putorino. It lies in the lowland bioclimatic zone (20–80 m a.s.l.). The vegetation is secondary scrub-forest dominated by kanuka with scattered broadleaved shrubs (e.g. tutu, mahoe, *Pittosporum ralphii*). It has a high scenic value as it is viewed from SH2 and high wildlife values with tui, kereru, bellbird, fantail and grey duck all present. Possums and goats are the main threat to the conservation values of the area.

88. Earthquake Slip Conservation Area (93.9 ha) covers c. 8 km of high sea cliffs, steep faces and debris fans, 100-700 m in width (0–320 m a.s.l.) between the Waikari and Moeangiangi River mouths. The debris fans were created by the collapse of the former sea cliffs during the 1931 Napier earthquake, a feature of high national significance geologically. As a result, the sea no longer attacks the older marine cliffs, but is actively cliffing into the toe of the debris fans. The mid to lower slopes have scattered patches and more extensive areas of predominantly tauhinu-manuka scrub, with small localised patches and scattered trees of karaka, titoki and ngaio on the mid-slopes. There is a small remnant of primary coastal titoki-karaka forest, on a shelf of moderate to steep slopes, which straddles the boundary between the Conservation Area and RAP with which it is continuous (RAP WAH 45). The cliff faces have sparse vegetation of mainly *Hebe* sp., tuhara, whaririki, tauhinu and coastal herbs, in those areas inaccessible to goats. Goat numbers have been high in the past, with recent fencing and goat control now reducing the population. The Conservation Area is also a breeding site for blue penguins and the Australasian harrier.

89. Tutira Domain (202.9 ha) is a recreation reserve containing three lakes: Tutira, Waikopiro and Orakai, and surrounding strips of land that vary between 20-125 m in width. The lakes (c. 160 m a.s.l.) were formed by a mudstone landslide c. 6500 years ago (Soons & Selby 1992). They all drain into the Waikoau River, which becomes the Aropaoanui River closer to the coast. Vegetation around all of the lakes is secondary, with all but a few scattered trees of the original forest remaining. Willows and secondary broadleaved trees occur along the western side of Lakes Tutira and Waikopiro, with Japanese honeysuckle, blackberry and other weeds rampant amongst them. Lake Orakai and the eastern sides of the other two lakes, are surrounded by rough pasture and scattered clumps of rushes, sedges and reeds. The lakes have high cultural significance, having been used for fishing, hunting and dwelling places for centuries by Maori. They are also valuable as wildlife habitats.

90. Mangapukahu Scenic Reserve (77.0 ha) covers moderate to steep south-facing slopes and bluffs on the true left of the Aropaoanui River, c. 5 km upstream from the river mouth. The reserve has a wide altitudinal gradient, extending from 10-380 m a.s.l. in the semi-coastal bioclimatic zone. It is completely fenced, and surrounded on three sides by pine plantations. The most original mature forest lies on the mid to lower slopes; large emergent kahikatea and matai over a tawa-dominated canopy, with titoki, young kahikatea, matai and rewarewa. Kohia, *Metrosideros colensoi* and *Metrosideros diffusa* are the most abundant lianes. The sub-canopy is dominated by mahoe, with pigeonwood. The upper slopes are more modified, with ngaio abundant amongst the kanuka-dominated scrub and low forest with occasional grassy clearings. Karaka, large tawa, titoki, nikau, mahoe, young kahikatea and

putaputaweta are also present in the canopy. The alluvial terraces have tall kanuka forest with pockets of primary and regenerating kahikatea-matai/tawa-titoki forest amongst it. The tributary stream on the eastern margin of the RAP is steeply incised in places, and clothed in ferns and broadleaved shrubs (gully fern, nini, shaking brake, pate, kawakawa, turepo, hook sedge, hen and chicken fern, young nikau, *Jovellana sinclairii*, putaputaweta, tree fuchsia and umbrella moss). Possum and feral goat control has markedly reduced the numbers of feral animals within the reserve and this is reflected in the health and diversity of the recovering understorey.

91. Waipatiki Scenic Reserve (64.5 ha) covers moderate to very steep generally south-facing hill-slopes that are dissected with deep stream gullies, c. 31 km north of Napier. It lies in the semi-coastal bioclimatic zone (20-210 m a.s.l.). All streams, including the Ruatoitoi Stream that flows down the eastern margin, are true left tributaries of the Waipatiki Stream which forms the reserve's southern boundary. The reserve is underlain by sandstones, siltstones, limestones and conglomerates. The most mature forest lies along the lower slopes and alluvial stream terraces, with emergent kahikatea and occasional matai over a tawa-dominated canopy. Titoki is also present. The mid-slopes have an abundance of nikau in mosaic with older karaka, titoki, tawa, conical kahikatea, putaputaweta, mahoe, pigeonwood and treeferns. The upper slopes and ridges have secondary kanuka forest, which merges into younger manuka-tauhinu scrub. Amongst the kanuka are scattered emergent rewarewa, karaka, nikau, titoki and ngaio. The stream banks are clothed in ferns (nini, gully fern, common shieldfern, *Pteris macilenta)* and tuhara, mosses, *Jovellana sinclairii*, Mexican daisy, young nikau and puatea. Sections of the old Napier-Wairoa road, that were initially created and used by pre-European Maori, run along the reserve's eastern edge.

92. Waipatiki Domain The larger part (13 ha) of this reserve is indigenous forest with a high conservation value, described here as a PNA, the balance (c. 5 ha) is a separate area of open exotic grassland. The PNA is located 30 km north of Napier, on terraces and south-facing hill-slopes beside the Waipatiki Stream, in the coastal bioclimatic zone (5–120 m a.s.l.). The most mature forest lies along the stream terraces and lower slopes: modified primary forest dominated by emergent kahikatea and matai, over a patchy canopy of tawa, and less frequent titoki. Groves of young titoki, nikau and wineberry are present where the canopy is discontinuous. The hillslope and upper stream gullies have secondary kanuka scrub-forest, with putaputaweta, young nikau and tawa, pigeonwood, kaikomako and kohuhu. There is an abundance of bird life within the reserve, including kereru, fantail, tui, morepork and bellbirds. Exotic weeds and willows along the stream pose the biggest threat to the integrity of the reserve, with fencing now excluding domestic stock.

93. White Pine Bush Scenic Reserve (19.0 ha) lies 220–300 m a.s.l. beside SH2, c.25 km north of Napier, in the semi-coastal bioclimatic zone. The lower slopes and terraces beside the Kareaara Stream support tawa-titoki forest with emergent kahikatea and matai. Groves of nikau are scattered amongst the canopy, with young palms present at all levels in the forest. The understorey, recovering from goat browse that occurred prior to fencing and control, is diverse with abundant ferns and ongaonga. The moderate to steep upper slopes have younger low forest, with scattered emergent kahikatea and rewarewa, over titoki and a mosaic of broadleaved species (mahoe, ngaio, pigeonwood and houhere). The reserve was partially logged up until the early 1920s. Scattered large kahikatea and matai, some of which are estimated to be 800 yrs old (Grant 1996) were left on the lower slopes . Birds present

within the reserve include grey warbler, tui, kereru, fantail and morepork. Kiwi were recorded there prior to 1950.

94. Tangoio Falls Scenic Reserve (50.8 ha) lies near the southern boundary of the Ecological District, in a steep stream valley (10–220 m a.s.l.) adjacent to SH2, c. 24 km north of Napier. Two streams, the Kareaara and the Rauwiri-Kokomuka, intersect within the reserve; the Kareaara Stream has two waterfalls along its course, and the Rauwiri-Kokomuka has one. The vegetation within the reserve is mainly regenerating advanced secondary forest of titoki, mahoe, putaputaweta and houhere, with scattered emergent rewarewa and kahikatea. Nikau palms, and kiekie are also present. The reserve has cultural significance as two pa sites are there: Otoi pa, and Pukenui pa built much later.

95. Whakaari Conservation Area (9.7 ha) includes a rocky headland, coastal cliffs and a low isthmus just north of Tangoio Beach, as well as c. 2 km of access road (Leyland Road). The vegetation is mostly pasture grasses, with areas of low tauhinu scrub. The entire area is grazed by stock and occasional feral goats. Wildlife present includes skinks on boulder banks on the isthmus and coastal bird species. The area also has cultural significance to local iwi and was the site of a pa and an old whaling station.

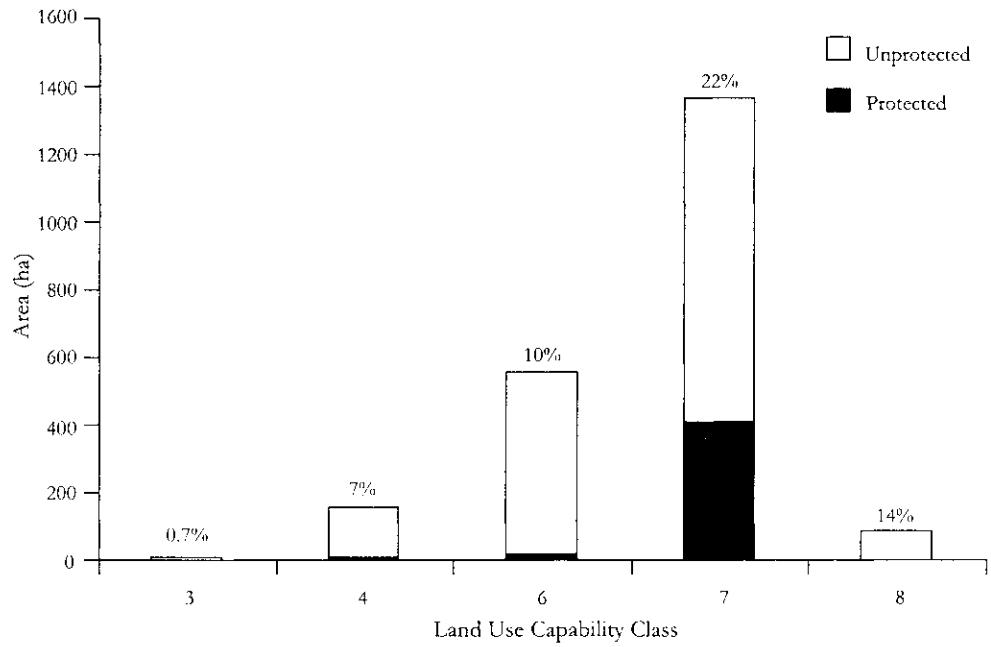
5.3 MAHIA ECOLOGICAL DISTRICT

Existing Protected Natural Areas (PNAs) total 432 ha, or 18% of the total vegetation surveyed in the Mahia Ecological District and only 2.5% of the total district. The proportion of vegetation/landform classes represented within the protected areas ranges from 0% (for 12 of the 20 vegetation classes, e.g. tawa forest, tawa-titoki forest, tawa-titoki/kohekohe forest, and the bulk of the secondary vegetation classes), to 100% (of conifer/broadleaved forest that all lies within the Mahia Peninsula Scenic Reserve) (Table 7).

The bulk of the protected vegetation (87%) is primary forest, most of which lies within the Mahia Peninsula Scenic Reserve with the remainder in Haynes Covenant. 62% of the surveyed primary vegetation however is unprotected. Of the surveyed vegetation in the district 38% of the primary forest, 6.1% of the advanced secondary forest, 3.9 % of secondary scrub-shrubland, 16 % of freshwater wetland, and 79% of cliff vegetation is protected. None of the duneland or saltwater wetland (Maungawhio Lagoon and Whangawehi estuary) areas is represented within protected areas. The PNAs are clustered in the central western-southwestern portion of Mahia Peninsula, with only Jobson's Swamp Wildlife Reserve on the isthmus. No PNAs are present on the eastern plateau or at the southern end of the district. In addition, only a very small proportion of the protected vegetation lies within the coastal bioclimatic zone, mostly within Long Point Conservation Area. Therefore, the protected vegetation is not representative of the full diversity of vegetation classes in the district.

The majority of the protected vegetation (92 %) lies on Land Use Capability Class 7; moderate to steep hill country where erosion is often the factor limiting pastoral success.

FIGURE 8 : DISTRIBUTION OF PNAs AND UNPROTECTED INDIGENOUS VEGETATION IN RELATION TO LAND USE CAPABILITY CLASSES IN THE MAHIA ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by surveyed indigenous vegetation.

TABLE 7 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN PROTECTED NATURAL AREAS IN ALL UNPROTECTED STUDY SITES, IN THE MAHIA ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	PROTECTED (HA)	(%)	UNPROTECTED (HA)	TOTAL (HA)
Primary/logged primary				
conifer/tawa-kohekohe forest	345	86	55	400
tawa forest	0	0	37	37
tawa/kohekohe forest	42	8.2	470	512
tawa-titoki forest	0	0	12	12
tawa-titoki/kohekohe forest	0	0	62	62
Advanced secondary				
conifer/broadleaved forest	1.8	100	0	1.8
broadleaved forest	3.5	5.4	61.5	65
kanuka-broadleaved forest	0	0	21	21
Secondary forest/scrub/shrubland				
kanuka forest	25.0	13	173	198
kanuka scrub	0	0	253	253
manuka scrub	0	0	2.8	2.8
tauhinu scrub-shrubland	0	0	37	37
manuka-kanuka scrub	0	0	139	139
broadleaved/small-leaved scrub	0	0	15.8	15.8
broadleaved scrub-shrubland	0	0	19	19
Cliff vegetation	6.2	79	1.2	7.8
Freshwater wetlands and lakes	8.6	15	48.4	57
Saltwater wetlands/lagoons	0	0	159	159
Duneland	0	0	446	446
TOTAL	432	17.7	2013	2445

The following are brief descriptions of the PNAs within the Mahia Ecological District. The numbering follows that in Fig. 10.

96. Jobson's Swamp Wildlife Management Reserve (6.8 ha) encompasses part of a series of inter-dunal wetlands, at the northwestern end of the Mahia Isthmus. The wetlands support a range of vegetation including rushland, raupo reedland, scattered sedges, and manuka scrub with scattered cabbage trees and tauhinu. Zoysia, a species

of interest, has been recorded within the reserve. Pine trees, which occur along three-quarters of the reserve's boundary, provide a buffer for the wetland against southerly and easterly winds, but may also be affecting water levels. The reserve is an important wildlife habitat with the spotless crake, Australasian bittern, pukeko, grey duck and mallard duck all recorded there.

97. Mahia Peninsula Scenic Reserve (373.8 ha) encompasses the headwaters of the Whangawehi Stream, which forms a natural basin (40–366 m a.s.l.). It is by far the largest and most diverse remnant of forest remaining in the Mahia Ecological District. The core of the reserve is tawa-dominant primary forest. On the lower slopes tawa is joined in the canopy by large pukatea and nikau, with emergent rimu and rewarewa. The upper slopes are similar in composition, but with pukatea less frequent. The ridges have low forest of young matai, rimu and kahikatea, with mapou, heketara, scattered young tawa, nikau and kohekohe. The slopes at the northern end of the reserve have a mosaic of secondary vegetation, from scrub to young broadleaved shrubland with kanuka, kohuhu, mahoe, pate, wineberry, heketara, houhere and young nikau. At least three large specimens of northern rata, a species which is now rare in the district, occur in the forest on the lower slopes of the reserve. The understorey of the reserve is showing strong signs of recovery following feral goat control programmes. There is a walking track through the western half of the reserve and the perimeter is completely fenced.

98. Long Point Conservation Area (6.2 ha) consists of a narrow strip of coastal cliffs of mainly limestone rock that extend for c. 1 km either side of Long Point on the western side of Mahia Peninsula, and a second area of cliffs 2 km to the south, between Huruhurunui and Mangatea Streams (0–60 m a.s.l.). Apart from exposed rock, the vegetation is dominated by exotic grassland, local tauhinu and manuka scrub, and scattered ngaio. The area has significance as a wildlife habitat, with black-backed gulls, red-billed gulls, white-fronted tern and possibly pelagic seabirds present.

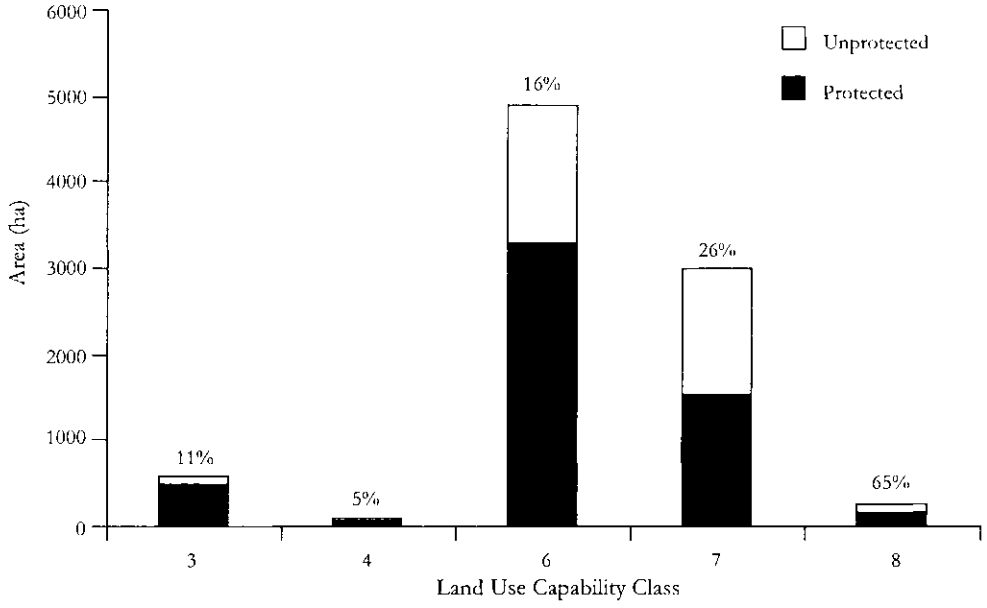
99. Haynes Covenant (48.0 ha OSC) is the second largest protected area in the Mahia Ecological District. It lies in the southwestern part of the peninsula, on moderate to steep south-facing slopes (extending from stream side to ridge top 60-250 m a.s.l.) in the Mangatea Stream valley, c.1-2 km inland. The core of the covenant is primary/advanced secondary coastal forest, which fades to tauhinu and kanuka scrub at the margins. Tawa, karaka and ngaio are the main canopy trees, with scattered emergent rewarewa and a single northern rata and large matai. Kohekohe is the most abundant sub-canopy species. The area has been grazed intensively in the past, with some of the spurs still open and grassy. Stock are now excluded and the understorey is showing signs of recovery.

5.4 MATAWAI ECOLOGICAL DISTRICT

Existing PNAs within the southern half of the Matawai Ecological District total c. 5490 ha, or 61 % of the total indigenous vegetation present and 10.7% of the southern half of the district included in the current study area. Many of the larger protected areas were originally State Forests (e.g. Matawai Conservation Area) that passed to the Department of Conservation on its inception. Many of them have had varying degrees of human-induced modification (e.g. logging).

Of the primary forest present in the southern half of the district 69% of it lies within protected areas compared with only 39% of the advanced secondary vegetation, 21% of secondary scrub and shrubland, and 4% of freshwater wetlands. Proportions of the vegetation/landform classes within protected areas vary from 0 %, in the case of tawa-beech forest, conifer/broadleaved forest, and manuka scrub, to 95% for conifer/broadleaved-beech forest (most of its lies within Maungatapere Kawenata, Rakauroa Scenic Reserve and Waikareiti North and Moanui Conservation Areas) (Table 8). Most of the vegetation within the protected areas (86.5%) is higher altitude/montane, with red and silver beech as components. This is reflected in the fact that 90% of the protected vegetation occurs on Land Use Capability Classes 6, 7 and 8 (Fig. 9): Class 6 being stable and mildly erosion-prone moderate to steep slopes, Class 7 being steep and often erodible hill country and Class 8 being protection land. There is also a substantial area of protected vegetation on Class 3 (flat to very gentle rolling land), within Matawai Conservation Area.

FIGURE 9 : DISTRIBUTION OF PROTECTED NATURAL AREAS (PNAs) AND UNPROTECTED NATURAL VEGETATION IN RELATION TO LAND USE CAPABILITY CLASSES WITHIN THE SOUTHERN HALF OF THE MATAWAI ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of total land area in the class that is occupied by surveyed indigenous vegetation.

TABLE 8 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN PROTECTED NATURAL AREAS IN ALL UNPROTECTED STUDY SITES IN THE SOUTHERN HALF OF MATAWAI ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	PROTECTED (HA)	(%)	UNPROTECTED (HA)	TOTAL (HA)
Primary/logged primary				
beech forest	1063	73	403	1466
conifer/beech forest	1556	78	445	2001
conifer/broadleaved-beech forest	747	95	42	789
conifer/tawa-beech forest	931	94	64	995
tawa-beech forest	0	0	77	77
conifer/tawa forest	13.6	3.6	365.4	379
tawa forest	654	47	750	1404
conifer forest	18.2	20	70.8	89
Advanced secondary				
conifer/broadleaved forest	0	0	162	162
broadleaved forest	276	51	265	541
Secondary scrub/shrubland				
manuka scrub	0	0	416	416
broadleaved/small-leaved scrub	118	24	376	494
broadleaved scrub-shrubland	113	65	60	173
Freshwater wetland	0.7	4.4	15.3	16
TOTAL	5490	61	3512	9002

The following are brief descriptions of PNAs within the southern half of the Matawai Ecological District. (Only one additional PNA, a 3 ha covenant, was within the northern half of the disitrict surveyed by Leathwick *et al.* (1995).) The numbering follows that in Fig. 10.

1. Motu Scenic Reserve (20.1 ha) is a small reserve on the flood plain of the Motu River (480 m a.s.l.), adjacent to Motu settlement. It contains an oxbow wetland with surrounding kahikatea swamp forest grading into forest on well-drained alluvial flood plain. The forest has tall kahikatea (30 m) and scattered matai and rimu emergent over a low canopy of mainly houhere, kaikomako, wheki-ponga and lemonwood. Young kahikatea (c. 12 m tall) are locally abundant. Carex-raupo reed-sedgeland surrounds the lake. The reserve is important as wetlands are poorly represented in the present reserve system and few areas of kahikatea forest on flood plains still remain (Clarkson & Regnier 1989). It is also important as a wildlife habitat.

2. Moanui Conservation Area. Part (c.140 ha) of this 1478 ha Conservation Area lies within the Matawai Ecological District; the southern end, lying within the lowland-montane bioclimatic zones (640-c. 800 m a.s.l.). The vegetation at the southern end of the Conservation Area is logged primary rimu-broadleaved-beech forest, where rimu have been largely removed leaving a forest dominated by tawa and beeches (Nicholls 1976). Mistletoe (probably the 'declining' (de Lange *et al.* 1999) mistletoe *Peraxilla colensoi*) was seen during this survey in the forest beside Moanui Rd. It is a typical mistletoe of silver beech (Wardle 1984).

3. Tawa Station Covenant (5.9 ha OSC) lies close to the boundary between Matawai, Waiapu and Tiniroto Ecological Districts, on a southeast-facing slope. It comprises a discrete fenced stand of primary pukatea/tawa forest with titoki, mamaku, occasional kahikatea and rare totara. Rimu may have been present in the past, but has been removed by either logging or crown fires. It is significant as little of the original vegetation remains in this part of the district, as its easy contours encouraged clearance. It also complements the values of the Whakarau Scenic Reserve.

4. Whakarau Scenic Reserve (0.51 ha) lies on north-facing slopes (220–240 m a.s.l.) above the Waikohu River. It is a small remnant of lowland tawa-titoki forest, with emergent matai, totara and rewarewa. Patches of black beech are present. Weka and whio have been recorded in the reserve in the past, but whio have been absent for some years. Part of the reserve has been invaded by silver poplar.

5. Papatu Scenic Reserve (6.7 ha) lies in the junction between SH2 and Oliver Rd, just north of Rakauroa. It covers hill-slopes, steep riparian slopes and alluvial terraces beside the Waikohu River (420–460 m a.s.l.). The vegetation is all advanced secondary forest, with emergent rewarewa and a canopy of kamahi, local tanekaha, and akepiro, five finger, kohuhu and mahoe. A narrow band of red beech trees runs along the banks of the Waikohu River. The reserve was a significant wildlife habitat with both weka (present definitely in the mid-1990s) and whio recorded in the past. Weka may still be present but whio have now gone from the reserve.

6. Mangarere Scenic Reserve (9.7 ha) is a narrow strip of forest on lowland hill-slopes (520–560 m a.s.l.), beside SH2 just south of Rakauroa. The forest is predominantly tall kahikatea over a tawa canopy, with rewarewa, hinau, titoki, pukatea and black maire scattered throughout it. Striking pole stands of rimu, matai and kahikatea are also present.

7. Harnett Covenant (45.4 ha OSC) covers much of the upper catchments of two tributaries of the Waikohu River. It extends from stream side to ridge crest (560-950 m a.s.l.) on moderate to steep predominantly southeasterly facing hill-slopes adjacent to the northeastern corner of Matawai Conservation Area. The vegetation within the covenant is predominantly modified primary rimu-tawa-beech forest at lower altitudes, which grades into red beech-silver beech forest on the upper slopes (not surveyed).

8. Matawai Conservation Area (2649.9 ha) lies in a large basin, bounded by steep inward facing scarps of Miocene sandstone on the southern and eastern edges, which includes the headwaters of the Motu River. It covers a wide altitudinal range from 570-1068 m (lowland-montane bioclimatic zones) and includes extensive areas of gentle hill-slopes and alluvial flats characteristic of the Matawai Ecological District. Rakauroa Scenic Reserve is continuous with it along its southern boundary. Partial logging and burning has created a mosaic of secondary, logged primary, and primary vegetation.

The forest at lower altitudes is predominantly (rimu)-beech forest, with modest areas of (rimu)-tawa forest on a northerly-facing slopes towards the northern edge of the forest. Rimu, miro, Hall's totara, and northern rata are emergent over a mixed canopy of hinau, rewarewa, kamahi, red beech, silver beech and tawari. Kahikatea is a substantial component of much of the alluvial forest. At higher altitudes red beech and silver beech are the dominant species. Miro, kamahi and tawari are also abundant. *Peraxilla colensoi*, a mistletoe whose populations are 'declining' (de Lange *et al.* 1999), has been recorded there on silver beech. The Conservation Area has outstanding conservation values as the largest tract of indigenous forest remaining on the easy terrain of the district. It is also a valuable wildlife habitat with common forest birds abundant. Threatened kiwi and weka have also been reported (Shaw 1989). The area is used recreationally for hunting and tramping.

9. Rakauroa Scenic Reserve (566.6 ha) lies c. 13 km southwest of Matawai, and comprises two adjacent but separate sections, of 205 ha (northern half) and 362 ha (southern half). It covers an altitudinal gradient from 680–1040 m a.s.l. rising from the lowland to montane zones. The northern area is contiguous with the Matawai Conservation Area, with Rakauroa Tahora Rd forming its southern boundary. It contains a small area of primary rimu/tawa forest, with logged tawa forest and montane beech forest making up the bulk of it. The southern section is contiguous with Maungatapere Kawenata. Its lower to mid-slopes support logged rimu-tawa-beech forest, with silver beech forest dominating at higher altitudes. The reserve has significance as a wildlife habitat with weka, NI brown kiwi, shining cuckoo, rifleman, kereru, tui and bellbird all recorded within it.

10. Maungatapere Kawenata (692 ha) covers the bulk of the Maungatapere massif with adjoining lower slopes and ridges. It is continuous with Rakauroa Scenic Reserve to the east. Maungatapere is a dramatic plateau landform with a summit area of c. 1 km across dipping east (at only 2° initially then more steeply), bounded by steep slopes to the north and south and a dramatic bluff to the west. The bluffs and steep slopes on the edge of the plateau have long shed rock-fall debris over the slopes below. Within this irregular debris on the western side is a wetland hollow which intermittently fills to form a small lake up to 100 m across. The Kawenata covers an altitudinal range of 620-1051 m corresponding to the lowland-montane bioclimatic zones. The lowland zone is dominated by tawa up to about 800 m, and the montane zone above 900 m is dominated by silver beech, with a complex transition zone between them. This pattern is greatly complicated by terrain details and disturbance factors (e.g. animal browsing and past logging).

11. Waioeka Conservation Area. A small part (c. 36 ha) of this large PNA lies within the Matawai Ecological District, the balance within Waioeka and Waikaremoana Ecological Districts. Nicholls (1974) describes the primary vegetation within the Matawai portion of the Conservation Area as being predominantly rimu-tawa-beech forest. The rest of the vegetation is either broadleaved scrub or advanced secondary broadleaved forest.

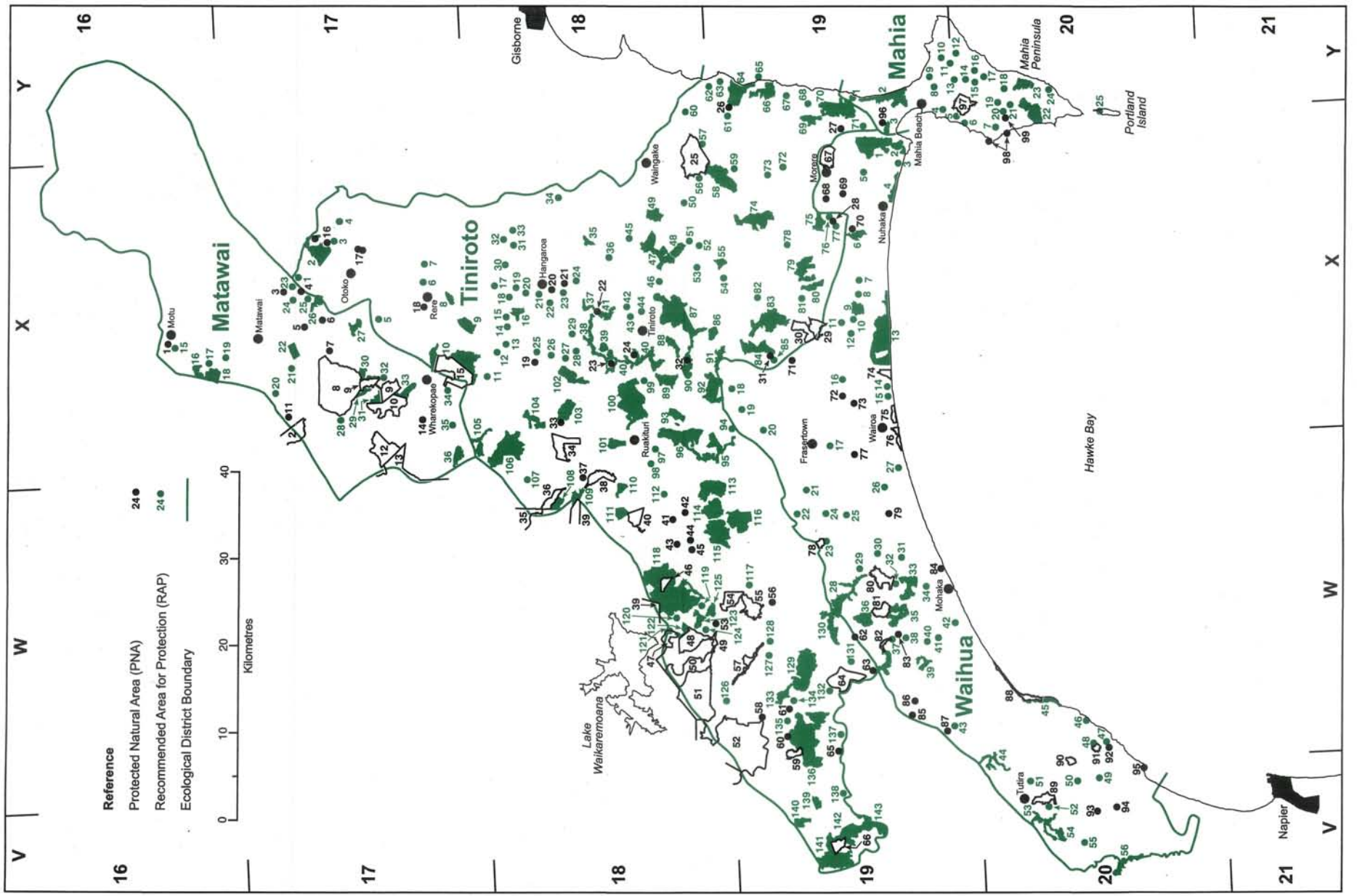
12. Te Wera Bush Conservation Area (571.9 ha) and **13. Waikareiti North Conservation Area** (a 339 ha part of a much larger area overlapping into the adjacent Waikaremoana Ecological District) lie within the Matawai Ecological District side of the headwaters of the Riwhara Stream, which flows south into the Hangaroa River, and the upper catchments of several tributaries of the Koranga Stream flowing north to the Waioeka River. They cover an altitudinal range from 600–976 m a.s.l, in the lowland to montane bioclimatic zones. Together they form a promontory of forest

extending out from the solid forest tract of Waioeka Conservation Area and Te Urewera National Park. The lower altitudes support rimu/tawa-beech forest, with tawa fading from the canopy c. 800 m. Above 800 m the vegetation is predominantly rimu/beech forest, with forests at the highest altitudes dominated by beech (red and silver). Logging and clearance have been most marked on the margins and lower slopes. In most logged areas beech and podocarp regeneration is strong, except along the margin where there is stock access. Here the vegetation merges to a low scrub of mountain horopito, mingimingi, broadleaf, bracken and crownfern. The Conservation Areas are significant as wildlife habitats with bellbird, fantail, greywarbler, kaka, kakariki, kereru, NI brown kiwi, NZ falcon, NZ robin, rifleman, tomtit and tui all recorded within them.

14. Berkahn Covenant (5.3 ha OSC) lies on moderate undulating terrain 500-540 m a.s.l. at Tahora, c. 5 km west of Wharekopae. It contains logged primary (rimu)/ tawa forest and treeland, with tree fuchsia, mahoe, kamahi, tawari, kaikomako and hinau also present. The understorey is showing sign of recovering following fencing, with abundant seedlings, ferns, young tawa, rimu, kahikatea, miro and matai. Kereru and common forest birds like tui are present.

15. Wharekopae Conservation Area. Part (c. 248 ha) of this 954 ha PNA lies within Matawai Ecological District, on predominantly northwesterly facing scarp faces and their forested foot-slopes 440-855 m a.s.l. The bulk of the Conservation Area lies within the Tiniroto Ecological District. A full description of it is included within that district's list of PNAs (section 5.1).

FIGURE 10: LOCATION OF RAPS AND PNAS WITHIN THE ECOLOGICAL DISTRICTS.



6 What values need protection?

Of the 871 study sites assessed in this study, 766 or 88% currently have no formal protection. An additional six areas have partial protection as marginal strips under the Conservation Act, but they are not regarded as formal PNAs in this study. The following lists, based on a two- stage selection process (refer section 3.2 and Appendix 8), identify as Recommended Areas for Protection (RAPs) the most significant of those unprotected areas. In total there are 246 RAPs in the study area, covering 33 385 ha or 6.8% of the total study area (refer Fig. 10).

In selecting the RAPs strong emphasis was placed on a number of factors, in particular each site's representativeness in the ecological district context, the diversity of its vegetation and landforms, its naturalness, size and shape, long-term viability, and the presence of any rare species or special features. We have tried to ensure that the recommended sites occur across the full range of geology, landforms and climate occurring in the study area, and have attempted to redress the imbalances of conservation protection, e.g. in the coastal and lowland areas. We have also endeavoured to increase the representation of ecosystems such as secondary scrub and forest, freshwater wetlands, dunelands and estuaries, which are not adequately represented in the PNA network at present.

Each of the RAPs has been assigned a priority ranking, to indicate its overall relative conservation value, in the context of the ecological district in which it occurs.

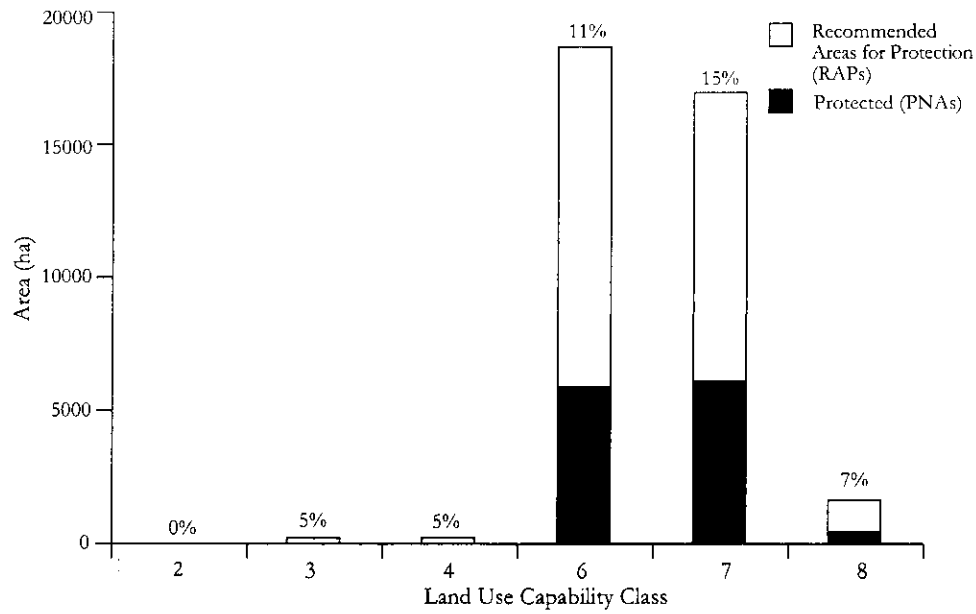
6.1 TINIROTO ECOLOGICAL DISTRICT RAPS

449 study sites were assessed within the Tiniroto Ecological District during this study, of which 397 have no formal protection. Of those unprotected study sites all or part of 210, covering a total of 25 398 ha or 8.7 % of the Ecological District, are now identified within 143 Recommended Areas for Protection (RAPs) and are described below. Indicative information on the areas and proportionate representation of the various vegetation/landform classes in the selected RAPs is provided in Appendix 11, Table 1.

The RAPs are well distributed geographically across the district (Fig. 10), and across the Land Use Capability Classes (Fig. 11). They address a number of the imbalances in the current PNA network, with many of the RAPs lying in the central lowland, drier northeastern and eastern coastal parts of the district, and in the high rainfall upland area in the southeast where virtually no PNAs occur. A number of them also follow the major river systems (e.g. Hangaroa and Waikura River valleys) identifying the semi-continuous chains of indigenous vegetation that connects and enhances existing PNAs.

The character of the RAPs ranges from sizeable areas of primary forest, e.g. Mt Whakapunake (RAP TIN 87) and Haliburton's "Pioneer Bush" (RAP TIN 142), to extensive areas dominated by secondary vegetation, e.g. Te Ahioteatua (RAP TIN 114), Coopers Block (RAP TIN 115), Makapua Stream (RAP TIN 116). RAPs in the dry northeastern corner of the district, where near-total destruction of the original vegetation has occurred, are mainly small and scattered reflecting this past modification. Of the RAPs, 42 are Priority 1, 56 are Priority 2, and 45 are Priority 3.

FIGURE 11 : DISTRIBUTION OF RECOMMENDED AREAS FOR PROTECTION (RAPs), AND CURRENT PROTECTED NATURAL AREAS (PNAs) IN RELATION TO LAND USE CAPABILITY CLASSES WITHIN THE TINIROTO ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of each LUC Class supporting PNAs and RAPs.

RAP TIN 1 WAIKOHU RIVER

Refer to Maps 1 and 48 (pp. 92 and 359)

Study area No.	28
Priority:	1
Grid Reference:	NZMS 260 X17 148008
Area:	33 ha
Altitudinal range:	150-270 ha
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa-titoki forest kanuka-broadleaved forest

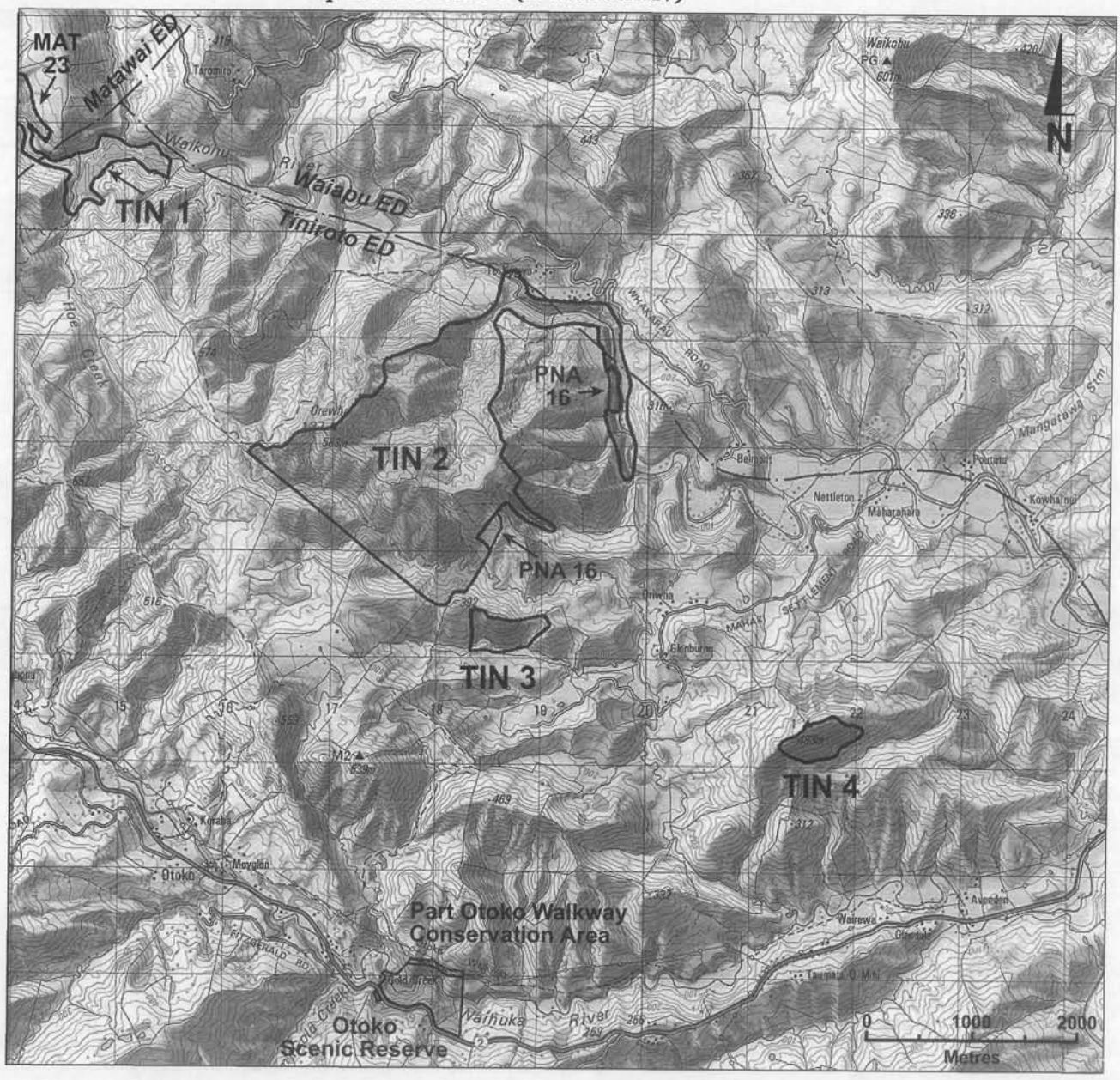
Description

This RAP lies in the northern corner of the district, near the boundaries of the Tiniroto, Matawai and Waiapu Ecological Districts. It covers narrow alluvial terraces, moderate to steep slopes along the lower Hoe Creek, and narrow alluvial terraces, terrace risers, moderate to steep slopes and scarp faces beside the Waikohu River, around and downstream of the creek's confluence. The vegetation within the RAP includes secondary tanekaha forest, in mosaic with mixed secondary forest-shrubland. Many species present (e.g. kanuka, totara, houhere, kowhai, mahoe, *Pittosporum ralphii*, and ngaio) are typical of steep riparian faces in the district. There are also several pockets of primary kahikatea/tawa-titoki forest on the foot-slopes and small alluvial terraces beside the Hoe Creek and wider alluvial terraces/terrace risers beside the Waikohu River. A wide range of other, mostly secondary, canopy species is present, along with an understorey of divaricating shrubs. Active erosion of scarps by the undercutting action of the river, and subsequent shrub colonisations, are part of the dynamic character of the riparian zone. The area appears to be unfenced, with limited invasion by wilding pines in places.

Significance and justification

This RAP contains the best examples of secondary tanekaha forest seen in the eastern part of the district. Tanekaha, a stress-resistant conifer of lowland to submontane forests, has a local distribution in the northern part of the Tiniroto Ecological District. It was probably never widespread, but has become even more restricted with forest clearance. The RAP also contains some of the better examples of primary alluvial forest remaining in the Waikohu River valley. It also has significance as part of a semi-continuous chain of indigenous vegetation along the Waikohu River and its tributaries, including RAPs MAT 26, 25, 24, 23, WAI 150 (Leathwick et al. 1995), TIN 2 and PNA16, all of which lie within 4 km of this RAP.

Map 1: RAPs TIN 1-4 (NZMS 260 X17)



RAP TIN 2 OREWHA

Refer to Map 1

Study area No.	29
Priority:	3
Grid Reference:	NZMS 260 X17 180980
Area:	415 ha
Altitudinal range:	90-583 m
Bioclimatic zone:	lowland
Vegetation classes:	kanuka-broadleaved forest manuka-kanuka scrub

Description

This large RAP lies on the boundary between Tiniroto and Waiapu Ecological Districts. It contains two stream valleys: the upper catchment of a true left tributary of the Waihuka River (which drains to the southeast) and almost the entire catchment/ stream valley of a true right tributary of the Waikohu River (which drains to the northeast). Both catchments have moderate to steep hill-slopes and narrow ridge crests. It also includes moderate to steep slopes/scarp faces above, and narrow alluvial terraces/steep terrace risers beside the Waikohu River. The RAP rises to a high point of 583 m (Orewha) along the northwestern boundary. It is fenced along its southeastern and southwestern boundaries, merging on all other margins to young scrub and pasture. Two QEII covenants are continuous with the RAP: one is a block of predominantly primary forest along the RAP's southeastern margin that includes a small raupo swamp, while the other lies on riparian slopes and steep faces on the true right of the Waikohu River and contains a substantial area of primary tawa-dominated forest.

The bulk of the vegetation is a mosaic of secondary scrub, dominated by manuka and kanuka, and forest dominated by kanuka, with lemonwood, rewarewa, five finger, kowhai, *Pittosporum ralphii*, mamaku and cabbage tree scattered amongst the canopy. Kanuka forest-scrub is predominant with smaller areas of manuka-dominated scrub on the upper slopes and ridges. Grassy patches are evident in the areas of younger scrub. Small fragments of tawa-dominated primary forest occur principally in the moist south-facing gullies, with a substantial area beside the Waikohu River (included within the QEII covenant). Titoki, pukatea, kahikatea, rewarewa, young matai, conical kahikatea and cabbage tree are also present amongst the forest canopies - the concentration of podocarps is higher on the alluvial terraces. The vegetation along the river banks is dominated by broadleaved trees and shrubs including *Pittosporum ralphii*, kohuhu, tutu, five finger, kowhai, kanuka, ngaio and patches of whaariki. The steepest riparian areas have only sparse scrub-shrubland.

Limited wilding pine invasion has occurred in the central eastern portions of the RAP and in places along the river banks, with some invasion of macrocarpa in the southwest. Domestic stock have access to much of the RAP.

Significance and justification

This RAP is significant as it includes the largest tract of indigenous vegetation covering a comprehensive range of landforms and altitudes in the dry northeastern part of the district where little of the original vegetation remains. It contains some of the better remnants of alluvial forest and complements and buffers two QEII covenants with which it is continuous. The RAP is also significant as it forms, along with RAP WAI 150 in the Waiapu Ecological District (Leathwick *et al.* 1995) and RAP TIN 1, part of a semi-continuous chain of indigenous vegetation along the Waikohu River.

RAP TIN 3 ORIWHA BUSH

Refer to Map 1

Study area No. 919

Priority: 2

Grid reference: NZMS 260 X17 186963

Area: 20 ha

Altitudinal range: 240-360 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest

kanuka scrub-forest

Description

This RAP lies on a south-facing moderate hill-slope extending from stream side to ridge crest in the upper catchment of a tributary of the Waihuka River, c. 3.5 km northeast of Otoko. It contains a core of modified primary forest on the lower to mid-slope, surrounded by secondary scrub-forest. The northern, eastern and southern boundaries of the remnant are paddock fenced.

The primary forest is tawa-dominated, with scattered pukatea, conical kahikatea, rewarewa and titoki in the canopy. The forest merges at all margins into secondary kanuka-dominated vegetation, with a rolling even canopy. Occasional broadleaved trees and young kahikatea are scattered along the lower slopes and stream sides.

Signifiance and justification

This RAP is significant as it contains one of the few remnants of primary forest on ordinary hill-slopes remaining in the dry northeastern part of the district, where clearance of the original vegetation was generally very thorough. The area is compact and the primary forest is well buffered by regenerating secondary forest.

RAP TIN 4 WAIHUKA BUSH

Refer to Map 1 (p. 92)

Study area No. 45

Priority: 2

Grid reference: NZMS 260 X17 216953

Area: 20 ha

Altitudinal range: 320-483 m

Bioclimatic zone: lowland

Vegetation class: tawa forest

Description

This RAP covers south-southeasterly facing moderate upper slope to ridge crest in the upper catchment of a small tributary of the Waihuka River, c. 6 km east of Otoko. The vegetation in the core of the RAP is degraded primary forest, with advanced secondary forest around the margins. The primary forest has an uneven canopy dominated by tawa and pukatea, with abundant emergent rewarewa and young kahikatea. Where the tawa is absent or sparse and in the advanced secondary vegetation, mahoe, houhere, kowhai, tree fuchsia, pate, kohuhu, *Pittosporum ralphii* and heketara form

a low broadleaved canopy. The vegetation has suffered past burning and logging with only occasional original canopy trees remaining. It likely survived complete destruction as it lies on moister south facing slopes. Limited paddock fencing allows domestic stock access, with the RAP merging to treeland and pasture at all margins.

Significance and justification

This RAP is significant as it lies in the dry northeastern section of the Tiniroto Ecological District, where most of the original indigenous vegetation has now been cleared for farming and few remnants of primary hill-slopes vegetation remain.

RAP TIN 5 MAKARETU STREAM

Refer to Maps 2 and 48 (pp. 98 and 359)

Study area No.	53 & 54
Priority:	1
Grid Reference:	NZMS 260 X17 087913/092911
Area:	12 ha
Altitudinal range:	510-560 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/general hardwood-beech forest conifer/tawa-beech forest

Description

This RAP lies on the narrow alluvial terraces, terrace risers and lower hill-slopes beside Makaretu Stream, c. 8 km southwest of Otoko, in the transitional zone between the Tiniroto and Matawai Ecological Districts. It consists of three core areas of primary alluvial conifer/broadleaved-beech forest, dominated by kahikatea, connected by degraded forest and treeland. Makaretu Rd passes through the centre of the RAP, with the largest forest remnant on the southern side and two smaller areas connected by degraded forest/riparian strips to the north. The forest of the northerly patches has kahikatea, rimu, totara and matai emergent over a tall tawa-dominated canopy with red beech. Hinau, kamahi, lancewood, mahoe and kohuhu are also present. The forest to the south, is similar but in mosaic with secondary rewarewa/kamahi forest. Black maire is present throughout. The RAP is grazed by domestic stock, with limited invasion by wilding pines, silver poplar and Indian dogwood.

Significance and justification

The primary alluvial forest contained within this RAP is perhaps more characteristic of forest on alluvial sites within the Matawai Ecological District. It is one of only a few sites in the Tiniroto Ecological District where kahikatea-dominated forest in association with red beech was recorded. The red beech within this RAP lies near the distributional limits of the species in the northeastern part of the district. Up until recently this stretch of stream was also important as whio habitat. Despite ongoing modification, the core forest canopies are essentially intact.

RAP TIN 6 TE KOPAE

Refer to Map 2 (p. 98)

Study area No. 65

Priority: 2

Grid Reference: NZMS 260 X17 135854

Area: 27 ha

Altitudinal range: 240-380 m

Bioclimatic zone: lowland

Vegetation type: tawa forest
broadleaved forest

Description

This RAP covers moderate south-facing hill-slopes from stream side to ridge crest. The stream is a small true left tributary of the Wharekopae River, 2 km east of Rere. The vegetation of the RAP is a mosaic of primary and secondary low forest. The primary forest is dominated by tawa with titoki, scattered emergent pukatea, rewarewa, hinau and nikau. Kohuhu, putaputaweta and ngaio are most abundant in the secondary forest, along with mahoe, kanuka, lancewood, hinau, cabbage tree, young kahikatea and matai. Long-term grazing by domestic stock has opened the understorey and largely halted regeneration.

Significance and justification

The presence of nikau, with its strong coastal association, is significant as it lies c. 35 km from any coast. This inland distributional limit is more in keeping with nikau's distribution in the Turanga Ecological District, whose climate is comparable with this dry northeastern part of Tiniroto Ecological District.

RAP TIN 7 POURIWAI

Refer to Map 2 (p. 98)

Study area No. 67

Priority: 1

Grid Reference: NZMS 260 X17 155850

Area: 20 ha

Altitudinal range: 140-320 m

Bioclimatic zone: lowland

Vegetation class: conifer/tawa-titoki forest

Description

This RAP lies next to Wharekopae Rd in a small southeast-facing sub-catchment above the Wharekopae River, c. 4 km southeast of Rere. It contains a mosaic of

predominantly primary forest extending from the edge of an alluvial terrace, to ridge crest. Primary kahikatea/tawa-titoki/mahoe forest with totara, matai and hinau also present occurs on the lower slope, merging into a crown-fired variant, tawa-titoki/ mahoe forest, at mid-slope. On ridge crests and flanking spurs this merges into secondary kanuka-kohuhu-kowhai forest with rewarewa and ngaio.

Significance and justification

This compact RAP is significant as it lies in the northeastern dry zone of the Tiniroto Ecological District, where little of the original vegetation remains, and it encompasses a full range of forested landforms in a complete sub-catchment. Although the RAP is partly grazed the canopy is essentially intact.

RAP TIN 8 TANGIHAU

Refer to Map 2 (p. 98)

Study area No.	76
Priority:	2
Grid Reference:	NZMS 260 X17 115824
Area:	63 ha
Altitudinal range:	200-486 m
Bioclimatic zone:	lowland
Vegetation classes:	broadleaved forest broadleaved/small-leaved scrub

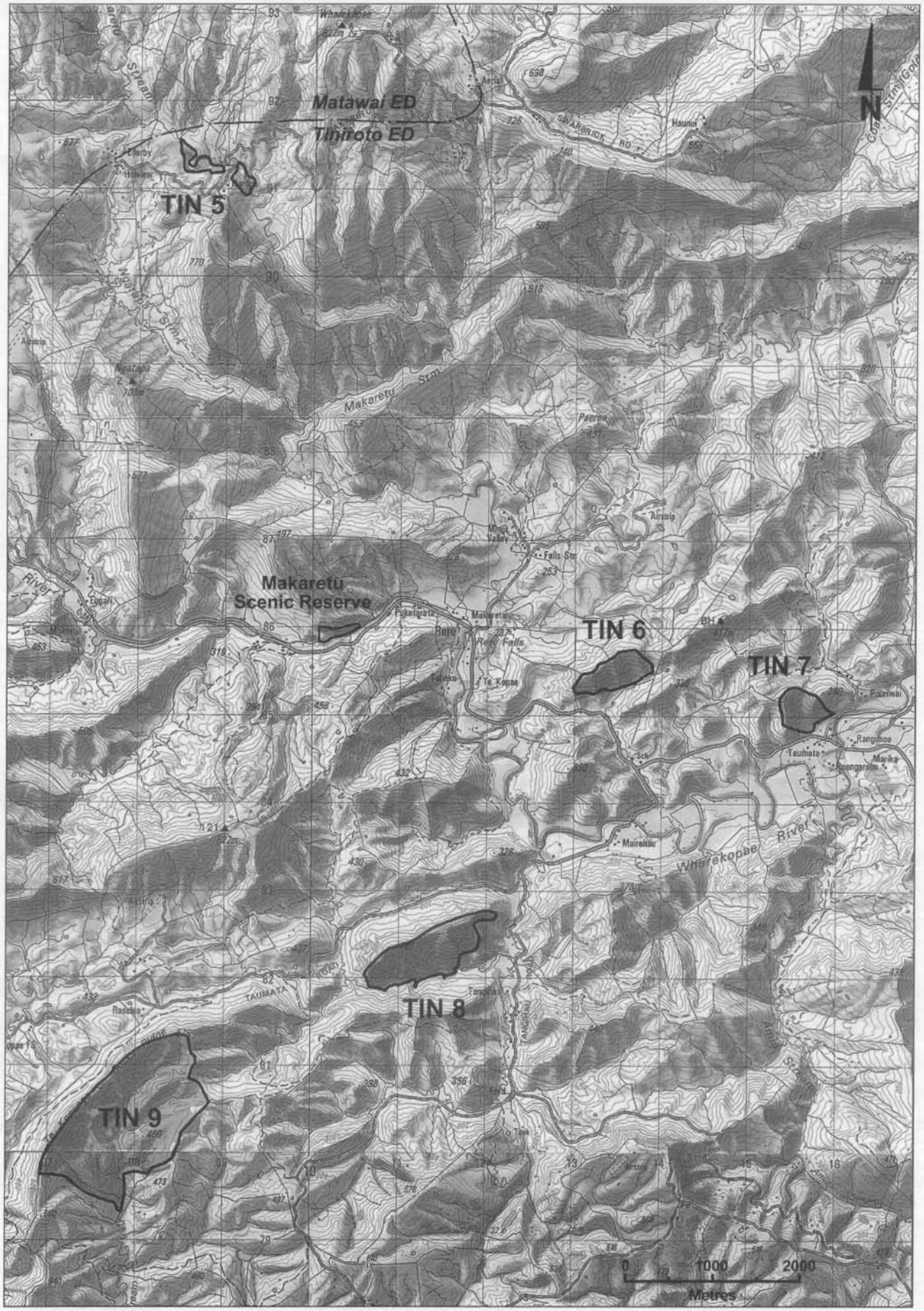
Description

This RAP consists of a south-southeasterly facing hill-slope that is finely dissected by a series of spurs and steep-sided gullies emanating from a very sharp and narrow ridge, beside a true right tributary of the Wharekopae River. The lower slopes are hummocky and covered in debris from the steep hill-slopes above. Vegetation on the ridge and dry spurs is a mosaic of kowhai, kanuka and rewarewa, with tawa forest dominating the steep-sided moist gullies and lower slopes. Pukatea occurs amongst the tawa, particularly in the central parts of the gullies, along with occasional nikau and young kahikatea. Large kawakawa dominate the understorey of the lower slopes with ongaonga. Mahoe and pigeonwood are most abundant in the sub-canopy. Feral goats appear to graze throughout, with domestic stock grazing evident on the gentler slopes. Forest birds recorded during the survey include kereru, tui, fantail and the NZ falcon.

Significance and justification

This RAP is significant as it contains a vegetation pattern typical of dry thin-soiled ridges and moist south-facing gullies and slopes within the district. As with RAP TIN 6 the presence of nikau is also notable. This site is the most inland occurrence of the species in the northeastern portion of the Tiniroto Ecological District, c. 36 km from the coast.

Map 2: RAPs TIN 5-9 (NZMS 260 X17 & X18)



RAP TIN 9 ROCKY RIDGE

Refer to Map 2

Study area No.	75
Priority:	2
Grid Reference:	NZMS 260 X17 080805
Area:	205 ha
Altitudinal range:	350-575 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest broadleaved forest kanuka forest manuka scrub

Description

This RAP covers the headwaters of the Mangatete Stream, a true left tributary of the Hangaroa River. Strongly tilted sandstone/mudstone underlies the moderate to steep sided valley, with the most prominent feature, Rocky Ridge, the sharp narrow ridge along the RAP's northwestern margin. The northwest-facing bluffs (top c. 20 m of the slope), that are also included within the RAP, fall steeply from the ridge. The main ridge is fenced with a farm track running along it.

A history of logging and fires has produced a mosaic of vegetation. The lower slopes support young secondary kanuka-dominated scrub, with manuka more extensive in the secondary vegetation on the mid to upper slopes. Older advanced secondary rewarewa/broadleaved forest (including mahoe, kohuhu, heketara, lancewood, putaputaweta and white maire) is extensive on the upper east-facing slopes and scattered in the moist lower stream gully slopes. Strips of advanced secondary black beech forest occur amongst the broadleaved mosaic, along the main ridge and side spurs.

The bluffs to the northwest support only patchy remnants of the original shrubland vegetation. Species present include New Zealand broom, whatariki, common maidenhair, *Pomaderris ericifolia* and *Haloragis erecta*. Of interest was the presence of *Coprosma brunnea*, a prostrate shrub which occurs on open sites with coarse, well drained soils, and *Vittadinia australis*, a low-growing plant of rocky places. Sheep, cattle (present during several winter months) and feral goats graze much of the RAP.

Significance and justification

This sizeable RAP is significant as it contains a wide range of successional vegetation types on a full range of landforms in a complete headwater catchment system. It is representative of a zone between the drier northeast and wetter parts of the district to the northwest and southwest. It is also the only site within the district where the divaricating shrub *Coprosma brunnea* was recorded.

RAP TIN 10 MOKONUIARANGI-PAPOKEKA STREAM

Refer to Map 3

Study area No.	176
Priority:	1
Grid Reference:	NZMS 260 X17 030805/043845
Area:	744 ha
Altitudinal range:	300-821 m
Bioclimatic zone:	lowland to montane
Vegetation classes:	conifer/broadleaved-beech forest tawa forest kanuka/broadleaved forest broadleaved/small-leaved scrub

Description

This RAP consists of two areas adjoining Wharekopae Conservation Area. The larger area to the east and south of the conservation areas includes extensive easterly to southerly aligned ridges dissected by true left tributaries of the Hangaroa River including the Parahinahina and Papokeka Streams. A smaller area at the northern end of the conservation area encompasses the eastern end of the Mokonuiarangi Range and its associated steep slopes and bluffs to the north and east, draining north into the Wharekopae River. It nominally straddles the boundary to the Matawai Ecological District, but is described here with Tiniroto. Taumata Rd forms the RAP's south-eastern margin, with a small area on the southern side of the road also included within the RAP, an area of riparian vegetation along the Papokeka Stream.

The RAP is an intricate mosaic of varied primary forest and advanced secondary shrubland-low forest, created by various logging, clearance and burning episodes. The spurs and ridges are dominated either by advanced secondary kamahi forest, or primary black beech forest. The moist stream gullies and lower slopes support either tawa-dominated primary forest with scattered young rimu, totara and kahikatea (on the lower slopes), or broadleaved shrubland-low forest of kamahi, scattered young tawa, treeferns, wineberry, putaputaweta, heketara, tree fuchsia, kohuhu and groves of rewarewa. The RAP also includes a small area of primary rimu-beech forest along the northwestern boundary. The vegetation merges to manuka scrub on the slopes above Taumata Rd and in places along the other margins. Koromiko, mingimingi, karamu, young totara and kahikatea are present amongst the low manuka-dominated canopy.

The slopes and bluffs to the north support montane vegetation dominated in parts by red beech-black beech forest, swathes of low kamahi forest and scattered manuka-dominated scrub. The tail of riparian vegetation on southern side of Taumata Rd is dominated by broadleaved species including kamahi, mahoe, tree fuchsia, heketara, rewarewa, scattered tall kanuka and young conical kahikatea.

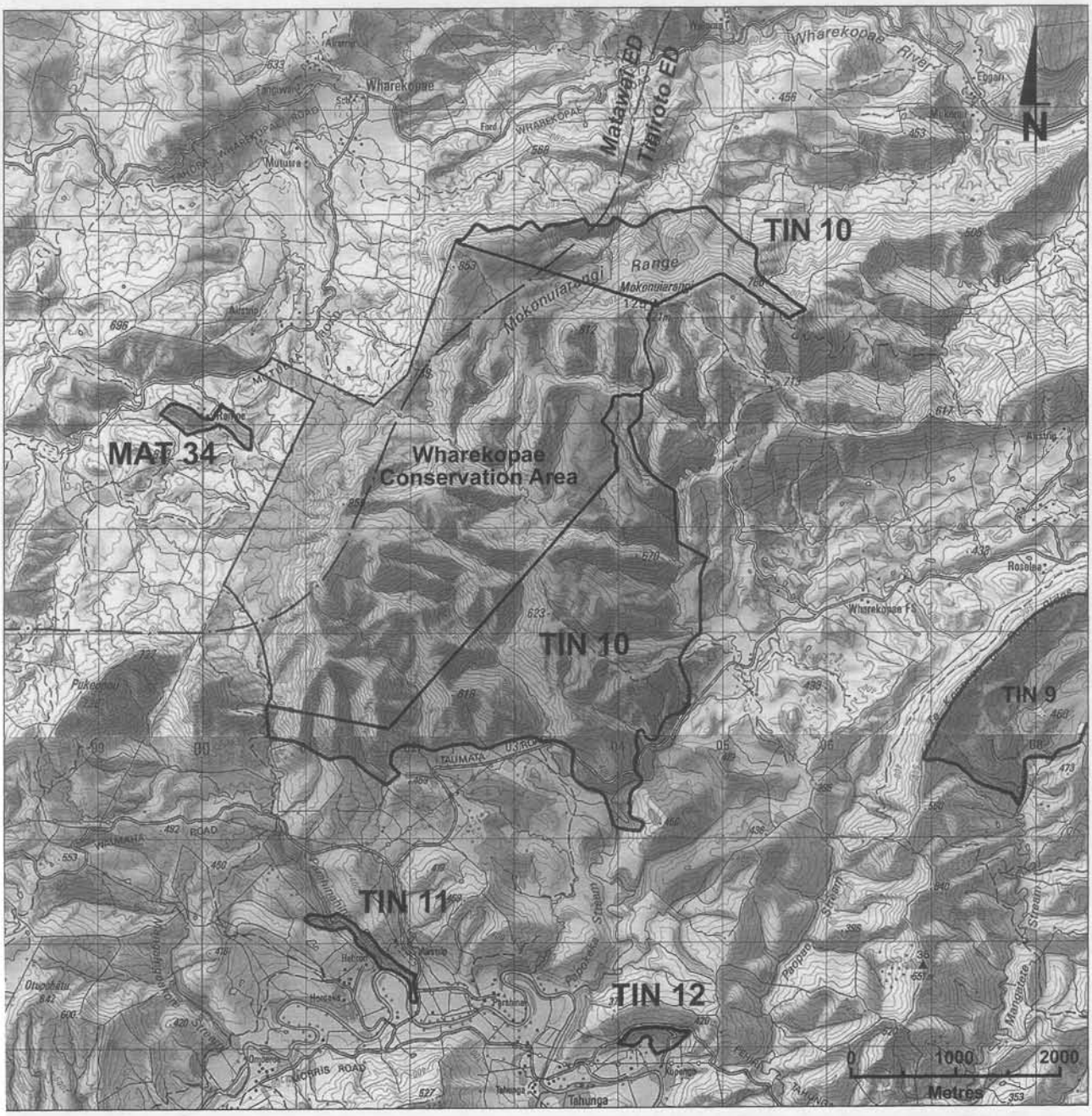
Parts of the RAP are grazed by domestic stock, with fence lines maintained through the young scrub and on some of the prominent ridges. Feral goats are also present, further threatening regeneration and the preservation of species diversity. Wilding

pines are also present in localised patches. Kereru and common forest bird species were recorded.

Significance and justification

This large RAP, along with the Wharekopae Conservation Area (PNA 15) with which it is continuous, forms a 1700 ha tract of indigenous vegetation. The vegetation within the RAP is substantially more intact and diverse than the Conservation Area. Together they span an altitudinal gradient of c. 570 m, from the lowland to montane bioclimatic zones, covering a complete range of landforms and aspects and featuring complete successional sequence from young secondary scrub to varied primary forest. The climate-landform-ecological features are transitional from Tiniroto to Matawai Ecological District character. The RAP has an SSWI ranking of 'moderate'.

Map 3: RAPs TIN 10-12 and MAT 34 (NZMS 260 X17 & X18)



RAP TIN 11 PARAHINAHINA STREAM

Refer to Map 3 (p. 101)

Study area No. 78

Priority: 3

Grid Reference: NZMS 260 X18 017779

Area: 16 ha

Altitudinal range: 260-340 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
conifer/kanuka forest

Description

This RAP lies on moderate to steeply-incised slopes along the Parahinahina Stream and true left banks of the Hangaroa River. The vegetation is mostly advanced secondary (totara)-kowhai-(kanuka) treeland forest which surrounds fragments of primary tawa-dominant forest. Other species present include kahikatea, black maire, titoki, *Pittosporum ralphii*, lancewood, mahoe and houhere. The area has been degraded locally by landsliding, grazing and invasion by Japanese honeysuckle.

Significance and justification:
This RAP is a good example of riparian secondary vegetation, which occurs along stream valleys in this part of the district. It also forms part of a c. 75 km semi-continuous chain of indigenous vegetation along the Hangaroa River valley that includes RAPs TIN 105, 12 - 16 and 20 - 24.

RAP TIN 12 KUPENGA

Refer to Maps 3 and 4 (pp. 101 and 105)

Study area No. 80

Priority: 2

Grid Reference: NZMS 260 X18 045771

Area: 11 ha

Altitudinal range: 250-320 m

Bioclimatic zone: lowland

Vegetation class: conifer forest
conifer/tawa forest

Description

This RAP lies on alluvial terraces beside the Hangaroa River and extends up moderate hill-slopes to the Pehiri-Tahunga Rd. It contains essentially primary kahikatea-(matai)-(totara)/(tawa)-(titoki)/mahoe forest on the alluvial terraces, with modified conifer/tawa forest and a range of secondary species including kowhai, lemonwood and

houhere present on the lower slope. Included in the RAP is a fragment of dense kahikatea-dominated forest on swampy alluvium. Matai, pokaka, black maire and small-leaved kowhai are also present. Numerous divaricating shrubs occur in the understorey of the alluvial forest, including poataniwha, shrubby mahoe, *Myrsine divaricata*, *Pseudopanax anomalus* and turepo. A fragment of *Carex geminata* agg. sedgeland is also present on swampy alluvium near the river.

Despite some grazing by domestic stock within the RAP, the forest canopy and understorey are largely intact. A more serious problem is local invasion by sycamore, small-leaved privet and stinking iris. Ornamental shrubs (*Rhododendron, Camellia*) have been planted along one margin. Control of these exotic species, particularly sycamore and small-leaved privet, will be needed to maintain the forest's integrity.

Significance and justification

This RAP is significant as one in a series of notable podocarp-rich forest remnants that extend for c. 20 km along the Hangaroa and Waikura River valleys. Small-leaved kowhai, a species with only a local distribution in the district, is present.

RAP TIN 13 TRAFFORD'S BUSH

Refer to Map 4 (p. 105)

Study area No. 81

Priority: 1

Grid Reference: NZMS 260 X18 054753

Area: 32 ha

Altitudinal range: 220-260 m

Bioclimatic zone: lowland

Vegetation class: conifer forest

Description

This RAP covers alluvial terraces, lower hill-slopes on either side of the Hangaroa River, and a small island in the centre of the river. The alluvial terraces have primary podocarp-rich forest with emergent kahikatea, some matai and totara over a sparse broadleaved tawa-titoki canopy. Mahoe is the most abundant sub-canopy tree. Many other primary (e.g. rimu, pokaka) and secondary (e.g. small-leaved kowhai, kowhai, small-leaved milk tree, houhere, kaikomako, pigeonwood) species are present, along with a range of divaricating shrubs (including shrubby mahoe, poataniwha, *Pseudopanax anomalus* and rohutu). A small stand of black beech occupies a higher terrace at the southern edge of the forest. The small island has stands of totara and black beech, with kowhai, willow and open grassy areas amongst it and on the margins. Small-leaved privet and Japanese wineberry were noted in the understorey of alluvial forest, both of which may require control in the future.

Significance and justification

This RAP is another botanically and scenically valuable feature of the Hangaroa/ Waikura River valleys, and is an outstanding example of primary podocarp-rich

alluvial forest. Part of the RAP has been fenced for over a decade and has a fully intact understorey.

RAP TIN 14 UPPER HANGAROA RIVER

Refer to Map 4

Study area No. 85, 86 & 107

Priority: 1

Grid Reference: NZMS 260 X18 073753

Area: 37 ha

Altitudinal range: 210-260 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
conifer forest
kanuka forest

Description

This RAP occupies alluvial terraces and colluvial foot-slopes about a section of the upper Hangaroa River, on either side of the Pehiri-Tahunga Rd. It contains a fine, visually conspicuous example of primary kahikatea-(matai)/(pokaka)/(mahoe) forest with younger kahikatea stands interspersed. Other species present include rimu, totara, black maire, white maire, tawa, hinau, kaikomako, small-leaved milk tree, small-leaved kowhai, kowhai, narrow-leaved lacebark and houhere. There is also at least one stand of primary black beech forest within it. In places the original forest has been degraded by grazing to pokaka-(kahikatea)-(totara)-(kowhai) treeland. There are also smaller contiguous patches of secondary forest dominated variously by kanuka or mixtures of kowhai, kanuka and narrow-leaved lacebark. The area is mostly grazed by domestic stock and suffers from marginal invasion by silver poplar. The canopy however is still largely intact.

Significance and justification

Relatively large and compact, this RAP is one of the finest remnants of podocarp-rich alluvial forest remaining in the Hangaroa/Waikura River valleys. It is continuous with RAP TIN 15 to the east.

RAP TIN 15 COOLMOREE

Refer to Map 4

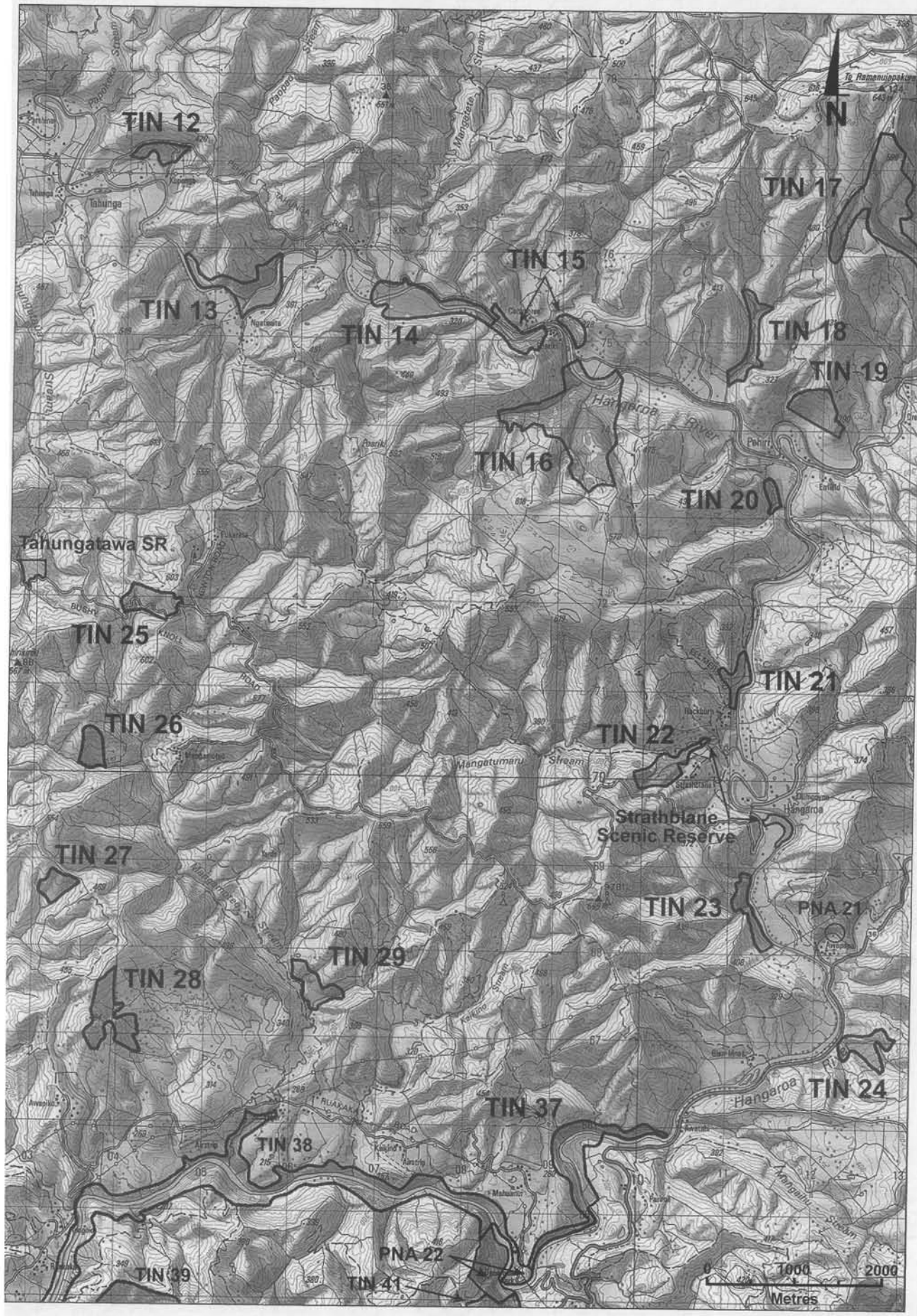
Study area No. 108

Priority: 3

Grid Reference: NZMS 260 X18 085750/091752

Area: 21 ha

Map 4: RAPs TIN 12-29 & 37 (NZMS 260 X18)



Altitudinal range: 210-320 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
kanuka-broadleaved forest

Description

This RAP includes remnants of alluvial terrace/terrace riser forest and hill-slope/scarp face vegetation on either side of the Hangaroa River. Pehiri Tahunga Rd runs through the RAP on the northern side of the river. The alluvial terraces/terrace risers support primary kahikatea-dominated forest, with locally common advanced secondary pockets of totara, as well as rimu, matai, tawa, titoki, black maire and mahoe, and other characteristic secondary tree species of the district. The hill-slopes and scarp faces on the true right side of the river have generally sparse secondary vegetation of kanuka, kowhai, lemonwood, kohuhu, cabbage tree, young totara and kahikatea. The hill-slope vegetation on the south-facing slopes on the northern side of the road (in both the main RAP area and the outlier to the east) is more diverse and intact, with a mosaic of broadleaved species and young podocarps including kowhai, mahoe, kanuka, pigeonwood, cabbage tree, and young totara. The RAP is grazed in part, particularly on the hill-slopes. Common field and bush birds have been recorded.

Significance and justification

This RAP is significant as it is one of a series of podocarp-rich forest remnants that form a semi-continuous chain along the Hangaroa/Waikura River valleys. It is also a significant wildlife habitat with an SSWI ranking of 'moderate'.

RAP TIN 16 POARIKI

Refer to Map 4 (p. 105)

Study area No. 90

Priority: 2

NZMS 260 ref: NZMS 260 X18 093740

Total area: 98 ha

Altitudinal range: 200-500 m

Bioclimatic zone: lowland

Vegetation classes: conifer/kanuka-broadleaved forest
kanuka forest

Description

This RAP lies on striking moderate to steep generally north-facing slopes, narrow ridges and eroding bluffs/scarp faces on the true right Hangaroa River and up two of its smaller tributaries, together with narrow terraces and riparian slopes on the true left. The vegetation is dominated by secondary kanuka scrub-forest, particularly in the southeastern tributary. The northwestern tributary is more diverse with kowhai, kohuhu, lancewood, cabbage tree and young kahikatea amongst the mainly kanuka

canopy. The lower slopes of the stream gullies contain mosaics of broadleaved trees and shrubs including tawa, mahoe and kohuhu. The vegetation on the faces above the river is more open and patchy with only scattered kanuka-dominated scrub, with kowhai amongst pasture and bare bluffs. The gentler slopes and terraces beside the river have pockets of broadleaved trees, young totara and kahikatea amongst kanuka scrub-forest. The RAP is unfenced and grazed most notably on the margins.

Significance and justification

This RAP is an integral part of a semi-continuous chain of indigenous vegetation that extends for c. 75 km along the Hangaroa River valley. It also contains representative secondary vegetation on very steep slopes and tributary valleys typical of stretches of the Hangaroa River valley, and covers a wide altitudinal gradient. The secondary vegetation has potential to recover as it is a large tract with seed sources in close proximity.

RAP TIN 17 TE RAMANUIAPAKURA

Refer to Maps 4 and 5 (pp. 105 and 119)

Study area No. 89

Priority: 1

Grid Reference: NZMS 260 X18 126766

Area: 69 ha

Altitudinal range: 380-600 m

Bioclimatic zone: lowland

Vegetation/landform classes:

beech forest
conifer/tawa forest
broadleaved forest
freshwater wetland

Description

This RAP lies on the southern slopes of Te Ramanuiapakura and covers the headwaters of a tributary of the Waikura River. The landscape has moderate dip-slopes with a westerly aspect and sharp east-facing scarp-slopes. The vegetation on the dip-slopes is predominantly primary (rimu)-(rewarewa)-(pukatea)/tawa/mahoe-pigeonwood forest, with small black beech stands on ridge crests. Other tree species present include matai, kahikatea and a range of secondary broadleaved species: houhere, putaputaweta, tree fuchsia, lancewood, pate and ongaonga. The scarp faces have secondary (rewarewa)/kohuhu forest with heketara, kowhai and mahoe. These have been locally degraded by grazing to treeland and contain other typical secondary species of the district. The stream at the southeastern end of the RAP flows through a small raupo-dominated wetland (not surveyed) that was formed by a dam of landslide debris from the upper slopes. The forest is grazed and open, with an intact canopy.

Significance and justification

This RAP is the largest remnant of the original hill-slopes forest in the northeastern part of the Tiniroto Ecological District, with a mosaic of black beech on ridges and rimu-matai/broadleaved forest on hill-slopes. It also contains a wetland that is an interesting landslide feature.

RAP TIN 18 PEHIRI (1)

Refer to Maps 4 and 5 (pp. 105 and 119)

Study area No. 91

Priority: 3

Grid Reference: NZMS 260 X18 110747

Area: 15 ha

Altitudinal range: 200-300 m

Bioclimatic zone: lowland

Vegetation class: conifer/broadleaved forest

Description

This RAP contains a strip of secondary vegetation along the margins of a true right tributary of the Waikura River. It is dominated by kowhai-kohuhu-totara forest, with lancewood, putaputaweta, five finger, houhere and kanuka. The RAP is unfenced, with grazing by domestic stock throughout.

Significance and justification

This RAP contains a good intact example of the kowhai-dominated riparian vegetation that occurs in the dry northeastern part of the district. It is also part of a semi-continuous c. 75 km chain of indigenous vegetation along the Hangaroa River valley.

RAP TIN 19 PEHIRI (2)

Refer to Maps 4 and 5 (pp. 105 and 119)

Study area No. 92

Priority: 3

Grid Reference: NZMS 260 X18 120743

Area: 20 ha

Altitudinal range: 220-340 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
broadleaved forest
kanuka scrub-forest

Description

This compact RAP lies on gentle hill-slopes in a wide basin and on gentle southeast facing hill-slopes on the true right above the Waikura River. The northwestern half of the basin contains advanced secondary broadleaved forest, with kohuhu, lancewood, five finger, young tawa, houhere, young kahikatea, rimu and matai. There are also small pockets of young (kahikatea)/tawa forest. The southeastern half supports younger kanuka-dominated scrub-forest. Kohuhu, five finger, lancewood, kowhai and young podocarps are scattered throughout. The southeast facing slopes have broadleaved forest, with a low continuous canopy of mahoe, kohuhu, houhere, young tawa, pukatea, young kahikatea and pigeonwood. The RAP appears to be completely fenced. Kereru and common forest birds have been recorded.

Significance and justification

Although alluvial terrace forest is well represented in the Hangaroa and Waikura River valleys (e.g. RAP TIN 12, 13 and 30), gentle hill-slope forest such as that within this RAP has largely been cleared. This RAP is one of the few representative remnants of secondary and advanced secondary vegetation on fertile moderate hill-slopes in this part of the district. It forms an important topographic sequence from near the valley floor of a major river system to ridge crest between RAP TIN 17 and 30.

RAP TIN 20 ROCKBURN (1)

Refer to Maps 4 and 5 (pp. 105 and 119)

Study area No. 133

Priority: 2

Grid Reference: NZMS 260 X18 114733

Area: 4.6 ha

Altitudinal range: 200-230 m

Bioclimatic zone: lowland

Vegetation class: conifer forest

Description

This RAP lies on alluvial terraces, stream side banks and the lower section of the terrace riser on the true right of the Hangaroa River. A small stream runs through the RAP. The RAP is fenced on all sides, but the fence to the west is broken giving stock access. Mature eucalypts encircled the RAP at the time of survey, but they have since been removed and milled.

The alluvial river terrace supports primary kahikatea-(matai-totara) forest. Several very old podocarps remain, however most have probably established more recently following some major disturbance. Tawa, titoki and black maire are scattered amongst the podocarp-rich canopy. The understorey is dense with a range of divaricating and small-leaved shrubs including shrubby mahoe, *Neomyrtus pedunculatus*, *Coprosma propinqua*, turepo, pokaka, weeping mapou, mapou, rohutu, *Coprosma areolata*, *Coprosma rotundifolia* and poataniwha. The healthy condition of the understorey of the RAP likely results from stock exclusion (prior to the

failure of the fence). Parts of the forest floor and stream sides are carpeted in ferns (tarawera, kiwakiwa, gully fern, *Leptopteris hymenophylloides* and common shieldfern) and seedlings. The forest along the stream banks is similar, but with a more diverse broadleaved sub-canopy, including mahoe, tree fuchsia, pigeonwood, rangiora and pate.

Domestic stock have access to the RAP via the broken fence, with pugging and browsing evident. A number of weed species were recorded, including old man's beard (one plant seen and removed), Japanese honeysuckle, small-leaved privet and wild strawberry. The first three species are the most invasive and will require monitoring and control.

Significance and justification

This RAP is important as part of a semi-continuous chain of indigenous vegetation along the Hangaroa River valley. It is also one of the most intact and diverse remnants of alluvial podocarp-rich forest in the upper Hangaroa River valley, with 11 species of small-leaved and divaricating shrubs recorded.

RAP TIN 21 ROCKBURN (2)

Refer to Map 4 (p. 105)

Study area No. 135

Priority: 2

Grid Reference: NZMS 260 X18 111711

Area: 9.3 ha

Altitudinal range: 190-240 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
conifer/broadleaved forest

Description

This RAP lies on an alluvial terrace and east-facing slopes beside the Hangaroa River. A small stream, a true right tributary of the Hangaroa River, flows through the RAP. Kahikatea dominates the primary forest on the alluvial terrace, with large matai and totara over an understorey of divaricating shrubs (including poataniwha, pokaka, *Pseudopanax anomalus*, shrubby mahoe and turepo). The slopes at either end of the RAP support forest of similar composition but with tawa, mahoe, titoki and occasional kowhai in the canopy. The forest in the central portion of the RAP, on either side of the small stream, is also similar to the terrace forest, but with more abundant broadleaved species in the sub-canopy including pate, mahoe, rangiora and kanono. The banks of the stream are clothed in ferns and moss.

The RAP is fenced along the top edge and northern sides, with the forest margins fading to a band of divaricate shrubs. A well developed farm track runs through the RAP parallel to the river. Some grazing was noted particularly along the track margins. A number of weeds are present particularly along the track edges including Jerusalem cherry, blackberry, wild strawberry, barberry, and old man's beard (by the river).

Significance and justification

This RAP is an integral part of a semi-continuous chain of podocarp-rich forest remnants along the Hangaroa River valley (along with RAPs TIN 12 - 16 and 20). Despite logging, a number of large kahikatea (1.2-2 m dbh) and totara are still present. The ground cover of the forest is in general diverse, with stock damage most notable at the margins.

RAP TIN 22 STRATHBLANE (1)

Refer to Map 4 (p. 105)

Study area No.	141
Priority:	2
Grid Reference:	NZMS 260 X18 103701
Area:	17 ha
Altitudinal range:	200-370 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer forest conifer/tawa-titoki forest conifer/broadleaved forest

Description

This RAP covers north-facing slopes and alluvial terraces beside the lower reaches of the Mangatumaru Stream, a true right tributary of the Hangaroa River. Bushy Knoll Rd forms the southern boundary of the RAP, with a farm track dividing the forest on the terrace and forming the northern boundary. The RAP is continuous with the small northern lobe of the Strathblane Scenic Reserve (PNA 20) on the alluvial terrace to the northeast. The primary alluvial terrace forest has large kahikatea, totara and matai over an open understorey of scattered divaricate shrubs (e.g. poataniwha, pokaka, *Pseudopanax anomalus* and shrubby mahoe). The lower slopes above the farm track and upper steep slopes have advanced secondary low forest with rewarewa (on the upper slopes), totara and kahikatea over a low broadleaved canopy dominated by kowhai, kohuhu and lancewood. On the mid-slopes the forest is primary with emergent kahikatea and scattered matai over a tawa-titoki canopy. Domestic stock have access to the whole RAP, with the most severe stock damage on the alluvial terraces. Kereru and fantail were recorded.

Significance and justification

This RAP is significant as it is one of the few examples of primary forest on sunny dry fertile north-facing slopes in this part of the district, where most primary forest remaining is on wetter south-facing slopes. It also acts as a buffer to the small (1 ha) northern part of the Strathblane Scenic Reserve (PNA 20), with which it is continuous, and contains a wide range of vegetation and landform types, extending from alluvial terrace to ridge crest.

RAP TIN 23 STRATHBLANE (2)

Refer to Map 4 (p. 105)

Study area No. 143

Priority: 3

Grid Reference: NZMS 260 X18 113685

Area: 15 ha

Altitudinal range: 180-260 m

Bioclimatic zone: lowland

Vegetation types: conifer forest
conifer/broadleaved forest

Description

This RAP lies on a narrow alluvial river terrace and moderate to steep slopes on the true right of the Hangaroa River. A small true right tributary runs through the centre of the RAP. The narrow terrace has a band of primary logged kahikatea-totara forest. This merges into primary logged kahikatea-(matai-totara) forest with a sub-canopy of mainly kowhai and kohuhu forest-treeland. Other broadleaved species in the canopy include pokaka, lancewood, houhere, putaputaweta and mahoe. The forest has one large emergent rimu. It is grazed beneath by sheep and cattle, with the understorey open and grassy in parts. Past logging has removed most of the largest podocarps. Willows occur along sections of the river banks, but are not continuous.

Significance and justification

This RAP is significant as it contains primary slope and terrace forest that contributes to a c. 75 km semi-continuous chain of indigenous vegetation along the Hangaroa River valley. It contains a high concentration of large podocarps.

RAP TIN 24 AWATAHI

Refer to Map 4 (p. 105)

Study area No. 145

Priority: 3

Grid Reference: NZMS 260 X18 124670

Area: 16 ha

Altitudinal range: 190-320 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
conifer/tawa forest
kanuka-broadleaved forest

Description

This RAP covers a gentle to steep west-facing hill-slope above the Hangaroa River, into which a small true left tributary is incised. The stream is less incised, with a narrow terrace, towards its confluence with the river. The steepest slopes at the upper end of the RAP support secondary kowhai-kohuhu-kanuka treeland, with scattered young totara and cabbage tree. Pure totara forest forms narrow bands along the northern edge of the RAP, merging into thick advanced secondary totara-kahikatea forest above the incised stream banks. The central slopes of the RAP have kahikatea-(totara-rewarewa)/tawa forest, with titoki also present in the canopy. The understorey is grazed and open to c. 2 m, with large podocarp stumps evidence of past logging. The lower slopes/stream terraces also have totara-kahikatea forest, with pokaka, titoki and tawa. The understorey is dominated by small-leaved shrubs including poataniwha, *Coprosma rotundifolia* and *Pseudopanax anomalus*.

Long-term grazing has opened the understorey and largely halted regeneration over much of the RAP. Old man's beard, in its initial stages of invasion, was recorded at the beginning of the track leading to the RAP. Kereru, tui and fantail were all noted during surveying.

Significance and justification

This RAP is significant as an area of high fertility hill-slope forest with a high concentration of podocarps, notably totara. It contains one of the largest individual totara seen during this survey (approx. 2.5 m through at the base).

RAP TIN 25 PUKERATA

Refer to Map 4 (p. 105)

Study area No. 125

Priority: 3

Grid Reference: NZMS 260 X18 042719

Area: 16 ha

Altitudinal range: 500-560 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
broadleaved scrub-shrubland

Description

This RAP lies on south-facing moderate slopes on both sides of Bushy Knoll Rd, forming a scenic corridor. The upper slopes support rimu-rewarewa/tawa forest, with a diverse understorey of seedlings, ferns and grasses (including gully fern, hen and chicken fern, heruheru, kiokio and forest oat grass). The large number of saplings indicates regeneration is occurring, with young mahoe, heketara, kanono, rangiora, pigeonwood and silver fern all noted. On the lower slopes, where past modification was more intense (e.g. logging/burning of the surrounding land and for road construction) there is a low broadleaved mosaic of kohuhu, pigeonwood, rangiora, wineberry, mapou, houhere, pate, tree fuchsia and houhere.

The area is currently signposted as the Tahungatawa Scenic Reserve but is actually on private land and not formally protected. The only potentially invasive plant noted was cotoneaster. Kereru and common bush birds including tui, fantail and grey warbler were recorded.

Significance and justification

This RAP is significant as it contains primary rimu/tawa forest with a diverse and intact understorey; few other surveyed remnants of this forest type had such prolific regeneration. It also has high scenic value as it fringes the Bushy Knoll Rd.

RAP TIN 26 MANGAMOTEO

Refer to Maps 4 and 19 (pp. 105 and 203)

Study area No. 137

Priority: 2

Grid reference: NZMS 260 X18 036702

Area: 12 ha

Altitudinal range: 350-480 m

Bioclimatic zone: lowland

Vegetation class: beech forest
conifer/tawa forest
tawa forest

Description

This RAP covers a narrow alluvial terrace, south-facing moderate to steep slope, and ridge in the upper catchment of the Mangamoteo Stream, a true right tributary of the Hangaroa River. The forest on the mid-slopes, which makes up the bulk of the RAP, is partially logged primary (rimu-matai)-pukatea/tawa-titoki forest. It has abundant young matai and some miro, with mamaku, mahoe, white maire, nikau and tree fuchsia all present in the sub-canopy. Large epiphytic puka are also present in the canopy. Lianes present include kiekie and supplejack. The lower slope and narrow stream terrace support partially logged primary kahikatea-(matai)/tawa-titoki forest. The canopy is broken in places with associated grassy patches and the understorey is quite open due to stock browse and pugging. There are narrow bands of black beech forest on the upper slope/ridge and along the southwestern edge of the RAP near the stream. Mapou, young black beech, lancewood, mingimingi, totara and *Helichrysum aggregatum* var. *aggregatum* are all present in the beech forest sub-canopy/ understorey.

The RAP has abundant bird life with kereru, tui, bellbird, fantail and grey warbler all recorded during the survey. Sheep and cattle have pugged and grazed some parts of the understorey, particularly on the terrace, with feral goats also noted. Large stumps (many over 1.5 m diameter) remain in the understorey as evidence of past logging.

Significance and justification

This RAP, though quite small, is significant as it contains primary indigenous vegetation that extends from stream side to ridge crest, with its original interrelationships intact: beech forest on the ridges and tawa-dominated vegetation on the hill-slopes. It is intermediate in character between the other RAPs identified in the Mangamoteo Stream catchment (RAPs TIN 25 and 29).

RAP TIN 27 AWAPIKO

Refer to Maps 4 and 19 (pp. 105 and 203)

Study area No. 567

Priority: 3

Grid Reference: NZMS 260 X18 033687

Area: 11 ha

Altitudinal range: 340-420 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
beech forest

Description

This compact RAP covers moderate to gentle south-facing slopes, on the northern side of a stream gully. The stream is part of the upper catchment of a true left tributary of the Mangapiopio Stream (a large true left tributary of the Hangaroa River).

The vegetation of the RAP is primary rimu/tawa-pukatea forest, with abundant large pukatea. Large hinau and epiphytic puka are also abundant amongst the tawa-dominated canopy, with occasional titoki. Mahoe and pigeonwood dominate the sub-canopy. Long-term grazing has completely opened the understorey of the forest to c. 5 m, with only scattered ferns (e.g. *Lastreopsis glabella*, nini, thread fern and tarawera) and young seedlings on the forest floor. However, the canopy is still healthy and intact.

Two narrow strips of advanced secondary black beech forest occur on the upper ridges. The understorey is open, with the forest reduced to a treeland in parts. Mingimingi, red-fruited karamu, young rimu and matai are most abundant in the sparse, dry understorey. The tall forest is buffered on some margins by young scrub, which includes mingimingi, manuka, putaputaweta, houhere, young kahikatea, rimu and matai. Tui and kereru were present.

Significance and justification

Despite being small and grazed this RAP is significant as is has primary forest that retains the interrelationship of black beech on the ridges and rimu/tawa forest on the hill-slopes. There is also a high proportion of large emergent rimu.

RAP TIN 28 AWAPIKO/ST LEGER

Refer to Map 4 (p. 105)

Study area No.	563, 562 & 568
Priority:	2
Grid Reference:	NZMS 260 X18 038672
Area:	30 ha
Altitudinal range:	290-470 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest conifer forest tawa forest broadleaved shrubland manuka scrub

Description

This RAP contains three forest remnants, two on moderate east-facing hill-slopes at the head of an ancient landslide and the third on south-facing stable hill-slopes adjacent, all drained by small true right tributaries of the Hangaroa River. The small gaps between the forest patches are being infilled by scattered manuka shrubland to scrub, some of which is included in the RAP as a minimal linkage area.

The northern forest is the largest of the three, extending in a sweeping arc from ridge crest to mid-slope on what would have been the old slip surface/source of the landslide. It also includes a small wetland along the lower forest margin, with raupo around part of its margin (not surveyed). The forest within the remnant is primary logged tawa forest, with pukatea abundant in the canopy on the lower slopes, and rewarewa and hinau abundant throughout. The canopy also has numerous young podocarps: kahikatea (greater numbers on the lower slopes), rimu, matai and totara. The sub-canopy is a mixture of broadleaved trees including mahoe, putaputaweta, pigeonwood and treeferns. Aka, *Metrosideros colensoi*, bush lawyer, *Rubus schmidelioides*, supplejack, and native jasmine are the most abundant lianes. The understorey, although grazed, is still quite diverse with gully fern, red-fruited karamu and many young saplings of houhere, putaputaweta and wineberry. The remnant is partly fenced along its eastern boundary, merging to treeland or manuka-broadleaved scrub on all other margins.

The smaller eastern remnant lies on moderate slopes at the side of the head-scarp of the landslide, that merge into hummocky slopes at the head of the landslide debris. It has primary logged tawa-dominated forest, with abundant pukatea, scattered rewarewa, hinau, young rimu, kahikatea, puka, and one large totara. Along its north-eastern margin there is a narrow band of even-aged young kahikatea, with occasional totara. At its southern corner this forest merges into younger advanced secondary forest with rewarewa, young rimu and kahikatea over a mixed canopy of kanuka, houhere, mahoe, lancewood, putaputaweta and treeferns. There are also small patches of young tawa, and several very large primary hinau. The understorey appears to be fairly open, particularly around the margins.

The south-facing remnant also contains primary logged tawa-dominated forest, with abundant pukatea, scattered rewarewa, rimu, kahikatea, and several huge hinau. Mahoe dominates the sub-canopy, with treeferns, heketara and putaputaweta. This forest merges into secondary manuka scrub, and broadleaved shrubland (with kohuhu, houhere, heketara, lancewood, young kahikatea and totara) at some margins, with pasture bounding it on all others.

The remnants within the RAP are all subject to grazing and trampling by domestic stock and feral goats, with varying degrees of understorey modification. Kereru and common bush birds including grey warbler, fantail and tui were present within the RAP.

Significance and justification

This RAP is significant as it contains diverse primary forest on a range of landforms, from stable ridges to old landslide head-scarps and debris, and including a small wetland, over a wide range of aspects. Little primary forest remains on ancient landslides, like that represented in this RAP, as the easy terrain and fertile soils resulting from the slide debris made them targets for clearance and pasture development.

RAP TIN 29 KAHUI BUSH

Refer to Map 4 (p. 105)

Study area No.	572
Priority:	2
Grid Reference:	NZMS 260 X18 063675
Area:	15 ha
Altitudinal range:	220-270 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer forest conifer/tawa forest

Description

This RAP covers alluvial terraces, terrace risers and moderate hill-slopes beside and above the Mangamoteo Stream, a true right tributary of the Hangaroa River. The stream meanders through the terraces, its bed littered with limestone rocks full of shell fossils. The stream appears to have good water quality with small fish, aquatic invertebrate larvae and snails all noted in abundance. Its banks have scattered ferns and herbs including gully fern, kiwakiwa and *Jovellana sinclairii*.

The southern end of the RAP supports logged primary kahikatea-(matai-totara) forest-treeland on alluvial terraces. Tawa, titoki, young rimu, lemonwood, tree fuchsia, white maire, young matai and kahikatea are scattered amongst the tall podocarps. The terraces are heavily grazed. The understorey is open to c. 5 m with dominant pasture grasses, and only scattered ferns and shrubs (including common shieldfern, gully fern, kiwakiwa, *Coprosma rotundifolia*, kaikomako, poataniwha, *Pseudopanax anomalus*, red-fruited karamu and turepo). The higher older terraces in the northwest, together with terrace risers and upper hill-slopes, have forest with a tawa-

dominant canopy. Low numbers of pukatea are present amongst the tawa, with emergent rimu, kahikatea and occasional matai. The canopy is more intact than that of the southern terrace forest. However, there are still occasional open grassy patches. Mahoe is the most abundant sub-canopy species, with pigeonwood, tree fuchsia, young rimu and kahikatea. The understorey is also quite open and grazed, with a similar suite of shrubs and ferns as on the southern terrace. Additional fern species, present only in the hill-slope understorey, include *Asplenium hookerianum*, common maidenhair and irirangi.

Both the terraces and hill-slopes have been logged, with many large podocarp stumps remaining. Long-term grazing and trampling by domestic stock has opened the understoreys of both forest types, with the most marked impact on the southern alluvial terraces. Kereru, tui and grey warbler were recorded within the RAP.

Significance and justification

The RAP is significant as it contains primary podocarp-rich alluvial forest, on terraces of varying ages and fertility and consequently forest type. It complements the values of the RAPs on steeper slopes at higher altitude further up the Mangamoteo Stream (TIN 25, TIN 26) and the narrow terraces and steep slopes along the lower reaches of the Mangamoteo Stream and Hangaroa River (TIN 38).

RAP TIN 30 WAIKURA VALLEY

Refer to Map 5

Study area No. 100, 109 & 110

Priority: 1

Grid Reference: NZMS 260 X18 150754

Area: 45 ha

Altitudinal range: 230-360 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
conifer/broadleaved forest
broadleaved forest
broadleaved scrub-shrubland

Description

This RAP forms a semi-continuous narrow band of primary forest on alluvial terraces and lower slopes beside the Waikura River. The forest runs along the Pehiri-Tahunga Rd, with most of it lying on the southern side. Formal protection of part of the area is under action through the QEII National Trust. The forest on the northern side of the road lies on a narrow terrace and moderate hill-slopes. The main tract of forest contains a superb example of primary kahikatea-matai-(totara)/(pokaka)-(black maire)/weeping mapou forest. Also present as sub-canopy species are white maire, small-leaved kowhai, kowhai, narrow-leaved lacebark and houhere. The understorey is rich with divaricating shrubs including weeping mapou, rohutu, shrubby mahoe and poataniwha. Small populations of the recovering but 'conservation dependent' heart-

leaved kohuhu and 'vulnerable' *Coprosma pedicellata* occur in treeland on the true right of the Waikura River on swampy alluvium (on both sides of the road).

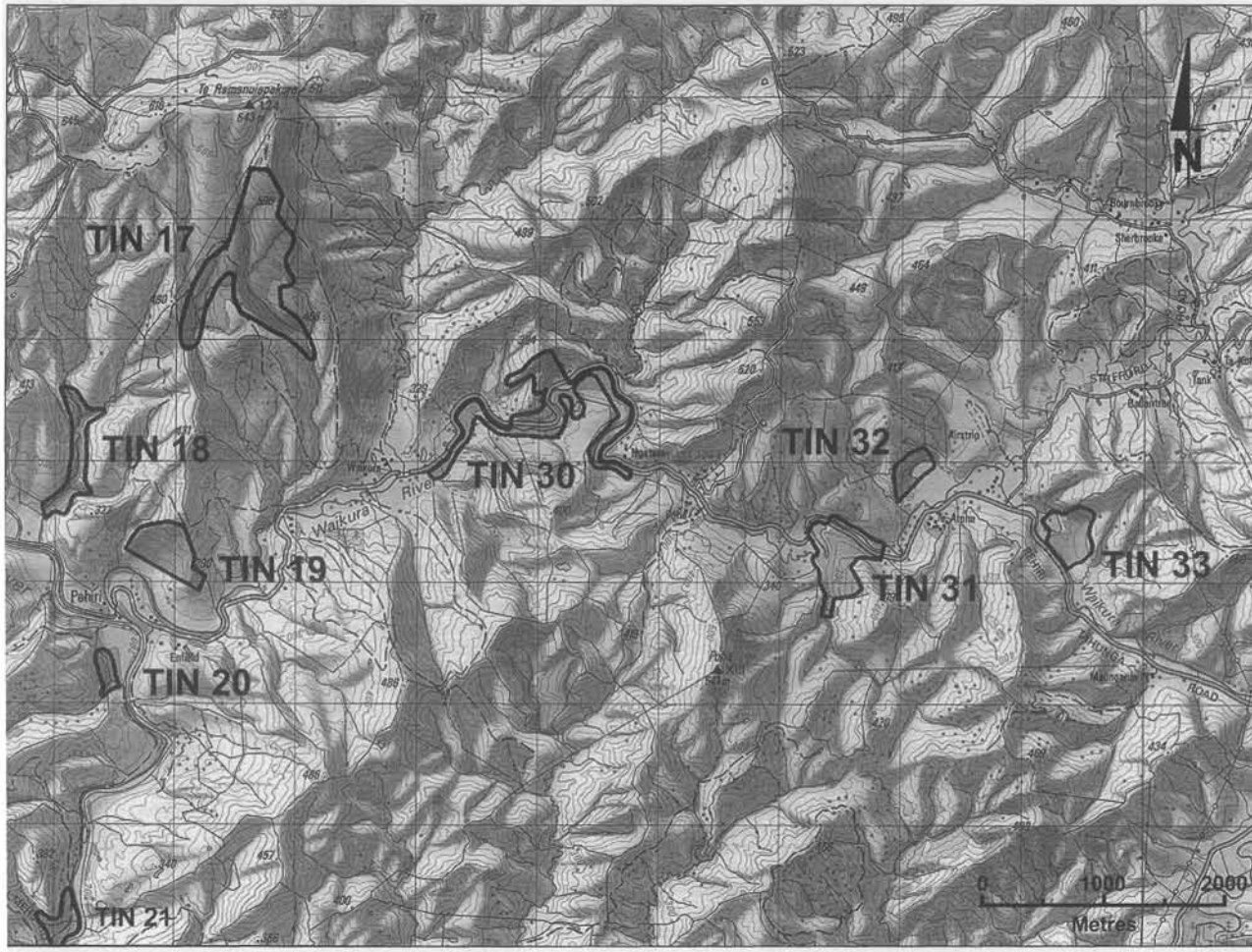
The alluvial terraces on the northern side of the road support primary kahikatea/(pokaka)-(houhere)-(kowhai) forest with divaricating shrubs dominating the understorey on the lower part. There is a small, much trampled, wetland amongst this forest. The terrace forest merges up-slope into low advanced secondary broadleaved forest dominated by houhere, kowhai, kohuhu and lancewood, with young kahikatea, totara, five finger, mahoe and cabbage tree also present.

The forest is grazed and crack willow is scattered along parts of the terraces with serious invasion in the northern part of the main forest. Indian dogwood *(Cornus capitata)* was also noted. Despite modification, the canopy and understorey of the terrace forests is largely intact.

Significance and justification

This RAP is significant as it contains substantial populations of the recovering but 'conservation dependent' heart-leaved kohuhu, and 'vulnerable' *Coprosma pedicellata* at its northern limit. It also contributes both botanically and scenically to an outstanding semi-continuous tract of alluvial podocarp-rich forest along this valley.

Map 5: RAPs TIN 30-33 and 17-20 (NZMS 260 X18)



RAP TIN 31 TE AROHA (1)

Refer to Map 5 (p. 119)

Study area No. 101

Priority: 1

Grid Reference: NZMS 260 X18 175743

Area: 26 ha

Altitudinal range: 250-360 m

Bioclimatic zone: lowland

Vegetation/landform classes:
conifer forest
freshwater wetland/oxbow lake

Description

This RAP occupies swampy alluvium and an adjacent westerly facing hill-slope within the Waikura River valley. Primary kahikatea-totara-(matai)/(pokaka)-(white maire)/ weeping mapou forest occurs on the alluvial terrace and lower slopes. A small wetland/oxbow lake lies in the northwestern corner of the RAP, with a fringe of sedge and rush species. During Cyclone Bola the wetland was almost completely silted up. The terrace forest merges into primary matai-(totara)/tawa-titoki forest on the hill-slope, with scattered patches of low secondary broadleaved forest (including kowhai, mahoe and kohuhu).

Significance and justification

The alluvial forest within this RAP is significant as it supports populations of the recovering but 'conservation dependent' heart-leaved kohuhu and 'vulnerable' *Coprosma pedicellata*. There is also good continuity between the primary slope and alluvial forest. Despite grazing, the area is largely intact and is visually prominent.

RAP TIN 32 TE AROHA (2)

Refer to Map 5 (p. 119)

Study area No. 171

Priority: 2

Grid Reference: NZMS 260 X18 181750

Area: 8.5 ha

Altitudinal range: 250-290 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
freshwater lake

Description

This RAP includes a remnants of primary alluvial swamp terrace forest, terrace riser/ hill-slope forest treeland, and a small lake beside the Waikura River. The alluvial forest is dominated by kahikatea and forms a fringe around the northwestern margin of the small lake. Matai and totara are also present in the tall canopy. The understorey supports healthy populations of the recovering but 'conservation dependent' heart-leaved kohuhu (some 33 individuals) and 'declining' shrub *Teucridium parvifolium*. Mats of the 'endangered' small creeping herb *Mazus novae-zeelandiae* are also present beneath the kahikatea forest. Most of the hill-slope forest is now gone, with only a scattered treeland above the terrace forest, and a small patch in the northern corner. The lake was partially silted up during Cyclone Bola and is grazed to the margin. Crack willows are invading the southwestern and northeastern ends of the lake.

Significance and justification

Given the presence of two threatened and one conservation dependent species (de Lange *et al.* 1999) and the fact that the vast majority of alluvial terrace forest has been cleared from the Tiniroto Ecological District, this area is very deserving of its RAP status. It is one of the best alluvial forest remnants remaining in the Waikura River valley and contributes to semi-continuous chain of podocarp-rich forest remnants in the valley.

RAP TIN 33 TE AROHA (3)

Refer to Map 5 (p. 119)

Study area No.	170
Priority:	1
Grid Reference:	NZMS 260 X18 194744
Area:	14.8 ha
Altitudinal range:	250-320 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer forest freshwater lake

Description

This RAP covers an alluvial terrace and gentle lower hill-slopes on the true right of the Waikura River. Primary kahikatea swamp forest extends over part of the alluvial terrace, with a small permanent lake on the western side. The hill-slope above supports primary matai-totara forest, with scattered large kahikatea. The lake has been modified by cattle browsing and pugging, and suffered damage during Cyclone Bola. Purei and *Juncus* sp. are the dominant species around its margin. Crack willows are establishing on the western side of the lake, which will require control in the future. The exclusion of stock from this RAP would enhance its conservation values and help to ensure its long-term viability.

Significance and justification

The hill-slope forest within this RAP is significant as it is probably the closest to original composition and structure of all the Waikura River valley remnants. In addition the RAP supports a populations of the recovering but 'conservation dependent' heart-leaved kohuhu (*Pittosporum obcordatum*), the 'declining' *Teucridium parvifolium* (de Lange *et al.* 1999), and an undescribed species of fern, *Polystichum* sp. 'deep purple'.

RAP TIN 34 GILLINGHAM BUSH

Refer to Map 6

Study area No.	172
Priority:	3
Grid reference:	NZMS 260 X18 232686
Area:	13 ha
Altitudinal range:	340-460 m
Bioclimatic zone:	lowland
Vegetation class:	conifer/tawa forest tawa forest broadleaved scrub-shrubland

Description

This RAP covers moderate fertile slopes with a south-southeast aspect that extend almost down to the Waikoko Stream c. 1.5 km west of Waerengaokuri and the boundary between the Tiniroto and Turanga Ecological Districts. The RAP is partially fenced along its western boundary

The vegetation is largely modified primary forest with tawa, pukatea and rewarewa the main canopy trees on the upper slopes, titoki, tawa, pukatea, hinau and houhere on the lower slopes. There are scattered matai and kahikatea also in the canopy. The canopy is of irregular height averaging c. 15 m. The sub-canopy is dominated by mahoe, kohuhu, putaputaweta and lancewood with occasional tree fuchsia, nikau, heketara, pate and pigeonwood. Kohia, supplejack, *Metrosideros colensoi* and bush lawyer were the most notable climbers. The understorey has an array of shrubs and ferns including kawakawa, hangehange and hen and chicken fern.

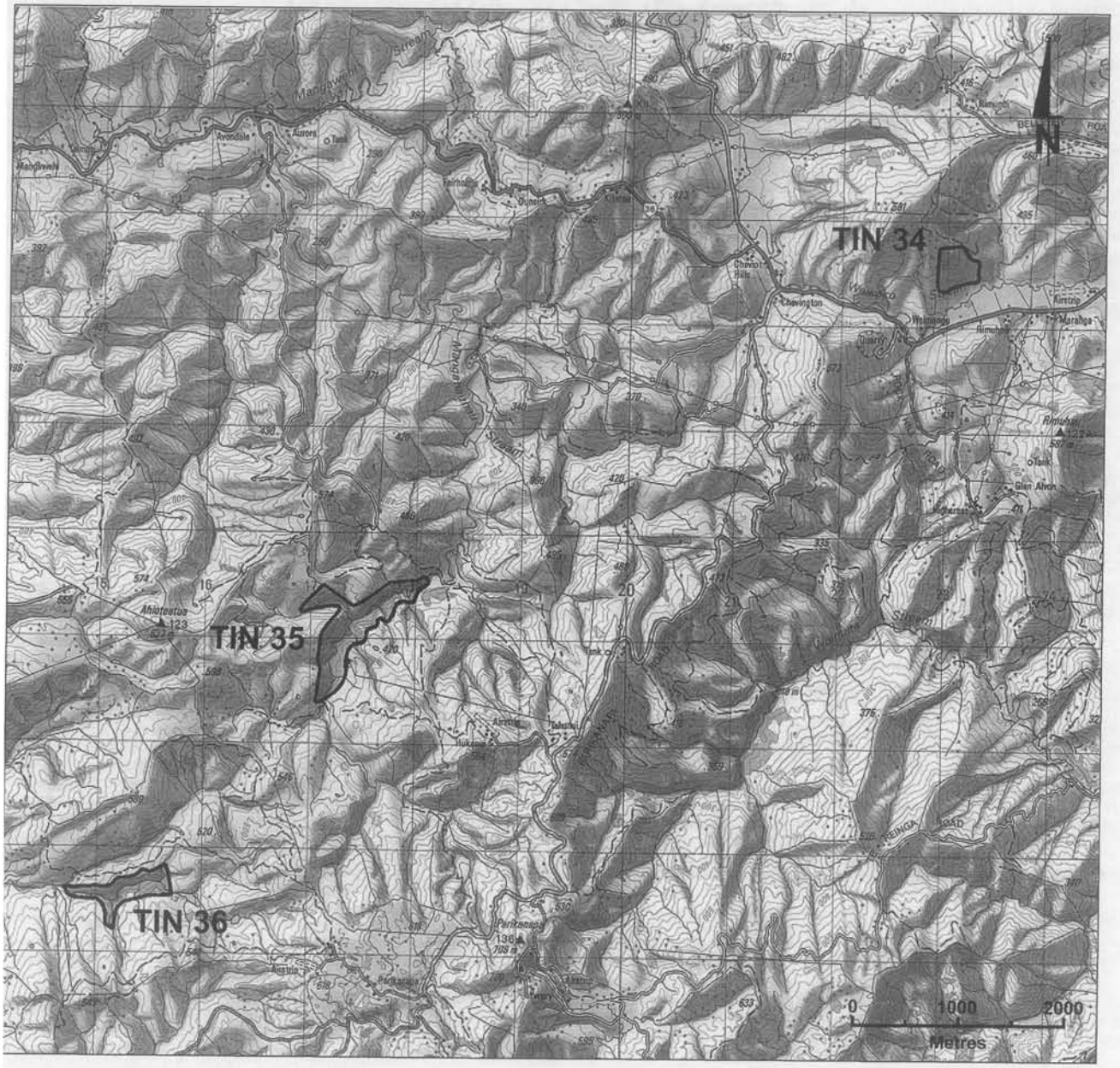
The lower slopes and a small area to the east have more modified secondary forest with wineberry, houhere, lancewood, kohuhu, mahoe, putaputaweta, mamaku, rewarewa, pigeonwood and occasional young matai. Hawthorn is also present, with infestation worse in the eastern areas outside the RAP. Canopy gaps are common, with pasture grasses, bracken, and broom locally on the fringes.

The forest has been modified by fires and past logging operations, however, a considerable number of original canopy trees have survived. Domestic stock have access throughout, with impact most severe in the younger eastern parts of the RAP. Kereru, tui and the more common bush birds were recorded.

Significance and justification

This RAP is significant as it lies on the eastern fringe of the Tiniroto Ecological District where most of the indigenous vegetation has been cleared or substantially modified - particularly that on the moderate to high natural fertility country. The RAP is a significant record of the original vegetation patterns, and one of the few remnants of the original tawa-dominated forest.

Map 6: RAPs TIN 34-36 (NZMS 260 X18)



RAP TIN 35 MANGAHAUHAU STREAM

Refer to Map 6 (p. 123)

Study area No.	238
Priority:	3
Grid Reference:	NZMS 260 X18 175650
Area:	46 ha
Altitudinal range:	280-460 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest conifer/broadleaved forest broadleaved forest broadleaved scrub-shrubland kanuka-manuka scrub cliff vegetation

Description

This RAP lies in a moderate to steeply incised stream valley, in the western branch of the upper Mangahauhau Stream catchment. The steep east-facing slopes have exposed limestone bluffs along their upper margins. The vegetation is a mosaic of different-aged secondary scrub and sparse treeland, with small areas of primary forest on the lower slopes. The primary forest is dominated by tawa, with emergent young kahikatea. Where the tawa canopy is sparse, kohuhu, mahoe, lancewood and tall kanuka are abundant. The south-facing slopes and a large area of vegetation up a side gully to the northwest have a mosaic of broadleaved trees and tall kanuka (including tawa, kohuhu, mahoe, putaputaweta, heketara, houhere and lancewood). Kowhai is scattered throughout the vegetation, particularly on the steepest slopes and at the edges of the gully. The steep east-facing slopes to the south have an open treeland with kohuhu, houhere, mahoe and scattered young titoki.

The exposed bluffs along the upper slopes support patchy flaxland-shrubland, including whahariki, kohuhu, tutu, common maidenhair, kaikomako and kiokio. *Scandia rosifolia*, a herb of cliffs and ledges with a local distribution, is also present on those cliffs inaccessible to feral goats. The lower slopes are open and grassy, dropping sharply into the stream. The stream bed has large boulders and distinctive mudstone/sandstone banding.

Grazing by domestic stock and feral goats occurs throughout the RAP, reducing the diversity of species in the understorey and maintaining grassy openings. Kereru and common bush birds including bellbird, tui, grey warbler and fantail are present.

Significance and justification

Although the vegetation is fragmented and sparse in parts, this RAP is one of the few sites in the eastern section of the district that has diverse and largely intact cliff vegetation, along with fragments of primary hill-slope forest. The RAP has significant water quality and soil conservation values. Surrounding unvegetated stream gullies suffered moderate to severe erosion during Cyclone Bola.

RAP TIN 36 PARIKANAPA

Refer to Map 6 (p. 123)

Study area No. 236

Priority: 3

Grid Reference: NZMS 260 X18 155627

Area: 22 ha

Altitudinal range: 320-410 m

Bioclimatic zone: lowland

Vegetation classes: tawa-titoki forest
broadleaved forest
broadleaved scrub-shrubland

Description

This RAP covers a moderate to steeply incised stream valley in the upper catchment of Kaikoura Stream, a true left tributary of the Hangaroa River. The north-facing slopes have a patchy mosaic of kowhai and broadleaved and small-leaved trees, including kohuhu, putaputaweta, heketara, cabbage tree, kanuka and mingimingi. Young kahikatea are scattered throughout. The moister south-facing slopes have more intact primary forest of tawa-(titoki), with pigeonwood, mahoe, kohuhu, rewarewa and scattered kahikatea. Kowhai are present on the steepest areas of the slope and along the upper edge. An old slip face at the eastern end of the south-facing slopes has low broadleaved forest dominated by mahoe and mahoe wao, with wineberry, pate, rangiora and putaputaweta. The understorey has carpets of gully fern. The low canopy fades to treeland with open grassy patches throughout. Grazing, by domestic stock and feral goats, has kept the north-facing slopes open. Their exclusion would enhance regeneration on these slopes.

Significance and justification

This RAP is one of only a few remnants of primary hill-slope forest remaining in the middle eastern portion of the district. It also has a significant role in soil conservation and water quality. During Cyclone Bola many of the surrounding unvegetated stream gullies suffered severe erosion (including the open areas of the northern faces with the RAP).

RAP TIN 37 PARIROA

Refer to Maps 7 and 4 (pp. 127 and 105)

Study area No. 594 & 151

Priority: 2

Grid Reference: NZMS 260 X18 095651

Area: 47 ha

Altitudinal range: 130-280 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
conifer/tawa forest
broadleaved scrub-shrubland-low forest

Description

This RAP includes a wide horseshoe bend, steep riverside faces and scarp slopes, cliffs, a 140 m high sandstone bluff and a narrow ridge along the cliff tops, on the true right of the Hangaroa River c. 6 km north of Tiniroto. On the true left there are wide alluvial (partly bouldery) terraces with moderate to steep terrace risers. The true right scarp faces are being undercut by the river and have fresh slips and older surfaces with various aged vegetation. Doneraille Park is continuous with it to the south.

The steepest unstable east-facing scarp faces/slopes at the southern end of the RAP have a mosaic of shrubland with kowhai, tutu, swards of tuhara, mahoe and kanuka, and bare rock. The more stable moderate southeast-facing slopes in the centre support advanced secondary kahikatea/kowhai forest. *Pittosporum ralphii*, mahoe, tree fuchsia, lancewood, young totara, kanuka, wineberry and houhere grow amongst it. Along the top edge above the scarp faces/cliffs is a treeland of advanced secondary totara.

The alluvial terraces and lower terrace risers in the horseshoe bend support primary kahikatea/(tawa-kohuhu-kowhai-totara) forest. Pukatea and black maire are also present in the canopy, with occasional groves of pole kahikatea. The understorey has a number of small-leaved shrubs typical of terrace forest including poataniwha, pokaka, *Pseudopanax anomalus* and rohutu. On the steeper upper edges of the terrace risers podocarps become less frequent, with kowhai abundant amongst kohuhu, kanuka, putaputaweta and mahoe. The steep unstable true right slopes opposite have a low patchy mosaic of broadleaved trees and shrubs (including *Pittosporum ralphii*, tutu and mahoe), whatariki and young totara. Kowhai also occurs on the steeper slopes and bluff faces.

The steep true right slopes are not accessible to domestic stock. However, the terraces appear to be grazed/browsed, with the understorey grassy and open in parts. Feral goats are also present within the RAP, their agility allowing them to browse the steeper areas. Selective logging has occurred in the past, mainly in the terrace forests. The steepest true right slopes of the RAP experience continual natural disturbance (e.g. flooding and riverine erosion) that maintains the vegetation in an early to mid successional state. Pines have been planted along the top edge of the southern part of the RAP, with one wilding pine recorded amongst the adjacent shrubland.

Significance and justification

This RAP forms an integral part of the semi-continuous chain of indigenous vegetation that extends for c. 75 km along the Hangaroa River valley. The terrace forest within the RAP is also significant as one of the better examples of the original podocarp-rich terrace forest of the lower Hangaroa River valley. The cliffs within the RAP are some of the most striking along the Hangaroa River and are readily visible from SH36. It is also buffers Donneraille Park Recreation Reserve (PNA 22) to the south.

Map 7: RAPs TIN 37-44 (NZMS 260 X18)



RAP TIN 38 MID HANGAROA RIVER

Refer to Map 7

Study area No.	150, 561, 570 & 571
Priority:	1
Grid Reference:	NZMS 260 X18 045652
Area:	240 ha
Altitudinal range:	120-300 m
Bioclimatic zone:	lowland

Vegetation classes: conifer forest
conifer/tawa forest
conifer/kanuka forest
tawa-titoki forest
broadleaved forest
kanuka-broadleaved forest
kanuka-manuka scrub

Description

This RAP extends for c. 8 km on either side of the Hangaroa River from Doneraille Park in the east to the Ruakaka Rd bridge in the west. It covers narrow alluvial terraces, moderate to steep terrace risers, steep riverside scarps/bluffs, moderate to steep stream gully slopes, and upper hill-slopes. It extends up a number of small true left and true right tributaries of the Hangaroa River. The largest of these, Mangamoteo Stream (a true right tributary of the river), has primary and secondary vegetation in its lower reaches, with the main area of vegetation ending in a deep gully beside Ruakaka Rd. The lower section of the Mangamoteo Stream is quite steeply incised, with a waterfall near its confluence with the river. The southern (downstream end) of the RAP also includes a compact forest remnant extending well above and back from the river, and including a small lake in its southeastern corner that has raupo reedland at its margins (not surveyed).

Apart from that forest remnant, most of the intact vegetation lies on the moister south-facing slopes and terraces. This includes a mosaic of kanuka forest, with young totara, kahikatea and broadleaved trees amongst it, and pockets of podocarp-rich primary forest. Most of the primary alluvial forest has been logged to some extent, and is dominated by large kahikatea and totara, with occasional matai (mostly young). Occasional pockets of black beech occur on ridges/spurs (e.g. at the mouth of the Mangamoteo Stream).

The biggest areas of primary forest lie in the Mangamoteo Stream gully, in the catchments of the two true left tributaries at the southern end of the RAP and on the alluvial terrace and terrace risers opposite. The upper reaches of the Mangamoteo Stream gully has kahikatea-totara/mahoe-kohuhu forest, with large primary kahikatea and totara emergent over many young pole trees. Trees and shrubs in the sub-canopy include mahoe, white maire, pokaka, putaputaweta and tree fuchsia. In places the understorey has swards of ongaonga, with divaricating and small-leaved shrubs abundant (e.g. poataniwha, rohutu and shrubby mahoe). Black beech occurs on spurs at the mouth of the Mangamoteo Stream.

The primary forest in the catchment at the southern end of the RAP lies in the upper eastern gully slopes. It is dominated by tawa, with titoki, scattered young kahikatea and kowhai. Mahoe, mamaku, lancewood, kohuhu and putaputaweta are present in the sub-canopy and where the tawa canopy is broken. The rest of the vegetation in the southern catchments is secondary forest that ranges from pure kanuka to kanuka-broadleaved forest where kanuka is only a component in a canopy that includes mahoe, five finger, kohuhu, kaikomako, kowhai and treeferns, to broadleaved forest.

The alluvial terraces at the southern end of the RAP, on both side of the river, support primary kahikatea/tawa forest with occasional matai and tall kanuka on the forest margins. The understorey has a high diversity and abundance of divaricating and small-leaved shrubs, including *Coprosma rotundifolia*, poataniwha, pokaka,

Pseudopanax anomalus, rohutu, shrubby mahoe and turepo. Ferns and herbs are also abundant (including common shield fern, nini, gully fern, *Jovellana sinclairii* (damp banks) and hook sedge). Smaller areas of this primary forest type also occur in other places along the length of the RAP, mainly on the damper south and west-facing terraces and terrace risers. The terrace risers above the southern alluvial terraces on the true right support secondary kanuka-totara-(kahikatea) forest treeland, with kohuhu, lancewood, cabbage tree, mahoe and kowhai present amongst the low canopy.

At the eastern end of the RAP on the true right, where it adjoins Doneraille Park, there is an area of advanced secondary vegetation with a low canopy dominated by totara, pokaka and mahoe. The understorey is sparse and dominated by small-leaved shrubs (*Coprosma rotundifolia*, *Pseudopanax anomalus*, rohutu, shrubby mahoe and young matai) and swards of ongaonga.

The kanuka-dominated vegetation, which is sparse on the drier north-facing slopes, and occurs in places amongst the primary forest is a patchy mosaic which ranges from young kanuka-manuka scrub to solely kanuka scrub-forest, to kanuka forest. Broadleaved trees, including kohuhu, titoki, houhere, lancewood, mahoe, cabbage tree, tree fuchsia, rohutu, pokaka and wineberry are scattered amongst the canopy of the older kanuka-dominated vegetation. The understorey beneath the kanuka is generally open and grazed, but with divaricating shrubs thick in places (e.g. *Coprosma rigida*, poataniwha, *Pseudopanax anomalus*, red-fruited karamu and rohutu).

The steep scarps and bluffs above the river support patchy bands of flaxland-shrubland, with *Pittosporum ralphii*, whahariki, kowhai, tuhara, *Gahnia* sp., kohuhu, koromiko taranga and Mexican daisy. Kowhai occurs on the steeper banks on both sides of the river, often with a band of young totara along the upper south-facing margins. NZ jasmine, bush lawyer, *Rubus schmidelioides*, pohuehue, NZ convolvulus and aka are the most conspicuous climbers in these areas.

Domestic stock have access to much of the vegetation on the gentler upper slopes. Feral goats are also present in the river valley and are able to penetrate many areas too steep for stock. Blackberry, wild strawberry, Mexican daisy and willows in places along the river edge were the main weeds noted. Kereru and common bush birds including grey warbler and tui were noted.

Significance and justification

This large and diverse RAP is significant as it contains a diverse range of vegetation types (from young secondary scrub to podocarp-rich primary forest), on a range of landforms (extending from river side terraces to moderate to steep fertile stream gully slopes to steep scarps and bluffs) and different aspects. It contains excellent examples of podocarp-rich primary forest characteristic of the high fertility soils within the Hangaroa River valley. This RAP is continuous with Doneraille Park Recreation Reserve (PNA 22) to the east and with Hangaroa Scenic Reserve (PNA 23) and RAP TIN 40 at its southwestern, downstream end. Together they are key parts of a semi-continuous chain of indigenous vegetation that extends for c. 75 km along the Hangaroa River valley.

RAP TIN 39 GREENLAKE FOREST

Refer to Map 7 (p. 127)

Study area No.	560
Priority:	3
Grid Reference:	NZMS 260 X18 044637
Area:	64 ha
Altitudinal range:	190-460 m
Bioclimatic zone:	lowland
Vegetation class:	kanuka-broadleaved forest kanuka forest

Description

This RAP covers a basin with moderate to steep west-facing slopes, ridges, and small bluffs (around the upper basin margin). It includes the complete headwater catchments of two branches of a true left tributary of the Hangaroa River, with wide steep-sided stream gullies. A farm track runs through the RAP, about two-thirds of the way up the slopes. Most of the boundaries of the RAP are fenced.

This RAP contains extensive areas of kanuka and kanuka-dominated forest, with the kanuka mainly c. 12-14 m high. The older kanuka forest has emergent rewarewa and small groves of young totara and occasional young kahikatea amongst it. Broadleaved trees are also scattered though the canopy/sub-canopy, including lancewood, kohuhu, putaputaweta, houhere, mahoe, wineberry, kowhai, heketara and pigeonwood. The understorey is a diverse mixture of small-leaved shrubs, young seedlings, saplings, herbs and ferns (including red-fruited karamu, *Coprosma rigida*, mingimingi, wineberry, putaputaweta, kawakawa, *Haloragis erecta*, gully fern, *Pteris macilenta*, hard fern and kiwakiwa). The younger kanuka vegetation ranges from kanuka treeland, to dense kanuka forest with similar species as above, but with only occasional broadleaved trees amongst the mainly kanuka canopy. Stands of kowhai occur along the steep upper slopes and ridges.

The upper steep slopes and bluffs above the farm track are unstable with a number of various aged slips. Domestic stock (in low numbers) and feral goats are present within the RAP. Despite this, the understorey is largely intact with only minimal browsing sign. Scattered wilding pines were noted, in the southwestern corner of the RAP. Regeneration is occurring with a large number of saplings and young trees throughout. Tui, fantail and kereru were recorded within the RAP.

Significance and justification

This RAP is significant as one of the best, most diverse, examples of late successional kanuka forest in the northern part of the ecological district. It is a compact area with good catchment boundaries and a range of landforms. It is also associated with a c. 75 km semi-continuous chain of diverse indigenous vegetation along the Hangaroa River.

RAP TIN 40 LOWER HANGAROA RIVER

Refer to Map 7 (p. 127)

Study area No.	552
Priority:	1
Grid Reference:	NZMS 260 X18 028588
Area:	385 ha
Altitudinal range:	80-400 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer forest conifer/tawa forest conifer/kanuka forest kanuka forest

Description

This RAP forms a c. 7.5 km semi-continuous riparian corridor along the Hangaroa River valley, on narrow alluvial terraces, moderate to steep river banks and gentle to moderate hill-slopes. It also extends up a number of true left and true right tributaries, including the Whareti, Mangatotara, Mangamate and Tumokonui Streams. The last has the most extensive riparian and hill-slope vegetation around it.

The RAP is an intricate mosaic of primary and secondary riparian and hill-slope vegetation, the result of natural (e.g. changing river levels, riparian erosion) and human-induced processes (logging, clearance and burning). The most extensive vegetation type, which occurs throughout the RAP, is secondary kanuka-dominated scrub-forest. The canopy varies from pure kanuka to kanuka-totara forest to kahikatea-totara-(kanuka) forest where kanuka is only a small component of the canopy. Almost all the totara and kahikatea present are young poles, with only occasional large trees in this forest type. Kowhai, lancewood, kohuhu and houhere are also present amongst the canopy is some places. Red-fruited karamu, *Coprosma rotundifolia*, poataniwha, *Pseudopanax anomalus*, mingimingi, common shieldfern, kiwakiwa and tarawera are the most common understorey species, but all are infrequent on the open and grazed upper river banks and hill-slopes. Pure totara forest occurs in the true right tributary between the Mangamate and Mangatotara Stream.

The most intact and original vegetation within the RAP is primary podocarp/tawa and podocarp forest, most of which occurs in the fertile gentler foot-slopes and terraces. The largest areas of primary forest lie in the southeast corner of the RAP, the upper catchment of the Mangamate Stream (much of which is protected within the Berry Covenant (PNA 24), see below), and on the true right terraces/hill-slopes adjacent and north of the Mangatotara Stream mouth, with smaller pockets throughout. The large podocarps within the forest comprise a mixture of kahikatea, rimu, totara, matai and infrequent miro. In some places the podocarps dominate with tawa infrequent or absent. Titoki, mahoe, kowhai, kohuhu, mahoe and lancewood are also present in the canopy/sub-canopy.

Pockets of logged primary tawa forest are also scattered throughout the RAP. These have few, if any, emergent podocarps, and a sub-canopy dominated by mahoe with

putaputaweta, houhere, five finger, lancewood, lemonwood and kowhai. Hinau, black maire and titoki are also present amongst the tawa.

Long-tailed bats, one of New Zealand's two species of endemic terrestrial mammals, may be present within the RAP, with records in nearby parts of the Hangaroa River catchment (e.g. RAP TIN 38). The large podocarps along the river can provide both roosting sites and food sources for them (King 1995). Domestic stock have unrestricted access to much of the RAP, with fencing only intermittent along the river banks' upper edges. Feral goats are also present and browse many of the areas that are too steep for domestic stock. Blackberry, occasional wilding pines and old man's beard were the only problem weed species noted.

Significance and justification

The RAP is significant as it contains some of the best primary alluvial and hill-slopes forest remaining within the lower reaches of the Hangaroa River valley, outside of the existing PNA network. It is also continuous with and buffers two PNAs: Hangaroa Scenic Reserve (PNA 23) at its northern end, and Berry Covenant (PNA 24) which lies in the upper reaches of the Mangamate Stream; and one RAP (RAP TIN 38). It is a key part of a semi-continuous c. 75 km chain of indigenous vegetation along the Hangaroa River valley. The RAP, with its diverse range of vegetation and landforms also supports a number of bird species, including kereru, tui, fantail and grey warbler, and probably also long-tailed bats. Visible from SH36, the RAP also has significant aesthetic values.

RAP TIN 41 POUTI

Refer to Map 7 (p. 127)

Study area No. 550

Priority: 3

Grid Reference: NZMS 260 X18 084635

Area: 105 ha

Altitudinal range: 220-478 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
broadleaved/small-leaved scrub
kanuka scrub
manuka scrub

Description

This RAP consists of a band of riparian and east-facing steep slope vegetation along an unnamed stream flowing north to join the Hangaroa River at Doneraille Park. The stream is steeply incised in places, with only occasional narrow grassy terraces. Several substantial waterfalls are present in the stream's lower reaches.

The vegetation on the extensive east-facing slopes is dominated by manuka scrub, particularly on the dry ridges and spurs and upper slopes, with some kanuka-dominated scrub and forest on the lower hill-slopes. Broadleaved trees, including kohuhu, kanuka, five finger, houhere, kowhai, mahoe, wineberry, young totara, and

kahikatea (particularly on the lower slopes) are present in the stream gullies and amongst the scrub on the lower slopes. Occasional wilding pines are present. The slopes above the main stream have advanced secondary broadleaved shrubland grading to low forest, with groves of even-aged pole kahikatea. Kanuka, kohuhu, five finger, houhere, kowhai, mahoe, wineberry and heketara are the dominant canopy species. In some places the canopy is pure kanuka scrub-forest. Farm tracks cross the area at a number of points. Domestic stock have access to the entire area, with grazing most noticeable in the southern portion of the RAP and on the upper stream slopes. Scattered wilding pines in the main stream gully, and poplars planted along some of its margins, are the most conspicuous weeds.

Significance and justification

This RAP has significance for the very high diversity of secondary vegetation types, and as a buffer to Doneraille Park's southern boundary, with which it is continuous. It is part of a c. 75 km semi-continuous chain of indigenous vegetation along the Hangaroa River valley. Parts are readily visible from SH36.

RAP TIN 42 HAMER'S BUSH

Refer to Map 7 (p. 127)

Study area No. 547

Priority: 1

Grid Reference: NZMS 260 X18 087607

Area: 15 ha

Altitudinal range: 390-460 m

Bioclimatic zone: lowland

Vegetation class: broadleaved forest

Description

This compact RAP lies c. 2 km northeast of Tiniroto. It covers moderately steep valley sides and ridges, in the catchment of an unnamed true left tributary of the Hangaroa River. SH36 forms the RAP's western boundary, with Parikanapa Rd bordering it to the northeast. Newly planted pines abut the RAP along its southeastern boundary.

The vegetation within the RAP is advanced secondary shrubland-forest that has established following burning/removal of the original forest (probably rimu/tawa forest). Rewarewa is emergent over an almost continuous canopy of treeferns and mixed broadleaved trees and shrubs, including five finger, mahoe, kohuhu, wineberry, lancewood, heketara, tree fuchsia, houhere, kamahi and rangiora. Young rimu are also scattered amongst the canopy. The tallest rewarewa are concentrated on the upper slopes and main ridges. Where the canopy is broken, swards of bracken and hard fern dominate. The mistletoe *Tupeia antarctica* was abundant throughout the RAP, with most growing on five finger. Several mistletoe plants were also observed growing on tree lucerne beside the owner's home.

Domestic stock grazed the RAP in the past, but these are now excluded. The owner carries out periodic feral goat control, with goats also shot out of the adjacent pine plantation. Scattered wilding pines are the only conspicuous weed species.

Significance and justification

This RAP's high significance stems mainly from the presence of an abundant and healthy population of *Tupeia antarctica*, a mistletoe with a threat status of 'declining' (de Lange *et al.* 1999). Preferentially browsed by possums, *Tupeia* is now uncommon over much of its range and is probably the most threatened mistletoe within the East Coast Hawke's Bay Conservancy (King & de Lange 1995). No other sizeable populations of the species were recorded during this survey.

RAP TIN 43 TAWAROA

Refer to Map 7 (p. 127)

Study area No.	591
Priority:	3
Grid Reference:	NZMS 260 X18 083603
Area:	34 ha
Altitudinal range:	380-490 m
Bioclimatic zone:	lowland
Vegetation classes:	tawa forest broadleaved forest kanuka-manuka scrub

Description

This RAP lies c.1 km northeast of Tiniroto. It encompasses most of the upper sub-catchment of a true right tributary of the Mangaotara Stream (a true left tributary of the Hangaroa River). The RAP is bounded on its eastern side by Noble-Campbell Rd, with paddock fencing to the southeast. To the southwest it fades to young scrub with scattered pines.

The RAP is dominated by secondary vegetation, which ranges from young tauhinu-manuka scrub, through to areas of advanced secondary vegetation with emergent rewarewa over a broadleaved tree and shrub mosaic. The upper southeast-facing slope has the oldest vegetation, with rewarewa, scattered young kahikatea and rimu emergent over a mixed canopy of old tawa, hinau (on spurs), pole kahikatea and rimu. Where tawa is absent putaputaweta, pigeonwood, mahoe, lancewood, wineberry and silver fern form a low mixed canopy.

Kanuka-manuka scrub is the most abundant vegetation type beside Noble-Campbell Rd, and in the lower stream gully slopes. The scrub has patches of treeferns and broadleaved species amongst it which include mamaku, heketara, houhere, kohuhu, mahoe, five finger and tree fuchsia. Abundant seedlings and ferns are present in the understorey. In places, particularly in the area in which the last burning occurred (1985), there are swards of young treeferns.

The youngest tauhinu-manuka scrub lies on slopes in the southeast corner of the RAP. *Lycopodium* sp., swards of hard fern and bracken, blackberry and the low shrub red-fruited karamu dominate the understorey. Blackberry is most abundant near the scrub margins. Saplings of broadleaved species and ferns occur beneath. Wetland areas along the main water course contain raupo, *Juncus* sp. and *Isolepis prolifer*.

The RAP was grazed in the past, with the original fencing still evident. Most of the area is now stock-free, with feral goat control carried out by the owner. As a consequence the understorey is showing strong signs of recovery with seedlings and saplings abundant (e.g. tree fuchsia, young rimu and kahikatea). Wilding pines are scattered throughout the younger vegetation, particularly on the slopes in the southeast. The RAP has an SSWI ranking of 'potential'. Birds observed in the area include kereru, tui, morepork, fantail, grey warbler and silvereye.

Significance and justification

This RAP is significant as it contains a small population of the 'declining' (de Lange *et al.* 1999) native mistletoe *Tupeia antarctica*, which is also present in RAP TIN 42. It also includes a wetland/stream to ridge sequence, and a wide range of vegetation types/successional stages in a compact area covering slopes of all aspects. Together with RAP TIN 42 (a large area of regenerating scrub-forest with a composition similar to the southeastern slopes of this RAP) it forms a semi-continuous tract of native vegetation.

RAP TIN 44 NOBLE-CAMPBELL ROAD WETLANDS

Refer to Map 7 (p. 127)

Study area No. 624

Priority: 2

Grid Reference: NZMS 260 X18 083595/086591

Area: 19 ha

Altitudinal range: 410-460 m

Bioclimatic zone: lowland

Vegetation/landform classes:

conifer forest
tawa/broadleaved forest
manuka scrub
freshwater wetland

Description

This RAP includes a complex of four wetlands (and associated slopes) that lie in small basins on gentle sloping hill-slopes, c. 2 km east of Tiniroto. The two western wetlands are stepped, with the northern of the two draining into the wetland below it and then into a tributary of the Mangaotara Stream, a true left tributary of the Hangaroa River. The other two wetlands to the east are discrete lakelets.

The upper western wetland has a central core of raupo reedland, with manuka swamp surrounding it. Open water is present around the reedland in winter and disappears

during the summer months. The manuka swamp has manuka trees, sphagnum, *Juncus* sp., with swards of ferns on the margins. The slopes at the northeastern end have a patch of secondary manuka scrub with rewarewa, lancewood, treeferns and tutu scattered amongst it.

The lower western wetland is about 50% open water, with raupo reedland in bands along the margins and at the eastern edge. This merges to a small area of manuka swamp. The northeastern slopes above the wetland have a small clump of older forest, with emergent rewarewa over a broken canopy of tawa, houhere, hinau, treeferns, kohuhu and putaputaweta. The rest of the scrub-forest has a low mosaic canopy of houhere, kanuka, putaputaweta, mahoe and treeferns, fading to manuka scrub. Some of the manuka scrub has been burnt recently, with charred stems evident.

The two discrete lakelets to the east are divided by a low hummock clothed in young manuka scrub. The southern of the two is smaller with scattered raupo reedland, rush and sedge species around its margin and grazing and trampling around its southern half. The lakelet to the north has advanced secondary/primary forest around its northern margin, that extends up a shallow hill-slope. Young kahikatea is abundant on the lower slopes and damper lakelet sides, with tawa/broadleaved low forest and treeland further up-slope. The forest merges to young manuka scrub. The northern lakelet has manuka swamp, scattered raupo reedland, sedge and rush species around its margin and is also grazed.

All the wetlands are grazed and trampled around parts of their margins. There are also drains dug in and around the upper western wetland. Blackberry is the only conspicuous weed.

Significance and justification

This RAP is highly important as it contains wetlands of diverse character, with intact indigenous vegetation around their margins: a rare feature in the district. It also complements the values of RAPs TIN 42 and 43 which lie within a kilometre of them. The RAP is significant as a wildlife habitat for both forest-scrub and wetland bird species, including grey warbler, fantail, swallow, NZ scaup, black swan, paradise shelduck and pied shag.

RAP TIN 45 TAUMUTU BUSH

Refer to Map 8 (p. 138)

Study area No. 768

Priority: 2

Grid Reference: NZMS 260 X18 174600

Area: 33 ha

Altitudinal range: 520-670 m

Bioclimatic zone: lowland

Vegetation class: conifer/tawa forest

Description

This RAP lies on a long northwest-facing hill-slope in the upper catchment/headwaters of the Rangiora Stream. A small pine plantation abuts the RAP to the north-northeast, with a farm track running through the centre. The lower slopes support the most intact and diverse forest: (rewarewa-kahikatea-rimu)-tawa-broadleaved forest. The upper slopes (above the farm track) have more modified tawa/broadleaved forest, with scattered rewarewa (locally dense) and occasional young podocarps. The broadleaved species include titoki, mahoe, pigeonwood, kohuhu and kowhai. The condition of the understorey was not assessed. Kereru and common forest birds have previously been recorded.

Significance and justification

Compact and with a high proportion of primary vegetation, this RAP has a 'moderate' SSWI ranking. The RAP is important as it lies on easy fertile terrain with a warm and sunny aspect, and very little of this forest/land type escaped clearance for farming.

RAP TIN 46 KAIKOURA BUSH

Refer to Map 8 (p. 138)

Study area No. 770

Priority: 2

Grid Reference: NZMS 260 X18 123566

Area: 30 ha

Altitudinal range: 420-540 m

Bioclimatic zone: lowland

Vegetation class: conifer/tawa-beech forest

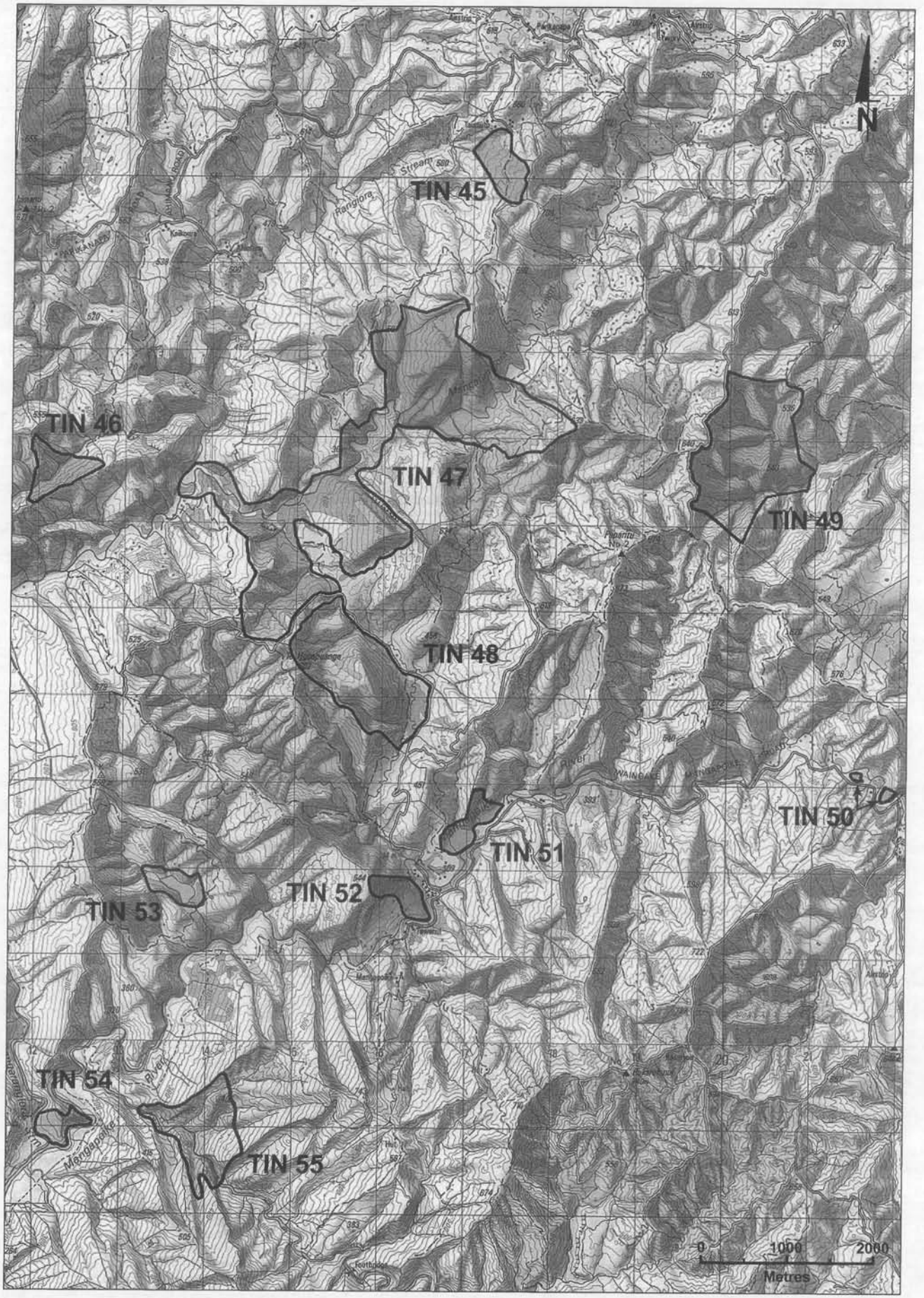
Description

This compact triangular RAP lies on moderate northeast-facing stream gully slopes and ridges in the upper catchment of a tributary of the Rangiora Stream, c. 13 km west of Waingake. The Rangiora Stream is a true right tributary of the Mangarangiora Stream. Most of the vegetation within the RAP is primary rimu/tawa forest, with areas of black beech forest on narrow spurs, and secondary broadleaved shrubland around the forest margins and in the northwest. The forest on the slopes has emergent rimu, matai and kahikatea, with pukatea, mamaku, rewarewa and puka scattered throughout the tawa-dominated canopy. Mahoe and pigeonwood are most abundant in the sub-canopy. The perimeter of the forest has been logged, but the central slopes are intact with many large emergent rimu and matai.

Significance and justification

This RAP is significant as a compact remnant of primary forest that retains much of its original canopy and understorey diversity, in a stream catchment where most of the original vegetation has been removed. It is a good example of the original forest pattern of the area, on typical landforms. It is close to a number of much larger RAPs (e.g. TIN 47 & 87), providing a stepping stone for wildlife movement between them.

Map 8: RAPs TIN 45-55 (NZMS 260 X18 & X19)



RAP TIN 47 MANGARANGIORA STREAM

Refer to Map 8

Study area No.	769
Priority:	1
Grid Reference:	NZMS 260 X18 155565
Area:	500 ha
Altitudinal range:	300-680 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest conifer/tawa forest tawa forest broadleaved shrubland-forest kanuka forest manuka scrub

Description

This large RAP covers a complete section across the Mangarangiora valley, from ridge to ridge. The landscape includes dramatically planar dip-slopes that parallel the sandstone strata dipping at 20° west, with steep scarps to the east and on the southern and northern edges of some rock slabs. The Mangarangiora Stream meanders through low terraces in the northern part of the RAP, becoming entrenched in narrow gorges where it has cut through the sandstone to the southwest. The RAP extends for c. 4 km to the stream's confluence with the Rangiora Stream, c.5 km east of Mt Whakapunake. It is partially fenced along its northeastern boundary, with a newly established pine plantation along the northwestern margin abutting the riparian vegetation above the stream. A fence-line and vehicle/stock access route forms the RAP's boundary to the southeast, separating it from RAP TIN 48. It merges into treeland, young scrub and pasture along the other margins.

The extensive tract of forest in the north has a mosaic of primary and advanced secondary vegetation, which is the result of past logging and fires. Black beech dominates most of the ridges and lower stream gully slopes, with a mixture of primary tawa-dominated forest, rewarewa/broadleaved forest, groves of treeferns and abundant young podocarps and rewarewa/manuka scrub in between. A similar forest-scrub pattern also occurs on the northwest-facing conspicuous rock-slab dip-slope in the central true left of the RAP.

The northwest-facing slopes in the northeastern corner of the RAP, support manuka scrub with scattered broadleaved trees and treeferns amongst the canopy. The vegetation along the Mangarangiora Stream and tributary stream banks is also largely secondary, but with some advanced broadleaved, beech and podocarp-dominated forest in mosaic with it. Most of the primary/advanced secondary forest, dominated by kahikatea, matai, rimu, totara and tawa, occurs on the narrow terraces and gentler slopes along the Mangarangiora Stream. In parts the vegetation is discontinuous with steep bare scarp faces and fresh slips amongst the young scrub and low forest. Several small raupo wetlands occur on gentle slopes on the true right of the Mangarangiora Stream, in the central part of the RAP.

Significance and justification

This RAP is significant as it contains a complete valley section, with diverse primary and advanced secondary vegetation complemented by extensive and diverse secondary vegetation on a wide range of landforms and over a wide altitudinal gradient. The landforms are dramatic, incorporating regularly dipping strata and asymmetry characteristic of this part of the ecological district. The stretch of valley covered by this RAP has a diverse stream character, with gorges and waterfalls alternating with flood plains and terraces. It is almost continuous with RAP TIN 48, and is an important wildlife habitat with an SSWI ranking of 'moderate'.

RAP TIN 48 TE HOUOPUANGA

Refer to Map 8 (p. 138)

Study area No.	120 & 121
Priority:	3
Grid Reference:	NZMS 260 X18 156542
Area:	140 ha
Altitudinal range:	360-602 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest tawa forest kanuka forest broadleaved/small-leaved scrub

Description

This RAP lies in the upper catchment of an unnamed true right tributary of the Mangapoike River. It covers a range of landforms, from alluvial stream terrace, to steep slopes, bluffs and ridge crests that rise to the Te Houopuanga high point (602 m). Several small raupo wetlands surrounded by manuka scrub are present in a stream gully at the northern end of the RAP (not surveyed). Well-developed farm tracks form the northeast and northern boundaries. The southern end of the RAP contains the most intact tall forest, with continuous secondary broadleaved/small-leaved scrub and low broadleaved forest over the remainder. The alluvial terraces support kahikatea/tawa forest-treeland, a mosaic of old tawa and kahikatea and young pole kahikatea. The understorey supports shrubs typical of terrace forest: *Coprosma rigida*, shrubby mahoe, *Neomyrtus pedunculata*, *Pseudopanax anomalus* and rohutu. Swards of hard fern and pasture grasses occur where the canopy is broken. On the slopes above the terrace the forest is dominated by tawa, with pigeonwood, mahoe, silver fern and putaputaweta in the sub-canopy. On the ridge crest there is a small area of black beech forest, with totara, kohuhu and rewarewa. The secondary scrub consists of rewarewa/kanuka forest on the lower slopes, with manuka scrub on the upper steep slopes and ridge crests.

Large rimu and kahikatea have been almost completely logged out of this forest, with only scattered individuals remaining and the occasional mature totara. Grazing has maintained the old logging tracks and opened up other parts of the understorey,

limiting regeneration. Kereru and common bush birds including tui have been recorded.

Significance and justification

This RAP is significant as very little forest on alluvial terraces, as represented within this RAP, has escaped logging and clearance. The RAP is also valuable as it contains a range of successional stages, representative of the higher rainfall zone in which it lies. It is an important wildlife habitat with an SSWI ranking of 'potential'. It is essentially continuous with RAP TIN 47 to the north, recognising an extensive semi-continuous tract of indigenous vegetation.

RAP TIN 49 UPPER KAUWAEWAKA

Refer to Map 8 (p.138)

Study area No.	122
Priority:	3
Grid Reference:	NZMS 260 X18 205570
Area:	176 ha
Altitudinal range:	320-640 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest broadleaved shrubland kanuka scrub-forest manuka scrub

Description

This RAP covers the headwaters and much of the upper catchment of the Kauwaewaka Stream, a true left tributary of the Te Arai River. The vegetation is largely secondary, a clearance/burning induced mosaic of kanuka scrub-forest with emergent rewarewa, scattered broadleaved trees (including mamaku, kohuhu, mahoe, houhere, lancewood and mapou) and treeferns. Manuka occurs in small patches on upper slopes where it was previously more dominant, however it is now mostly giving way to broadleaved successional species. Patches of older broadleaved shrubland-forest lie in the moister gullies. Black beech forest of different ages occurs in narrow strips on some ridges and spurs. The RAP has an SSWI ranking of 'potential', with common bush and field birds recorded.

Significance and justification

This RAP covers almost the complete headwaters of a stream in the eastern upper moist part of the district. It includes vegetation in a variety of successional stages, from early secondary scrub to primary forest (e.g. beech forest) on characteristic steepland terrain.

RAP TIN 50 WAITUNA

Refer to Maps 8 and 9 (pp. 138 and 148)

Study area No. 928

Priority: 3

Grid reference: NZMS 260 X18 219529/215532

Area: 3.1 ha

Altitudinal range: 360-400 m

Bioclimatic zone: lowland

Vegetation class: conifer/beech forest

Description

This RAP includes two discrete remnants in the upper Mangapoike River valley. The downstream one lies on an alluvial terrace on the true left of the Mangapoike River beside Waingake Mangapoike Rd, while the upstream (eastern) one lies on an alluvial terrace, riparian slopes and a narrow spur on the true right of the river. Pines have recently been planted in the surrounding pasture, with a stand of older pines abutting the eastern end of the upstream remnant. There are also links to indigenous vegetation on steep riparian slopes upstream from this remnant on both the main stream and its large tributary.

The forest of the remnants are varied mosaics of kahikatea, matai, silver beech, red beech and lowland ribbonwood. The upstream remnant is the larger and more intact. The understoreys of both remnants have a rich array of divaricating and small-leaved shrubs including *Coprosma rigida*, *Neomyrtus pedunculatus*, poataniwha, pokaka, *Pseudopanax anomalus* and weeping mapou. Kowhai is present on the steep riparian slopes.

The remnants have both been grazed for a long period. However with the establishment of pines in the surrounding paddocks stock are now excluded, and the understoreys may now have a chance to recover in their absence.

Significance and justification

The forest remnants within this RAP, though small, are significant as alluvial forest remnants in the high rainfall southeastern part of the district, and for the notable assemblage of species they contain: red and silver beech in association with a mixture of podocarp species, and diverse broadleaved canopy and understorey species.

RAP TIN 51 MANGAPOIKE RIVER

Refer to Map 8 (p. 138)

Study area No. 119

Priority: 2

Grid Reference: NZMS 260 X18 169524

Area: 23 ha

Altitudinal range: 280-390 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
conifer/tawa forest

Description

This RAP contains forest-treeland on alluvial terraces flanking the Mangapoike River and lower hill-slopes on its true right, c. 11 km southwest of Waingake. The alluvial terrace and terrace risers support modified primary kahikatea/tawa forest-treeland, with scattered tawa and abundant pole kahikatea. The understorey is dominated by small-leaved shrubs including *Coprosma rotundifolia*, kaikomako, shrubby mahoe, turepo, *Pseudopanax anomalus* and weeping mapou. Modified primary rimu/tawa forest is present on the mid to upper slopes, with several large matai, hinau and mamaku also present amongst the canopy. The dry upper margins and modified ridges support mainly secondary scrub vegetation of young totara, manuka, mingimingi, akepiro, kohuhu, *Corokia cotoneaster*, snowberry and red-fruited karamu, with some black beech forest on the main ridges.

A farm track runs through part of the alluvial terrace, with animal tracks and grazing maintaining grassy patches throughout. High numbers of weeds were noted in the remnant including old man's beard (several old vines and numerous seedlings), robinia, Japanese honeysuckle and willow (along the river edge at the eastern end of the RAP).

Significance and Justification

Although in rather poor condition, this RAP is significant for the relatively large area of forest on fertile terraces it contains, and other diverse primary-secondary vegetation, extending from stream side to low ridge.

RAP TIN 52 PAPARATU TAUMUTU

Refer to Map 8 (p. 138)

Study area No. 929

Priority: 2

Grid Reference: NZMS 260 X18 164516

Area: 21 ha

Altitudinal range: 280-544 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
conifer/tawa forest
tawa forest
cliff vegetation

Description

This RAP covers riparian slopes, an alluvial terrace and moderate to very steep south-easterly facing hill-slopes and cliffs/bluffs on the scarp face of a prominent hill (Taumutu), on the true right of the Mangapoike River, c. 12 km southwest of Waingake. The terrace and lower slopes support modified primary kahikatea-(miro)/ tawa forest, that merges into logged tawa forest on the mid-slopes. The upper hill-slopes and ridges are dominated by secondary red beech-silver beech-black beech forest. Cliff/bluff areas below the ridges are dominated by a mosaic of secondary vegetation including *Pittosporum ralphii*, kohuhu, rangiora, manuka, bracken and mingimingi, and pasture species.

Exotic trees are present in several places along the riparian slopes. Domestic stock graze the lower slopes and terrace, with feral goats likely throughout. Formal protection of part of this RAP is currently under action through the QEII National Trust.

Significance and justification

This RAP is significant as it contains a high diversity of primary and advanced secondary vegetation on a dramatic sweep of landforms, from steep bluffs representative of the east-facing scarp slopes in this part of the district, to easy foot-slopes and alluvial terraces.

RAP TIN 53 PAPARATU LAKE

Refer to Map 8 (p. 138)

Study area No. 117

Priority: 1

Grid Reference: NZMS 260 X18 137518

Area: 22 ha

Altitudinal range: 320-380 m

Bioclimatic zone: lowland

Vegetation/landform classes:

conifer/tawa forest
broadleaved/small-leaved scrub
freshwater lake

Description

This RAP features an unmodified natural lake formed by an ancient landslide which dammed a small tributary of the Mangapoike River. It includes primary and secondary forest around the lake and wetland area at its head. Podocarp/tawa forest occurs in three semi-continuous patches on the northern and eastern sides of the lake, with lower advanced secondary broadleaved forest along the southwestern edge. Kahikatea is the most abundant tall tree within the forest, with scattered large rimu, over a broadleaved canopy dominated by mahoe. Bands of raupo fringe the margin,

with *Carex geminata* and other wetland plants in the alluvial wetland at the head of the lake. The lake is not fenced, with stock grazing and trampling to the lake margin.

Significance and justification

This RAP is significant as one of the few lakes in the Tiniroto Ecological District still surrounded by largely original vegetation. The RAP is also an important wildlife habitat for both wetland and forest birds including kereru, tui and fantail.

RAP TIN 54 MANGARANGIORA CONFLUENCE

Refer to Map 8 (p. 138)

Study area No. 401

Priority: 2

Grid Reference: NZMS 260 X19 123490

Area: 16 ha

Altitudinal range: 140-240 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
tawa forest

Description

This RAP lies at the end of a narrow necked peninsula in the confluence of the Mangarangiora Stream and Mangapoike River. It covers moderate to steep slopes interrupted by a narrow alluvial terrace, and bluffs/scarps above the river. A steep eroding scarp divides the RAP into two discrete patches of forest.

The bulk of the RAP is primary rimu-rewarewa/tawa-(pukatea) forest (cf. forest type D of Nicholls 1976). The rimu present are very large, with scattered tall matai and kahikatea. Hinau and white maire are also present in the tall tawa-dominant canopy. The narrow terrace and hill-slope above the confluence and the small patch to the north support primary rewarewa/tawa-(pukatea) forest, with titoki, puka, hinau, matai and young kahikatea. The steep faces and bluff edges have abundant kowhai.

The scarp face is bare and appears to be mobile with fresh debris around the base. Feral goats were seen traversing the scarp face, which no doubt contributes to its mobility. Feral goats and domestic stock have also opened up the understorey of the forest, removing most of the palatable species.

Significance and justification

Though small, this RAP has significance as one of only a few remnants of primary rimu/tawa forest remaining in the Mangapoike River valley, and the only one with sizeable rimu. It also has a continuum of vegetation on a range of landforms including terrace, slope and bluff communities.

RAP TIN 55 MANGAPOIKE BLUFFS

Refer to Map 8 (p. 138)

Study area No.	402
Priority:	2
Grid Reference:	NZMS 260 X19 140490
Area:	77 ha
Altitudinal range:	180-470 m
Bioclimatic zone:	lowland
Vegetation classes:	black beech forest conifer/tawa forest broadleaved forest manuka scrub

Description

This RAP lies along a large unnamed true left tributary joining the Mangapoike River c.1 km north of its confluence with the Mangarangiora Stream. It covers a number of sandstone scarp faces, colluvial debris from the scarp, and west-sloping dip-slopes all cut through by the unnamed stream (and its tributaries) in a sharply incised gorge.

The core of the RAP, on the central colluvial slopes, lower scarp faces and south-facing slopes above the main stream, has primary (rimu)/rewarewa-tawa-kohuhu forest, with small patches of black beech forest on some ridges and beside the stream. Pukatea, hinau, kowhai, young totara, matai, titoki, nikau, putaputaweta and puka are also present in the canopy. The banks above the stream are blanketed with tuhara, kiokio, tutu and whararikì. The south-facing scarp faces and lower colluvial slopes have low advanced secondary forest dominated by broadleaved trees (including kohuhu, scattered tawa, rewarewa, lemonwood, pukatea and pigeonwood). The steepest bluffs on the scarp support *Pittosporum ralphii*, kowhai, whararikì, kaikomako, akepiro, *Gahnia* sp., *Hebe parviflora*, common maidenhair and mapou. The uppermost part of the RAP has the youngest vegetation; manuka-dominated scrub, with mingimingi, kohuhu, treeferns, young rewarewa and regenerating conifers.

Feral goats are able to reach all but the steepest parts of the scarp faces, with domestic stock impacting more on the gentler colluvial slopes to the north and east.

Significance and justification

The landscape in which this RAP lies is dominated by an alternating series of strong and weak rocks dipping c. 20° to the west, creating very regular dip-slopes, east-facing scarps (35-80° slope), with rolling hummocky colluvium between. This RAP is one of the few remnants remaining on this distinctive landscape feature, with no others, apart from TIN 47, extending as this one does over the full range of landforms. Of interest is the presence of nikau, c. 20 km from the nearest coast. This may be a result of milder climatic conditions in the Mangapoike River valley.

RAP TIN 56 FAIRVIEW

Refer to Map 9 (p. 148)

Study area No.	573
Priority:	2
Grid Reference:	NZMS 260 X18 248508
Area:	15 ha
Altitudinal range:	520-670 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest tawa forest broadleaved forest

Description

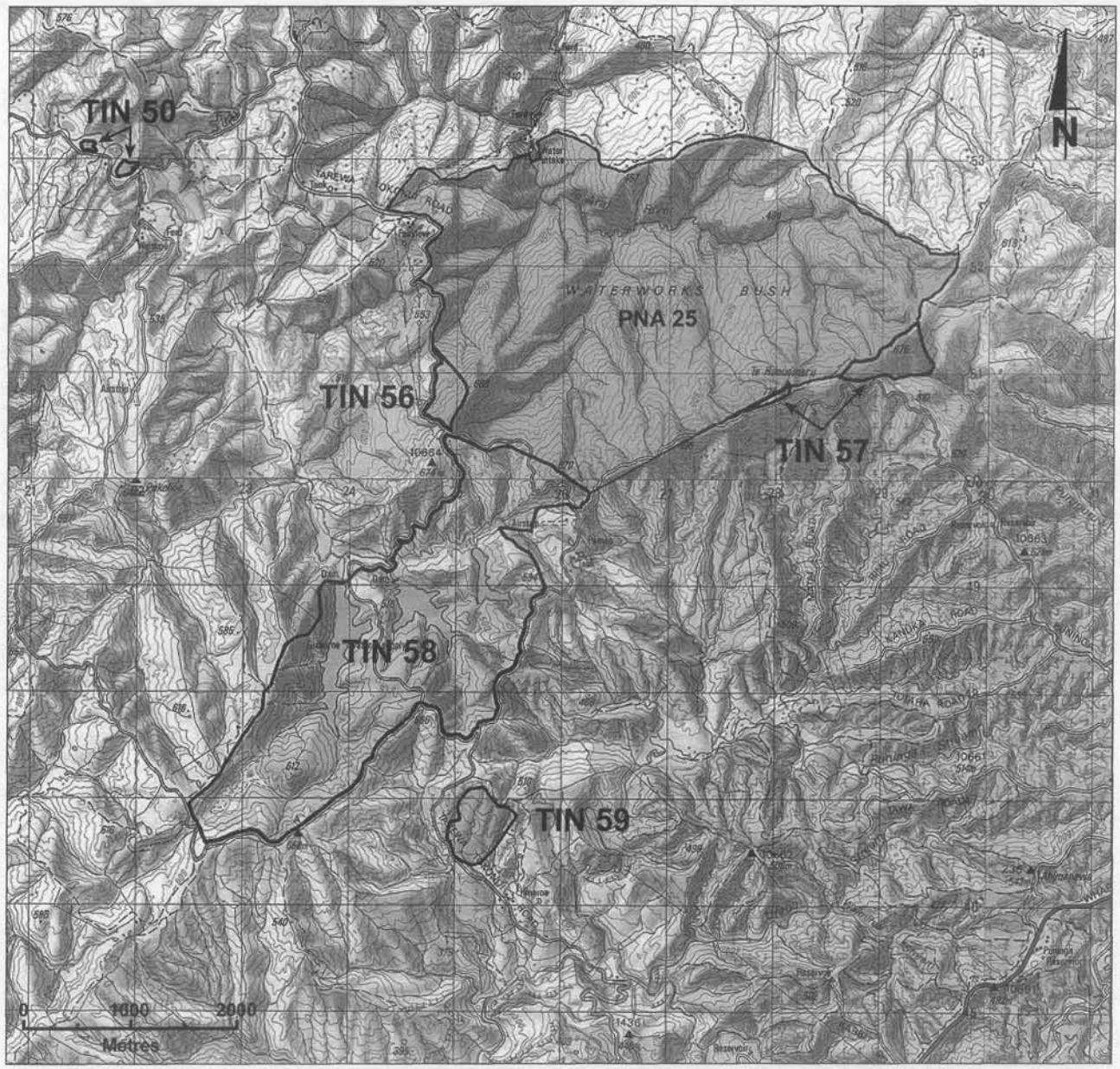
This RAP lies on moderate northwest-facing slopes that drain into the headwaters of the Mangapoike River. It is continuous along its eastern boundary with Waingake Waterworks Bush QEII covenant (1104 ha), an extensive tract of forest in the headwaters of the Te Arai River. To the west it is bounded by Tarewa-Tokonui Rd.

The vegetation within the RAP is predominantly tall primary/advanced secondary forest. Silver beech forest dominates the ridge at the southern end, with scattered red beech on the flanks. This merges into modified primary/advanced secondary broadleaved forest on the upper slopes and main ridge, dominated by rewarewa, with rimu, hinau, lancewood, tawa, putaputaweta, heketara, mahoe, kohuhu and tree ferns common in the irregular canopy. Kamahi, essentially now absent (apart from several small trees), was likely more abundant in this forest prior to the introduction of possums (that browse the species heavily). The mid to lower slopes support less modified primary tawa-dominated forest with scattered emergent rimu, and occasional kahikatea and hinau. Extensive areas of pig rooting was noted, but with little other indication of ungulate browse.

Significance and justification

This RAP contains diverse primary/advanced secondary forest, which complements and enhances the ecological and conservation values of Waingake Waterworks Bush (PNA 25), and Pamoa Waterworks Corridor (RAP TIN 58), providing a valuable link between the Bush and Corridor, for fauna and seed dispersal.

Map 9: RAPs TIN 56-59 & 50 (NZMS 260 X18 & X19)



RAP TIN 57 TE RIMUOMARU

Refer to Map 9

Study area No.	573
Priority:	3
Grid Reference:	NZMS 260 X18 279507/291512
Area:	24 ha
Altitudinal range:	520-718 m
Bioclimatic zone:	lowland-montane
Vegetation classes:	beech forest tawa forest broadleaved scrub

Description

This RAP contains two areas that are continuous with the southern boundary of the Waingake Waterworks Bush QEII covenant (1104 ha). One is a narrow strip of north-facing slopes abutting the straight-line boundary west of Te Rimuomaru high point. The other is a remnant of forest on southeast-facing slopes in the upper catchment of the Purupuruwhaka Stream, which is a major tributary of the Maraetaha River that flows north into the Turanga Ecological District. Its lower slopes are bounded by exotic conifer forest to the south and merge to pasture in the east.

The strip of vegetation along the ridge is predominantly broadleaved montane scrub, with scattered primary elements (primarily red and silver beech trees). The south-easterly-facing slopes have modified primary tawa-dominated forest with scattered podocarps in a patchy mosaic with broadleaved low forest and treefernland, that merges into more intact beech-dominated forest on the upper slopes.

Significance and justification

Both areas within the RAP are significant as they are continuous with the Waterworks Bush covenant. The area west of Te Rimuomaru is the only part of the catchment of the Te Arai River headwaters not included within the covenant. The area on south-easterly facing slopes is complementary to the covenant, which lies on predominantly north-facing slopes.

RAP TIN 58 PAMOA WATERWORKS CORRIDOR

Refer to Map 9

Study area No. 815 & 540

Priority: 1

Grid Reference: NZMS 260 X19 245485

Area: 566 ha

Altitudinal range: 450-670 m

Bioclimatic zone: lowland

Vegetation/landform classes:

conifer/beech forest
conifer/tawa forest
kanuka scrub
manuka-kanuka scrub
manuka scrub
freshwater wetland

Description

This RAP includes the complete catchments of three dammed tributaries (water supply reservoirs) and the surrounding moderate hillp-slopes with broad rounded ridges with thick pumice-based soils in the upper headwaters of the Mangapoike River. It also includes a 500-1500 m wide corridor of vegetation to the north that links the dam catchments with Waingake Waterworks Bush (a 1104 ha area of mainly primary forest). The topography of the corridor is finely dissected by branch streams

separated by steep-sided ridge systems. Both the reservoirs and Waterworks Bush are part of the Gisborne District Council's water supply scheme. Tarewa-Tokonui Rd partly bounds the RAP to the east and north, essentially dividing it from Waterworks Bush. Newly established pine plantations abut the RAP to the east, south and west. There is also a small area of pines between the corridor and dam catchment. This area should have only one rotation of pines, and be allowed to regenerate to native forest following their harvest.

The vegetation around the three dams is dominated by manuka, with a dense canopy that ranges from 4-7 m in height, with minor taller kanuka scattered in more fertile sites. This vegetation has established over some 40-50 years from pastoral farmland. There are groves of treeferns, predominantly in the south-facing and moister gully slopes amongst the manuka. Pockets of larger trees, including tawa, rewarewa, rimu, kahikatea and black and red beech are scattered throughout, some of equivalent secondary origins, some older primary forest relics. A small compact remnant of primary rimu/tawa forest lies on the northeast boundary amongst the young scrub. Its sub-canopy is dominated by mahoe and pigeonwood, and the understorey is thick and diverse with an array of palatable species (including hen and chicken fern, kanono and pate). A 6 ha wetland in the head of the largest catchment contains raupo and a wide range of other vegetation, but was not surveyed in detail.

Within the corridor the vegetation is a mosaic of bracken fernland, manuka scrub forest, patches of taller kanuka, and pockets of red and silver beech, on the hill-slopes and in gullies. Most of the beech trees are less than 80 years old, having grown up since the original forest clearance for farming. Young Hall's totara, treeferns, heketara, houhere, tree fuchsia, putaputaweta, lancewood, kohuhu and cabbage tree are scattered through the scrub/low forest. A small area of modified primary forest with red and silver beech and mixed broadleaved species lies on the up-hill side of Tarewa Tokonui Rd.

Pigs, goats, deer and possums are all present, with regeneration occurring despite their presence.

Significance and justification

This RAP is important because of its large size, because it contains entire catchment systems with diverse secondary vegetation and minor primary forest, and because of its linkages with Waterworks Bush. It represents the best example of secondary vegetation on the easy upland topography and thick ashy soils in the high rainfall zone in the southeast of the district. The vegetation of this RAP has enormous potential to succeed to more advanced secondary forest, and ultimately to quasi-primary forest. With retention of the corridor section the future biodiversity and ecological health of the reservoirs area and the primary virgin forest of Waterworks Bush (c. 1000 ha) will be enhanced, allowing plant and animal species to migrate between Waterworks Bush and the reservoirs. This is especially important for those species, like insects and smaller vertebrates (e.g. gecko and skink species) that are less mobile. The wetland is also recognised as an important wildlife habitat with an SSWI ranking of 'moderate': spotless crake and other water fowl have been recorded there.

RAP TIN 59 HINEROA

Refer to Maps 9 and 12 (pp. 148 and 167)

Study area No.	541
Priority:	1
Grid Reference:	NZMS 260 X19 253467
Area:	30 ha
Altitudinal range:	400-520 m
Bioclimatic zone:	lowland
Vegetation class:	beech forest conifer forest conifer/tawa forest freshwater wetland

Description

This compact RAP covers moderate to gentle hummocky slopes of old landslide material on the uphill side of the Tarewa-Tokonui Rd, draining southward towards the Nuhaka River. The lower slopes are swampy in places with pools of sitting water, and wetland areas also occur on the margins at the northwestern edge, and eastern corner. Pines surround the RAP, except where willow and larch have been planted on the flat bulldozed area at the southern corner.

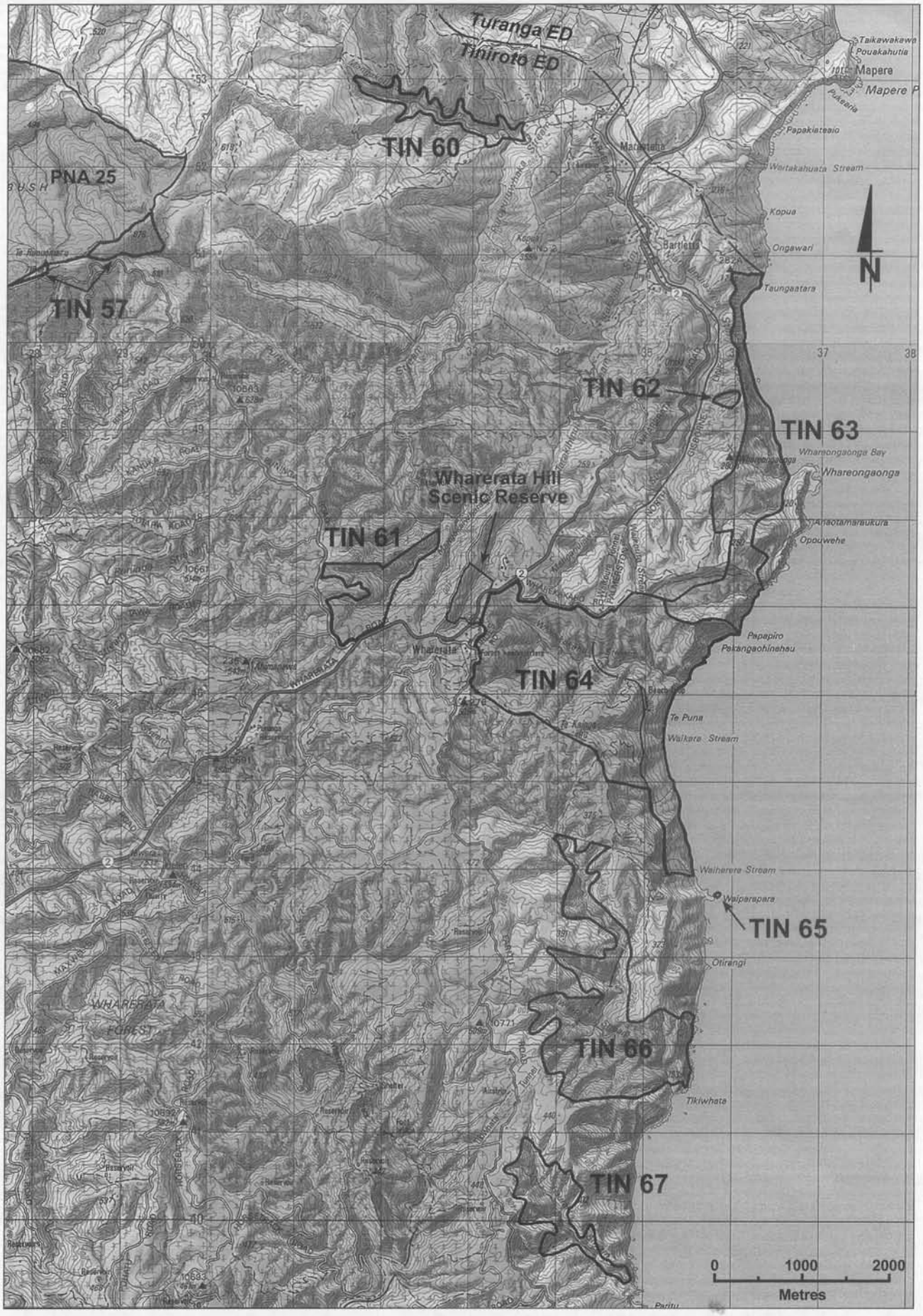
The vegetation within the RAP is primary rimu/tawa-(pukatea-kahikatea) forest. Hinau, rewarewa, matai and scattered miro are also present in the canopy. Many of the tall canopy trees have puka in their crowns. The understorey is thick and diverse with many saplings, shrubs and ferns (including tawa, matai, miro, kahikatea, pigeonwood, pukatea, heketara, kawakawa, hangehange, hen and chicken fern, gully fern and nini). On the lower slopes beside the road there are groves of young pole kahikatea, with thousands of young seedlings beneath. The wetland areas have abundant buttressed pukatea. Black beech is present on some ridges. Along the north-western margin of the RAP, the canopy becomes patchy and broken with exotic grasses and scrub species dominating.

Partial logging may have taken out the larger of the podocarps, but many sizeable trees remain, particularly rimu and scattered large kahikatea. Feral goats sign was noted, with tracks and occasional browse on palatable shrubs. Kereru, fantail and tui were noted.

Significance and justification

This RAP is significant as one of the most diverse remnants of primary rimu/tawa forest in the upland southeast part of the Tiniroto Ecological District, relating to its complex landslide terrain. Lying less than a kilometre from the Mangapoike Dam catchments (RAP TIN 58), this RAP also provides an important seed source for regeneration of primary species within that area's extensive secondary vegetation. Of note is the presence of kiekie and puka, both species more typical of semi-coastal forest closer to the coast in this district.

Map 10: RAPs TIN 60-67 & 57 (NZMS 260 X18, X19, Y18 & Y19)



RAP TIN 60 MANGAKOTUKUTUKU STREAM

Refer to Map 10

Study area No. 177

Priority: 1

Grid Reference: NZMS 260 Y18 325526

Area: 36 ha

Altitudinal range: 100-300 m

Bioclimatic zone: lowland

Vegetation classes: kanuka forest
broadleaved/small-leaved scrub
cliff vegetation

Description

This RAP covers the moderate to steep lower bluffs/slopes and narrow alluvial terraces of the Mangakotukutuku Stream catchment, a true left tributary of the Purupuruwaka Stream. Both feed the Maraetaha River which originates in the Tiniroto Ecological District, flowing through the Turanga Ecological District to the sea. Mature pine plantations completely surround the RAP. The steep south-facing cliffs/slopes support a mixture of small-leaved and broadleaved shrub species that include manuka, kanuka, kawakawa, tutu, rangiora, kohuhu, putaputaweta, kakabeak and *Hebe tairawhiti*. The rest of the remnant is a mosaic of scattered larger trees, tall kanuka, and broadleaved shrub species. Primary pukatea, tawa, karaka and titoki are present as scattered trees and clumps on the lower slopes with ngaio and kowhai extending up the steeper slopes.

The pines surrounding the RAP may threaten the margins when the trees are harvested. Feral goats and possums are present.

Significance and justification

This RAP lies near the boundary between the Tiniroto and Turanga Ecological Districts, in the semi-coastal/lowland bioclimatic zone where very little of the original vegetation remains. It also supports a sizeable population of the 'declining' *Hebe tairawhiti*, a newly described shrub with a limited distribution, and shrubs of the 'critically endangered' kakabeak far from other populations to the north and west. RAP TUR 25 within the Turanga Ecological District, which contains several remnants of semi-coastal forest (Clarkson & Clarkson 1991c), lies within c. 1.5 km of it.

RAP TIN 61 WHARERATA LOOKOUT BUSH

Refer to Map 10

Study area No. 487

Priority: 2

Grid Reference: NZMS 260 Y19 318472

Area:	67 ha
Altitudinal range:	220-560 m
Bioclimatic zone:	lowland
Vegetation class:	tawa forest broadleaved forest

Description

This RAP lies on moderate to steep stream gully slopes in the headwaters of the Mangakaiwharanga Stream, beside and north of the Wharerata Lookout on SH2. Pine plantations surround the RAP, with SH2 forming a small segment of its southeastern boundary.

The upper slopes of the RAP support a mosaic of primary and advanced secondary forest dominated by tawa, with many young rimu, miro, hinau (particularly on the ridges), kamahi and rewarewa. The diversity and number of palatable species (e.g. supplejack, hangehange and rangiora) in the understorey indicates that browsing pressure is low to moderate. The lower slopes have younger vegetation that has regenerated probably following past burning. Rewarewa is emergent over a mosaic of broadleaved trees and treeferns, including mahoe, putaputaweta, heketara, pukatea and young tawa.

Weeds present include blackberry, scattered wilding pines in the younger vegetation on the lower slopes, cotoneaster near the lookout, and several vines of old man's beard in the early stages of invasion. The last two are potentially serious weeds. Pigs are also present, with large areas of rooting noted.

Significance and justification

This RAP is significant as one of only a few sizeable remnants of indigenous vegetation in the semi-coastal bioclimatic zone of the Tiniroto Ecological District. It also has abundant rimu regeneration and young healthy northern rata. Of interest is the presence of kamahi, a species absent from the semi-coastal bioclimatic zone elsewhere in the ecological region. The higher rainfall and relatively high humidity of the southeastern part of the Tiniroto Ecological District, compared with the semi-coastal zone in either the Turanga or Waihua Ecological Districts allows kamahi to extend its range to within 4 km of the coast. The RAP also has significant scenic/aesthetic value, with a lookout and picnic tables beside it on SH2.

RAP TIN 62 MANGANUIAWEA STREAM

Refer to Map 10 (p. 152)

Study area No.	535
Priority:	2
Grid Reference:	NZMS 260 Y19 359494
Area:	4.3 ha
Altitudinal range:	140-190 m
Bioclimatic zone:	coastal
Vegetation classes:	tawa/kohekohe forest

Description

This RAP comprises a small compact forest remnant amongst mature pines in the northeastern corner of the ecological district, near its boundary with the Turanga Ecological District. The forest remnant extends from mid-slope to ridge crest in a small sub-catchment of the Manganuiwea Stream. A narrow band of pines runs between the forest and the coastal slopes and faces within RAP TIN 63. The vegetation of the forest remnant is tall primary coastal tawa-dominated forest, with hinau, pukatea and rewarewa along the northern ridge. Karaka, ngaio and large lancewood are also scattered amongst the canopy. Kohekohe dominates the sub-canopy. It merges into a small area of kanuka forest in the northwestern corner.

Feral goats likely graze the understorey of the forest, however long term exclusion of domestic stock (due to the establishment of the pine plantation) and buffering from the pines has probably allowed the forest understorey to regenerate and become more diverse and healthy.

Significance and justification

This RAP is significant as it contains compact area of primary forest within the coastal bioclimatic zone, of which only c. 68 ha remains in the Tiniroto Ecological District.

RAP TIN 63 WHAREONGAONGA

Refer to Map 10 (p. 152)

Study area No. 535

Priority: 2

Grid Reference: NZMS 260 Y19 362484

Area: 171 ha

Altitudinal range: 0-280 m

Bioclimatic zone: coastal

Vegetation classes: broadleaved forest
small-leaved scrub
coastal cliffs

Description

This RAP includes extensive areas of easterly-facing coastal cliffs, steep slopes and narrow stream gullies between Papapiro in the south to Taungaatara in the north. Towards the southern end are more extensive catchments, with only moderate to gentle slopes, perched above the steeper slopes and cliffs below. These 'basins' have extensive kanuka forest/scrub merging and mixing with manuka scrub. The vegetation on the steep coastal faces is dominated by manuka scrub with tauhinu, kanuka scrub and low forest. The more stable areas of the coastal slopes have scattered karaka amongst the scrub. The moister stream gullies have remnants of primary coastal broadleaved forest dominated by karaka, with kohekohe, titoki and mahoe. Feral goats graze parts of the cliffs, which are prone to instability and erosion.

Significance and justification

This RAP is significant as it contains a variety of coastal vegetation on an extensive tract of cliffs and steep coastal- facing hill-slopes and stream gullies that are characteristic of the coastal landforms in the Tiniroto Ecological District. It is continuous with RAP TIN 64 along its southern boundary.

RAP TIN 64 WHAREKAKAHO STREAM

Refer to Map 10 (p. 152)

Study area No.	812
Priority:	1
Grid Reference:	NZMS 260 Y19 345462
Area:	424 ha
Altitudinal range:	0-450 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation classes:	tawa/kohekohe forest broadleaved forest kanuka scrub-forest manuka scrub tauhinu scrub-shrubland

Description

The RAP encompasses virtually all of the catchment of the Wharekakaho Stream, together with areas of coastal faces (including Waikara Stream) to the south and an additional small catchment and cliffs to the north. It forms part of the eastern or coastal faces of the Wharerata Ranges, rising from sea level to c. 450 m. There are broad ridges and some moderately sloping upper basins falling steeply to the main stream and coast. In its lower reaches the stream is sharply incised, with a small fan delta at its mouth. There is evidence of slumping and instability on the coastal faces in the past, but modern erosion is minimal except on the sea cliffs and stream margin. The Palmerston North-Gisborne railway passes through and under the area. Railway Reserve land is up to 250 m wide in parts and totals almost 30 ha of the RAP. Paritu Rd and SH2 bound the RAP to the west, with Wharekakaho Rd bounding it to the north.

The vegetation pattern of the RAP reflects a history of fire and grazing. The coastal faces are a mosaic of secondary tauhinu scrub (lower coastal faces) and kanuka scrub forest (small clumps on the lower coastal faces and moist fertile sites). A small raupo-dominated wetland lies on narrow shelves of colluvial debris on the coastal face (c. 30-40 m a.s.l.). Coastal herbfields (with sea primrose and wild celery) are present on the rock slopes in the splash/spray zone.

Manuka scrub dominates on the slopes above the cliffs and on ridges throughout the RAP. It varies in height and associated species, according to age and soil factors. Scattered broadleaved trees and kanuka are present amongst the canopy in the older scrub. Young bracken-(manuka) scrub is present at the southern end of the RAP, the result of a recent fire. Kanuka dominates the secondary vegetation in the more fertile sites, with scattered karaka and kohekohe amongst the tall and even canopy. The

oldest broadleaved vegetation lies in the moister gullies and lower stream slopes of the Wharekakaho catchment. It ranges from karaka treeland (small patches around the stream mouth and lower coastal faces) to (pukatea)/mahoe-kohekohe forest (stream margins and lower faces), to tawa-rewarewa-kohekohe-mahoe forest (the most extensive broadleaved type, on upper slopes and gullies).

Wilding pines, blackberry, old man's beard (moderately abundant on the upper slopes near Wharekakaho Road) and pampas grass (present in low numbers near the stream bed) were all noted within the RAP. The feral goat problem is substantial. Their browsing is preventing succession of the tauhinu shrubland-scrub to forest, and keeping the understorey of some forest areas open.

Significance and justification

The RAP has significant ecological values, relating to the integrity of the stream catchment and the continuity and diversity of indigenous vegetation - from coastal herbfield and forest, to the head to the Wharekakaho Stream (3 km inland). It is the most diverse and intact of the series of coastal catchments that extend from Whareongaonga in the north to Mahanga in the south, in the Tiniroto Ecological District. The RAP has an SSWI ranking of 'moderate', with common field and bush birds recorded. A small pa site occupies a narrow ridge crest about 70 m above the sea immediately south of the Wharekakaho Stream. The coast and forest is a notable scenic feature seen from the railway.

RAP TIN 65 WAIPARAPARA STACK

Refer to Map 10 (p. 152)

Study area No. 178

Priority: 2

Grid Reference: NZMS 260 Y19 357438

Area: 0.1 ha

Altitudinal range: 0-10 m

Bioclimatic zone: coastal

Vegetation class: broadleaved scrub

Description

This RAP lies less than 20 m off the eastern coast. It is a small rock stack with coastal scrub and herb vegetation and bare cliffs.

Significance and justification

This RAP is significant as one of only a few coastal rock stacks present within the Ecological District. The stack is a grey-faced petrel breeding site and has a 'High' SSWI ranking. This site was not visited during this survey.

RAP TIN 66 TIKIWHATA STREAM

Refer to Map 10 (p. 152)

Study area No.	905
Priority:	1
Grid reference:	NZMS 260 Y19 345420
Area:	244 ha
Altitudinal range:	0-420 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation class:	tawa forest broadleaved forest manuka scrub

Description

This RAP covers almost the entire catchment of the Tikiwhata Stream, in the narrow coastal section of the Tiniroto Ecological District, and an 800 m stretch of coastal sandstone cliffs extending from c. 200 m north of the stream mouth. The slopes of the stream catchment are moderate to steep with scattered exposed rocky bluffs, long wide ridges and narrower spurs dissected by many streamlets. The main stream has a narrow rocky bed that becomes incised towards the coast. The slopes end in the steep coastal sandstone cliffs to the east. The Palmerston North-Gisborne railway line runs through the upper section of the RAP and includes four tunnels. The RAP is bounded by pine plantations to the north and young shrubland and pasture to the west.

The vegetation pattern within the RAP is a typical result of a lengthy period of 'reversion' after earlier burning and forest clearance: manuka-dominated scrub on the ridges and upper slopes and coastal broadleaved forest and swards of tree ferns in the moister stream gullies. The ridges and upper slopes have the youngest manuka scrub, with mingimingi, tauhinu and red-fruited karamu abundant in the understorey. The scrub has patches of hard fern amongst it. Older manuka-dominated vegetation on the mid-slopes and in shallow gullies has emergent rewarewa, and kohekohe, mamaku, treeferns, pigeonwood, heketara, *Pittosporum ralphii*, wineberry, five finger and rare young tawa. The moist stream gullies are dominated by primary and advanced secondary broadleaved forest. The primary forest patches are tawa-dominated with emergent rewarewa, scattered titoki, epiphytic puka, nikau and pukatea. Kohekohe dominates the sub-canopy with scattered larger trees present amongst the canopy. Kiekie, pigeonwood and mapou are also present in the sub-canopy. The rest of the broadleaved forest is a mosaic of mainly kohekohe and titoki, with karaka, pigeonwood, mahoe, tree fuchsia and mamaku. The moist stream side banks, particularly those inaccessible to stock, support *Jovellana sinclairii*, houhere, rangiora, kawakawa, common willowherb, gully fern and common shieldfern. The vegetation on the coastal cliffs is mostly sparse, with manuka and tauhinu scrub along the upper edges and in more stable areas.

Vegetation disturbance and modification has been long-term and is on-going within this RAP: natural erosion, burning (both for clearance and sparked by the fires of steam trains that used the line), clearance for pasture, possible logging (on the accessible upper slopes), and earth movement during the construction of the railway line and

tunnels. Domestic stock and feral goats have also had a marked impact with most of the RAP accessible to them. Grazing/browsing was noted in all but the most inaccessible slopes and sections of the stream banks. Mexican daisy, the only invasive weed noted, was abundant in some parts of the understorey and in places along the stream. Kereru and silvereye were noted.

Significance and justification

This RAP is significant as a large area of mainly secondary vegetation covering much of a stream catchment system and coastal cliffs in the coastal to semi-coastal bioclimatic zones of the Tiniroto Ecological District. The steep coastal slopes of the eastern part of the district have suffered severe modification through fires and clearance, with most of the coastal forest now reduced to narrow strips in gullies. The vegetation also covers a wide altitudinal gradient (0-420 m), over a full diversity of landforms. It is the second largest area of indigenous vegetation in the series of sea-flowing catchments between Whareongaonga in the north and Mahanga in the south, after Wharekakaho (TIN 64).

RAP TIN 67 HAURAKI STREAM

Refer to Map 10 (p.152)

Study area No. 900

Priority: 2

Grid reference: NZMS 260 Y19 342398

Area: 70 ha

Altitudinal range: 20-400m

Bioclimatic zone: coastal to semi-coastal

Vegetation class: broadleaved forest
manuka scrub

Description

This RAP covers much of the catchment of the Hauraki Stream, a small steeply incised stream flowing directly to the sea c. 8 km north of Mahanga. The slopes of the catchment are moderate to steep with long narrow spurs and ridges bounding the smaller incised side gullies. The RAP has some paddock fencing, with young scrub, hard fern fernland, or pasture on most boundaries. Paritu Rd lies c. 50 m away to the west.

Most of the vegetation is secondary, with pockets of primary forest and advanced secondary broadleaved scrub-forest in the lower stream gully slopes. Manuka dominates the secondary scrub, with tauhinu, hard fern, mingimingi, red-fruited karamu and occasional kanuka. The advanced and primary vegetation is a mixture of titoki, tawa, kohekohe, karaka, pigeonwood, nikau, mahoe and abundant treeferns.

The catchment has suffered long term modification, including burning, clearance and grazing by domestic stock and goats. Older vegetation remains only in the moist lower gully slopes and along the banks of the central incised stream valley.

Significance and justification

This RAP is significant as a coastal stream catchment largely in indigenous vegetation in the highly modified coastal bioclimatic zone of the Tiniroto Ecological District. It is the third largest in a series of sea-flowing catchments that extend between Wharcongaonga in the north and Mahanga in the south, after RAPs TIN 64 and 66. It encompasses a wide altitudinal sequence (20-400 m) and contains a diversity of successional vegetation from hard fern fernland to manuka scrub to coastal broadleaved forest.

RAP TIN 68 CIRCUIT ROAD FOREST

Refer to Map 11

Study area No. 485

Priority: 3

Grid Reference: NZMS 260 Y19 325374

Area: 11 ha

Altitudinal range: 160-320 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
tawa/kohekohe forest

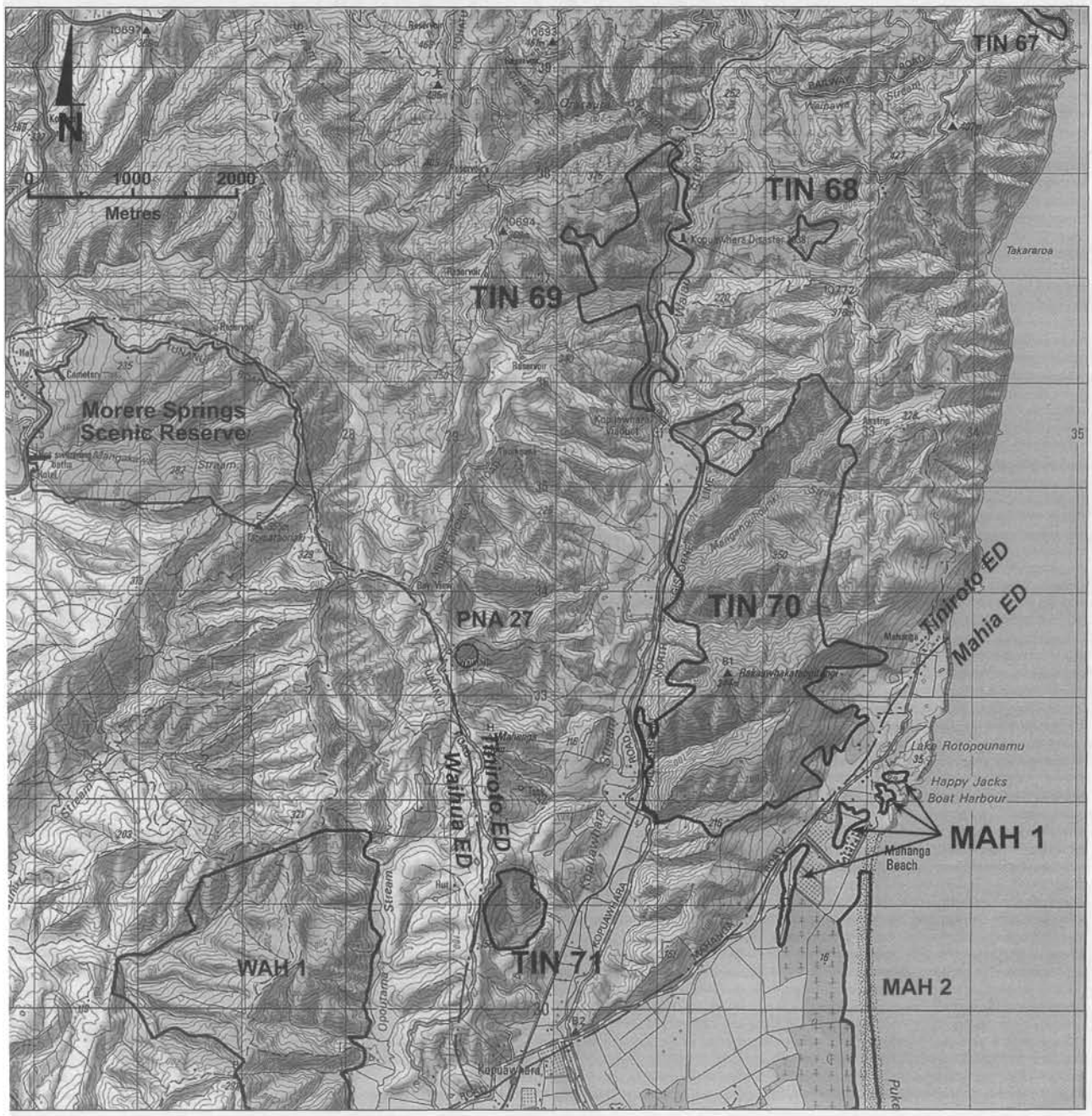
Description

This RAP lies on moderate to steep slopes in the head of a small stream catchment, a true left tributary of the Waiau Stream. Mature pines surrounding the RAP were being felled during this survey. The RAP has primary tawa-dominated forest with scattered emergent rewarewa, young rimu and pukatea on the lower slopes. Kohekohe and mahoe dominate the sub-canopy. The tawa forest grades into black beech forest on the narrow spurs. During the pine felling, trees at the margin were damaged and the understorey, which had been buffered by the pines, was also exposed to wind damage.

Significance and justification

This RAP is significant as one of only a few remnants of semi-coastal forest remaining in the Tiniroto Ecological District. Few remnants retain the original pattern of black beech on the dry ridges with tawa-dominated forest on the hill-slopes and in the stream gullies. Though small, the forest is intact and diverse, with notable rimu regeneration.

Map 11: RAPs TIN 68-71 and MAH 1 (NZMS 260 X19 & Y19)



RAP TIN 69 KOPUAWHARA MEMORIAL FOREST

Refer to Map 11

Study area No.	490
Priority:	3
Grid Reference:	NZMS 260 Y19 308370
Area:	127 ha
Altitudinal range:	40-330 m
Bioclimatic zone:	semi-coastal

Vegetation classes: tawa/kohekohe forest
conifer/broadleaved forest
broadleaved forest
kanuka-manuka scrub

Description

This RAP lies in tributary valleys and moderate slopes, ridges and alluvial terraces on the true right side of the Waiau Stream (upper Kopuawhara valley), together with a smaller area of terraced foot-slopes on the true left. The Gisborne-Palmerston North railway line runs through the valley bottom. The Kopuawhara Disaster Memorial, built to commemorate the drowning of 21 people in a flash flood during the construction of the line, lies on the alluvial terraces opposite the RAP. Pine plantations abut the RAP along its western margin, with a new plantation soon to be established to the south.

The RAP is a mosaic of primary, advanced secondary and secondary vegetation. The primary forest lies predominantly on the lower to mid slopes of the stream catchments in the west of the RAP. Tawa dominates the canopy, with pukatea, rewarewa, hinau, puka and nikau. Kohekohe and mahoe dominate the sub-canopy. The understorey is diverse and lush with groves of young nikau, kawakawa, pigeonwood, young silver fern, carpets of thread fern, and hen and chicken fern. The forest merges into young kanuka-manuka scrub in mosaic with older rewarewa/broadleaved-treefern shrubland. The alluvial terrace supports advanced secondary forest with a low canopy dominated by young kahikatea and totara. Mahoe, putaputaweta, pigeonwood, houhere and kaikomako are also present. Broadleaved trees and shrubs dominate the stream banks and cuttings beside the railway line, including tutu, mahoe, rangiora and wineberry. Ferns and herbs are abundant in the moist and shady sites: kiokio, gully fern, heruheru, *Jovellana sinclairii* and *Nertera* sp.

Domestic stock are absent from the RAP, and feral goats do not appear to be present in large numbers. This is reflected in the understoreys of the forest and secondary vegetation, which are all exhibiting strong regeneration. Wilding pines, scattered amongst the scrub, were the only weeds noted. Bellbird, kereru and fantail are present.

Significance and justification

This RAP is significant as part of a semi-continuous corridor of indigenous vegetation along the Kopuawhara and Waiau Streams, including RAP TIN 70. It contains a range of vegetation types, across a varied landscape (including alluvial terraces, terrace risers and moderate hill-slopes) and a broad altitudinal gradient (40-330 m).

RAP TIN 70 MAHANGA FOREST

Refer to Map 11 (p. 161)

Study area No. 479

Priority: 1

Grid Reference: NZMS 260 Y19 325329

Area: 577 ha

Altitudinal range: 20-380 m

Bioclimatic zone: coastal to semi-coastal

Vegetation classes: beech forest
tawa/kohekohe forest
conifer forest
kanuka/manuka scrub

Description

This extensive RAP covers east-facing moderate to steep coastal hills north of Mahanga settlement and west-facing moderate to steep rocky slopes over the ridge in the Kopuawhara Stream valley. All or most of the catchments of five true left tributaries of the Kopuawhara Stream are included. In the upper reaches of one of these, Mangahouhouriki Stream, a QEII covenant is under action following the survey, to formally protect part of the RAP. The Gisborne-Palmerston North railway runs through the Kopuawhara valley, along the base of the west-facing hill-slopes.

The vegetation within the RAP is a complex mosaic of secondary manuka-tauhinu scrub grading to kanuka forest, advanced secondary forest and tawa-dominated primary forest. The east-facing coastal slopes support primary logged rewarewa/tawa-pukatea/kohekohe forest that fades in places to treeland. Titoki, karaka, nikau, puka, lemonwood, and kahikatea (on the lower slopes) are also present. The canopy is open in places, with grassy patches and stock tracks throughout. Small clumps of even-aged kahikatea-dominated forest occur on the rolling terrace below, amongst patches of manuka scrub and pasture. Cattle have trampled and grazed the understorey of the terrace treeland, which is largely reduced to pasture. A small raupo wetland lies in a depression at the northern end of the RAP's eastern side.

The bulk of the vegetation on the west-facing slopes of the Kopuawhara valley is secondary kanuka/manuka scrub-forest. Ribbons of primary forest lie in moist south-facing stream gullies near the Rakauwhakatangitangi high point (344 m), and in a larger area (38 ha) on the true right slopes above the mid-reaches of the Mangahouhouriki Stream. The forests are again tawa-dominated, with scattered emergent rewarewa and pukatea, over a kohekohe-dominated sub-canopy. Karaka, hinau, puka, ngaio and groves of nikau are also present in the canopy. Black beech occurs in small clumps on ridges/spurs above Mangahouhouriki Stream.

The kanuka scrub-forest over much of the RAP is of low diversity, with few other species amongst the canopy. The understorey is generally open with only scattered ferns and unpalatable shrubs: common shieldfern, hard fern, red-fruited karamu, mingimingi, and tauhinu. Occasional primary trees (e.g. karaka, kohekohe, ngaio and nikau) that escaped earlier clearance and burning occur amongst the secondary vegetation, particularly in the stream gullies. The younger scrub is a mosaic of tauhinu, manuka, kanuka and mingimingi, and is also open beneath.

The mosaic of vegetation within the RAP is the result of a long history of fire (pre-European burning, burning and clearance for agriculture, and accidental fires caused by fires emanating from steam trains that once used the Gisborne-Palmerston North railway line), and logging. Primary forest in the Kopuawhara valley remains only on the moist south-facing slopes that would have been more fire resistant. Recent burning has occurred along the main ridge. Long-term grazing by domestic stock and feral goats has had a marked effect on regeneration and the diversity of the understoreys of

the forest and scrub. An old man's beard infestation is present on the lower coastal slopes/alluvial terraces, with control being carried out by the owner. Japanese honeysuckle, also present on the terrace, could become a problem in the future.

Significance and justification

This RAP is significant as the largest area of indigenous vegetation remaining in the coastal/semi-coastal bioclimatic zones of the Tiniroto Ecological District. It lies on a diversity of landforms and aspects. The black beech within this RAP is the most southerly recorded within the semi-coastal bioclimatic zone of the Tiniroto Ecological District.

RAP TIN 71 TUNANUI ROAD BUSH

Refer to Maps 11 and 42 (pp. 161 and 323)

Study area No.	581
Priority:	3
Grid reference:	NZMS 260 X19 295309
Area:	33 ha
Altitudinal range:	20-140 m
Bioclimatic zone:	semi-coastal
Vegetation class:	tawa/kohekohe forest kanuka scrub-forest

Description

This compact RAP lies c. 4 km north of Opoutama, on moderate slopes and spurs in the headwaters of a small tributary that drains to the eastern coast via the Kopuawhara Stream. It lies very close to the southern corner of the Tiniroto Ecological District and shares characteristics with adjoining semi-coastal areas in the Waihua Ecological District where drainage is to the south directly into Hawke Bay. Tunanui Rd runs parallel to the RAP's western boundary, with the rest of the RAP merging to kanuka scrub and pasture.

The upper stream gully slopes support a core of degraded primary forest: rewarewa is emergent over a mixed canopy of tawa, pukatea, karaka, infrequent ngaio, titoki and epiphytic puka. Kohekohe, mahoe and pigeonwood are most abundant in the sub-canopy. The understorey has been heavily grazed, with only scattered kawakawa, hangehange, common shieldfern and aka present. The remainder of the RAP, on the surrounding moderate slopes, ridge and gully slopes east of the primary forest, is rewarewa/kanuka forest-scrub. The kanuka-dominated canopy is largely continuous with scattered large pukatea, hinau, karaka and kohekohe particularly where the two vegetation types merge. The understorey of the kanuka-dominated vegetation is very open and grazed, with red-fruited karamu being the most abundant shrub.

The upper slopes are partially exposed to southerly and easterly winds with wind shear on the most exposed kanuka. Long-term grazing by domestic stock and feral goats has removed most of the palatable species from the understorey. Japanese

honeysuckle, noted growing along the roadside, was the only potentially invasive weed seen.

Significance and justification

The RAP is important as a sizeable and compact area approaching full sub-catchment coverage, with a high proportion of primary vegetation in the semi-coastal zone. Little of the original coastal-semi-coastal forest featuring abundant kohekohe and karaka remains within either the Tiniroto Ecological District or the adjoining part of the Waihua Ecological District, with most now cleared for pasture. It is a significant wildlife habitat with an SSWI ranking of 'moderate'.

RAP TIN 72 MANGATOTO

Refer to Map 12 (p. 167)

Study area No. 534

Priority: 3

Grid Reference: NZMS 260 X19 253407

Area: 12 ha

Altitudinal range: 280-360 ha

Bioclimatic zone: semi-coastal to lowland

Vegetation class: tawa/kohekohe forest

Description

This RAP lies 5 km north of Morere, in the upper catchment of the Mangatoto Stream, a true left tributary of the Nuhaka River. It covers the rounded top of a hill, with continuous moderate to gentle slopes to the north and moderate slopes that become broken and steep to the south. The southern boundary is fenced. At the bottom of the north-facing slopes there is a small dammed wetland, dominated by raupo and *Juncus* sp. The lower slopes (<340 m) support tawa-dominated forest with many large pukatea, kahikatea and scattered hinau. The upper slopes (340-360 m) have rewarewa/tawa forest, with only scattered pukatea and titoki. Around the high point the tawa forest is low in stature, with mapou, putaputaweta and divaricating shrubs. Throughout the rest of the forest kohekohe, mahoe, pigeonwood and treeferns dominate the sub-canopy.

The southeast corner of the RAP is completely fenced, with a thick understorey of ferns, kawakawa, mahoe, pigeonwood, kohekohe, nikau and tawa seedlings/saplings. In the unfenced area the understorey is grazed and largely open to 4 m, with only scattered ferns (e.g. gully fern, nini, heruheru and *Lastreopsis glabella*) and seedlings. Large stumps in the understorey are evidence of past logging. A young seedling of old man's beard was noted (and removed during the survey). Invasion by this noxious weed is a high probability as it is present in a number of other remnants within the Nuhaka River valley.

Significance and justification

This RAP is compact and diverse, with an intact primary canopy and full range of slopes and aspects. It is one of the most inland sites of kohekohe (c. 14 km from the southern coast and c. 10 km from the eastern coast) in the southern semi-coastal zone of the Tiniroto Ecological District.

RAP TIN 73 MANGAHUA

Refer to Map 12

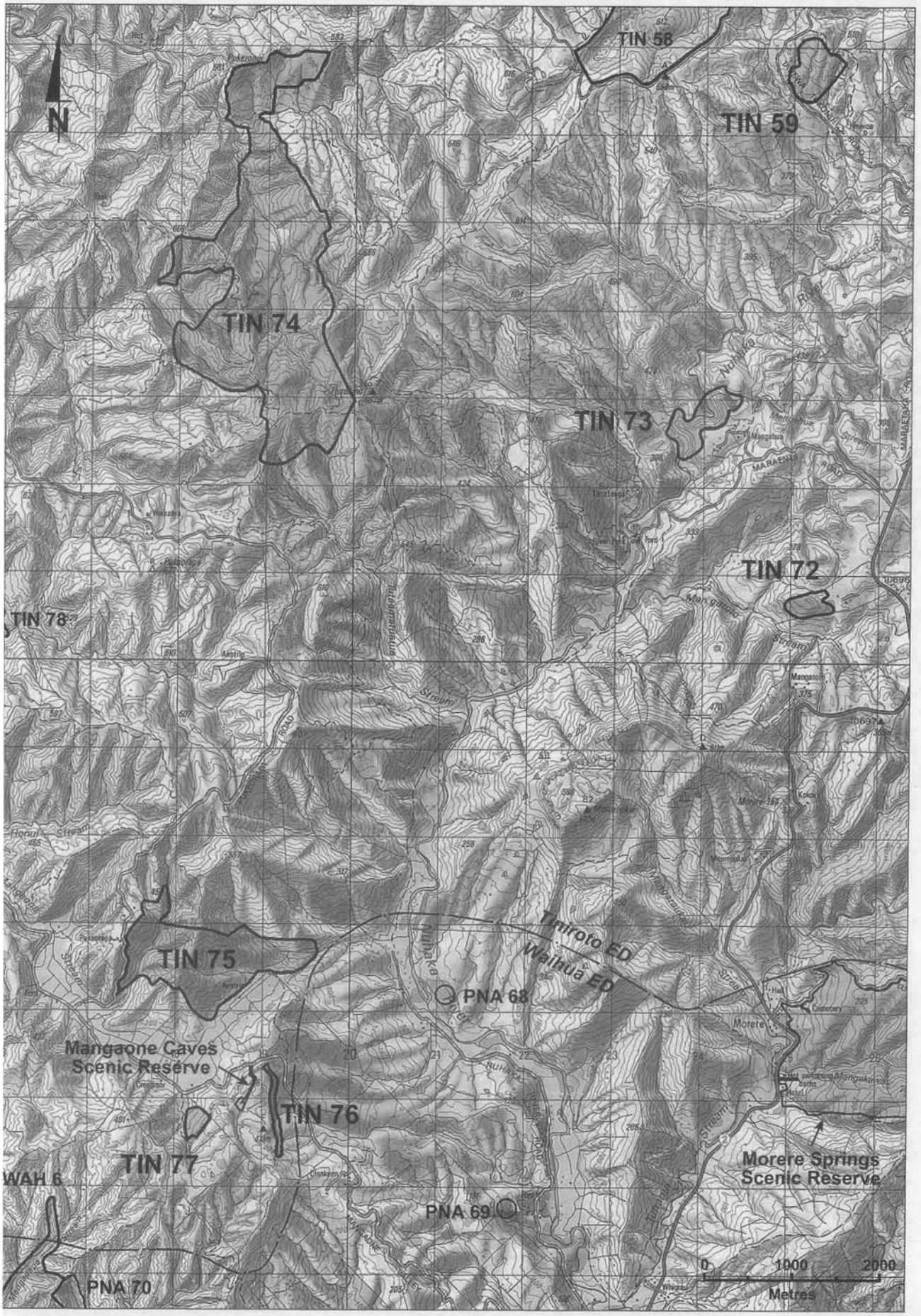
Study area No.	531
Priority:	3
Grid Reference:	NZMS 260 X19 238427
Area:	31 ha
Altitudinal range:	200-300 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest conifer/tawa forest broadleaved scrub

Description

This RAP lies in an entrenched meandering gorge, with narrow alluvial terraces, moderate to steep terrace risers and bluffs, on both sides of the Nuhaka River, 7 km north of Morere. It also includes an old high terrace and ridges/spurs above the gorge. Mature macrocarpa and eucalypt grow along the RAP's southeastern boundary, with pines recently planted along the southern and upper northeastern boundaries. The alluvial terraces beside the river support tawa-pukatea-(titoki) forest with scattered large emergent kahikatea, rewarewa and one totara. Puka and *Astelia* sp. are abundant in the tree crowns, with kiekie, supplejack and rata the most conspicuous climbers. Mahoe and pigeonwood are abundant in the sub-canopy. Gaps in the canopy are open and grassy and maintained by grazing. The steep terrace riser and upper old terrace are also tawa-dominated, with scattered rewarewa and one rimu. Abundant young miro and matai are present in the understorey. Narrow strips of black beech forest occur on the ridges and spurs, with mingimingi, forest oat grass, common shieldfern, red-fruited karamu, silver fern and mapou beneath. The steeper sections/ bluffs of the terrace riser have abundant kowhai, *Pittosporum ralphii*, tutu, akepiro, rangiora and kohuhu. Slip faces along the terrace riser, particularly in the middle of the RAP, are also dominated by these species.

Logging has removed most of the large podocarps, with only scattered rimu, kahikatea and totara remaining. Weeds present include blackberry and several vines of old man's beard. Stock appear to have limited access to the RAP, with the most severe grazing in the understorey of the old terrace. Feral goats travel throughout the river valley and probably cause most of the browsing damage noted on the lower terrace and terrace riser.

Map 12: RAPs TIN 72-77 & 59 (NZMS 260 X19)



Significance and justification

This RAP is compact and diverse, containing four distinct vegetation types. It is one of only a very few forest remnants that remain in the highly modified Nuhaka River valley, and the only one that contains a sequence of alluvial terrace, terrace riser and ridge vegetation.

RAP TIN 74 HURUKINO

Refer to Map 12 (p. 167)

Study area No. 537

Priority: 2

Grid Reference: NZMS 260 X19 190440

Area: 481 ha

Altitudinal range: 380-710 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
conifer/tawa forest
tawa forest
manuka scrub
bracken fernland

Description

This large RAP lies c.15 km north of Nuhaka. In the west the RAP covers a wide dissected basin with moderate to steep slopes that rise to high points of 648, 658 and 710 m. They include three sub-catchments in the headwaters of the Tukemokihi Stream. The central part of the RAP is an entire long narrow catchment flowing north from Hurukino (657 m). The northern part of the RAP, almost separated from the rest across a broad valley, covers a gentle to moderate hummocky landslide-affected slope with raupo swamp hollows evident on the southern side of Pukeranui. The streams in both the western, eastern and northern sections feed into the Mangapoike River. To the south, a small part of the upper catchment of the south-flowing Tutaematuatua Stream (a true right tributary of the Nuhaka River) is also included. New pine plantations abut the RAP to the northwest, east and south.

Logging, clearance, burning and grazing of this RAP have created a mosaic of different aged vegetation, ranging from logged primary forest to patches of young bracken and manuka-dominated scrub amongst rank pasture. All vegetation units have logging/ farm tracks of various ages through them. The older unused tracks are being vegetated by a range of regenerating broadleaved trees and shrubs (including wineberry, heketara, pate, tree fuchsia and mahoe) and treeferns.

Logged primary rimu/tawa forest is most extensive in the southern and northern thirds of the central catchment, the lower slopes/stream gullies of the western catchment and upper south-facing slopes of the northern section. Hinau, toro and miro are present amongst the tawa-dominated canopy, with mahoe, heketara, pigeonwood, mountain horopito and silver fern most abundant in the sub-canopy. Black beech is present on the main dry ridges and on some spurs, with red beech amongst it at higher

altitudes. Many of the emergent rimu that remain have survived past logging because they were unmerchantable.

The central and southwestern slopes of the eastern catchment have advanced secondary low forest with scattered small pockets of primary trees. Rewarewa is abundant over a patchy broken canopy of young tawa, Hall's totara, heketara, mountain horopito and treeferns. The pockets of older vegetation with scattered rimu occur mainly in the lower stream gully slopes. Where the canopy is open there are swards of bracken, mingimingi and young broadleaved shrubs. To the north of this unit, on the east-facing slopes, the low forest fades into younger scrub-shrubland dominated by young broadleaved trees (as above), with scattered rewarewa, tawa and rimu. Most of the largest trees are on the upper slopes and in the stream gullies.

The western sub-catchment has the most severe recent damage with most of the ridge vegetation cleared and burnt and reduced to bracken and young manuka. Only small areas of the RAP still have stock present (cattle), with feral goats, possums and deer the main browsers.

Significance and justification

This RAP is significant as the largest remaining tract of indigenous vegetation in the southeastern high rainfall section of the district. However, it is ranked second priority rather than first, because of the high degree of modification and fragmentation of the primary and secondary vegetation, which has been ongoing into recent years with extensive burning. Despite long-term modification the RAP, with its substantial areas of advanced secondary and primary vegetation has enormous potential for recovery, compared with many areas of 'purer' secondary vegetation. This RAP is also significant as a wildlife habitat, with an SSWI ranking of 'moderate to high'. Kereru, whitehead, tui, fantail and rifleman are all present, with bats also reported.

RAP TIN 75 PUKEORAPA FOREST

Refer to Map 12 (p. 167)

Study area No. 258

Priority: 2

Grid Reference: NZMS 260 X19 181368

Area: 146 ha

Altitudinal range: 160-480 m

Bioclimatic zone: lowland

Vegetation types: conifer/tawa-kohekohe forest
tawa forest
manuka-kanuka scrub

Description

This sizeable RAP covers gentle to moderate hill-slopes above the broad floor of the head of the Mangaone Stream valley, which flows west to the Mangapoike and Wairoa Rivers, together with steeper slopes in the east drained by a true right tributary of the

Nuhaka River. A well-established pine plantation abuts part of the northern boundary, with Pukeorapa Rd forming its boundary to the west.

The long east-facing slopes support primary tawa-dominant forest with scattered emergent rimu, rewarewa and kahikatea. Pukatea, titoki, puka, hinau and kohekohe are also present. Grassy patches occur where the canopy is broken, particularly along the ridges. The damp lower foot-slopes have extensive areas of young kahikatea. The rest of the RAP is a mosaic of different aged secondary scrub and advanced secondary low forest-treeland. The advanced secondary forest is dominated by young tawa and rewarewa, over groves of treeferns, mahoe, kohuhu, heketara, pukatea and young kahikatea. Pockets of original tawa forest are scattered throughout. The youngest scrub, in the northern part of the RAP, has manuka, mingimingi and tauhinu with scattered broadleaved trees.

Past logging has removed many of the largest podocarps from the primary forest, with grazing affecting the integrity and diversity of the understorey. The clearance of the pines along the northern boundary may cause damage to the RAP's margins.

Significance and justification

Covering a wide range of altitudes and landforms, this RAP is significant for its range of successional vegetation and a sizeable area of logged primary podocarp/tawa forest (cf. forest type D of Nicholls 1976), in the semi-coastal fringe of the higher rainfall zone in the southeast of the district. Kohekohe, near its inland limit, is a feature. Viewed across the perched valley floor from Mangaone Valley Road this RAP is visually striking.

RAP TIN 76 CLONKEEN BLUFFS

Refer to Map 12 (p. 167)

Study area No. 270

Priority: 2

Grid Reference: NZMS 260 X19 192347

Area: 6.2 ha

Altitudinal range: 340-400 m

Bioclimatic zone: semi-coastal

Vegetation class: cliff vegetation

Description

This RAP forms a band of vegetation on limestone cliffs/bluffs above Mangaone Valley Road, c. 5 km northwest of Nuhaka. The cliffs are heavily jointed and fractured with tree roots penetrating them. The pasture below is strewn with rocks and boulders that have fallen over time from the cliffs.

The vegetation on the cliffs is a shrub mosaic dominated by ngaio, mahoe, *Pittosporum ralphii*, hangehange, karo, karamu and rangiora (2-8 m tall). Other species present include wineberry, mahoe, houhere, tutu, five finger, common maidenhair, kiokio, gully fern, bush lawyer and pohuehue (*Muehlenbeckia complexa*). Domestic stock graze the surrounding pasture and hill-slopes up to

bottom of the cliffs. Feral goats are also present, browsing up into the shrubland and reaching many areas inaccessible to the domestic stock.

Significance and justification

The RAP is significant as after TIN 77 it contains the most intact example of semi-coastal limestone cliffs/bluff vegetation in the Tiniroto Ecological District, where limestone bluffs are a widespread and distinctive feature. It is also the only site where the small coastal tree karo was abundant in the district.

RAP TIN 77 CLONKEEN FOREST

Refer to Maps 12 and 30 (pp. 167 and 260)

Study area No.	271
Priority:	1
Grid Reference:	NZMS 260 X19 183347
Area:	6.8 ha
Altitudinal range:	300-400 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	(conifer)/tawa forest broadleaved forest cliff vegetation

Description

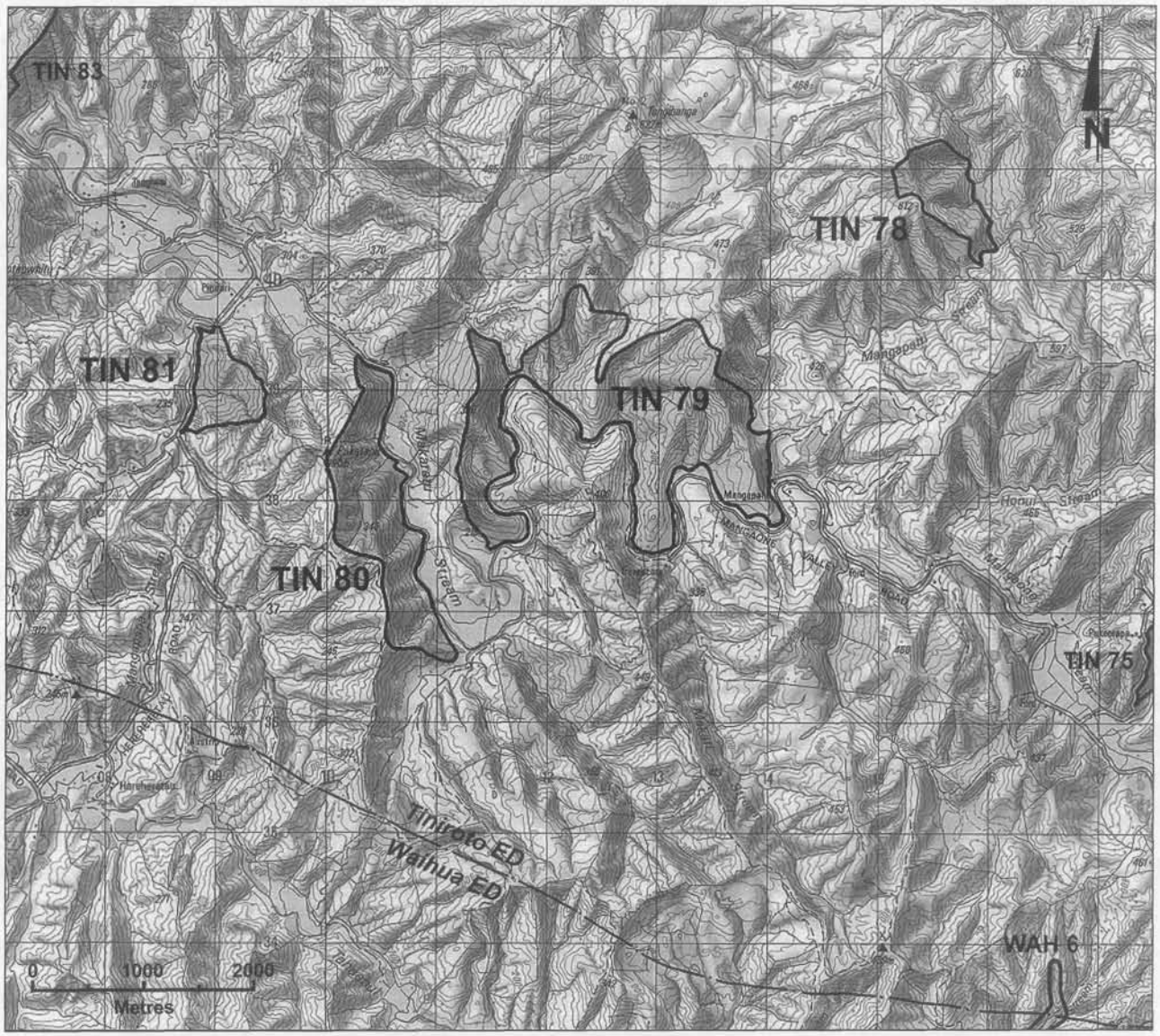
This compact RAP c. 6 km northwest of Nuhaka extends from stream side, over a northwesterly facing moderate to steep hill-slope to limestone cliffs/bluffs. The hill-slope is rocky in parts, strewn with limestone boulders from the bluffs above. Tawa is the dominant canopy tree over most of the RAP. On the lower to mid slopes it is in mosaic with rewarewa, pukatea, titoki and infrequent karaka, with kohekohe and mahoe dominating the sub-canopy. Kohekohe is most abundant on the mid to upper slopes, dominating the canopy in places where tawa is absent. Lianes present include kiekie, supplejack, *Metrosideros colensoi*, aka, native jasmine and bush lawyer. Several large emergent rimu are also present. The tawa-dominated forest on the upper slopes merges into ngaio-kowhai low forest-treeland. Ngaio and kowhai are also the dominant broadleaved species on the bluffs, with karamu, tutu, hangehange, koromiko, kawakawa, houhere, rangiora, and the ferns common maidenhair and kiokio also present. The vegetation at the bottom of the slope, on either side of the stream, is a mix of broadleaved trees and shrubs including titoki, kaikomako, houhere, pate, pigeonwood, putaputaweta and wineberry.

Past logging has removed most of the large podocarps. Domestic stock have access to the bush, with the understorey, particularly on the margin of the RAP and in canopy gaps, open and dominated by pasture grasses. Kereru, white-faced heron and common forest birds were recorded during the survey.

Significance and justification

This RAP is significant as it contains limestone cliff vegetation that is largely intact, the closest approximation to original cliff vegetation remaining in the southern semi-coastal to lowland part of the district. This is complemented by primary forest that extends over a full range of landforms, from stream side to upper slopes, with a northwesterly aspect; this is significant as most primary vegetation on the drier north-facing slopes in this part of the district is now gone.

Map 13: RAPs TIN 78-81 (NZMS 260 X19)



RAP TIN 78 MANGAPAHI STREAM

Refer to Map 13

Study area No.	538
Priority:	3
Grid Reference:	NZMS 260 X19 155409
Area:	50 ha

Altitudinal range: 350-600 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
broadleaved forest
broadleaved scrub-shrubland

Description

This RAP covers moderate to steep slopes and narrow ridges in the upper Mangapahi Stream catchment, c. 12 km north-west of Nuhaka. It is bounded on all sides by recent forestry development. The central core of the RAP is logged primary rimu/tawa forest, with rewarewa and scattered pukatea. A number of large rimu are scattered throughout the forest. Epiphytic puka are present in the canopy, with mahoe, heketara and pigeonwood all abundant in the sub-canopy and in places where the tawa canopy is broken. To the north and south the primary forest merges into advanced secondary low forest-shrubland with emergent rewarewa over a canopy dominated by putaputaweta, mahoe, heketara, young tawa, young rimu, kohuhu, lancewood and groves of treeferns. Vegetation on the dry ridges and spurs, and lower faces above the stream, grades to manuka-tauhinu-mingimingi scrub.

A newly constructed forestry development road runs along the top ridge, dividing treeland-scrub to the west from the rest of the RAP. Soil displaced during road construction has damaged the trees at the forest margin. Parts of the surrounding scrub (to the north and east sides) were recently burnt in preparation for the establishment of the pine plantation at the time of the survey. Domestic stock have impacted the vegetation in the past but with the conversion of the farm to forestry stock are now absent and feral goats are the major modifying influence.

Significance and justification

This compact RAP provides an important link for the dispersal of propagules, bird and bat species, between RAPs TIN 74, 75 and 79. It also contains a sizeable area of primary rimu/tawa forest. This forest is providing seed sources for regeneration of the surrounding more modified vegetation, which consequently has higher diversity.

RAP TIN 79 MANGAONE VALLEY

Refer to Map 13

Study area No. 280

Priority: 3

Grid Reference: NZMS 260 X19 126388

Area: 327 ha

Altitudinal range: 180-460 m

Bioclimatic zone: lowland

Vegetation classes: conifer/broadleaved forest
tawa forest
conifer/kanuka forest
kanuka-broadleaved forest

kanuka forest
manuka-kanuka scrub

Description

This extensive RAP forms a continuous band (c. 7 km long) on alluvial terraces, moderate steep hill-slopes and ridges on the true right of the Makaretu Stream at the end of Mangaone Valley Rd c. 12 km northwest of Nuhaka. Several small tributaries of the Makaretu Stream flow from or through the RAP, including the lower reaches of the Mangapahi Stream. Various modifying factors (e.g. logging, clearance and burning) have created a complex mosaic of vegetation from young secondary scrub to primary forest.

The secondary vegetation ranges in age and complexity, from young manuka-mingimingi scrub to kanuka/manuka scrub to kanuka forest to kahikatea-rewarewa-kanuka/broadleaved forest. The youngest scrub lies on the slopes of a big horseshoe bend (in the centre of the RAP, with scattered wilding pines) and on the slopes to the north.

There are two notable areas of primary forest. The larger more diverse one is at the southwestern end of the RAP on a sweeping terrace and hill-slopes rising to a narrow ridge, with (kahikatea-rewarewa-pukatea)/tawa forest treeland on the terrace, changing to (rimu)-rewarewa/tawa-(pukatea) forest up-slope. A smaller pocket of primary forest towards the eastern end of the RAP is tawa-dominated, with titoki, hinau and pukatea through the canopy, merging into modified forest that includes kanuka on its fringe. Large kowhai occur on the steeper faces and ridges throughout the vegetation. The terrace at the southwestern end of the RAP, which is largely grazed and open, has an old stream course running through it. Its stream banks and those along the Makaretu and Mangapahi Stream are clothed in shrubs, ferns and herbs (including rangiora, hangehange, kaikomako, kiokio, gully fern, *Jovellana sinclairii*, tuhara and Mexican daisy).

Wilding pines, blackberry and Mexican daisy were the most notable weed species. The pines, however are probably the only ones to necessitate future control/removal. Pine plantations that are being established along the northern boundary of the RAP, will provide a buffer to the young secondary vegetation.

Significance and justification

This RAP is significant as it covers a diversity of landforms from stream terrace to ridge, with corresponding diversity in vegetation types at a range of successional stages. It is also one of a series of areas that form a semi-continuous chain of indigenous vegetation along the Makaretu Stream, including RAPs TIN 75, 80, 81, 83, Waiparere Covenant (PNA 31), and Anewa Reserve (PNA 30). These areas provide important wildlife habitats. The RAP has an SSWI ranking of 'moderate', with kereru, tui, fantail, pipit, grey warbler and shining cuckoo all recorded.

RAP TIN 80 PUKETAPU FOREST

Refer to Map 13 (p. 172)

Study area No. 198

Priority: 1

Grid Reference: NZMS 260 X19 104380

Area: 127 ha

Altitudinal range: 180-390 m

Bioclimatic zone: lowland

Vegetation class: conifer/tawa forest
manuka-kanuka scrub

Description

This RAP lies on alluvial terraces, and moderate to steep predominantly east-facing slopes, most of which extend to a long narrow ridge which rises to the Puketapu Trig (390 m), on the true left of the Makaretu Stream. The Makaretu Stream forms the RAP's eastern and northern boundaries, with partial fencing along the upper ridge forming the boundary to the west. The main slopes of the RAP are primary logged (rimu)-rewarewa/tawa-(pukatea) forest, with patches of unlogged forest with rimu at original concentrations. Hinau, karaka, puka and nikau are also present in the canopy. Along the top ridge rewarewa, rimu, ngaio, pukatea, mapou and hinau form a low windshorn treeland, buffeted by winds from the south and west. The lower slopes and terraces have bands of pasture that merge into tawa treeland and patches of treeferns or manuka scrub. There is a also a small grazed area of primary rimu/(kahikatea-rewarewa-tawa) forest on the terraces in the central part of the RAP. To the south the forest merges into young manuka-kanuka scrub and a small area of logged primary tawa-dominated forest, similar in composition to the main forest.

Animal damage is most evident on the margins of the lower and upper slopes; however, feral goats were seen throughout the RAP. Minor erosion and slipping off the upper ridge is evident, exacerbated by animal damage to the supporting vegetation. Tui, kereru, grey warbler and fantail were all recorded during the survey.

Significance and justification

This RAP is the one of the largest and best examples of primary rimu/tawa forest (cf. forest type D of Nicholls 1976) in the southeastern part of the Tiniroto Ecological District, near the boundary with the Waihua Ecological District. It also has significance as a wildlife habitat with a SSWI ranking of 'moderate'.

RAP TIN 81 HEREHERETAU BUSH

Refer to Map 13 (p. 172)

Study area No. 201

Priority: 3

Grid Reference: NZMS 260 X19 090390

Area:	43 ha
Altitudinal range:	180-340 m
Bioclimatic zone:	lowland
Vegetation classes:	tawa forest broadleaved forest conifer/small-leaved scrub manuka scrub

Description

This RAP covers moderate to steep slopes beside Hereheretau Road, c. 9 km inland from Whakaki. A small true left tributary of Makaretu Stream emanates from it. The central upper to mid gully slopes support primary tawa-dominated forest, with emergent rewarewa, one large rimu, puka, hinau, nikau and titoki also present in the canopy. Scattered kahikatea are present on the mid slopes. Pigeonwood and mahoe are the most abundant sub-canopy trees. The primary forest merges into rewarewa/kanuka-kohuhu scrub-forest. Wineberry, young matai, totara, kahikatea and putaputaweta are scattered in various combinations amongst the kanuka-dominated canopy. The understorey is diverse and includes a number of fern and grass species (including common maidenhair, common shieldfern, gully fern, nini, thread fern, hook sedge and forest oat grass).

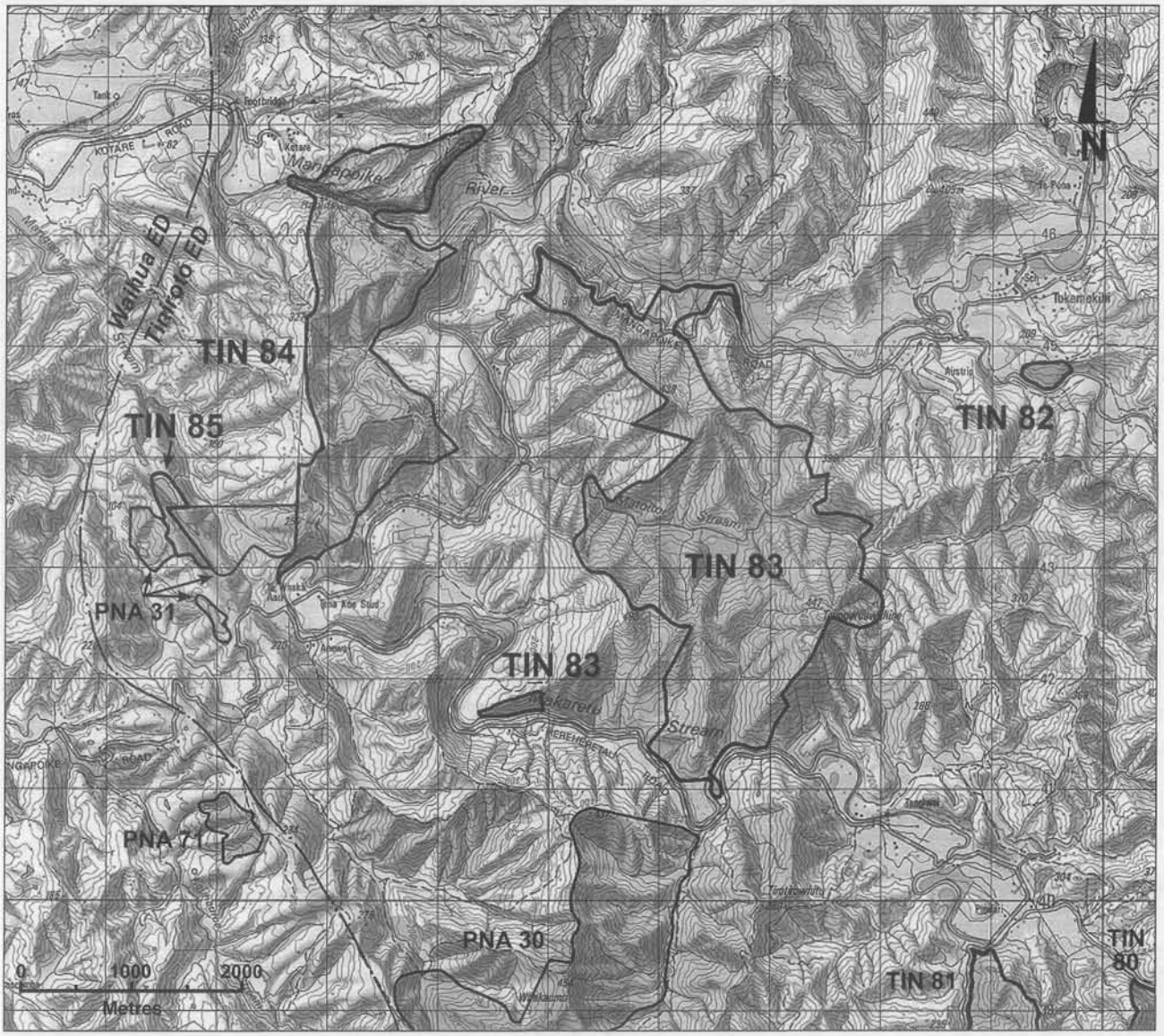
On the wide flat ridge and slopes above and beside the road, the kanuka-dominated vegetation fades to tall shrubland dominated by groves of young totara, matai and rewarewa, over mingimingi, manuka, *Pseudopanax anomalus*, bracken, red-fruited karamu and carpets of waewaekoukou. The slopes at the northern and southern ends of the RAP support young manuka scrub, with pockets of broadleaved trees (including wineberry, lancewood, cabbage tree, mapou and putaputaweta) and scattered wilding pines.

Domestic stock appear to have limited access to the RAP with fencing along its northern and southern boundaries and the road edge. Feral goats, present in high numbers in the Wairoa area, are having the most notable impact on the vegetation, reducing the numbers of palatable species in the understorey.

Significance and justification

This RAP is significant as it includes a diversity of succession stages in a compact area covering a full sub-catchment from ridge to valley floor on moderately fertile slopes. The secondary vegetation has increased regenerative potential with primary forest in the central gully providing the surrounding young scrub-forest with a seed source of advanced secondary and primary tree species. The RAP also has significance as a wildlife habitat, with an SSWI ranking of 'moderate'.

Map 14: RAPs TIN 82-85 (NZMS 260 X19)



RAP TIN 82 TUKEMOKIHI STREAM

Refer to Map 14

Study area No.	409
Priority:	2
Grid reference:	NZMS 260 X19 095447
Area:	9 ha
Altitudinal range:	120-210 m
Bioclimatic zone:	lowland
Vegetation class:	conifer/tawa forest

Description

This RAP lies on a narrow alluvial terrace and moderate terrace riser beside the Tukemokihi Stream, a tributary of the Mangapoike River. The vegetation within the RAP is primary kahikatea-rimu/tawa-pukatea-(titoki) forest: scattered large kahikatea

and rimu are emergent over a tall intact canopy dominated by tawa and pukatea. Titoki is also occasional throughout. The forest merges into broadleaved treeland-low forest and patches of kanuka forest along the upper edge of the terrace riser (northern margin).

Feral goats and domestic stock have access to RAP with obvious grazing in the understorey, and grassy patches maintained particularly along the stream terrace. Pines have recently been removed from the central top edge of the RAP, with the debris piles now partially preventing stock access. Kereru, tui and bellbird were all recorded during the survey.

Significance and justification

This RAP is significant as a compact area of diverse primary forest on fertile slopes and is the only remnant of primary forest remaining in the Tukemokihi Stream valley. It is also one of the few primary remnants in the western part of the high rainfall zone, in the southeastern part of the district.

RAP TIN 83 TAUNGARUAWAHINE

Refer to Map 14 (p. 177)

Study area No. 408, 296 & 410

Priority: 2

Grid Reference: NZMS 260 X19 066432/047417

Area: 620 ha

Altitudinal range: 70-493 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
tawa forest
kanuka forest
kanuka/manuka scrub

Description

This extensive RAP lies 17 km northeast of Wairoa. It contains repeating ridge valley systems that extend in a broad c. 5 km band from the Mangapoike River to the Makaretu Stream, with the Matoitoi Stream running through the centre. The RAP is underlain by west-dipping bands of resistant sandstone that have created an asymmetric landscape with smooth moderate westerly aspect slopes with steeper side valleys, and steeper dissected east-facing slopes with sandstone/limestone bluffs. The Makaretu Stream and Hereheretau Rd form the RAP's southern boundary, with Mangapoike River and Mangapoike Rd bounding it to the north. To the east and west it is bounded by young scrub and pasture.

The RAP is based on a large tract of secondary kanuka-dominated forest, with pockets/faces of primary podocarp/tawa forest. The secondary vegetation ranges from kanuka-manuka scrub, to areas of purely kanuka forest and areas that have abundant broadleaved trees (including rewarewa, mahoe, kohuhu, houhere, putaputaweta, lancewood and *Pittosporum ralphii*), nikau and young podocarps amongst the

kanuka canopy. Almost all the central core of the RAP is kanuka-manuka scrub and kanuka forest with small pockets of modified primary and advanced secondary forest.

A sizeable area of primary forest lies in the northeastern corner of the RAP on narrow terraces and moderate hillslopes between the Mangapoike River and Mangapoike Road. The upper slopes support tawa-(titoki-pukatea) forest with small-leaved shrubs dominating the understorey (including *Coprosma areolata*, *Neomyrtus pedunculata*, *Pseudopanax anomalus* and turepo). The lower slopes have modified pukatea-(tawa-kahikatea) forest, with groves of young kahikatea, occasional young matai and rimu, and wheki where the canopy is broken.

The southwest outlier of the RAP has an intact remnant of primary (rewarewa-rimu-matai)/tawa forest extending from stream side to ridge top on a south-facing moderate to steep hill-slope. The tawa-dominated canopy is tall and intact with scattered hinau, pukatea, lemonwood and lancewood. Kowhai is present along the edges of the stream and on steep faces below the ridge to the north.

In the south, between the Makaretu Stream and Hereheretau Rd, there is a small patch of primary kahikatea-rimu/tawa forest-treeland on an alluvial terrace and terrace riser. The forest canopy is largely intact, with large grassy patches and swards of blackberry amongst the treeland. Other species present in the canopy/sub-canopy include totara, matai, hinau, titoki, white maire, mahoe, tree fuchsia and silverfern.

The Makaretu Stream has extensive bands of willow along its banks, along with indigenous trees and shrubs, including karamu, mahoe, kowhai, houhere and cabbage tree. Where the banks are steep and bluffy there are swards of tuhara, whaririki, rangiora, *Gahnia* sp. and tutu. There is also a small raupo wetland on slopes above the Makaretu Stream, on the southwestern edge of the main RAP (not surveyed).

Domestic stock and feral goats are both present within the RAP, with the most noticeable browse around the margins and in the younger vegetation. Wilding pines are scattered amongst some of the younger secondary scrub.

Significance and justification

This RAP is significant for its continuity and comprehensive landscape scale, possessing secondary vegetation on a full range of landforms and aspects. This value is enhanced with the inclusion of areas of primary forest, which increase the RAP's diversity and regenerative potential. It is also significant as a wildlife habitat, with an SSWI ranking of 'moderate' (kingfisher, tui, kereru, fantail and grey warbler have all been recorded) and as an important part of a semi-continuous chain of indigenous vegetation along the Makaretu Stream, that includes the Kumi Conservation Area and Anewa Reserve (PNAs 29 and 30).

RAP TIN 84 MANGAPOIKE GORGE

Refer to Map 14 (p. 177)

Study area No. 350 & 351

Priority: 3

Grid Reference: NZMS 260 X19 033452

Area: 333 ha

Altitudinal range: 40-400 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
tawa forest
broadleaved forest
manuka-kanuka scrub
manuka scrub
cliff vegetation

Description

This RAP includes the gorge of the Mangapoike River, c. 4 km upstream from its confluence with the Wairoa River. The gorge is spectacularly narrow and deeply incised (50-200 m deep) into sandstone and limestone with very steep sides and bluffs. Also included are the moderate to steep slopes that flank the gorge and extend over several ridge and tributary valley systems 3 km to the south, to touch on the true left of the Makaretu Stream. Several farm tracks run through the RAP.

The vegetation is a complex mosaic of secondary and advanced secondary scrub and forest, reflecting the area's modification history i.e. logging, burning/clearance, with the last major burn c. 1994 in the central part of the RAP. The vegetation on the southern side of the gorge is dominated by secondary manuka-(kanuka)/(hard fern-bracken) scrub, with pockets of older kanuka forest, some of which has emergent rewarewa amongst it. In places the shrubs are sparse with swards of hard fern and bracken amongst them. The stream gullies have more diverse canopies with wineberry, large mingimingi, houhere, putaputaweta and mahoe. Several south-easterly facing stream gullies have advanced secondary tawa forest with scattered original trees. Other species present include pukatea, rewarewa, hinau, pigeonwood, mahoe and titoki. The small area along the western margin that has been recently burnt has very young manuka scrub, with mingimingi, wheki-ponga, hard fern, bracken, and burnt kanuka skeletons. The gorge slopes have sparse shrubland-flaxland vegetation, that includes tuhara, whaririki, kohuhu, *Gahnia* sp., kiokio, *Hebe* sp., kowhai and manuka.

On the northern side of the gorge the vegetation is a similar mix of secondary and advanced secondary vegetation. Bracken, manuka, mingimingi and scattered kanuka dominate the most modified the hill-slopes in the eastern half with small areas of rewarewa/broadleaved shrubland with black beech on the ridges in the west.

The bird life within the RAP is abundant and diverse. Species recorded include tui, tomtit, shining and rare long-tailed cuckoos, kereru, Australasian harrier, grey warbler, fantail, bellbird, black shag, paradise shelduck and silvereye. Domestic stock and feral goats graze much of the RAP.

Significance and justification

The RAP is significant as it contains a diverse range of mainly secondary vegetation, with primary elements still reflecting a little of the original vegetation patterns, on a full range of ridge and valley landforms and aspects. It also has extensive bluff systems, with their associated vegetation, culminating in the spectacular Mangapoike River gorge. It is continuous with Waiparere Covenant along its southwestern boundary, and is also part of the semi-continuous chain of vegetation along the Makaretu Stream

that includes RAPs TIN 75, 79, 80, 81 and 83. The Mangapoike River gorge and associated bluffs are a striking landscape feature, which can be viewed from Mangapoike Road.

RAP TIN 85 WAIPARERE WETLANDS

Refer to Map 14 (p. 177)

Study site No. 220

Priority: 2

Grid Reference: NZMS 260 X19 017433

Area: 13 ha

Altitudinal range: 130-160 m

Bioclimatic zone: lowland

Vegetation/landform classes:

tawa forest
manuka-kanuka scrub
freshwater lakes/wetlands

Description

This RAP contains several small lakes/wetlands and the hill-slopes surrounding them, on a broad hummocky ridge crest in the upper catchment of the Mangaone Stream, a true left tributary of the Mangapoike River. The RAP links two discrete parts of a QEII covenant (Waiparere covenant, PNA 31) with essentially continuous indigenous dryland and wetland vegetation, and extends to the north to include the largest wetland in the system. Kanuka scrub-forest occurs on the hill-slopes, with manuka scrub around the margins of the wetlands. There are scattered conifers and broadleaved trees amongst the young vegetation including kahikatea and matai. Kanuka scrub-forest and pasture bounds the RAP on its northern and southern margins.

The lakes/wetlands retain a predominantly native flora, with natural vegetation zonation patterns. This is unusual in an ecological district where most original wetlands have been drained/heavily modified for agricultural purposes. Species present include raupo, purei, manuka, mud pondweed, panakenake, sharp-spiked sedge, sphagnum, giant umbrella sedge, kahikatea and swamp kiokio. Where stock have access there are signs of trampling and browsing, with less diverse flora.

Significance and justification

The RAP is significant for a number of reasons. It lies in close proximity to and is contiguous with extensive areas of native vegetation (e.g. Waiparere QEII covenant, RAP TIN 83), and includes several largely natural wetlands and a range of vegetation types which help to sustain a rich and varied bird life. Forty two forest, scrub and wetland bird species have been recorded in the vicinity at different times, including bellbird, tui, kereru, tomtit, fantail, morepork, NZ dabchick, and shining cuckoo.

RAP TIN 86 MAHURANGI

Refer to Map 15

Study site No.	426
Priority:	1
Grid Reference:	NZMS 260 X18 055504
Area:	106 ha
Altitudinal range:	320-610 m
Bioclimatic zone:	lowland
Vegetation class:	beech forest conifer/tawa forest

Description

This RAP covers long narrow ridges on a gently west-dipping surface, a southern continuation of the great limestone slab of Mt Whakapunake (RAP TIN 87). It is drained by a series of parallel stream gullies in the upper catchment of a true right tributary of the Hangaroa River. Newly planted pine plantations abut the RAP on all but its eastern boundary, where it ends abruptly in treeland and pasture. The RAP is partially fenced along this farmland boundary. A farm track runs through the RAP on its southern side, separating a small corner of forest.

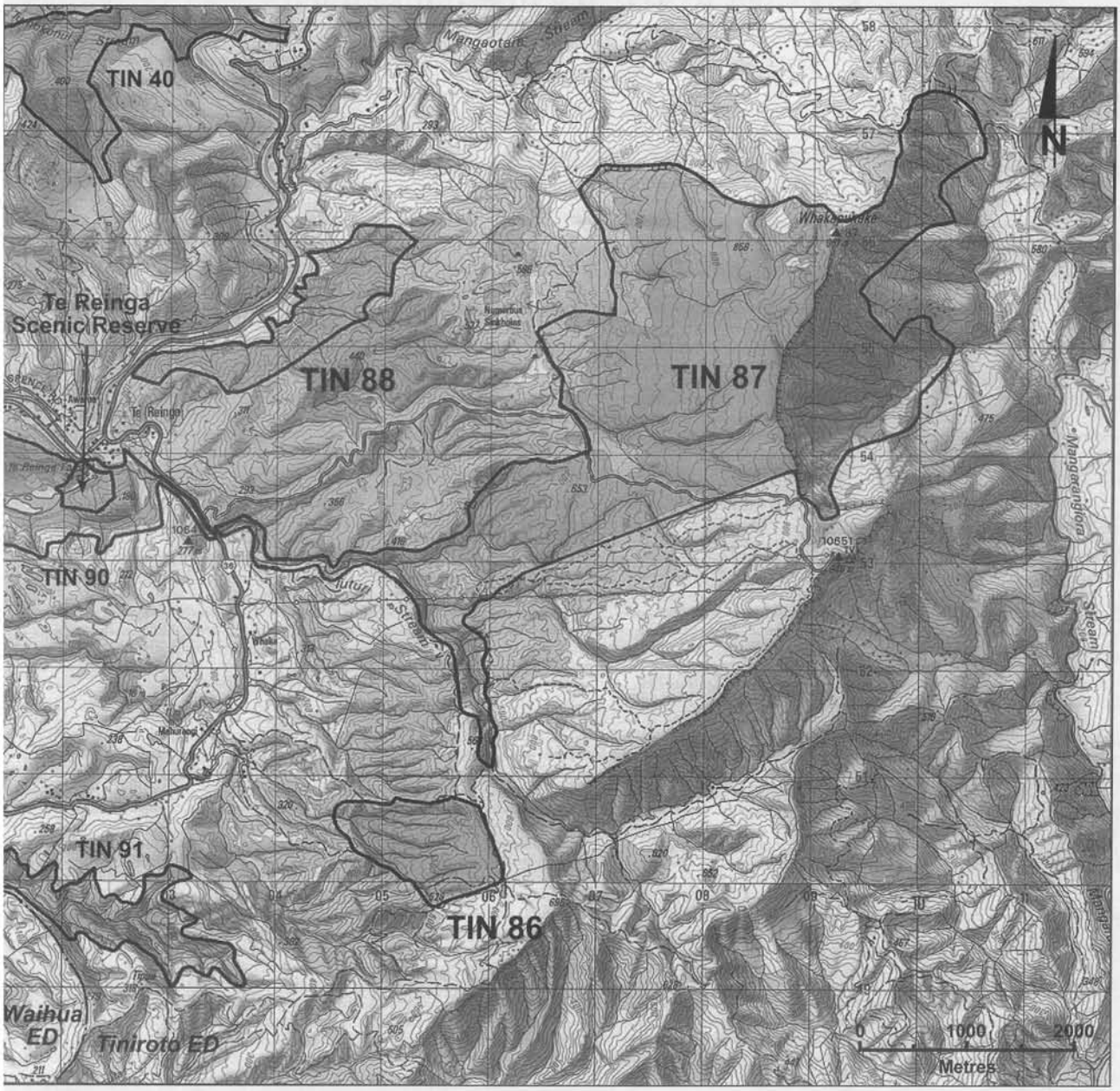
The stream gullies and mid-slopes support primary rimu-(miro-rewarewa)/tawa forest, with hinau, puka and pukatea emergent on the lower slopes (below c. 500 m). Where selective logging has occurred (particularly in the southern corner) few large podocarps remain; the canopy is largely tawa-dominated, with rewarewa and large pukatea. However, in patches where the tall tawa is absent or sparse, the canopy is a low mosaic of broadleaved species, including wineberry, mahoe, tree fuchsia and young tawa. The tawa-dominated forest merges into narrow strips of primary black beech forest on the main ridges and spurs. Rimu are also present on the ridges, with heketara, silver fern, lancewood, mingimingi, crown fern, young beech and plentiful young miro and rimu in the sub-canopy/understorey. Along the northern and southern edges the forest merges into younger secondary vegetation. This is a mosaic of manuka-dominated scrub and bracken fernland, with treeferns and broadleaved shrubs and trees in the lower southern gullies.

Domestic stock and feral goats are present, with grazing and trampling damage most notable around the forest margins and along the farm track.

Significance and justification

Compact and diverse, this RAP is one of the best examples of primary rimu/tawa forest remaining in the southeastern part of the district, retaining the full relationship of podocarp/tawa and beech forest. It is significant as a mid-altitude representative of the primary forest pattern complementing the broken altitudinal sequence on Mt Whakapunake (RAP TIN 87). The RAP is also a significant wildlife habitat, with an SSWI ranking of 'moderate'. The bird life is diverse and abundant with tui, fantail, kereru, grey warbler and tomtit all recorded.

Map 15: RAPs TIN 86-88 (NZMS 260 X18 & X19)



RAP TIN 87 WHAKAPUNAKE

Refer to Map 15

Study site No.	427
Priority:	1
Grid Reference:	NZMS 260 X18 075545
Area:	1161 ha
Altitudinal range:	200-961 m
Bioclimatic zone:	lowland to montane
Vegetation classes:	beech forest conifer/tawa-beech forest conifer/tawa forest

tawa forest
kanuka forest
kanuka-manuka scrub
bluff vegetation

Description

This large RAP lies on the slopes of Mt Whakapunake, a dominant landscape feature in the centre of the Tiniroto Ecological District. The west-facing flanks of Whakapunake consist of an extensive gently dipping sheet of limestone, with extensive bluff/scarp systems along the northern and eastern edges. The limestone has numerous caves, sink holes, tomos and underground streams. The continuity of indigenous vegetation that once extended from Te Reinga to the summit of Whakapunake has now been restricted to the tenuous links via Tuturi Stream; logging, fires, subsequent conversion to pasture and the recent establishment of pine plantations on the western flanks have created a mosaic of indigenous vegetation, grassland and exotic forest. Treeferns and broadleaved species (e.g. rewarewa, tawa, putaputaweta and mahoe) remain in the gullies amongst the newly established pines. A road leading to a TV transmitter station passes through the centre of the RAP.

The most extensive area of indigenous primary forest occurs around the high point (961 m), extending west to around 600 m along the northern side and to c. 400 m on the southern side. It also extends east down bluffs and moderate to steep hill-slopes in the Mangarangiora Stream catchment. The forest is dominated by red beech and silver beech at the highest altitudes, with scattered emergent rimu and miro below 800 m. The understorey is dense and diverse, with crown fern, broadleaf, mountain horopito, hupiro, *Dicksonia lanata*, kanono, *Pseudopanax anomalus*, young beech, miro, Hall's totara and forest oat grass. The beech forest merges into rimu-tawa-beech forest down-slope (around 700 m), with most of this lower altitude forest restricted to the southern side of the of the mountain and two discrete patches on the northern side. Tawa dominates the stream gullies, with beech dominating the margins and spurs. Scattered miro, Hall's totara and hinau are also present in the canopy, with mahoe, tree fuchsia, pate, toro and lancewood abundant in the sub-canopy. The secondary vegetation around the margins of the RAP is of different ages, ranging from almost pure manuka-kanuka scrub to broadleaved shrubland.

The RAP also includes a narrow riparian strip along the Tuturi Stream, which has a mosaic of secondary kanuka-broadleaved shrubland to low forest, primary conifer/ tawa forest and patches of primary black beech forest. This strip connects the main lowland forest in the south to the forests around the Te Reinga Falls (RAP TIN 90), with the boundary between the two RAPs arbitrarily made at SH36.

The steep bluffs to the east, above the forest in the Mangarangiora catchment, although modified in places, support interesting local assemblages of herbaceous species, including *Craspedia viscosa*, *Anaphalioides bellidioides*, *Euphrasia cuneata*, and *Parahebe catarractae* ssp. *diffusa*.

Deer and pig sign were noted during the survey and feral goats were present in low numbers. Cattle mainly graze the upper southwesterly slopes penetrating some distance from the open pastoral areas around the transmitter road into the beech forests.

Significance and justification

This RAP encompasses a range of significant ecological and geological/landscape values. Mt Whakapunake is a high-altitude 'island' in a predominantly lowland landscape, containing primary forest that extends over a wide altitudinal range (200–961 m a.s.l.). Together with RAP TIN 90 to the west (30–200 m a.s.l.) it covers virtually the complete altitudinal range available in the ecological district. The limestone bluff/cliff system is striking as a landscape feature. The RAP is also important as a wildlife habitat with an SSWI ranking of 'moderate to high'; NZ falcon, kereru, tomtit, rifleman, whitehead, tui, bellbird, grey warbler and fantail are all present.

RAP TIN 88 LOWER WHAKAPUNAKE

Refer to Map 15 (p. 183)

Study area No. 427

Priority: 3

Grid Reference: NZMS 260 043555

Area: 123 ha

Altitudinal range: 80-440 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
kanuka scrub-forest
bracken fernland
cliff vegetation

Description

This RAP lies on the northwesterly facing moderate-steep hill-slopes and prominent limestone bluffs at the western end of the Whakapunake dip-slope. The mid to lower slopes are strewn with rocky debris that has fallen from the cliffs/bluffs. A number of small true left tributaries of the Hangaroa River, many of which originate high up on the dip-slope, flow through the RAP. SH36 lies to the west of the RAP, with newly established pine plantations abutting much of the southeastern boundary.

The RAP has a mosaic of primary and secondary vegetation, from bracken fernland kanuka scrub-forest to primary tawa-dominated forest. The primary logged pukatea/tawa-(titoki) forest is largely restricted to the mid to lower gully slopes, extending in fingers down towards SH36. Other species present amongst the tawa forest include kohuhu, mahoe, heketara, pigeonwood, lancewood and silver fern. Kanuka scrub-forest, treefernland, and bracken fernland (in the most recently burnt areas along the upper edges), link these remnants of primary forest. *Pittosporum ralphii*, kowhai, hangehange, whaririki, rangiora, karamu, koromiko and common maidenhair occur on the steepest bluffs and cliffs.

Stock graze the accessible lower to mid slopes, with goats able to browse all but the steepest bluffs. Gorse (along the upper margin) and occasional wilding pines (mainly amongst the secondary vegetation on some ridges), were the most conspicuous weeds noted.

Significance and justification

This RAP is significant as it contains remnants of the lowland tawa-dominated forest that would have originally covered the lower slopes of the Whakapunake dip-slope, most of which has now been cleared. The prominent limestone bluffs/cliffs within the RAP are also significant; they are a characteristic landform of the district, made more significant by the fact that they have a dry northwesterly facing aspect but still support native vegetation. The bluffs and lower slopes of the RAP are highly visible from SH36.

RAP TIN 89 TAUWHARETOI (1)

Refer to Map 16

Study site No.	425
Priority:	1
Grid Reference:	NZMS 260 X18 000560
Area:	216 ha
Altitudinal range:	80-318 m
Bioclimatic zone:	lowland
Vegetation classes:	tawa forest conifer forest kanuka forest

Description

This RAP lies on moderate to steep hill-slopes, long parallel ridges and alluvial terraces on the true left of the Ruakituri River, c. 3 km northwest of Te Reinga. It covers two stream catchments (true left tributaries of the Ruakituri River) and a dissected face to the south. The river forms much of the RAP's southern boundary, with pasture along its northern, eastern and western margins.

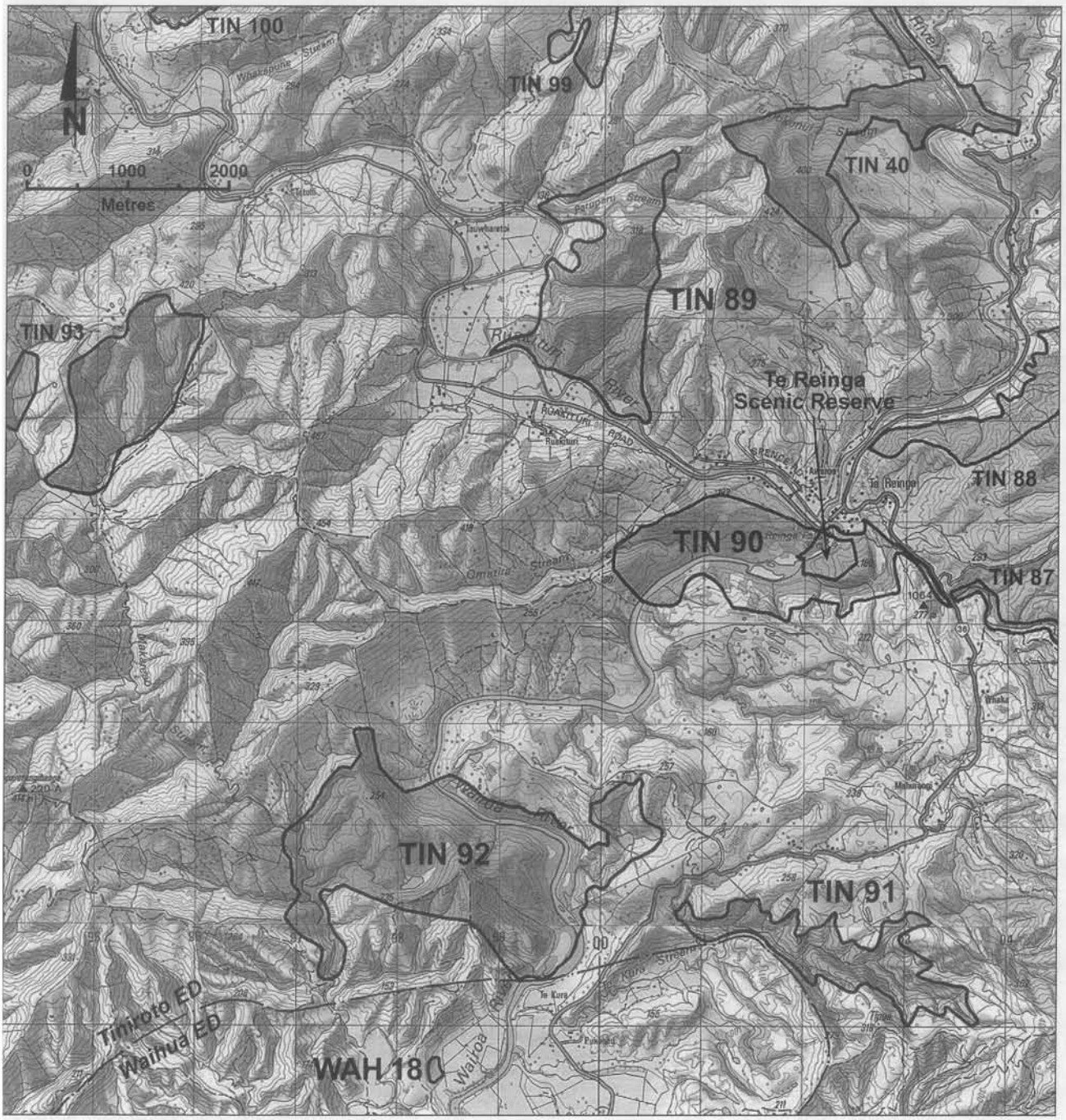
Past logging and clearance/burning has created the mosaic of different aged vegetation within this RAP. Logged primary forest lies on the moist predominantly south-facing gully slopes, with scattered rimu, rewarewa, kahikatea and matai emergent over the tawa-dominated canopy. Titoki, mamaku, hinau and pukatea are also present. Secondary kanuka forest dominates the upper slopes and ridges on the sunny northerly faces, between the forested gullies. It ranges from forest with a pure kanuka canopy, to that which has abundant broadleaved trees, young tawa and podocarps amongst it. On alluvial terraces in the southwest corner of the RAP there is a pocket of advanced secondary kahikatea-totara forest.

The forest on the alluvial terraces has largely been reduced to sparse heavily grazed treeland. Domestic stock have access to the whole RAP, with feral goats also present. No problem weed species were noted. Kereru and common bush and field birds including tui, fantail and grey warbler are present within the RAP.

Significance and justification

This RAP is significant as it contains vegetation covering a great diversity of successional stages including a substantial area of primary forest, on a wide range of ridge and valley landforms. It also has significant wildlife habitat values, with an SSWI ranking of 'moderate'. The RAP can be viewed from Ruakituri Road, forming an attractive back drop to the river.

Map 16: RAPs TIN 89-92 and WAH 18 (NZMS 260 X18 & X19)



RAP TIN 90 TE REINGA

Refer to Map 16 (p. 187)

Study site No.	679
Priority:	1
Grid Reference:	NZMS 260 X18 020535
Area:	202 ha
Altitudinal range:	30-200 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest kanuka forest manuka-kanuka scrub

Description

This RAP is continuous with and essentially encloses Te Reinga Scenic Reserve which lies on hill-slopes and steep faces around Te Reinga Falls (35 m high), just below the confluence of the Hangaroa and Ruakituri Rivers. The western portion of the RAP comprises narrow alluvial terraces and moderate slopes rising to ridges flanking both sides of the Wairoa River. The south-facing (true right) slope is strongly dissected by Omatira Stream near the RAP's western end. To the east it includes a parallel-sided canyon which is a meander loop of the former river course deeply incised into the Whakapunake limestone, and most of the hill surrounded by the canyon (Te Ihu-o-Rakai), the part not included in the scenic reserve. Tuturi Stream, which drains much of the western flanks of Mt Whakapunake (RAP TIN 87) falls over the eastern rim of the canyon at times of flood, while at normal flows it flows underground to emerge as springs feeding Waerakeina Stream in the downstream end of the canyon. A narrow strip of riparian vegetation up Tuturi Stream is included in the RAP, linking to TIN 87 at the arbitrary boundary of SH36.

Past logging, clearance and fires have created the mosaic of vegetation around the falls. Most of the south-facing hill-slopes support secondary vegetation, which ranges from young bracken and manuka scrub, to pure kanuka forest and tall kanuka in mosaic with broadleaved trees and shrubs (including rewarewa, heketara, mahoe, kohuhu, kowhai, akeake, houhere and five finger). Pockets of tawa forest lie in the stream gullies and lower moist hill-slopes, with titoki, pukatea, occasional kahikatea, rimu and totara. At the western end of the RAP on the alluvial terraces and south-facing lower hill-slopes there is a strip of primary unlogged rimu-kahikatea-(totara)/tawa-pukatea forest. The largest podocarps are at least 35 m tall. The understorey is kept sparse by browsing animals, with only scattered young tawa, small-leaved shrubs and ferns. Those parts of the upper slopes that have been affected by the most recent fires, that crossed the ridge from the north, have a patchy low vegetation dominated by manuka, bracken and blackberry.

The northern slopes around Te Ihu-o-Rakai are dominated by manuka scrub, with kanuka, kohuhu, putaputaweta, kowhai, five finger, mahoe, cabbage tree and rewarewa. Wilding pines are scattered over the low canopy. The southern slopes have tall kanuka forest, with emergent rewarewa. Young titoki, tawa, kahikatea, akeake and mahoe are also present amongst the canopy. The steep faces above the river

support a variable mosaic of kowhai, akeake, tutu, *Pittosporum ralphii*, kohuhu, kanuka, tuhara, rangiora, kiokio, whahariki, Mexican daisy, *Jovellana sinclairii*, kanuka and kaikomako.

The downstream half of the old river meander supports modified primary/advanced secondary tawa-titoki forest with abundant pukatea, gully tree fern, occasional nikau, kanuka and kahikatea (towards the river - including one very large individual with a diameter of >2 m). The sub-canopy/understorey is a lush mosaic of broadleaved trees and shrubs and ferns, including mainly mahoe, pate, houhere, hangehange, nini and hen and chicken fern. The limestone outcrops and walls of the canyon support *Jovellana sinclairii*, kiokio, sweet fern and scrub nettle. The north-facing and eastern slopes have more modified forest, with scattered tawa, titoki, mahoe, kohuhu, tall kanuka and lancewood dominating the canopy. Above the canopy are two original podocarps: a large rimu and a matai. Grazing and browsing has almost eliminated the understorey vegetation. The forest merges to tall kanuka forest and kanuka scrub which extend to the west on north-facing slopes above the Wairoa River.

The most conspicuous weeds are Japanese honeysuckle, hawthorn, scattered wilding pines, willows and poplars (in dense swards along the river bank), Mexican daisy, cotoneaster and blackberry. Control of the first three species is most urgent. Domestic stock (horses, sheep and cattle) browse and trample the vegetation in places. Cattle are the most damaging and invasive, whilst sheep probably keep undergrowth from regenerating in the river terrace forest. Feral goats and possums are present too, with the goats able to browse even the steepest rocky faces above the river and falls. Control/exclusion of these species is a high priority.

Significance and justification

This RAP has high significance, containing varied and spectacular landforms and a diverse range of vegetation from primary terrace and hillslope forest, cliff and riverine vegetation, to a range of secondary scrub-forest. It also complements and enhances the conservation values of the Te Reinga Scenic Reserve (PNA 32), with which it is continuous. The vegetation within the RAP is more diverse, and contains a significant percentage of primary vegetation in comparison with the scenic reserve, covering both steepland, gorge and terrace landforms. The downstream part of the RAP includes the only section of the Wairoa River or its major tributaries where indigenous vegetation covers a section across the whole valley from ridge to ridge, other than in the far headwaters.

The RAP is also important as a wildlife habitat. Fifteen indigenous bird species have been recorded in the forests around Te Reinga, including tui, bellbird, silvereye, fantail, kereru, shining cuckoo, Australasian harrier, NZ kingfisher, white-faced heron, black-backed gull, black shag, and pied stilt. Long-tailed bats are also likely to be present, with many potential roost sites (large podocarps and rock overhangs). They have been recorded c. 10 km north in the Hangaroa River valley (RAP TIN 38).

The RAP has highly significant aesthetic/scenic and cultural values.

RAP TIN 91 PUKEHAU

Refer to Map 16 (p. 187)

Study site No.	542
Priority:	3
Grid Reference:	NZMS 260 X19 023497
Area:	121 ha
Altitudinal range:	50-300 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest kanuka-broadleaved forest kanuka scrub forest

Description

This RAP covers moderate to steep-sided stream gully slopes in upper catchment of the Te Kura Stream, a true left tributary of the Wairoa River. The vegetation on the sunny north-facing slopes is dominated by fairly even-aged kanuka forest. The moister south-facing slopes have a diverse range of broadleaved trees and treeferns amongst the kanuka, including putaputaweta, houhere, mamaku, small-leaved kowhai, kowhai, totara, young kahikatea, kohuhu, titoki. The sub-canopy and understorey are also diverse with mahoe, heketara, pigeonwood, five finger, hangehange and karamu. The stream banks are lush in parts with swards of kiokio, *Jovellana sinclairii*, gully fern, nini, hangehange and rangiora. Several ridges of black beech forest are present at the eastern end of the gully. The western end of the gully has scattered large kahikatea and young totara. The vegetation on the north-facing slopes is more patchy and broken with fewer broadleaved species amongst kanuka-dominated canopy. Red-fruited karamu, common shieldfern and locally swards of blackberry dominate the understorey.

Feral goats and domestic stock (sheep and cattle) are present within the RAP, however only feral goats appear to graze the steeper slopes. The understorey on both side of the gully shows signs of grazing. The RAP is also threatened by kanuka clearance, with a number of stumps observed particularly on the southern edge. Blackberry and wilding pines were the most conspicuous weeds. Tui, fantail and grey warbler were recorded during the survey.

Significance and justification

This RAP is significant as it contains one of the best examples of indigenous vegetation on a steeply incised stream gully system in the central part of the district. The indigenous vegetation also plays a significant role in erosion control.

RAP TIN 92 MAKAREAO-WAIROA RIVER

Refer to Map 16 (p. 187)

Study site No.	418
Priority:	1
Grid Reference:	NZMS 260 X18 985505
Area:	462 ha
Altitudinal range:	20-260 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer forest tawa forest kanuka forest kanuka scrub freshwater lake

Description

This RAP straddles the Wairoa River, the bulk of it on the true right where an undulating ridge system encloses a shallow basin that contains a small lake (a). To the west-southwest the moderate to gentle slopes drain into the Makareao Stream, a true right tributary of the Wairoa River. The outer slopes to the north and east are moderate to steep, falling to alluvial terraces on the river side. The RAP also includes terraces and riparian slopes on the opposite (true left) side of the river, the slopes around a small deeply incised true left tributary which drains a small lake (b), and a wide basin, with moderate to steep sides in which the lake is set.

Tall kanuka forest is the dominant vegetation type within the RAP, with most tall and even-aged with a solid canopy. Along the northeastern river terraces and terrace risers (true left side of the river) there are small patches of podocarp forest, with kahikatea, totara and scattered matai. Kanuka forest surrounds these areas and dominates the terrace risers, with scattered broadleaved trees amongst the canopy (including houhere, cabbage tree, mahoe and putaputaweta). Bands and pockets of primary broadleaved trees, and tawa-pukatea forest are present in the stream gullies on the upper gentle slopes. One of the largest areas of such forest lies on moderate slopes at the northeastern end of lake (a). The tall canopy is intact and dominated by tawa and pukatea with numerous conical kahikatea particularly on the lower slopes merging onto valley floor areas of poorer drainage. Emergent rimu and matai are present but only in very low numbers. There are also substantial areas of primary forest along the margins of the Makareao Stream to the west. Lake (a) is surrounded by a wide band of raupo reedland, with other rush and sedge species around the margin.

The vegetation around lake (b) includes a substantial core area of primary logged tawa-pukatea forest in the northern valley draining into the lake. There are occasional large rimu and kahikatea emergent over the tawa-dominated canopy. The kahikatea are more abundant at the bottom of the slope, forming a narrow band along the southern margin of the forest, near the lake edge where the soil is wetter. The tawa forest is buffered by a broad band of kanuka forest with scattered broadleaved trees amongst it, grading to younger pure kanuka forest to scrub amongst pasture.

Paddock fencing occurs throughout the RAP with obvious cleared strips long the fence lines. The forest is also grazed throughout, by both domestic stock and feral goats. Both lakes have obvious signs of trampling and grazing around their margins. Kereru, whitehead, tomtit and common bush birds including fantail have been recorded within the RAP.

Significance and justification

This RAP is significant for its large area of solid kanuka-dominated secondary forest on a comprehensive range of ridge, slope and valley landforms and aspects, diversified with important remnants of primary forest. It also contains two lakes whose catchments are almost completely dominated by indigenous vegetation, very few of which remain in the Tiniroto Ecological District. It is the farthest downstream of a long chain of sizeable riparian forest areas on the Wairoa River and its Hangaroa/Ruakituri River tributaries. The RAP has an SSWI ranking of 'moderate'. There is a terraced pa site at the southwestern corner of the RAP. The kanuka forested landscape of this RAP is highly visible from SH36.

RAP TIN 93 TETUHI

Refer to Map 17 (p. 194)

Study site No. 761

Priority: 3

Grid Reference: NZMS 260 X18 953553/942552

Area: 175 ha

Altitudinal range: 190-410 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
kanuka forest
kanuka-(manuka) scrub

Description

This RAP includes a large area on generally southeast facing finely dissected moderate to steep hill-slopes in the upper catchment of the Makareao Stream, a true right tributary of the Wairoa River, and a smaller remnant to the west that covers the lower slopes and stream sides of a wider basin sub-catchment. The RAP is bounded on all margins by young scrub and pasture. The core of the smaller remnant, on the lower hill-slopes and stream slopes is primary tawa-pukatea-rewarewa forest. Hinau, totara (one), northern rata (one) and titoki are also present. This forest is surrounded by kanuka forest, that grades to younger kanuka-manuka scrub to the west.

The larger portion of the RAP is dominated by manuka-(kanuka) scrub, with primary tawa-dominated and advanced secondary broadleaved forests in the stream gullies. The broadleaved species and treeferns present in the gullies and amongst the older kanuka include mamaku, wheki, wheki-ponga, tawa, rewarewa, mahoe, pigeonwood, heketara, houhere, lancewood, kohuhu, titoki, young podocarps and kowhai. The youngest scrub, with manuka, mingimingi and tauhinu amongst it occurs at the

southern end of the central remnant and around the margins of both. Those areas that are most heavily grazed and open have red-fruited karamu as the dominant understorey species, with pasture grasses.

Most of the vegetation within the RAP has established following clearance/burning of the original forest cover. As with most sites that have been burnt and cleared the bulk of the older and more diverse vegetation lies on the south-facing slopes and in the moist stream gullies. Feral goats and domestic stock have access to the remnants, with severe browsing and grazing noted in parts. Common bush birds including tomtit, grey warbler, tui, bellbird, Australasian harrier and fantail were recorded.

Significance and justification

This RAP's significance is derived from its substantial size and diversity. It contains vegetation at a range of successional stages, from young scrub to scattered primary forest fragments, over a range of altitudes and landforms. The areas of secondary vegetation within the RAP have tremendous potential, with the areas of primary forest contained within it providing a seed source for their further regeneration.

RAP TIN 94 MANGAARUHE TRIBUTARY

Refer to Maps 17 and 33 (pp. 194 and 276)

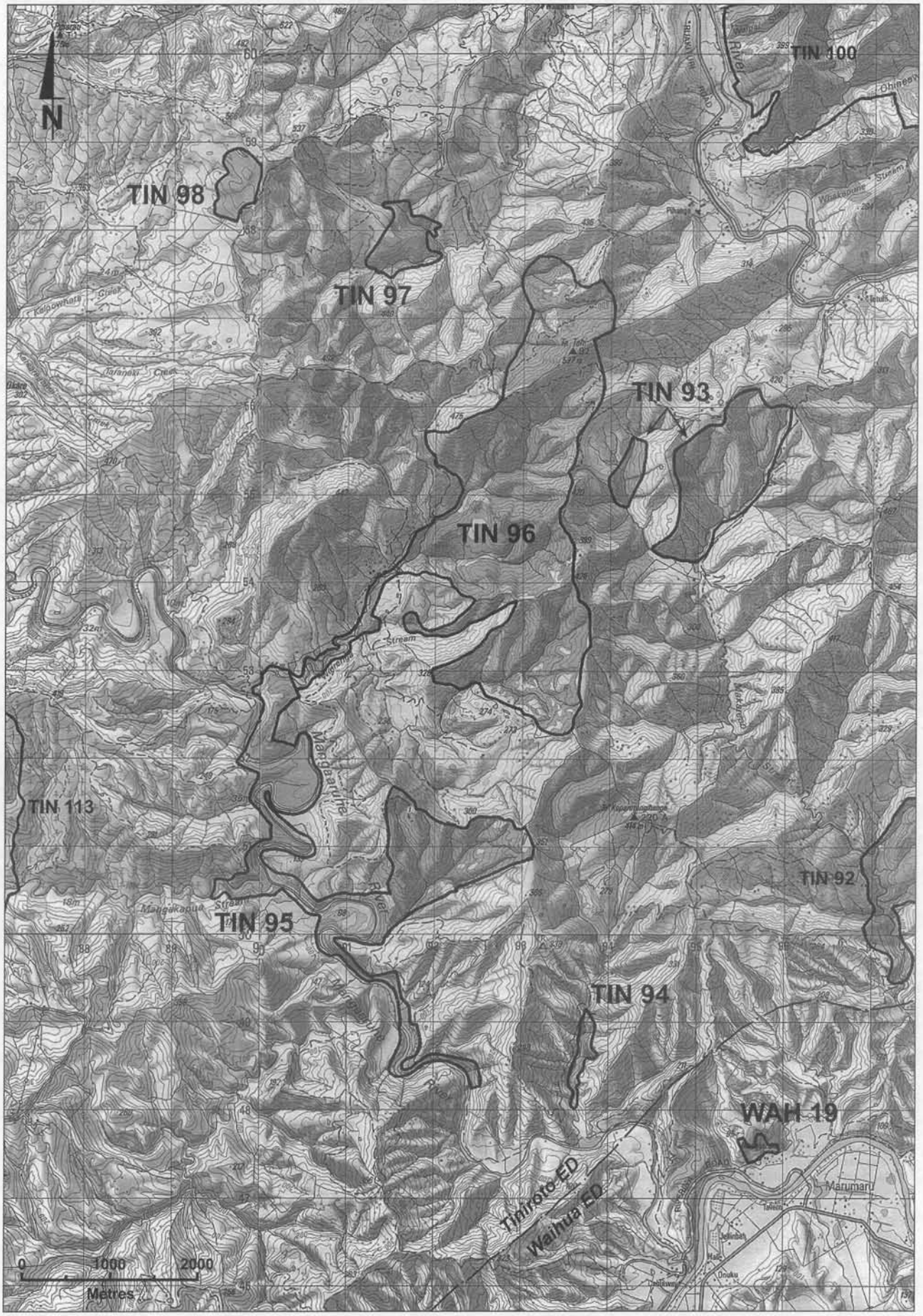
Study site No.	416
Priority:	2
Grid Reference:	NZMS 260 X19 936484
Area:	15 ha
Altitudinal range:	40-140 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest conifer/kanuka forest

Description

This RAP includes a 100-200 m wide band of forest extending 1.2 km along a stream valley, lying on narrow terraces, lower stream banks and moderate to steep hill-slopes. The stream is a small true left tributary of the Mangaaruhe River, which flows into the Wairoa River c. 2.5 km downstream from the tributary. The RAP covers only the lower to mid-slopes of the valley, with most of the indigenous vegetation lying on the westerly facing slopes.

The lower slopes around the stream support kahikatea-matai-(totara)/tawa forest treeland. The matai and kahikatea are large, with only occasional sizeable totara. The canopy also has occasional titoki, with pigeonwood, mahoe and houhere in the sub-canopy. The understorey is quite grazed and open with only scattered small-leaved shrubs and ferns (including *Coprosma rotundifolia*, poataniwha, *Pseudopanax anomalus*, rohutu, turepo, common maidenhair, common shieldfern, gully fern, kiwakiwa and nini). Up-slope tawa becomes scattered or absent from the canopy, with kahikatea, totara and tall kanuka the dominant canopy trees. Lemonwood, white

Map 17: RAPs TIN 93-98 and WAH 19 (NZMS 260 W18, W19, X18 & X19)



maire, kowhai, titoki, putaputaweta, mahoe and lancewood are also present. The understorey is largely open and grazed with a similar suite of small-leaved shrubs as on the lower slopes. Conspicuous vines present in the forests include *Metrosideros colensoi*, *Metrosideros diffusa*, NZ convolvulus, and native jasmine.

Sheep and cattle are the main browsers within the RAP, with some trampling and pugging along the stream margins. Selective logging has removed some of the larger podocarps, particularly totara which was used widely for fencing. The gully in which the RAP lies is relatively sheltered with exposure mainly to southerly winds. Mexican daisy and blackberry were the main weeds noted. Kereru, kingfisher, fantail and grey warbler are present.

Significance and justification

This RAP is one of the best remaining examples of the original podocarp-rich forest that would have clothed the fertile lower slopes and stream sides of the lower Mangaaruhe River valley in both the Tiniroto and Waihua Ecological Districts (this RAP lies very close to the transitional boundary between these districts). The lower reaches of the river are now much modified and cleared, with secondary kanuka-dominated scrub-forest the most extensive indigenous vegetation type.

RAP TIN 95 MANGAARUHE RIVER

Refer to Map 17

Study site No.	722 & 723
Priority:	2
Grid Reference:	NZMS 260 X18 902505
Area:	360 ha
Altitudinal range:	60-340 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest conifer/kanuka forest kanuka forest

Description

This RAP covers alluvial terraces (both old and current), moderate to steep river side banks and scarps, and gentle to moderate hill-slopes along an 11 km length of entrenched meanders of the Mangaaruhe River, and the moderate hill-slopes in a nearly complete catchment of an unnamed true left tributary. The unnamed stream is fed by a small wetland on the catchment's upper eastern margin (not surveyed). The RAP also includes riparian slopes in the lower reaches of the Wairenga (which originates in RAP TIN 96) and Mangakapua (which originates in RAP TIN 113) Streams. The centre of the RAP, on the true right of the river is abutted by a pine plantation.

The riparian vegetation within the RAP is predominantly secondary scrub-forest and advanced secondary forest that has established following past logging/burning/clearance. Kanuka is the dominant species, forming a pure canopy in places, particularly on the old alluvial terraces and in patches on the moderate river banks.

The older stands of kanuka have abundant totara regenerating through them and becoming emergent to form (totara)/kanuka forest. Other species scattered amongst the kanuka include kowhai, houhere, young kahikatea, treeferns, mahoe, pigeonwood and kohuhu. In several places on the moderate to steep river banks there are impressive patches of primary kahikatea-totara forest, with occasional matai, tawa and titoki. The largest of these lies on the true left of the river in the southern half of the RAP. The complete stream catchment also has predominantly secondary vegetation dominated by kanuka, with pockets of broadleaved trees in the lower stream gullies and on the moister south-facing slopes.

The RAP is grazed in parts by domestic stock and feral goats, with deer and pig sign also noted. Blackberry was the only conspicuous weed noted.

Significance and justification

This RAP is significant as an c. 11 km corridor of indigenous vegetation along the Mangaaruhe River, with pockets of primary vegetation providing seed sources for further regeneration. The vegetation varies in relation to the wide range of inner valley landforms including riparian bluffs, steep and moderate slopes, flights of alluvial terraces and the entrenched meander pattern, which is spectacular. The RAP also contains a side stream catchment and connects to RAP TIN 96 in the lower reaches of the Wairenga Stream.

RAP TIN 96 WAIRENGA STREAM

Refer to Map 17 (p. 194)

Study site No.	762
Priority:	2
Grid Reference:	NZMS 260 X18 930545
Area:	709 ha
Altitudinal range:	100-537 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer forest tawa forest kanuka forest manuka-kanuka forest

Description

This RAP encompasses several sub-catchments and the headwaters of the Wairenga Stream, a true left tributary of the Mangaaruhe River. The catchment consists of a series of moderate to steep sided stream gullies and bluffs that rise to long narrow ridges to the north (to Te Tahi high point 537 m) and east. It also includes the upper catchment of a true right tributary of the Ruakituri River, extending north from the Te Tahi high point. The RAP is continuous with RAP TIN 95, at its southwestern end, in the lower reaches of the Wairenga Stream. A newly established pine plantation bounds the RAP along most of its eastern margin, which is almost entirely fenced.

The vegetation is largely dominated by secondary kanuka scrub-forest, with small pockets of modified primary tawa-dominated forest in the lower stream gully slopes, and conifer treeland and forest along the main stream gully slopes. The kanuka forest has scattered emergent rewarewa, with young podocarps (totara, kahikatea and rimu), mahoe, houhere, putaputaweta, cabbage tree and treeferns amongst the canopy in places. There are also abundant kowhai amongst the kanuka on the steeper upper slopes. Manuka scrub occurs in moasic with kanuka scrub-forest on north-facing slopes and ridges towards the northern end of the area. The conifer forest-treeland has abundant totara, with occasional young kahikatea and matai, locally dense kowhai, houhere, cabbage tree, wheki, narrow-leaved lacebark and mahoe amongst the canopy. The steep riparian slopes that link this RAP and RAP TIN 95 along the Wairenga Stream are a mosaic of bare bluffs, conifer forest and younger kanuka-dominated shrubland-scrub-low forest.

Most of the original vegetation within the RAP has been cleared in the past for farming leaving only patches of primary vegetation in the moist stream gullies. Domestic stock and feral goats are present.

Significance and justification

The RAP is significant as a large tract of indigenous vegetation, with a diverse range of secondary and modified primary vegetation types, on a regular landform pattern with sunny and shady aspects, over a wide altitudinal range. It is also continuous with RAP TIN 95, an extensive predominantly riparian area, in the Mangaaruhe River. With its size and range of vegetation types this RAP is also an important wildlife habitat with an SSWI ranking of 'moderate': bellbird, tui, kingfisher, grey warbler, fantail, white-faced heron, tomtit, whitehead, threatened NZ falcon and kereru have all been recorded.

RAP TIN 97 WAIKATEA

Refer to Maps 17 and 18 (pp. 194 and 201)

Study site No.	762 h
Priority:	2
Grid reference:	NZMS 260 X18 916578
Area:	41 ha
Altitudinal range:	200-320 m
Bioclimatic zone:	lowland
Vegetation class:	conifer/tawa forest kanuka scrub-forest manuka scrub

Description

This RAP consists of two small sub-catchments in the upper catchment of a tributary of the Ruakituri River, c. 11 km west of Te Reinga. A central wide ridge divides the two small stream gullies. The western boundary of the RAP is fenced, while young kanuka scrub-forest occurs along the upper edge, and manuka-dominated scrub and pasture

bound the area at other margins. An active earthflow lies on the RAP's western boundary.

Primary conifer/tawa forest dominates the stream gullies and mid-slopes, with scattered emergent rimu, kahikatea, matai and rewarewa. Titoki, kowhai, pukatea and occasional hinau are also present amongst the tawa-dominated canopy. Secondary kanuka-dominated vegetation occurs along the upper central ridge, with houhere, kohuhu, cabbage tree, putaputaweta and wheki-ponga all present amongst the even continuous canopy. The understorey is quite open and grazed throughout, with some fern groves and palatable species present on the stream side banks and epiphytic. The manuka-dominated scrub on the other margins has broadleaved trees and shrubs and young conifers regenerating through it in places.

Significance and justification

This RAP is significant as it is largely primary forest, on a variety of moderate terrain and soils of high natural fertility, in a part of the district where very little such forest has survived although secondary vegetation is now relatively extensive.

RAP TIN 98 PARAUMU

Refer to Maps 17 and 21 (pp. 194 and 212)

Study site No. 801

Priority: 2

Grid Reference: NZMS 260 W18 897585

Area: 29 ha

Altitudinal range: 440-520 m

Bioclimatic zone: lowland

Vegetation class: conifer/broadleaved forest

Description

This compact RAP lies on gentle to moderate southwest facing hill-slopes, modified from ancient landslide material, in the headwaters of the Kaipowhata Stream (a tributary of the Mangatawhiti Stream, which flows into the Mangaaruhe River). A farm access road bounds the RAP along its eastern margin. A small lake (not surveyed) lies on the RAP's northern boundary. The vegetation is primary logged rimu-matai/tawa forest, with hinau, pukatea, white maire and kamahi also present in the canopy. Rimu and matai are the dominant emergents, with fewer rewarewa, miro, kahikatea and local totara. Treeferns and broadleaved species dominate where the tall canopy is broken. The understorey is grazed and open in parts, with high grazing pressure. Old logging roads are still visible.

Significance and justification

The forest (forest type M4 of Nicholls 1976) within this RAP, though partially logged, and degraded by grazing, still maintains a largely intact tall canopy, with abundant emergent podocarps. Most of the similar forest on gentle to moderate slopes in this western part of the district is in smaller patches or has been more heavily modified.

RAP TIN 99 TAUWHARETOI (2)

Refer to Map 18 (p. 201)

Study site No. 764

Priority: 2

Grid Reference: NZMS 260 X18 999591

Area: 64 ha

Altitudinal range: 160-390 m

Bioclimatic zone: lowland

Vegetation/landform classes:

tawa forest
kanuka/manuka scrub
freshwater lake
raupo reedland

Description

This RAP contains a complex of two lakes and a wetland nestled in a series of perched basins, and an adjoining upper stream gully that contains pockets of primary forest surrounded by secondary vegetation. The three lakes/wetlands contribute to streams that flow into the true left of the Ruakituri River. The southern wetland feeds the lake below it, while the northern lake drains into the adjacent stream gully. A farm track runs along the RAP's northern boundary, dividing it from Taumata Karamu RAP TIN 100.

The northern lake is surrounded on three side by moderate to steep hill-slopes. The hill-slopes support secondary kanuka-dominated treeland-forest with scattered broadleaved species. The lake margin is grazed around its margin with only scattered rush and sedge species. There are occasional bands of raupo reedland.

The lake to the south is half open water, with raupo reedland/*Carex* sp. islands throughout, and pockets of manuka swamp around its margin. Other species present include swamp kiokio, purei, *Juncus* sp. and willow weed. The wetland above has raupo reedland, *Isolepis prolifer*, rush and sedge species. Scattered on the hill-slopes around both is kanuka-manuka scrub low forest, with mahoe and other broadleaved species in places. Both are grazed and trampled around much of their margins.

The vegetation in the stream gully adjacent to the lakes to the east is dominated by secondary kanuka scrub-forest with scattered broadleaved trees, and several pockets of primary tawa-dominated forest in the gully bottom. The slopes also have scattered wilding pines.

The integrity of the wetland/lakes is threatened by cattle grazing and trampling, and the input of nutrients (effluent and fertilizer).

Significance and justification

The RAP is an important wildlife habitat with a number of wetland and forest birds recorded, including spotless crake, NZ scaup, grey duck, paradise shelduck, black shag, NZ dabchick and pukeko. Few of the many small hill country lakes and wetlands in the district have any direct associations with indigenous forest/scrub in their

catchments. It also complements and enhances the ecological values of RAP TIN 100 with which it is continuous.

RAP TIN 100 TAUMATA KARAMU

Refer to Map 18

Study site No.	174
Priority:	1
Grid Reference:	NZMS 260 X18 980605
Area:	1111 ha
Altitudinal range:	100-583 m
Bioclimatic zone:	lowland
Vegetation classes:	podocarp/broadleaved forest kanuka-broadleaved forest kanuka forest

Description

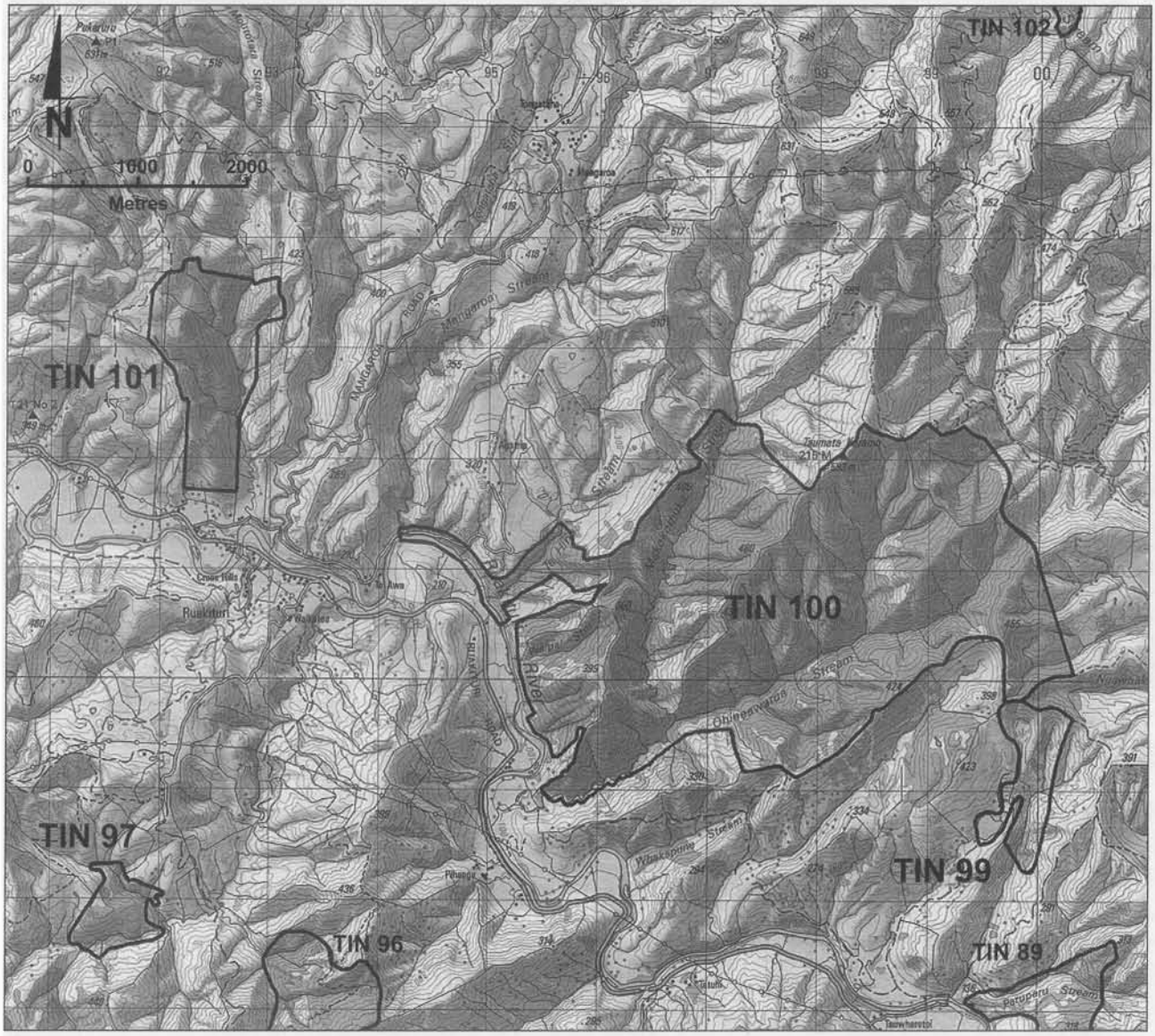
This RAP is one of the largest areas of privately owned indigenous vegetation in the northern part of the Tiniroto Ecological District. It covers most of the catchments of the Ohineawarua and Makokomuka Stream and small adjoining areas in true left tributaries of the Ruakituri River, together with smaller catchment headwaters draining to the true right of the Hangaroa River (including the upper Whareti Stream). The vegetation of the RAP is predominantly secondary kanuka scrub-forest, with ribbons of older podocarp/broadleaved forest on the lower slopes and in gullies. The older kanuka forest has a mosaic of broadleaved species and treeferns in the canopy (including mahoe, houhere, lemonwood, kowhai and kohuhu). The understorey of the kanuka scrub-forest is dominated by hard fern and red-fruited karamu, particularly on the margins and in the southern parts of the RAP. The primary forest in the gullies has occasional large rimu, kahikatea, pukatea, tawa and hinau. In the northern stream gully heads, close to the Taumata Karamu trig point, there are large areas of scattered primary trees amongst the tall kanuka canopy.

The band of riparian vegetation by the Ruakituri River, around the mouth of and upstream from Te Hinu Stream, is predominantly kanuka scrub forest on the upper margins, with tall kanuka in mosaic with primary and advanced secondary conifers, including kahikatea, totara and matai, and broadleaved shrubland low forest on the lower slopes and narrow alluvial river terraces.

Significance and justification

This RAP's extensive secondary scrub and forest is particularly significant for its landscape-scale size and comprehensive coverage of ridge and valley landforms. Scattered primary forest remnants provide additional diversity and seed sources. The secondary forest is regenerating and has enormous potential. The area has an SSWI ranking of 'moderate', with forest bird species present including tomtit, whitehead, fantail, grey warbler, NZ falcon and kereru.

Map 18: RAPs TIN 99-101 & 97 (NZMS 260 X18)



RAP TIN 101 TUAHU

Refer to Map 18

Study site No.	763
Priority:	2
Grid Reference:	NZMS 260 X18 925630
Area:	150 ha
Altitudinal range:	180-480 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest conifer/kanuka forest broadleaved/small-leaved scrub

Description

This RAP covers much of the catchment of a true left tributary of the Ruakituri River. It consists of pockets of logged primary forest (podocarp/tawa forest) in moderate stream gullies and lower hill-slopes, amongst secondary kanuka-dominated forest on upper hill-slopes and ridges. Several areas of young manuka-dominated scrub amongst rough pasture surround the core areas of forest. Many of the RAP's boundaries are fenced.

Past logging and clearance/burning has created the mosaic of vegetation within this RAP. Slopes in the northeast, northwest and south have the youngest scrub vegetation dominated by manuka, with kanuka and other broadleaved shrubs (including kohuhu and five finger). Kohuhu, kowhai, mahoe, cabbage tree, putaputaweta, five finger and young tawa are locally dense. Kahikatea is also common throughout the kanuka, with dense stands around stream gullies and on lower hill-slopes. Rewarewa, also common throughout, occurs in dense stands but on the ridges and upper hill-slopes. The logged primary forest in the stream gullies and faces is dominated by tawa and titoki, with pukatea, occasional treeferns and tall kanuka amongst the canopy. Kahikatea is the most abundant podocarp with scattered young and mature matai and rimu also present.

Feral goats and domestic stock grazed some parts of the RAP, particularly at the margins and amongst the young scrub to the south.

Significance and justification

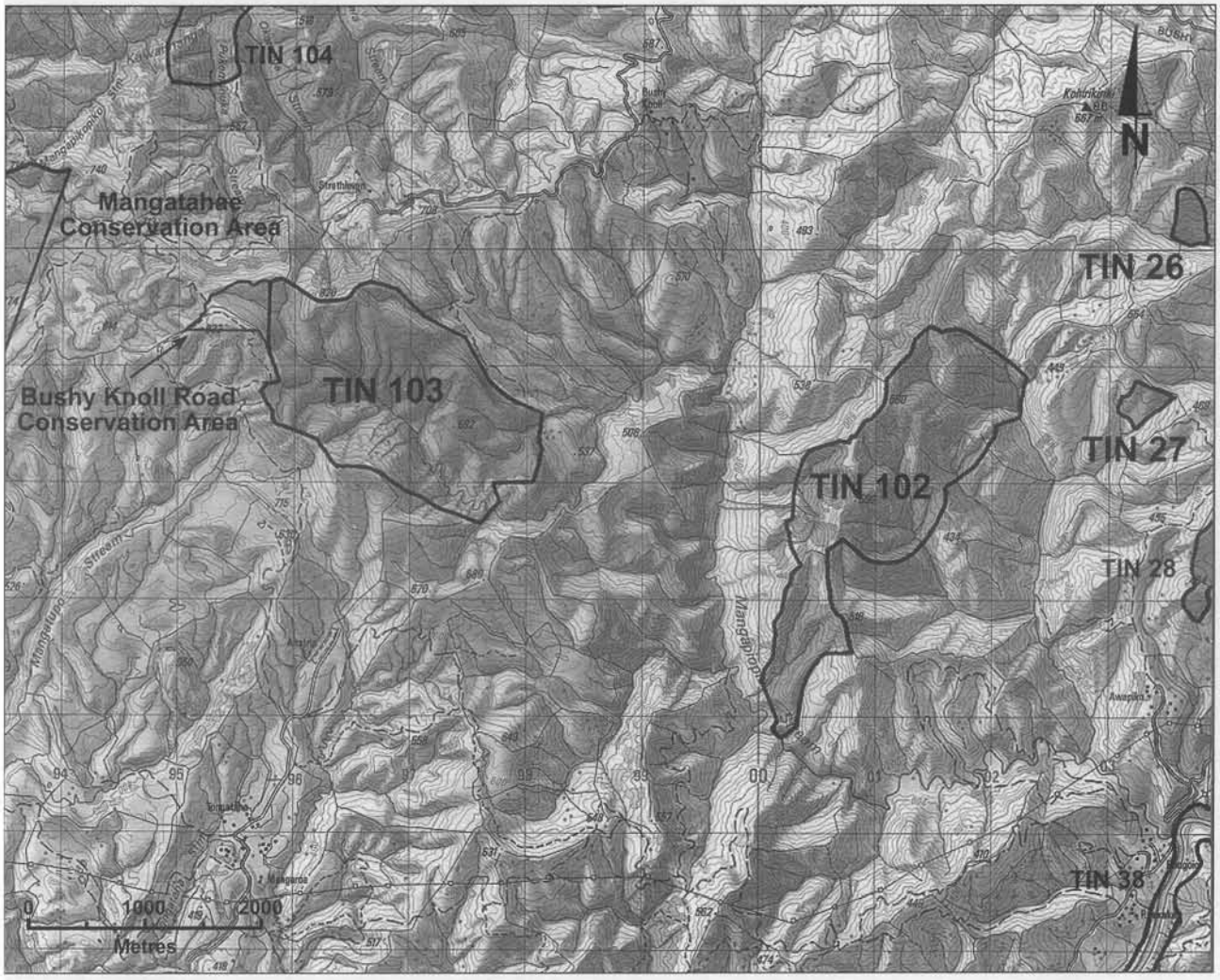
A notable botanical feature of this RAP is the abundance of pole kahikatea throughout both the tawa-dominated and the kanuka-dominated forests. This feature is unusual and occurs in only a few other less intact/diverse areas in this ecological district. The secondary vegetation within this RAP has enormous potential to regenerate given the diversity of primary species in the gullies. Although there is grazing pressure from some stock, feral goats, deer and pigs the understorey of both forest types is relatively intact. The RAP is also a significant wildlife habitat with tui, silvereye, grey warbler, Australasian harrier, and NZ falcon all recorded within the vicinity.

RAP TIN 102 MANGAPIOPIO STREAM

Refer to Map 19

Study site No.	116
Priority:	3
Grid reference:	NZMS 260 X18 010680
Area:	285 ha
Altitudinal range:	200-590 m
Bioclimatic zone:	lowland
Vegetation class:	kanuka forest broadleaved forest-scrub-shrubland manuka scrub

Map 19: RAPs TIN 102, 103, 26 & 27 (NZMS 260 X18)



Description

This RAP lies on mainly steep finely dissected hill-slopes in the catchment of the Mangapiopio Stream, a tributary of the Hangaroa River. The bulk of the RAP has an east-southeasterly aspect and falls from a long central ridge (high points 580 and 590 m) and prominent side spurs. The southern end of the RAP has long steep slopes that extend from the Mangapiopio Stream to narrow ridge crests. The vegetation on all margins fades to younger scrub and pasture, with only localised paddock fencing.

The vegetation within the RAP is a mosaic of secondary shrubland-scrub, and advanced secondary scrub-forest. Most of the more advanced vegetation lies in upper easterly facing gully slopes. Emergent rewarewa is abundant over a mixed broadleaved canopy which includes kohuhu, heketara, mahoe, wineberry, whekiponga and cabbage tree. The lower slopes are dominated by kanuka scrub with scattered broadleaved trees (including kowhai, putaputaweta, mahoe, heketara and pigeonwood) amongst the canopy and along the stream sides and gully bottoms. The upper slopes are dominated by lower manuka scrub, with mingimingi, red-fruited karamu, karamu and bracken. There are scattered open grassy patches amongst the secondary vegetation, particularly along the ridge crests and upper slopes.

Feral goats and domestic stock graze the RAP, however stock only appear to penetrate the RAP's margins. Slip faces are evident on some of the steep upper slopes.

Significance and justification

This RAP is significant as it displays successional patterns typical in the transition zone between the northeastern dry section of the district and moister areas to the south-west and west: kanuka-dominated successions on the lower-mid-slopes, with manuka-dominated successions on the upper slopes. It is also one of the largest kanuka-manuka dominated remnants in the northern part of the district, and the only one on steeply dissected terrain.

RAP TIN 103 BUSHY KNOLL

Refer to Map 19 (p. 203)

Study site No.	112
Priority:	1
Grid Reference:	NZMS 260 X18 965690
Area:	303 ha
Altitudinal range:	520-830 m
Bioclimatic zone:	lowland to montane
Vegetation classes:	beech forest conifer/tawa-beech forest broadleaved scrub-shrubland manuka scrub

Description

This RAP is contiguous with Bushy Knoll Road Conservation Area and covers both sides of an upper sub-catchment of the Mangapiopio Stream. The catchment drains to the east, with the stream deeply incised in the valley bottom separating generally sunny slopes to the south from shady spurs and tributary valleys in the north. The RAP also includes steep north-facing slopes that fall from the main northern ridge.

Primary red beech-silver beech forest extends over most of the narrow steep ridge on the northern side of the catchment, down the main spurs emanating from it, and the steep south-facing upper slopes. Stunted rimu and scattered Hall's totara occur throughout the beech forest, with tawari, kamahi, broadleaf, toro, mountain horopito, heketara and mingimingi present in the sub-canopy/understorey. The remaining forest on the lower slopes is primary rimu/tawa-beech forest. The beech on the lower slopes is predominantly red and black. Many of the larger podocarps have been destroyed by crown fires/selective logging. Steep bluffs and slip faces of different ages run along the slopes above the main stream, supporting a mosaic of broadleaved shrubland grading to forest. The dry north-facing slopes above the stream have been the most modified, with manuka scrub and older secondary broadleaved vegetation. Kowhai is abundant on the steepest faces.

Grazing is limited in the main forest area, with feral goats, deer and possums the main threats.

Significance and justification

Large and compact, this RAP is the one of the best examples of primary rimu/beech forest in the north-western part of the Tiniroto Ecological District. Its protection along with Bushy Knoll Road Conservation Area (PNA 33) would be very worthwhile, as it includes a much larger proportion of the same catchment, with a wider range of altitudes, aspects and vegetation diversity. Birds are abundant with tui, kereru, fantail, grey warbler and rifleman all recorded.

RAP TIN 104 KAWAIMANGA STREAM

Refer to Map 20 (p. 206)

Study site No.	128 & 129
Priority:	3
Grid Reference:	NZMS 260 X18 960725
Area:	186 ha
Altitudinal range:	340-595 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest conifer/tawa forest conifer/kanuka forest broadleaved scrub-shrubland manuka scrub

Description

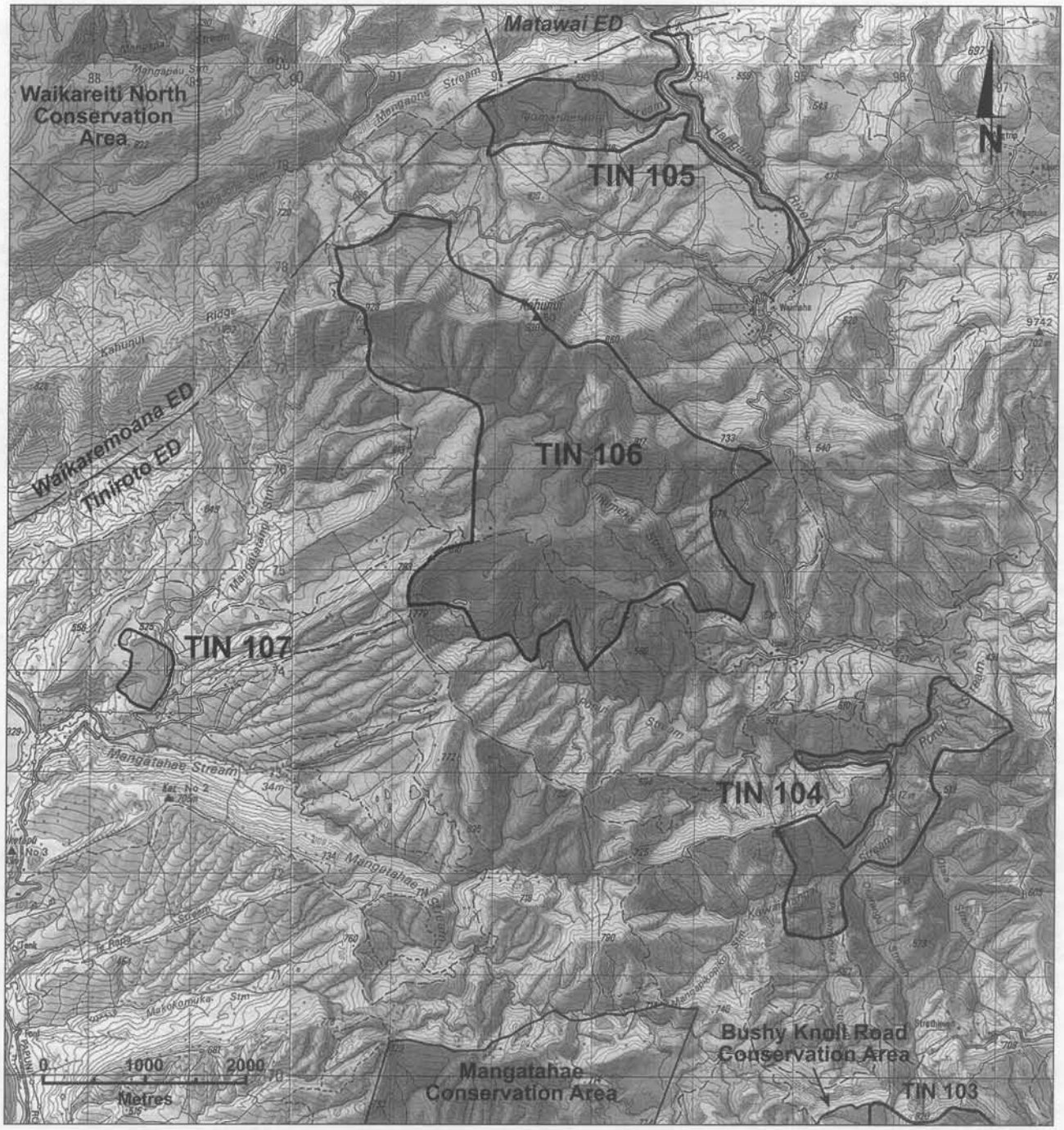
This RAP encompasses part of the catchments of the Okairanga, Otara, Pukemanuka and Kawaimanga Streams, which flow into Ponui Stream, a true right tributary of the Hangaroa River. The RAP merges into young scrub and bracken fernland and newly burnt land to the southeast and is bounded by pasture on all other margins. The slopes of the catchments are generally moderately steep, with unstable very steep faces and bluffs above the main stream where it is sharply incised. The vegetation over most of the RAP is a mosaic of secondary scrub, with older broadleaved shrubland forest in the stream gullies (including wineberry, rangiora, mahoe, putaputaweta, kohuhu, rewarewa, mamaku, occasional black beech and young podocarps). There is a substantial area of mainly primary forest on south-facing slopes above the Kawaimanga Stream. The mid to upper slopes, and lower slopes along the main stream gullies support modified primary podocarp/tawa forest, with scattered emergent rimu, matai and kahikatea. Occasional black beech are also present in the canopy on the upper slopes. The lower central slopes and ridge support younger secondary/advanced secondary (kahikatea)-kanuka/broadleaved forest.

Feral goat numbers are moderate to high, with domestic stock also present within the RAP. Parts have been recently burnt and cleared, with dead manuka spars evident over swards of hard fern, bracken and newly regenerated manuka scrub.

Significance and justification

This RAP contains a wide range of characteristic vegetation types, both primary and secondary, over a wide range of terrain including several kilometres of stream.

Map 20: RAPs TIN 104-107 (NZMS 260 W17, W18, X17 & X18)



RAP TIN 105 TAOMATIHERANGI STREAM

Refer to Map 20

Study site No.	96
Priority:	2
Grid Reference:	NZMS 260 X18 930795
Area:	139 ha
Altitudinal range:	360-656 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest tawa forest broadleaved forest broadleaved scrub-shrubland manuka scrub

Description

This RAP includes a forest-dominated remnant on predominantly south-facing hill-slopes extending from ridge to stream side, and the lower northerly faces/bluffs opposite, in the mid section of the Taomatiherangi Stream. This is continuous with a narrow riparian corridor that covers the stream's banks to its confluence with the Hangaroa River, and for c. 1 km upstream and c. 2 km downstream along the river's banks. The boundaries of the RAP on either side of the Taomatiherangi Stream appear to be completely fenced, with additional fencing in places along the upper edges of the riparian vegetation on either side of the Hangaroa River.

The vegetation of the remnant is predominantly secondary, the result of past logging and fires. The main ridge and upper spurs of the south-facing slopes support low even-aged advanced secondary kamahi forest, with heketara, mingimingi and pockets of young red and silver beech forest. This merges into rewarewa/tawa forest on the steep upper to mid-slopes. The lower slopes and stream sides have less modified red and silver beech forest, with young beech amongst larger primary trees, scattered kahikatea and rewarewa. Mamaku, kohuhu, mountain cabbage tree, mahoe wao and lemonwood are also present. Manuka dominates the scrub on the dry north-facing lower slopes, and young marginal vegetation at the eastern end of the main south-facing slope, with mingimingi, kohuhu, bracken, heketara, toetoe and wineberry establishing amongst it. The riparian vegetation along the lower reaches of the stream and along the Hangaroa River is a mosaic of young manuka-dominated scrub, broadleaved shrubland (with heketara, houhere, young Hall's totara, kohuhu, *Pittosporum ralphii* and kowhai) and small pockets of beech. Deer and pigs are present.

Significance and justification

This RAP is significant as it lies in the transitional zone between the Tiniroto, Matawai and Waikaremoana Ecological Districts. The dominance of kamahi in the advanced secondary vegetation and presence of silver beech at lower altitudes reflect this. It contains a diverse range of vegetation, from young secondary manuka scrub to tawa and beech-dominated primary forest, on a range of landforms (from stream side to

ridge crest). It is also an important part of a semi-continuous chain of indigenous vegetation patches that extend along the Hangaroa River valley for c. 75 km from the district boundary to its confluence with the Ruakituri River and beyond.

RAP TIN 106 KAHUNUI

Refer to Map 20 (p. 206)

Study site No.	97
Priority:	1
Grid Reference:	NZMS 260 X18 930760
Area:	886 ha
Altitudinal range:	460-930 m
Bioclimatic zone:	lowland-montane
Vegetation classes:	beech forest conifer/beech forest conifer/tawa-beech forest broadleaved forest manuka scrub

Description

This RAP is extensive, covering almost the entire catchment of the Ihumeka Stream, and the south-facing slopes of the upper Ponui Stream catchment, a true right tributary of the Hangaroa River. It also includes very steep slopes in its northwestern corner that extend from the main Kahunui highpoint (930 m) down to easy slopes and Waimaha Rd. A small lake lies in the top basin of the Ponui Stream catchment. Parts of the boundaries are fenced, with access tracks running along several of the main ridges and obvious (now largely overgrown) old logging tracks.

Four forest types were identified within this RAP: pure red beech-silver beech forest at the highest altitudes (between c. 820-930 m); rimu/beech forest between c. 780-820 m; rimu/tawa-beech forest at mid-altitudes; and rimu/tawa forest at the lowest altitudes. The pure beech forest occurs only along the high northerly ridge (Kahunui high point; 930 m) and spurs emanating south from it. Below c. 820 m the beech forest merges into rimu/beech forest, and (rimu)/beech forest where the rimu has been largely removed (either through logging or crown fires). Hall's totara and miro are also scattered as emergent and young trees. Tawa becomes a component of the forest below 800 m (or c. 750 m on the shadier faces), becoming the dominant canopy tree in the lower gullies. Small areas of (rimu)/tawa forest occur on the lowest slopes, with only scattered rimu remaining. Black beech is present on ridges/spurs, and along stream gullies at lower altitudes. Tawari, broadleaf, raukawa, heketara, kamahi, akepiro, tree fuchsia, tanekaha and young podocarps (rimu, miro and kahikatea on the lower slopes) are present throughout.

The eastern corner of the RAP has some large areas of secondary vegetation in mosaic with small remnants of primary forest and scattered primary trees. Swards of treeferns, bracken fernland and manuka scrub with mingimingi dominate in these modified areas. The steep upper slopes and bluffs to the north (from the Kahunui high

point) have suffered past burning and are dominated by montane secondary vegetation (that includes young beech, fernland, tree-fernland and mixed broadleaved shrubs) with a mixture of logged/burnt primary rimu/beech forest on the mid to lower slopes. Tawa is also a component on the gentler slopes near Waimaha Road.

Selective logging, fires and land clearance this century has left charred stumps, red beech spars and pockets of native vegetation in the surrounding paddocks. Despite logging many large rimu are still evident in the central forest area of the RAP (Ihumeka and Ponui Stream catchments). Some of the old logging tracks have been retained as farm tracks, while others are now overgrown with broadleaved species. The area is grazed by domestic stock, feral goats and deer but only the margins appear to have substantial animal damage. Feral pigs are also present. No problem weeds were noted.

Significance and justification

This RAP is significant for its large size and high diversity of vegetation types (from tawa-dominated lowland forest, to pure beech forest at the highest altitudes) which is a reflection of the wide altitudinal range it covers (460-930 m) and corresponding diversity of landforms on which it lies. It is the largest continuous tract of indigenous vegetation remaining in the northwestern part of the district, with the substantial Riwhara Conservation Area (PNA 13) lying c. 2.5 km to the west. It lies close to the boundary between the Tiniroto and Waikaremoana Ecological Districts and illustrates transitional character to the predominantly montane, wetter (higher rainfall) and regular mountainous topography of the Waikaremoana Ecological District. The exact boundary between the districts is largely arbitrary with high conservation/ecological values contained within the vegetation that lies west of the northwestern boundary of the RAP.

RAP TIN 107 PAPUNI

Refer to Map 20 (p. 206)

Study site No.	887
Priority:	2
Grid Reference:	NZMS 260 W18 885740
Area:	30 ha
Altitudinal range:	400-520 m
Bioclimatic zone:	lowland
Vegetation class:	conifer/tawa-beech forest freshwater lake

Description

This RAP covers subdued topography on an ancient landslide - gentle rolling to moderate slopes in the upper reaches of a small true left tributary of the Ruakituri River, 3.5 km northeast of Ruakituri Scenic Reserve (PNA 36). It includes a small lake that lies in a shallow basin in the northwestern corner of the RAP. An airstrip access road forms part of the RAP's eastern boundary and cuts across a corner through the

forest. On other margins the forest is bounded by pasture either abruptly or through narrow transitional treeland. The lake is grazed to its margin with only scattered reed, sedge and rush species remaining. The rest of the RAP is primary rimu/tawa-beech forest with a tall intact canopy dominated by tawa.

Significance and justification

The RAP is significant as little of this primary forest type remains on the gentle to moderately contoured land in the western part of the district - most has been logged or cleared.

RAP TIN 108 RIMANAUA STREAM

Refer to Map 21 (p. 212)

Study site No.	757
Priority:	1
Grid Reference:	NZMS 260 W18 855705
Area:	126 ha
Altitudinal range:	380-738 m
Bioclimatic zone:	lowland
Vegetation class:	conifer/tawa forest

Description

This RAP lies on a finely dissected moderate south-facing dip-slope on the true left of Rimanaua Stream (a true right tributary of the Ruakituri River). At the sharp ridge at the top or northeastern boundary of the RAP, it abuts against Ruakituri Scenic Reserve (248.7 ha). The RAP contains primary rimu/tawa forest, with occasional emergent matai, totara (on ridges) and northern rata. Several of the northern rata are dead, with many of the rest heavily browsed by possums. The canopy is tawa-dominated, with hinau and rewarewa common and tree ferns in dense groves in some of the stream gullies. On the lower slopes the RAP is bordered by a fringe of logged forest. In this narrow strip tawa, hinau, rewarewa and other hardwoods predominate.

Although partially fenced the RAP is grazed by a number of exotic animals including domestic stock, deer and feral goats. Despite the grazing pressure the understorey of the RAP is relatively intact with many species sensitive to grazing noted, e.g. tree fuchsia, broadleaf and kanono. Some recent selective logging has occurred creating localised areas of canopy and understorey disturbance. Exclusion of exotic animals would allow the understorey to recover and those areas at the margins damaged by logging to regenerate.

Significance and justification

This RAP complements the values of the Ruakituri Scenic Reserve (PNA 36) with which it is continuous. The reserve lies on steep north-facing slopes and bluffs, while the RAP lies on much gentler south-facing slopes. The steepness of the reserve has largely restricted the establishment of tall forest on the upper slopes, while the RAP is forested throughout, with high numbers of large podocarps. Together they form a continuous

compact forest tract of c. 375 ha. The bird life is diverse, due in part to the RAP's close proximity to the Scenic Reserve and Te Urewera National Park. Kereru, tomtit, tui, bellbird, kingfisher, grey warbler, fantail, silvereye, Australasian harrier and NZ robin were all recorded.

RAP TIN 109 NGAPAKIRA

Refer to Map 21 (p. 212)

Study site No.	759
Priority:	1
Grid Reference:	NZMS 260 W18 862681
Area:	101 ha
Altitudinal range:	390-884m
Bioclimatic zone:	lowland to montane
Vegetation classes:	conifer/tawa-beech forest conifer/tawa forest cliff vegetation

Description

This RAP extends from moderate northeast facing mid-slopes to steep upper slopes, to a striking system of very steep cliffs/bluffs in the Rimanaua Stream valley. The slopes and cliffs extend southeast from Ngapakira (991 m), part of the Matakuhia Range which originates within Te Urewera National Park. The RAP is continuous with the National Park along its western boundary and Erepeti Scenic Reserve (PNA 38) to the east.

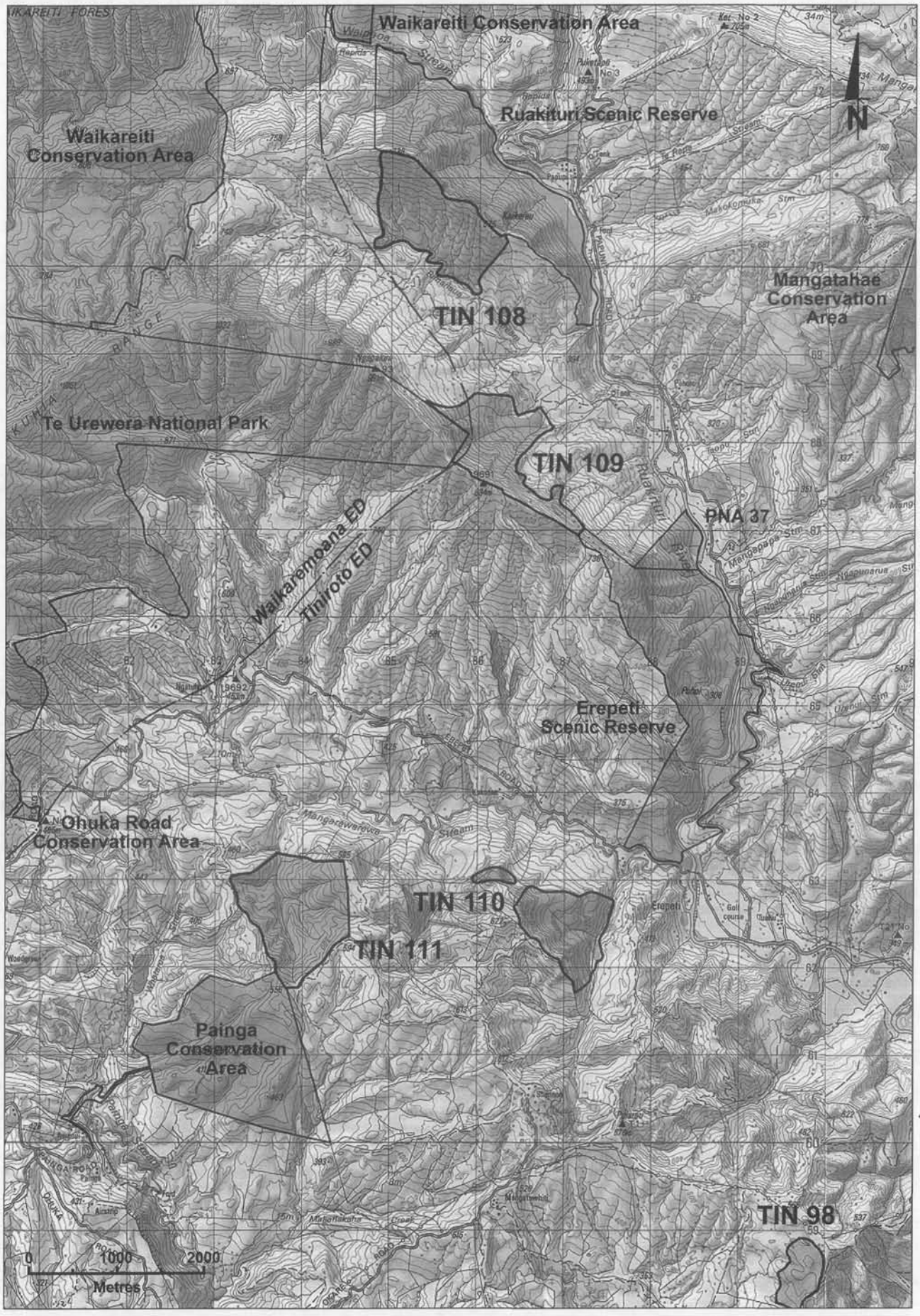
The mid-slopes support primary (rimu)/tawa forest that has been partially logged. Rimu is the most abundant emergent tree, along with scattered matai and miro. Hinau, rewarewa, tawari, pukatea, titoki and puka are present amongst the tawa-dominated canopy. This forest merges into primary unlogged (rimu)/tawa-beech forest on the moderate to steep upper slopes, with red and silver beech. The steep bluffs/cliff system has a variable mosaic of flaxland, shrubland and treeland. Species present include tutu, whaririki, *Pittosporum ralphii*, treeferns, *Gahnia* sp., kohuhu, *Hebe* sp., occasional large beech and kowhai. The larger trees are confined to banded ledges. The most inaccessible areas, away from feral goat browse, are the most intact.

Domestic stock and feral goats are present within the RAP, with damage most notable near the margins. The understorey away from the margins is more intact and diverse. Old logging roads on the lower slopes are now mostly over grown with broadleaved trees and shrubs (including wineberry and tree fuchsia). The bird life within the RAP is abundant and diverse with tui, bellbird, kereru, grey warbler, tomtit and NZ robin all recorded.

Significance and justification

The RAP is a link between, and complements the conservation/botanical values of Te Urewera National Park (PNA 39) and Erepeti Scenic Reserve (PNA 38). It covers a wide altitudinal range of almost 500 m and has a sequence of landforms from

Map 21: RAPs TIN 108-111 & 98 (NZMS 260 W18 & X18)



moderate mid-slopes to very steep bluffs/cliffs and a narrow ridge crest. The cliff system within the RAP may also support populations of the 'endangered' shrub kakabeak as it occurs on similar sites in the vicinity.

RAP TIN 110 SHANNON EAST

Refer to Map 21

Study site No.	748 & 749
Priority:	2
Grid Reference:	NZMS 260 W18 870625
Area:	87 ha
Altitudinal range:	200-600 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/broadleaved forest tawa forest broadleaved forest cliff vegetation

Description

This RAP lies predominantly in the catchment of a small tributary of the Mangarewarewa Stream, c. 1 km southwest of Erepeti Scenic Reserve (PNA 38). It covers steeply incised stream banks, and very steep hill-slopes/cliffs above and below a small gently sloping terrace. Also included is a small area on steep limestone bluffs and the flat crest above it, just west of the main remnant.

There is a small core of primary rimu-matai/tawa forest on the gently sloping terrace and surrounding lower hill-slopes of the main remnant, and on the flat crest of the outlier to the west, with high numbers of large podocarps throughout. Rimu is the dominant emergent with scattered kahikatea, matai, miro and totara. Tawa dominates in the canopy with locally common hinau. Logged primary tawa-dominated forest surrounds this core in the main remnant, on the upper moderate to steep slopes and in the lower stream gully. The primary forest of the main remnant is surrounded, on the steep mid to upper slopes and cliff systems, by broadleaved shrubland (including kohuhu, five finger and putaputaweta) with abundant kowhai. The vegetation of the bluff system of the western outlier is more sparse, with only scattered kowhai, whaariki, tuhara and broadleaved trees. High numbers of feral goats were seen and the open understorey reflects long-term browsing pressure. Kereru, tui, grey warbler, fantail and bellbird were all noted during the survey.

Significance and justification

This RAP is significant as it contains two small but diverse remnants of primary forest (forest class M3 of Nicholls 1976). This forest type was once more widespread but is now restricted to only a few remnants in the western portion of the district. The larger remnant is buffered and complemented by a range of modified and secondary vegetation. The landscape of the RAP is striking, with the stream course steeply incised

and the gentle to moderate terrace rising sharply to the steep sparsely vegetated bluffs. It is a significant wildlife habitat with an SSWI ranking of 'moderate'.

RAP TIN 111 SHANNON WEST

Refer to Map 21 (p. 212)

Study site No.	684
Priority:	2
Grid Reference:	NZMS 260 W18 840625
Area:	135 ha
Altitudinal range:	320-580 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/broadleaved forest broadleaved forest

Description

This RAP covers the small north-flowing catchment of an unnamed tributary of the Mangarewarewa Stream, with moderate to steep hill-slopes and steeply incised stream beds. It is continuous at its southern corner with Painga Conservation Area. Logged primary rimu-(matai)/tawa forest covers the steep lower hill-slopes and stream gullies in the north and east, with high numbers of large emergent rimu surviving. Titoki, mamaku and hinau are also present amongst the canopy. The ridges and upper hill-slopes have advanced secondary forest, with logging roads still clearly visible. Rewarewa is the dominant emergent in these areas, with a mainly broadleaved canopy (e.g. putaputaweta, mahoe, pigeonwood, kohuhu and lancewood) and high numbers of pole rimu, matai and miro throughout. The understorey has scattered ferns (e.g. thread fern, crown fern and water fern) with red-fruited karamu the dominant shrub.

The RAP was partially logged and cleared earlier this century leaving the outer ridges and upper slopes most modified. Although the remnant is fully fenced and domestic stock are excluded, high numbers of feral goats and deer keep the understorey relatively sparse, with most palatable species uncommon. Kereru, rifleman, tomtit and whitehead are all abundant within the RAP.

Significance and justification

The RAP contains primary and advanced secondary forest covering almost an entire catchment system of headwater tributary valleys, with a diverse range of landforms. It is continuous with and complements the botanical and conservation values of the Painga Conservation Area (PNA 40). The slopes of the RAP have a generally northerly aspect, while those within the conservation area have a predominantly southerly aspect. Together they form a c. 405 ha continuous forest tract of mainly primary forest, with an SSWI ranking of 'moderate to high'.

RAP TIN 112 OKARE

Refer to Map 22 (p. 216)

Study site No. 802

Priority: 2

Grid Reference: NZMS 260 W18 858573

Area: 14 ha

Altitudinal range: 320-390 m

Bioclimatic zone: lowland

Vegetation class: conifer/broadleaved forest

Description

This RAP consists of a small area of primary rimu-matai/tawa forest, 3 km northeast of Ohuka. It is located on the upper reaches of a small tributary of the Mangaaruhe River, on a very gentle south-facing dip-slope. It is fenced along its northern, eastern and southern boundaries, but grades to treeland-pasture in the east. Rimu is the most abundant canopy emergent, with matai occasional over a tawa-dominated canopy. Hinau, rewarewa, pukatea, mamaku, white maire and pigeonwood are also present in the canopy. Domestic stock have grazed and damaged the understorey. Kereru and common bush birds have been recorded.

Significance and justification

This small but intact and diverse RAP is significant as it contains one of the few remaining remnants of primary lowland rimu-matai/tawa forest (forest type M4 of Nicholls 1976) on gentle hill-slopes in the district. It is also an important wildlife habitat with an SSWI ranking of 'moderate'.

RAP TIN 113 MANGAKAPUA STREAM

Refer to Map 22 (p. 216)

Study site No. 721

Priority: 3

Grid Reference: NZMS 260 W18 864515

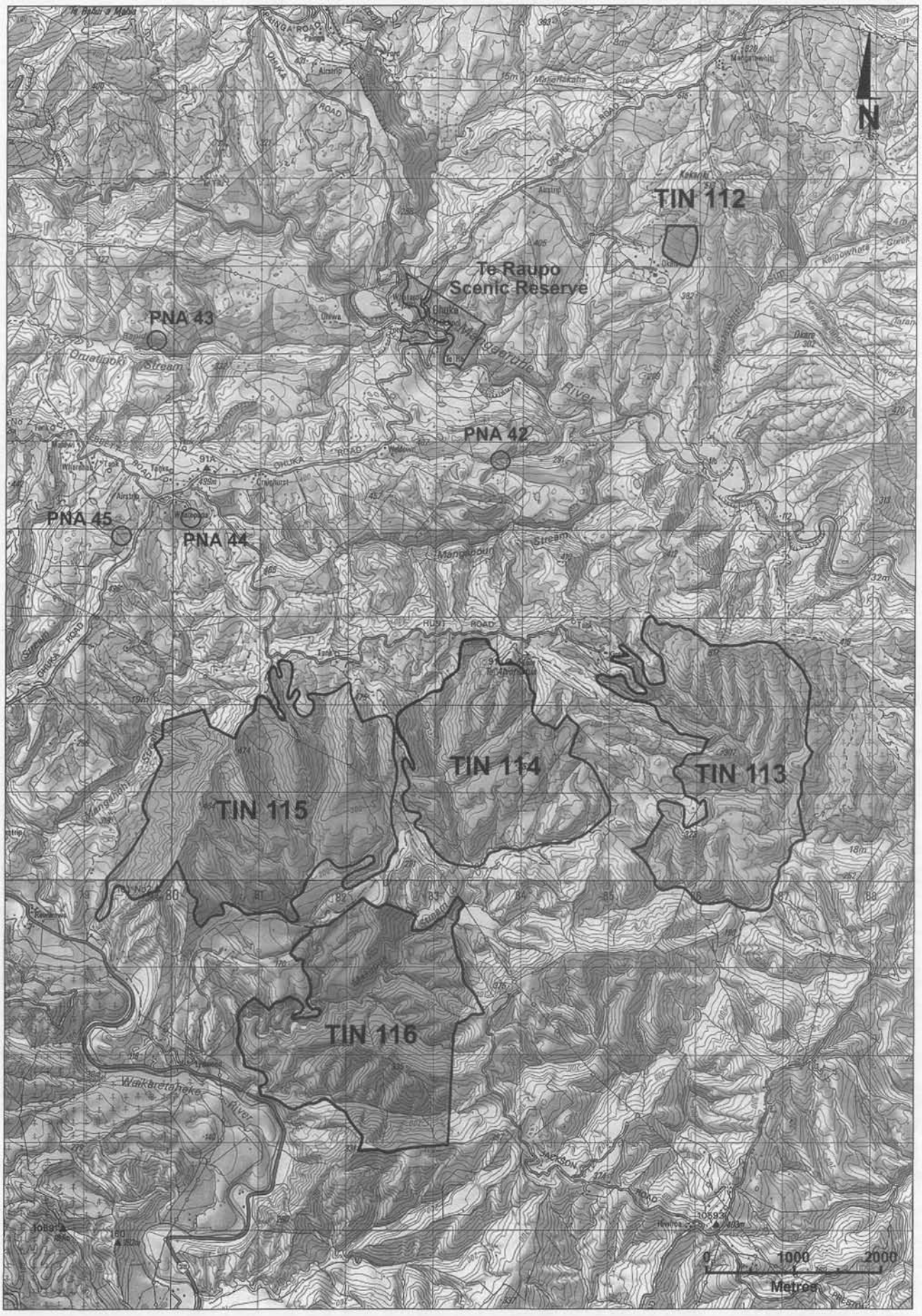
Area: 472 ha

Altitudinal range: 120-517 m

Bioclimatic zone: lowland

Vegetation classes: beech forest-treeland
broadleaved forest
kanuka forest
manuka-kanuka scrub

Map 22: RAPs TIN 112-116 (NZMS 260 W18 & W19)



Description

This RAP encompasses the headwaters/upper catchment of the Mangakapua Stream, a true right tributary of the Mangaaruhe River. The slopes of the catchment are largely south/southeast-facing. Mature pine plantation abuts the eastern boundary of the RAP, with a farm track forming the northern boundary along the main back ridge.

Most of the vegetation within the RAP is secondary kanuka (on the mid to lower slopes) and manuka-dominated (on the dry narrow ridges and upper slopes) scrub-forest, having regenerated following burning and clearance for pasture. The lower slopes and stream gullies have the oldest and most diverse vegetation, with a mosaic of broadleaved trees and tree ferns amongst rewarewa/kanuka forest. These include tree fuchsia, pate, lancewood, heketara, kohuhu, kowhai, mahoe, titoki, pigeonwood, mamaku, putaputaweta, houhere and five finger. The rest of the vegetation on the ridges is predominantly younger manuka scrub and rewarewa/manuka scrub, with some clumps and scattered individual beech trees. The scrub has mingimingi and red-fruited karamu amongst it. Young podocarps are regenerating throughout the scrub forest including totara, rimu, matai and kahikatea (lower slopes).

Feral goats, deer and pigs are all present within the RAP. Several tracks have been bulldozed recently to allow better access for hunting. Some wilding pines are present on the upper slopes amongst the manuka. Kereru, whitehead, tui, fantail and tomtit have been recorded in the RAP.

Significance and justification

The RAP includes a wide range of largely secondary vegetation types at different stages of succession, on a full range of landforms (from stream side to ridge crest). It is significant as a wildlife habitat - together with the three extensive RAPs TIN 114-116 nearby, that also contain extensive areas of indigenous vegetation, it has an SSWI ranking of 'moderate-high'.

RAP TIN 114 TE AHIOTEATUA

Refer to Map 22

Study site No. 720

Priority: 3

Grid Reference: NZMS 260 W18 835515

Area: 390 ha

Altitudinal range: 170-546 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
kanuka forest
manuka-kanuka scrub

Description

This RAP covers most of the headwaters of the Makapua Stream, a true left tributary of the Waikaretaheke River. The stream catchment contains moderately sloping stream gullies, with the main stream steeply incised in parts. The RAP also contains a small

raupo fringed lake in a shallow basin on the mid-slopes on the eastern side of the RAP. Hunt Road lies just to the north of the RAP, with RAP TIN 115 to the west. Much of the RAP's northeastern and northwestern boundaries are fenced, with the other margins merging into young scrub, treeland or pasture.

Almost all the vegetation within the RAP is secondary, having reverted from pasture. The northern half of the RAP around the Te Ahioteatua Trig (546 m) is largely young secondary kanuka-manuka scrub, with occasional emergent wilding pines (in highest concentration around the trig) and rewarewa. The younger manuka scrub has pockets of broadleaved trees and older kanuka scrub-forest in the stream gullies. Along the northern edge of the RAP on south-facing stream gully slopes there is a small patch of modified primary tawa-dominated forest. The forest has one large emergent rimu, with titoki, kowhai, pukatea, rewarewa, mamaku and tall kanuka amongst the canopy. To the south the RAP is dominated by older rewarewa/kanuka forest, with rewarewa most dense on the ridges and upper hill-slopes. The oldest secondary vegetation lies in the mid to lower stream gully slopes, with a diverse range of broadleaved trees, treeferns and young podocarps amongst the canopy (including houhere, lancewood, mahoe, pigeonwood, mamaku, wheki, totara and kahikatea).

The RAP is grazed by domestic stock during the winter and is used as a hunting block for deer and pigs year round. Tomtit, whitehead, kereru, tui, fantail and silvereye have all been recorded.

Significance and justification

This RAP is significant as it is a substantial area including a range of vegetation at all successional stages (young manuka scrub primary tawa-dominated forest), that extends over a wide altitudinal gradient (386 m) and range of landforms. It is one of a cluster of four extensive areas of indigenous vegetation in this part of the district, with RAPs TIN 113, 115 and 116. Together they create a significant wildlife habitat with an SSWI ranking of 'moderate to high'.

RAP TIN 115 COOPERS BLOCK

Refer to Map 22 (p. 216)

Study site No. 714

Priority: 1

Grid Reference: NZMS 260 W18 810505

Area: 602 ha

Altitudinal range: 120-474

Bioclimatic zone: lowland

Vegetation classes: tawa forest
kanuka forest
manuka-kanuka scrub

Description

This extensive RAP covers a large basin in the upper catchment of the Makapua Stream (a true left tributary of the Waikaretaheke River) c. 13 km southeast of Tuai. The basin

has long narrow (north-south) ridges separating moderate to steep stream gully slopes draining south. It also includes a long moderate to steep northwesterly facing slope outside the Makapua catchment on the northwestern edge of the RAP.

The vegetation on the moderate to steep hill-slopes is predominantly even-aged kanuka forest (10-12 m tall). Kanuka dominates the canopy with occasional to common emergent rewarewa throughout. In the stream gullies large rewarewa, pukatea, kahikatea, white maire and pigeonwood are major components of the canopy. Some of the ridges and bluffs are dominated by manuka scrub, in which young specimens of broadleaved tree species are established. Small pockets of modified primary tawa-dominated forest occurs in some of the lower stream gullies, with the largest area in a stream gully in the southeast corner. Titoki, rewarewa, pukatea, kanuka and young rimu are also present in the canopy.

The RAP is not fenced, allowing domestic stock to have free access. Large numbers of feral goats and deer are also present. The understorey is relatively free from obvious stock damage away from forest margins and farm tracks, however the vegetation reflects long-term grazing with non-palatable species like red-fruited karamu, hard fern, mingimingi and various *Blechnum* species abundant. Tomtit, whitehead, kereru, tui, fantail and silvereye have all been recorded in the RAP.

Significance and justification

This RAP is significant as the largest of the cluster of four extensive areas of indigenous vegetation in this highly modified part of the district. The RAP contains a greater proportion of older more advanced secondary vegetation and primary forest elements compared with the other three sites, RAPs TIN 113, 114 and 116. Together they create a significant wildlife habitat with an SSWI ranking of 'moderate to high'.

RAP TIN 116 MAKAPUA STREAM

Refer to Map 22 (p. 216)

Study site No. 700

Priority: 2

Grid Reference: NZMS 260 W19 822485

Area: 511 ha

Altitudinal range: 40-370 m

Bioclimatic zone: lowland

Vegetation classes: kanuka-broadleaved forest
kanuka scrub forest
manuka scrub

Description

The large RAP covers moderate to steep slopes dissected by narrow incised stream gullies in the lower catchment of the Makapua Stream, a true left tributary of the Waikaretaheke River. It includes a series of dramatic bluffs and high terraces along the Makapua Stream and several of the larger tributaries. SH38 lies close to the RAP's southwestern boundary, with newly established plantation forestry along the southern

margin. Parts of the rest of the RAP's margins are fenced, or merge to younger scrub and pasture.

The vegetation of the RAP is predominantly secondary scrub-forest dominated by kanuka, with locally dense rewarewa, especially on the ridges and amongst the older vegetation. The vegetation on the south-facing moister slopes tends to be older and more diverse with a range of broadleaved species including mahoe, pigeonwood, kohuhu, houhere, kowhai, heketara, titoki, five finger and tree fuchsia. There are also young podocarps amongst the canopy including totara, rimu, matai and kahikatea. Younger scrub vegetation in the southwest, notably on the flat terraces and locally elsewhere on the steepest slopes, is dominated by manuka, with tauhinu, mingimingi, red-fruited karamu and only scattered kanuka.

Domestic stock have access to parts of the RAP, with deer and feral goats also present. Scattered wilding pines in the younger scrub towards SH38 were the only problem weed species noted. Tomtit, whitehead, kereru, tui, fantail and silvereye have all been recorded in the RAP.

Significance and justification

This RAP is the second largest of a cluster of four extensive areas of indigenous vegetation in this highly modified part of the district, along with RAPs TIN 113-115. Together they create a significant wildlife habitat with an SSWI ranking of 'moderate to high'. The terrain of striking bluffs along the length of the Makapua Stream and indigenous cover on the high terraces near the Waikaretaheke River are very distinctive.

RAP TIN 117 TE IRINGAOWHARE FOREST

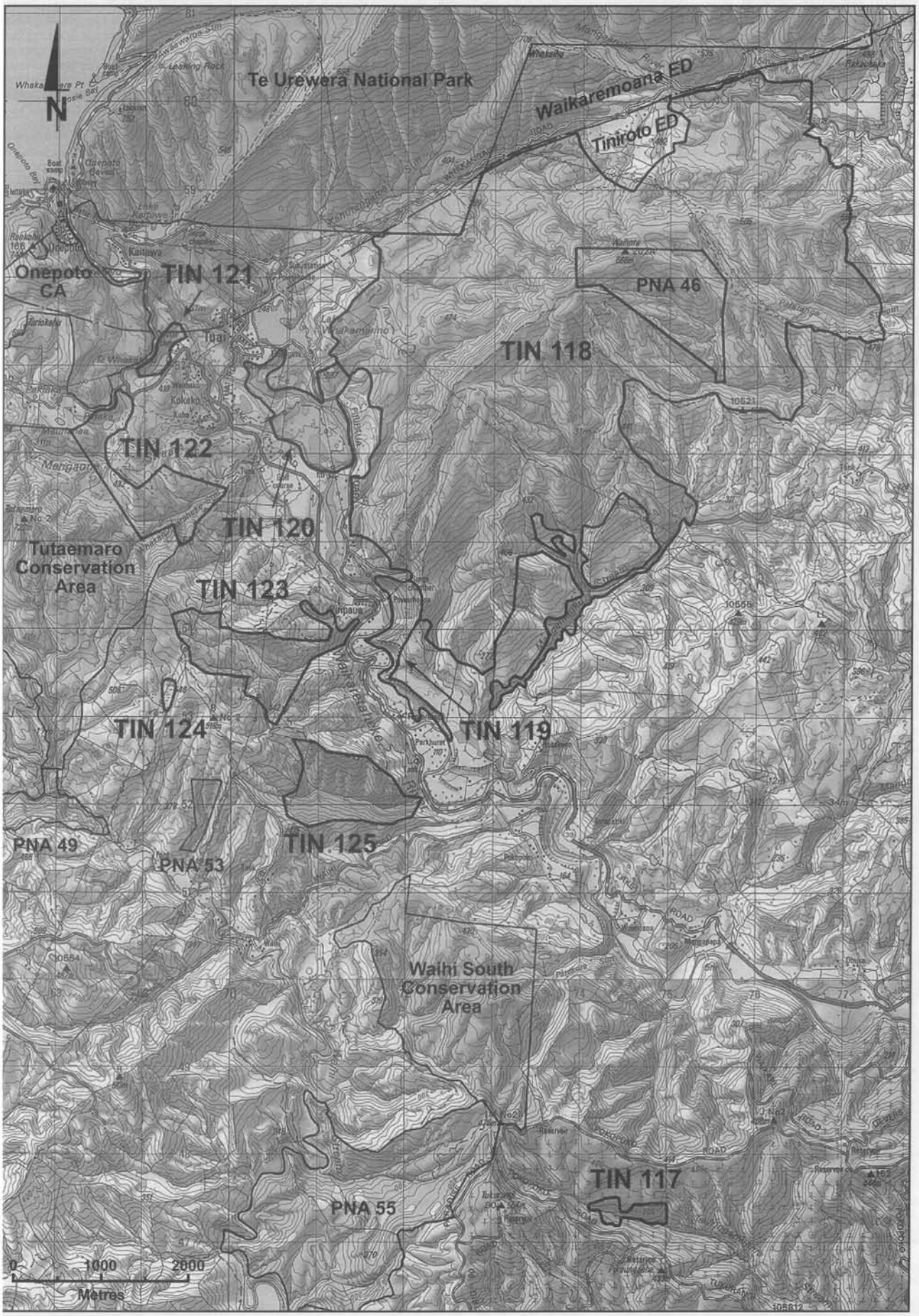
Refer to Map 23

Study site No.	705
Priority:	2
Grid Reference:	NZMS 260 W19 745473
Area:	18 ha
Altitudinal range:	240-330 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest tawa forest

Description

This RAP lies in the upper reaches of the Te Iringaowhare Stream, a true left tributary of the Waiau River. It covers the moderate mid to lower slopes along the stream and is completely surrounded by a mature pine plantation. The bulk of the RAP is logged primary tawa forest, with a small area of unlogged primary rimu/tawa forest in the northwestern corner. Rewarewa, titoki, hinau and occasional kowhai are present amongst the unlogged tawa-dominated canopy. Rimu is the dominant emergent, along with kahikatea and matai. The tawa forest has only scattered large rimu and kahikatea remaining, but there are a high number of young pole trees.

Map 23: RAPs TIN 117-125 (NZMS 260 W18 &W19)



The main threat to the integrity of the RAP will come during the harvesting of the pines. Feral goat numbers are low, with domestic stock now excluded with the conversion of the area to forestry.

Significance and justification

This small compact RAP is significant as an area of primary forest with a fairly healthy and intact understorey, in an area now dominated by exotic forestry. It is also a significant wildlife habitat with an SSWI ranking of 'moderate', for tomtit and whitehead and common bush birds. NZ robin have also been reported.

RAP TIN 118 WAIHORE

Refer to Map 23 (p. 221)

Study site No. 725

Priority: 1

Grid Reference: NZMS 260 W18 740570

Area: 2 099 ha

Altitudinal range: 130-666 m

Bioclimatic zone: lowland

Vegetation classes: tawa-beech forest
tawa forest
broadleaved forest
kanuka scrub-forest
manuka-broadleaved scrub

Description

This extensive RAP, lying immediately east of Tuai and Piripaua, covers the long ridges and valleys radiating from Waihore (666 m). Streams to the south and west (Mangamauku, Piranui and Kahutangaroa Streams) flow to the Waikaretaheke River, while those in the northeast (Oruatipoki and Patatanga Stream) flow to the Mangaaruhe River. Steep riparian slopes of segments of the Mangaaruhe River in the northeast and Mangamauku Stream in the south are included. Part of the north-western boundary is arbitrarily truncated by the boundary to Waikaremoana Ecological District at the foot of the long dip-slopes of the Ngamoko Range. At another segment it abuts Te Urewera National Park. The Ohuka Conservation Covenant (PNA 46), in the headwaters of the Oruatipoki Stream, is enclosed by the RAP.

Most of the vegetation within the RAP is secondary scrub which has regenerated from pasture. Old paddock fences are still clearly visible in places. The upper hill-slopes and ridges are dominated by manuka scrub, bracken fernland and mingimingi, with broadleaved species such as kamahi, wineberry, tutu, five finger, akepiro, with kanuka more dominant on the lower slopes. Gullies of primary and advanced secondary forest are scattered throughout the RAP, the largest of which lies within the Ohuka Conservation Covenant.

The primary forest within the RAP is predominantly tawa-beech forest, with tawa dominating the stream gullies and black beech mainly on the ridges. Scattered pole

rimu and kahikatea, northern rata and beech also occur amongst the tawa in some gullies. There is a small pocket of this primary forest in the northern corner of the RAP, on gentle to moderate hill-slopes near the Mangaaruhe River. The low canopy also includes mahoe, pigeonwood, putaputaweta, young beech and podocarps and five finger. Remnants of primary forest also exist on the southeast-facing slopes in the upper to mid Mangamauku Stream catchment. Here tawa and young podocarps are prominent, surrounded by secondary kanuka and broadleaved forest. Advanced secondary rewarewa/kamahi forest is largely confined to stream gullies and moist southeast-facing hill-slopes.

Major threats to the health and quality of this RAP include wilding pines (especially in the northwest and the southwest corners), high numbers of feral goats, deer (large amounts of sign noted) and pigs (large areas of heavily pig rooted ground were seen throughout the RAP). Significant possum browse was also noted in the kamahi-dominated advanced secondary forest, with severe canopy die-back of some trees.

Significance and justification

This extensive RAP is the largest area of unprotected indigenous vegetation in the Tiniroto Ecological District. It contains a full diversity of successional vegetation from young reverting scrub to primary forest, over a wide altitudinal gradient (extending from 130 to 666 m) and wide range of landforms. It is also continuous with Te Urewera National Park, providing continuity from the Park's steepland forest, through to moderate to rolling lowland hillcountry in the Tiniroto Ecological District. It has an abundance of indigenous bird species including kereru, tui, bellbird, Australasian harrier, tomtit, fantail, NZ falcon, fernbird and NZ robin.

RAP TIN 119 PIRIPAUA (1)

Refer to Map 23 (p. 221)

Study site No. 844

Priority: 1

Grid Reference: NZMS 260 W18 719538

Area: 42 ha

Altitudinal range: 110-310 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
tawa-titoki forest
broadleaved forest
kanuka forest-scrub

Description

This RAP lies on alluvial terraces, moderate to steep terrace risers, bluffs and moderate to steep slopes on the true left of the Waikaretaheke River adjacent and downstream of the Piripaua powerstation. The most intact primary vegetation lies on the alluvial terrace and lower terrace riser in the south: primary tawa-titoki forest, with occasional large kahikatea and young conical trees. Kowhai are present on the upper

terrace risers and bluff edges. A finger of primary/advanced secondary kahikatea forest extends from this forest across the terrace to the river's edge. Titoki and mahoe are scattered amongst the canopy, with divaricating shrubs and kawakawa in the open understorey. Small pockets of primary conifer and tawa-dominated forest occur on the terraces and slopes upstream towards Piripaua, connected by areas of kanuka forest-scrub and broadleaved forest.

Planted and wilding pines are present on some ridges and upper slopes, amongst the secondary vegetation in the northern part of the RAP. There is also a band of willows along much of the rivers edge. Most of the RAP appears to be grazed, with the understorey consequently quite open underneath. Past modification (burning/clearance/logging) has created a mosaic of different-aged vegetation within the RAP. Most of the kahikatea on the terraces has established following early logging disturbance, with the youngest secondary vegetation likely to have reverted from pasture.

Significance and justification

This RAP is significant as it contains the best of the few remnants resembling the original podocarp-dominated alluvial forest that remain along the Waikaretaheke River valley and a wide range of vegetation on the adjacent steep riparian slopes. It is continuous with RAP TIN 118 to the north, forming a corridor of indigenous vegetation along the river. It is prominent from SH38.

RAP TIN 120 UPPER WAIKARETAHEKE RIVER

Refer to Map 23 (p. 221)

Study site No. 741

Priority: 3

Grid Reference: NZMS 260 W18 706565

Area: 87 ha

Altitudinal range: 160-287 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
broadleaved forest
kanuka-manuka scrub

Description

This RAP lies on alluvial terraces, terrace risers, minor bedrock ridges and gentle to moderate slopes composed of debris flow material at the foot of the Waikaremoana landslide, in the upper catchment of the Waikaretaheke Stream just south of Tuai. The vegetation within the RAP is a mosaic of young secondary scrub, secondary and advanced secondary forest and modified primary forest. The most intact vegetation lies along the stream banks, and southern terraces and on the mid to lower slopes surrounding high point 287 m in the northern corner of the RAP. This is mainly advanced secondary vegetation either dominated by pole kahikatea, or broadleaved trees (including rewarewa, titoki, kohuhu, lancewood, five finger, mahoe and

silver fern). The younger secondary vegetation is a mix of manuka and kanuka scrub, with patches of bracken fernland and pasture grasses. A raupo swamp in the small valley southeast of the 287 m high point is included.

Much of the secondary vegetation within the RAP has established since the construction of the Waikaremoana hydro-electric power scheme in the late 1920s-1940s. A line of pylons runs through the RAP. There are wilding pines amongst the younger vegetation in the central part of the RAP, with patches of blackberry and buddleia the most conspicuous weeds. Some parts of the RAP are grazed with open grassy patches.

Significance and justification

Though it has suffered a high degree of modification, this RAP is significant as the largest area of indigenous vegetation on the valley floor of the Waikaretaheke River, and for covering a variety of high fertility slopes and alluvial surfaces and notable landslide debris landforms. It is also continuous with the extensive area of indigenous vegetation within TIN 118.

RAP TIN 121 TE WHAKATUTU

Refer to Map 23 (p. 221)

Study site No. 842

Priority: 1

Grid Reference: NZMS 260 W18 692570

Area: 12 ha

Altitudinal range: 330-420 m

Bioclimatic zone: lowland

Vegetation classes: broadleaved scrub-shrubland
freshwater lake and wetland

Description

This RAP contains a lake in a basin and an area of seepage wetland to the southeast, with a band of advanced secondary shrubland-low forest on the moderate to steep slopes to the northwest, c. 1 km west of Tuai. The lake is fed by a spring from Lake Waikaremoana - the water seeps through the slip material that originally created the lake. With the exception of one large kahikatea tree the vegetation around the lake is young, having established since the mid to late 1940s following the construction of the Waikaremoana hydro-electric power scheme. The shrubland runs from the lake margin to SH38 which forms the RAP's northwestern boundary. A motorcamp lies on a hill to the northeast above the lake. The vegetation on the hill-slope is a mosaic of broadleaved species (including wineberry, mahoe, mamaku, kohuhu, tree fuchsia and houhere) occasional young kahikatea (lower slopes), and tall kanuka. The lake edge and wetland downstream have manuka scrub around their margins, with *Juncus* spp., *Carex* spp. and bands of conical kahikatea c. 12 m tall (around the lake). The wetland also has pockets of open water at its southern end.

The lake edge and wetland are grazed, with the lake largely clear around its south-eastern side, with only scattered manuka, rush and sedge species around its southern end. Buddleia and blackberry were the main weeds noted.

Significance and justification

The lake within this RAP is one of a series of spring fed lakes in hollows within the debris of the landslide which originally created Lake Waikaremoana. Of the lakes within the outer fringe of the debris, within Tiniroto Ecological District, it is the most significant ecologically: it has an intact margin of wetland vegetation (albeit damaged on the southeastern side) that merges into forest, apparently outstanding water clarity and some species of native aquatic macrophytes are likely to be present. The attractive lake, its margins and forest back drop are well seen from SH38.

RAP TIN 122 POTAKA-WHAKARONGOTAHEKE STREAM

Refer to Map 23 (p. 221)

Study site No. 672

Priority: 2

Grid Reference: NZMS 260 W18 690555

Area: 98 ha

Altitudinal range: 280-460 m

Bioclimatic zone: lowland

Vegetation/landform classes:

kanuka-broadleaved forest
raupo reedland
manuka-kanuka scrub
freshwater wetland

Description

This RAP covers the upper catchment of the Whakarongotaheke Stream, part of the Mangaone Stream catchment and Potaka Lake, c. 2 km southwest of Tuai. It lies on gentle to moderate rolling slopes, with associated swampy/wetland areas around the lake and Mangaone Stream and somewhat steeper slopes close to Whakarongotaheke Stream. The RAP backs onto the lower northeastern slopes of the Tutaemaro Conservation Area (PNA 48), with a straight line boundary. The bulk of the RAP is young secondary kanuka-manuka-treefern scrub, which fades to swards of bracken and pasture in places. The scrub has scattered black beech, young podocarps (totara, rimu) and broadleaved shrubs amongst it. Pockets of kanuka-broadleaved forest lie on some hill-slopes and in the Whakarongataheke Stream gully. The broadleaved trees include rewarewa, pate, five finger, kohuhu, tree fuchsia, heketara, putaputaweta and wineberry. There are also several groves of pole kahikatea near the lake edge and around the Mangaone Stream wetland. The lake margin and wetland are dominated by raupo reedland. A well-developed network of access tracks runs through the RAP, with some parts heavily grazed. Weeds present within the RAP include wilding pines, willows (amongst and around the lake/wetland areas) blackberry, *Acacia* sp. and buddleia. Bush birds present include tui, bellbird, kereru and fantail.

Significance and justification

This RAP is continuous with and buffers the Tutaemaro Conservation Area (PNA 48) along its eastern boundary. It complements the conservation/botanical values of the conservation area, by including significant wetland and lake habitats and a diverse range of early to advanced secondary vegetation at lower altitude on gentle terrain.

RAP TIN 123 PIRIPAUA (2)

Refer to Map 23 (p. 221)

Study site No.	728 & 729
Priority:	2
Grid Reference:	NZMS 260 W18 705535
Area:	113 ha
Altitudinal range:	180-600 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest manuka-kanuka scrub

Description

This RAP covers moderate to steep slopes in the catchment of an unnamed true right tributary of the Waikaretaheke River, immediately downstream of Piripaua. Farm tracks cross the area on the upper and mid-slopes amongst the young scrub. Primary rimu-(matai)/tawa forest lies in the lower to mid main gully slopes, in the upper western gully, in a small gully near the southern corner of the RAP and in a tributary gully northeast of the main body of the RAP. Northern rata, matai, hinau, titoki, kahikatea and rewarewa are also present amongst the dense tawa-dominated canopy. There are also a large number of young pole kahikatea, matai and rimu. The sub-canopy is a mixture of mahoe, pigeonwood, pate, five finger, tree fuchsia and heketara. The forest understoreys are largely open and grazed with scattered shrubs (kawakawa, hangehange) and ferns (hen and chicken fern, kiwakiwa and perching spleenwort). The primary forest grades into advanced secondary broadleaved forest with mahoe, wineberry, houhere, kowhai, kohuhu, putaputaweta, five finger and pate, and kanuka-manuka scrub with an abundance of the same broadleaved species is present in the moist gullies and lower slopes of generally southerly aspect. Younger manuka or kanuka-manuka scrub dominates the drier slopes and ridges.

Past logging has removed many of the large podocarps, with stumps still evident in the understorey. The RAP is effectively unfenced, with feral goats, feral pigs and domestic stock present; the understorey is consequently very sparse/heavily grazed. Kereru, tui, Australasian harrier and bellbird were all noted.

Significance and justification

This RAP is significant as it contains sizeable areas of primary rimu-(matai)/tawa forest (forest type M3 of Nicholls 1976), a forest type that was once far more extensive in the southwestern section of the district. The primary forest and buffering secondary vegetation together cover almost an entire stream

catchment, extending from stream side to ridge crest. The RAP is part of a semi-continuous chain of indigenous vegetation and wildlife habitat along the Waikaretaheke valley, and also provides a linkage between the much larger habitat areas in RAP TIN 118 and Tutaemaro Conservation Area (PNA 48).

RAP TIN 124 WAIHI WETLAND

Refer to Map 23 (p. 221)

Study site No. 731

Priority: 3

Grid Reference: NZMS 260 W18 693533

Area: 5.1 ha

Altitudinal range: 460-480 m

Bioclimatic zone: lowland

Vegetation/landform classes:
conifer forest
freshwater wetland

Description

This RAP contains a small swamp and its margins in a perched basin that drains into the Waihi Stream, a true left tributary of the Waiau River. It lies c. 4 km south of Tuai. A farm track runs along most of the swamp's western boundary. The swamp vegetation is dominated by raupo reedland, with purei and *Juncus* spp. A small patch of kahikatea forest remains on its upper-eastern side. Kamahi, tree fuchsia, lancewood, mahoe, kohuhu, cabbage tree and infrequent tawa are present amongst the pole kahikatea. The forest is quite grazed and open with few lianes, ferns, seedlings and shrubs in the understorey (e.g. bush lawyer, *Metrosideros colensoi*, kiokio and mingimingi). The margins of the swamp are also grazed with some trampling.

Significance and justification

This RAP contains one of few freshwater wetlands left in the southwestern section of the district that still retains indigenous forest on its margins and the ecological transition from forest to wetland. Pied stilt have been observed nesting on the margin of the wetland (Beadel 1989b).

RAP TIN 125 PARKHURST

Refer to Map 23 (p. 221)

Study site No. 724

Priority: 1

Grid Reference: NZMS 260 W18 713522

Area: 97 ha

Altitudinal range: 140-400 m

Bioclimatic zone: lowland

Vegetation classes: conifer/hardwoods forest
kanuka forest
manuka-kanuka scrub

Description

Situated c. 5 km south of Tuai, this RAP covers the most of the catchment of a small unnamed true right tributary of the Waikaretaheke River. A farm track runs along its northern boundary, with fencing along the southern, western and north-eastern boundaries. Other margins merge into young manuka-dominated scrub and pasture. The south-facing moderate slopes of the main stream gully and lower stream sides support primary rimu-(matai)/tawa forest. Rimu is the main emergent podocarp, with occasional matai and kahikatea. Hinau, pukatea (lower slopes) and titoki are scattered amongst the tawa-dominated canopy. Tall kanuka forest is present on some ridges. The north-facing slopes have younger advanced secondary forest dominated by kanuka (canopy height 12 m and more), with scattered broadleaved trees and locally dominant emergent rewarewa. Areas of regenerating manuka-kanuka scrub occur around the southern, northern and western boundaries. The understorey is largely intact despite moderate numbers of feral goats in the area. Kereru, bellbird, tui, fantail and grey warbler are all present.

Significance and justification

This RAP is significant as it contains the fourth largest, and one of the most intact areas, of primary rimu-(matai)/tawa forest (Nicholls 1976) remaining in the western part of the district. It is well buffered by secondary vegetation, extending the forest to almost a complete catchment system. It is part of a semi-continuous chain of indigenous vegetation along the Waikaretaheke River valley, along with RAPs TIN 118, 119 and 123 and it lies less than a kilometre from two conservation covenants (Waihi North and Waihi South Conservation Covenants, PNAs 53 and 54).

RAP TIN 126 MANGAONE RAPIDS

Refer to Map 24 (p. 230)

Study site No. 733 & 735

Priority: 2

Grid Reference: NZMS 260 W18 605508

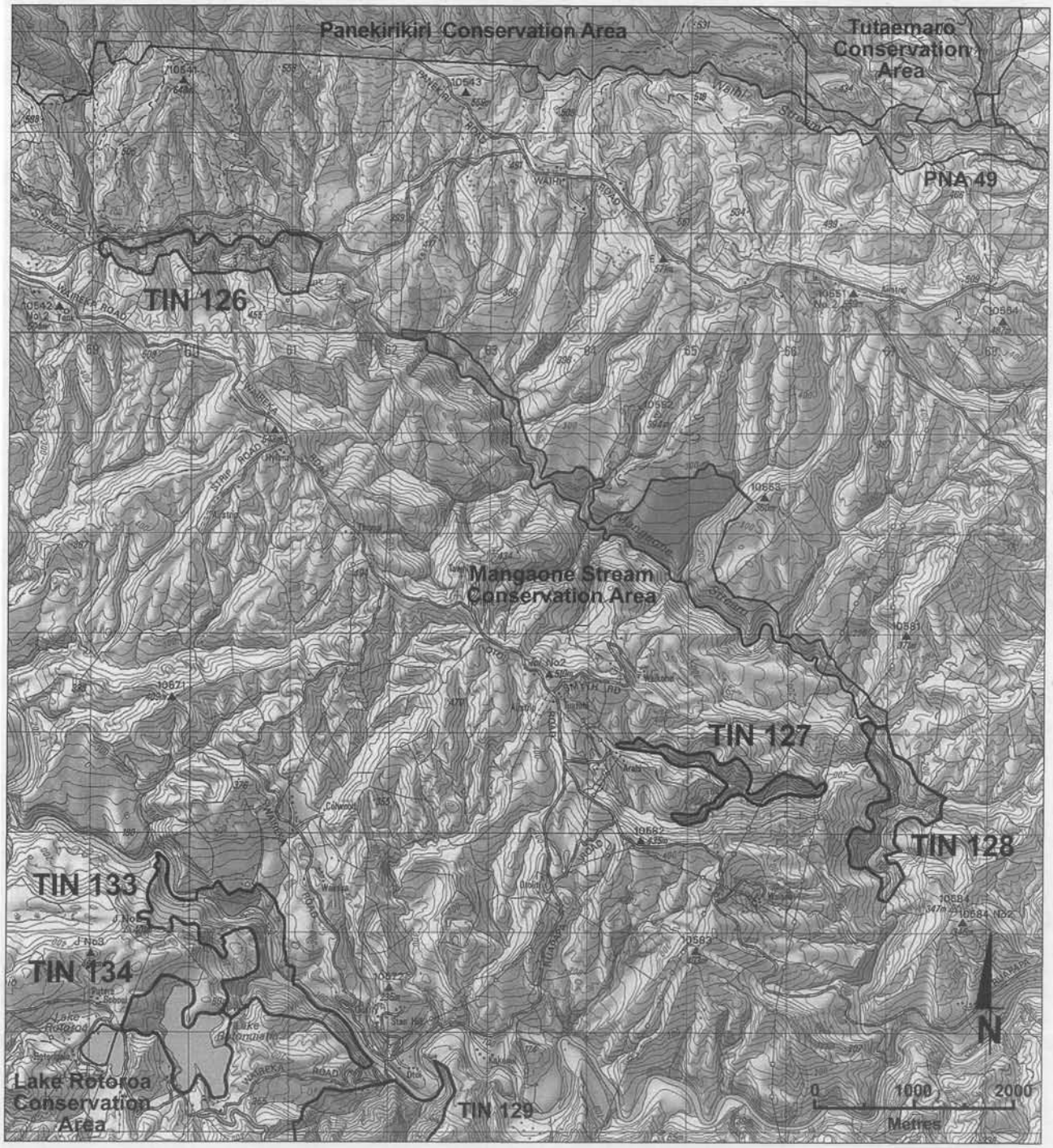
Area: 71 ha

Altitudinal range: 230-420 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
kanuka scrub-forest
manuka scrub

Map 24: RAPs TIN 126-128, 133 & 134 (NZMS 260 W18 & W19)



Description

This RAP is covers north-facing mainly steep slopes and bare rocky scarp faces along a segment of Mangaone Stream (Waiau tributary), where it is sharply incised into more moderate terrain, 2 km south of Panekirikiri Conservation Area. A narrow riparian margin on the opposite (true left) bank of the stream is included, together with a larger south-facing slope of moderate terrain at the eastern end of the RAP. Parts of the upper margins on both sides of the RAP are fenced. The vegetation on the north-facing slopes and along the edges of the steep scarp faces is a mosaic of manuka scrub, kanuka forest-scrub and conifer/kanuka forest. Trees present amongst the scrub-forest include kohuhu, rewarewa, pate, tree fuchsia,

wineberry, putaputaweta, totara, titoki and kowhai. Small pockets of black beech forest are scattered throughout this area with locally common pure totara stands.

The south-facing slopes feature more extensive primary rimu-kahikatea-totara forest around a scenic waterfall. Hinau, tawa and rewarewa also make up a small proportion of the canopy. This forest has been selectively logged, with large stumps and cut logs still visible in the understorey. However, there remain high numbers of mature podocarps. The understorey is relatively intact, despite the lack of fencing and high domestic stock numbers. Regeneration of some browse sensitive species (e.g. mahoe, hangehange) was noted.

The understorey of the accessible vegetation, on either side of the river, is grazed by feral goats, with sheep having limited access to much of it. Common forest birds were present.

Significance and justification

This RAP is significant as it contains a substantial remnant of primary conifer forest and indigenous vegetation on contrasting north and south-facing terrain. It contributes to a semi-continuous chain of indigenous vegetation along the Mangaone Stream, that includes the Mangaone Stream Conservation Area (PNA 57) and RAPs TIN 128 and 127. The incised stream course and rocky scarp faces are striking landscape features.

RAP TIN 127 ARAHI BUSH

Refer to Map 24

Study site No. 752

Priority: 2

Grid Reference: NZMS 260 W19 655455

Area: 42 ha

Altitudinal range: 190-400 m

Bioclimatic zone: lowland

Vegetation class: conifer forest
conifer/broadleaved forest
tawa forest

Description

This RAP extends from stream side to mid-slopes and in parts to the ridge crest, in a tributary of the Mangaone Stream (Waiau River) catchment. Most of the RAP lies on the shady south-facing slopes. Pine forest bounds the RAP's southern boundary, with fencing along parts of the other boundaries. The mid to lower slopes have a high proportion of primary forest either conifer or tawa-dominated. The vegetation on the upper slopes is predominantly advanced secondary kahikatea-totara-rewarewa/ broadleaved forest-treeland, with titoki, tawa, kohuhu, hinau, kowhai, putaputaweta, mahoe, kanuka and treeferns. This has groves of young totara and broadleaved shrubland- treeland at the margins with locally dense stands of kahikatea and totara, and a few very large podocarps remaining from the original primary forest. The understorey is open and grassy in parts, with grazing by domestic stock.

Significance and justification

This RAP is significant as it contains a high proportion of primary forest and advanced secondary totara-kahikatea forest that is characteristic of fertile slopes in this part of the district. With its higher proportion of primary forest, it complements the nearby RAP TIN 128, and contributes to a semi-continuous chain of indigenous vegetation along the Mangaone Stream, along with the Mangaone Stream Conservation Area (PNA 57), and RAP TIN 126.

RAP TIN 128 LOWER MANGAONE STREAM

Refer to Map 24 (p. 230)

Study site No. 712

Priority: 3

Grid Reference: NZMS 260 W19 670452

Area: 68 ha

Altitudinal range: 80-220 m

Bioclimatic zone: lowland

Vegetation classes: conifer forest
conifer/kanuka forest
manuka scrub

Description

This RAP comprises a wide riparian band along the mid to lower reaches of Mangaone Stream, a true left tributary of the Waiau River. The deeply incised stream has moderate to very steep riparian slopes and cliffs/bluffs, alternating with easy foot-slopes and alluvial terraces. The vegetation with the RAP is a mosaic of manuka scrub (on the steeper slopes with thin soils), kanuka forest-scrub, advanced secondary totara/kanuka forest, totara treeland-forest, and conifer forest (with kahikatea, on the narrow alluvial terraces and terrace risers). Broadleaved trees, including kowhai (on riparian and steeper slopes), kohuhu, mahoe, houhere, cabbage tree, putaputaweta, rewarewa, pigeonwood, tawa and titoki are present amongst some of the older kanuka and in stream gullies. The vegetation on the steepest and most unstable slopes and bluffs is sparse and discontinuous. The forest is grazed by stock in the less steep areas, with feral goats able to graze the steeper sections.

Significance and justification

This RAP contains abundant totara/kanuka forest, a vegetation type that is distinctive and not well represented in this part of the district. It contributes to a semi-continuous chain of indigenous vegetation along the Mangaone Stream, along with the Mangaone Stream Conservation Area (PNA 57) with which it is continuous and RAPs-TIN 126 and 127.

RAP TIN 129 CRICKLEWOOD ROAD

Refer to Map 25 (p. 235)

Study site No.	380
Priority:	2
Grid Reference:	NZMS 260 W19 640410
Area:	833 ha
Altitudinal range:	80-560 m
Bioclimatic zone:	lowland
Vegetation classes:	broadleaved forest kanuka forest kanuka-manuka scrub

Description

This extensive RAP lies on either side of Cricklewood Rd, which bisects it along the main ridge. To the north it covers predominantly north-facing moderate to steep hill-slopes draining into the perched upper to mid-sections of seven true right tributaries of the Waiau River. The slopes end abruptly in steep sparsely vegetated scarp faces and bluffs above the river or low terraces, with many of the tributaries forming waterfalls (39-65 m high) over the scarps. Most of these lower slopes are below the RAP, but at its western end the RAP extends to the river banks and narrow alluvial terrace to include continuous indigenous vegetation interrupted only by bare rock faces and bluffs. To the south the RAP covers moderate to steep slopes and scattered bluffs in the head of a true left tributary of the upper Waihua River.

Manuka and kanuka dominate the secondary vegetation of the RAP, ranging from young scrub to forest. The taller kanuka forest, with scattered broadleaved trees amongst it, lies in the stream gully slopes. Patches of treeferns and broadleaved trees occur throughout the kanuka-dominated vegetation. Manuka scrub dominates the dry ridges and northern facing slopes at the eastern end of the RAP. Pockets of rewarewa/kanuka forest lie in several of the upper stream gullies on both sides of Cricklewood Road, with kamahi, kohuhu, young tawa, akepiro, pate, mamaku, young podocarps, and wineberry amongst the canopy. Slip faces, which occur on the steeper slopes and above the Waiau River, have younger manuka and tauhinu scrub. Some of the forest areas in the upper slopes are open underneath with small grassy patches breaking the canopy.

Feral goats were noted within the RAP. The only conspicuous weeds were occasional wilding pines amongst the younger vegetation. Kereru, tui, whitehead and grey warbler have all been recorded.

Significance and justification

This RAP is significant because it is an extensive tract of indigenous vegetation, including a range of successional stages, that cover a wide altitudinal range (80-560 m) and range of terrain from ridge top to river side. The dominance of north-facing (drier) aspects is notable as there is a strong bias towards south-facing (moister) aspects in most other surviving areas of indigenous vegetation. The significance of the RAP's large size is enhanced by the degree of connection provided by the Waiau

River riparian vegetation (including RAP TIN 133) to other areas. It is a significant wildlife habitat with an SSWI ranking of 'moderate'.

RAP TIN 130 UPPER WAIHUA RIVER

Refer to Map 25

Study site No.	part 345, 346, 374 & 375
Priority:	1
Grid Reference:	NZMS 260 W19 690375
Area:	261 ha
Altitudinal range:	70-350 m
Bioclimatic zone:	lowland
Vegetation classes:	tawa forest tawa-titoki forest kanuka forest broadleaved scrub-shrubland manuka-kanuka scrub cliff vegetation

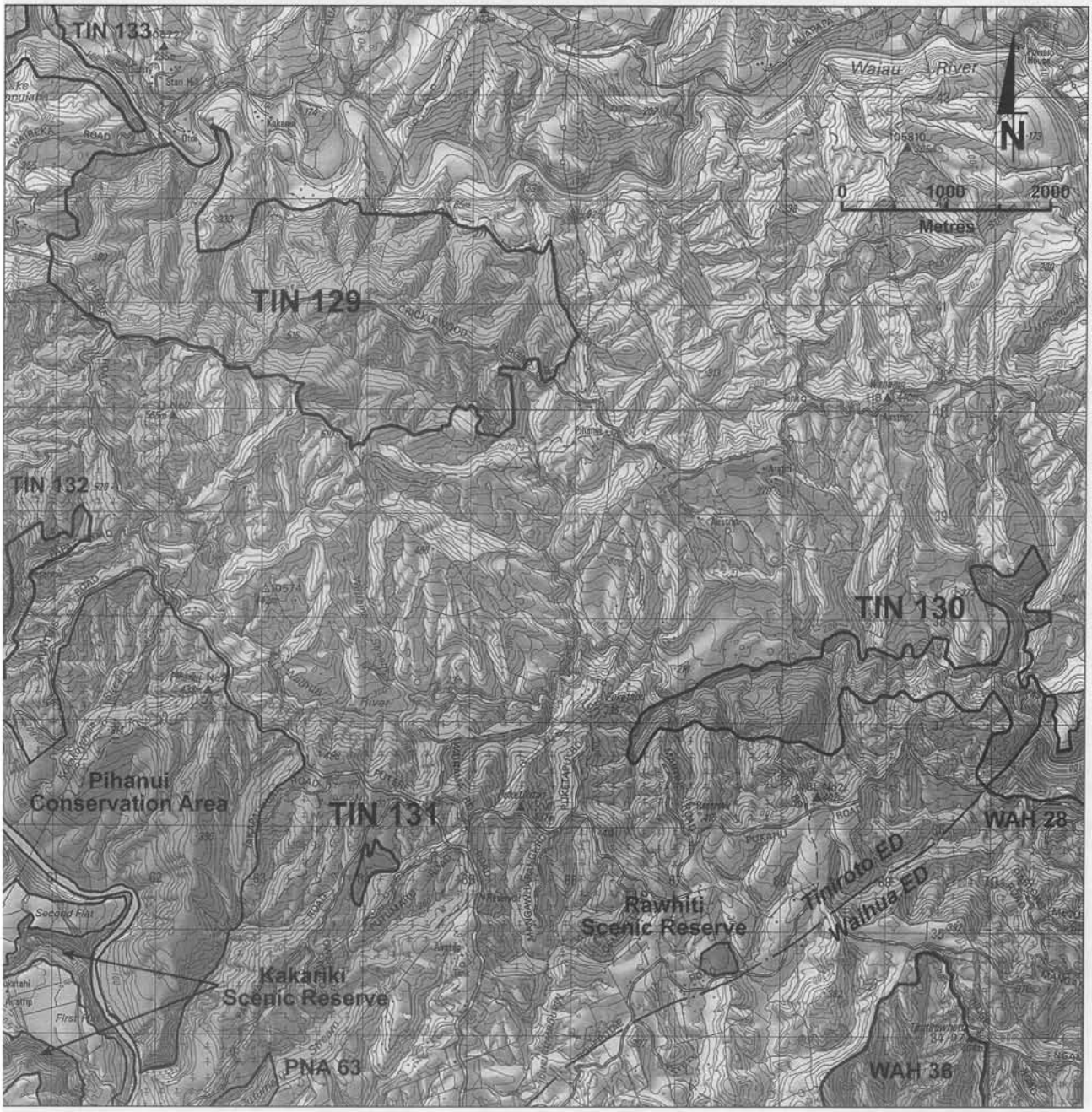
Description

This extensive RAP forms a band of vegetation (200-900 m wide) along a 5 km length of the Waihua River and its tributaries. One of the tributaries has a 43 m waterfall on it. The river is steeply incised, with steep scarp faces, narrow terraces along some stretches of the river and moderate to steep hill-slopes. The upper north-facing sections of the RAP are bounded by pine plantations. At its downstream end, the RAP abuts against the (somewhat arbitrary) boundary to the more coastally influenced Waihua Ecological District and RAP WAH 28.

The RAP is a complex mosaic of secondary, advanced secondary and primary vegetation: manuka-kanuka scrub to kanuka scrub to kanuka forest to kanuka-broadleaved forest to broadleaved forest to tawa-dominated forest. Most of the primary forest is in the moist lower slopes/stream gullies. Only scattered podocarps remain (kahikatea, miro, rimu) with most of them logged out. Other abundant species include titoki, pukatea, kowhai, hinau, pigeonwood, ngaio and kohuhu. Most of the terraces beside the river are grazed and open, with pasture grasses and weeds and only scattered young scrub. The steep cliff faces and bluffs within the gorge support a range of flaxland, scrub and shrubland, with *Pittosporum ralphii*, tuhara, whaririki, kowhai, kanuka, manuka, tauhinu and *Gahnia* sp.

The area has a small population of red deer, which move throughout the river system. Feral goats are also present, but were not seen in high numbers. The cliffs on the gorge sides provide a natural barrier to domestic stock. Tui, kereru and fantail were all recorded during the survey.

Map 25: RAPs TIN 129-131 (NZMS 260 W19)



Significance and justification

This RAP is significant as it covers a substantial length and area of diverse primary and secondary vegetation along the Waihua River, on a diverse range of valley-focused landforms, including alluvial terraces and terrace risers, moderate to steep hill-slopes and bluffs, with both sunny and shady aspects. Along with the contiguous RAP WAH 28, it extends over 13 km of the river's c. 40 km extent, and in some parts from ridge to ridge across the river valley, forming an important environment for wildlife.

RAP TIN 131 TUTUMARU STREAM

Refer to Map 25 (p. 235)

Study site No. 348

Priority: 3

Grid Reference: NZMS 260 W19 641357

Area: 12 ha

Altitudinal range: 300-350 m

Bioclimatic zone: lowland

Vegetation class: tawa forest

Description

This small RAP lies on moderate slopes in the upper catchment of the Tutumaru Stream, a true left tributary of the Mohaka River. It is completely surrounded by pine plantation and a small segment of Patuwahine Rd to the west. The core of the RAP is primary tawa forest, with advanced secondary broadleaved forest surrounding it. The canopy of the broadleaved forest is a mosaic of pigeonwood, wineberry, mahoe, ngaio, five finger, silver fern and putaputaweta. The understorey of the tawa forest is dense, with kanono, hangehange, rangiora, hen and chicken fern, gully fern and hook sedge.

The feral animal numbers within the RAP and the surrounding exotic forests are low, with hunting and poisoning operations carried out regularly. As a consequence the forest is diverse and displaying strong regeneration.

Significance and justification

This RAP is significant as it contains areas of primary tawa-dominated forest with an intact understorey and strong regeneration. The area is also an important wildlife habitat with forest birds including tui, bellbird, kereru, Australasian harrier, whitehead, fantail, grey warbler, shining cuckoo and long-tail cuckoo all recorded.

RAP TIN 132 ARIKANIHI STREAM

Refer to Map 26 (p. 238)

Study site No. 361

Priority: 3

Grid Reference: NZMS 260 W19 607382

Area: 49 ha

Altitudinal range: 70-440 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
tawa forest
broadleaved forest
kanuka forest

Description

This RAP covers moderate to steep slopes and bluffs of the lower to middle valley sides flanking Arikanihi Stream, a true left tributary of the Mohaka River. The stream falls over a substantial waterfall, about two-thirds of the way down its course. The RAP is surrounded by pine plantations, with Papa Rd forming its upper southeastern boundary. It is continuous with Pihanui Conservation Area (PNA 64) which includes the lowest 200 m of the stream catchment, with Kakariki Scenic Reserve on the opposite side of the Mohaka River (within the Mangaharuru Ecological District).

The most extensive vegetation type within the RAP is kanuka-dominated forest. Rewarewa and kowhai are scattered throughout, along with kohuhu, mapou, heketara, wineberry, houhere and mahoe. Hangehange, rangiora, heketara, red-fruited karamu, common shieldfern and hook sedge dominate the understorey. Old slips and ridges have occasional open grassy patches. Small patches of black beech forest are confined to the drier ridges and spurs amongst the kanuka forest. One upper southeast facing stream gully has a small pocket of dense kamahi-dominated forest. The understorey is open with only scattered shrubs and seedlings. There are also pockets of modified primary tawa-dominated forest in the upper catchment, with infrequent rewarewa and titoki.

Feral pigs and goats are present within the RAP, with much browse and pig rooting noted. Tui, kereru and bellbird were recorded.

Significance and justification

This RAP is significant for its wide range of vegetation types, from young secondary scrub to primary forest, on a diversity of inner valley landforms. It is continuous with Pihanui Conservation Area (PNA 64) that forms part of a semi-continuous chain of indigenous vegetation that extends for c. 40 km along the Mohaka River.

RAP TIN 133 WAIREKA-PUTERE

Refer to Maps 26 and 24 (pp. 238 and 230)

Study site No.	751 & 811
Priority:	3
Grid Reference:	NZMS 260 W19 608437
Area:	113 ha
Altitudinal range:	90-300 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/broadleaved forest kanuka scrub forest freshwater wetland

Description

This RAP covers moderate to very steep slopes/scarp faces on the true right Waiau River and moderate to steep slopes and alluvial terraces on the true left. It also includes the moderate to steep slopes and bluffs along the small true right tributary

Map 26: RAPs TIN 132-137 (NZMS 260 W19)



that flows from Lake Rotonuiaha (RAP TIN 134). The tributary cascades over a 50 m waterfall just after it leaves the lake. The vegetation on the south-facing slopes (true left of the river) is a complex mix of kanuka, with scattered broadleaved trees amongst it (including titoki, young tawa, kowhai, young rimu, pigeonwood and mahoe) and emergent kahikatea and totara that are dense in places. The north-facing slopes have younger more patchy kanuka scrub-forest, and manuka scrub (on the thinner soils and fresh talus slopes) with scattered young totara, that are occasionally in dense groves on the lower slopes and slump benches near the river. A raupo-dominated wetland adjoining such forest on the largest slump bench is included in the RAP.

The scrub and forest is generally very open and grassy underneath, with grazing by domestic stock and feral goats.

Significance and justification

This RAP is important for its diverse secondary vegetation on a variety of valley-focused landforms. It has an important ecological corridor function, essentially linking RAP TIN 134 around Lake Rotonuiaha and the large RAP TIN 129; and via narrower bands of riparian vegetation by the Waiau River, linking these areas with the larger Conservation Areas further upstream.

RAP TIN 134 LAKE ROTONUIAHA

Refer to Maps 26 and 24 (pp. 238 and 230)

Study site No.	385
Priority:	3
Grid Reference:	NZMS 260 W19 597432
Area:	70 ha
Altitudinal range:	280-360 m
Bioclimatic zone:	lowland
Vegetation class:	kanuka scrub-forest manuka scrub freshwater lake

Description

This RAP at Putere includes Lake Rotonuiaha and its margins, the vegetated gentle to moderate slopes on the northwestern side of the lake, and south-facing slopes at the northern side of the lake (where it joins to RAP TIN 133). The lake is fed by Lake Rotoroa, half of which is protected within the Lake Rotoroa and Lake Rotongaio Conservation Area (PNA 61). The stream that flows from Lake Rotonuiaha is a true right tributary of the Waiau River, falling over a 50 m waterfall (which is included in RAP TIN 133) to reach the river.

The lake edge vegetation is dominated by raupo reedland, with rush and sedge species around the margin. The vegetation on the slopes around the lake is young secondary kanuka-manuka scrub, with large areas dominated by bracken and hard fern. The low canopy is almost purely kanuka, with a small patch of broadleaved shrubland in a gully at the southwestern end. Kowhai, young kahikatea, kohuhu, cabbage tree, mahoe and wineberry are also present.

All of the vegetation within the RAP is secondary, following clearance for timber and agriculture, with grazing and trampling by domestic stock around the lake.

Significance and justification

The lake and its marginal vegetation are significant as a wildlife habitat with an SSWI ranking of 'moderate-high': wetland birds recorded include dabchick, spotless crake and NZ scaup. It is the largest and most diverse of the three

Putere lakes (including Lake Rotongaio and Lake Rotoroa) and the only one of which that has a sizeable area of indigenous vegetation on the gentle hill-slopes around its margin, therefore retaining the wetland-terrestrial vegetation continuum.

RAP TIN 135 LAKE ROTONGAIO WETLAND

Refer to Map 26 (p. 238)

Study site No. 923

Priority: 3

Grid reference: NZMS 260 W19 574435

Area: 5.8 ha

Altitudinal range: 390-400 m

Bioclimatic zone: lowland

Vegetation/landform class:
raupo reedland

Description

This RAP contains mainly wetland vegetation at the western end of Lake Rotongaio, beside Putere Rd. The lake lies in a wide hummocky basin. Raupo reedland dominates the lake edge vegetation, with a small pocket of broadleaved secondary forest on an 'island' isolated by the wetland at western edge of the lake, with open water around it to the east. The western edge of the wetland grades through sedgeland to pasture. It is unfenced with stock trampling and grazing evident.

Significance and justification

Although small, this is one of the largest areas of wetland vegetation in the western part of the district and it is diversified by the terrestrial 'island'. It has significance as a wildlife habitat, with an SSWI ranking of 'moderate-high'. Dabchick, spotless crake, scaup and Australasian bittern, eels and other species of native fish are all present. The lake is protected as a scenic reserve and also has cultural significance as a traditional eeling site, but its ecological values are substantially dependent on the associated wetland and 'island'.

RAP TIN 136 TE IHUORURUMAIOTERANGI

Refer to Map 26 (p. 238)

Study site No. 387, 364 & 365

Priority: 1

Grid Reference: NZMS 260 W19 555415

Area: 1 526 ha

Altitudinal range: 200-763 m

Bioclimatic zone: lowland

Vegetation classes: conifer/broadleaved forest
general broadleaved-beech forest
tawa forest
broadleaved forest
kanuka scrub forest
manuka scrub

Description

This extensive RAP lies mainly on the south-southeastern side of the prominent ridge passing through Te Ihuorurumaioterangi (763 m). It features long regular dip-slopes facing southeast, and encompasses the entire headwater catchment of the Tukitukipapa Stream and much of its mid-reaches and the headwaters of the Waiwai, and Mangapuru Streams. All are true left tributaries of the Mohaka River. A newly registered QEII covenant (PNA 59) on the northern side of Te Ihuorurumaioterangi is continuous with the RAP along the upper ridge. A small section of north-facing sandstone bluffs and steep slopes falling from 735 m high point east of the covenanted area is included within the RAP. It also includes a small area in the east in the upper catchment of a small tributary of Lake Rotoroa. Mature pine plantation abuts the RAP along its most eastern and western boundaries. The RAP is fenced along its eastern, southern and parts of its northern boundaries. It is also bounded by Woodlands Rd along a small part of its southeastern margin.

The vegetation of the RAP is a mosaic of primary, logged primary, advanced secondary and secondary vegetation. Some of the advanced secondary and low primary forest has regenerated following pre-European fires that swept through the area. Manuka scrub is common on the margins and along dry previously burnt ridges. Sparse manuka shrubland occurs on the north-facing bluffs on the northern edge of the RAP, with kanuka scrub-forest below.

The western end of the RAP is dominated by logged rimu-matai/broadleaved forest, in which most of the large podocarps have been removed. The canopy, which is discontinuous in places, is a mosaic of broadleaved species (including tawa, kamahi and tawari), young conical podocarps and treeferns. Beech forest is present on some ridges (predominantly black beech lower down, with more red beech at higher altitudes). Several pockets of this vegetation type are also present in the eastern half, amongst large tracts of younger secondary kanuka-dominated scrub-forest. Emergent rewarewa, kohuhu, wheki, putaputaweta, houhere, kamahi, cabbage tree and occasional young black beech are present amongst the canopy.

In the southeastern part of the RAP, in the mid-reaches of Tukitukipapa Stream, the vegetation is predominantly advanced secondary rewarewa/broadleaved forest, with high numbers of even-aged rewarewa. The canopy is a diverse mosaic of broadleaved species, including kohuhu, kowhai, lancewood, young tawa, titoki, kaikomako, five finger and young podocarps. In places this forest merges to younger manuka scrub, and elsewhere to pure kanuka forest. Areas of primary forests are present in several extensive stream gullies and on north/northeast-facing moderate slopes beside the Tukitukipapa Stream and Woodlands Rd. Here tawa dominates the canopy, with titoki and a mixture of broadleaved species. Scattered emergent rimu, matai and kahikatea occur throughout, with pockets of these species along parts of main stream. Small patches of predominantly black beech forest lie on ridges and stream sides throughout.

A small seasonal wetland lies in the upper reaches of the Mangapuru Stream in the northwestern corner of the RAP, with scattered conical kahikatea around its margin, along with sedge and rush species.

Feral goats, deer, pigs, possums and domestic stock are all present within the RAP, with domestic stock and feral goats grazing much of it. Regeneration is obviously being reduced or halted over parts of it (particularly in the tawa forest nearest Woodlands Rd). Some possum control is being carried out by a landowner in the southeastern part of the RAP. No problem weed species were recorded. Tomtit, kereru, fantail and whitehead have all been recorded.

Significance and justification

This RAP is significant as the second largest tract of unprotected vegetation remaining in the Tiniroto Ecological District (after RAP TIN 118). It covers a wide altitudinal range (200-763 m) and contains a diverse range of vegetation types including extensive primary forest, on a variety of landforms. It complements the much smaller areas of generally northerly aspect forest and bluffs within the contiguous QEII covenant (PNA 59) and Putere Scenic Reserve (PNA 60) along its northern boundary. It contains one of the largest areas of unprotected primary rimu-matai/broadleaved forest (forest class M3 of Nicholls 1976) left in the district; a forest type that would once have been far more extensive in the southwest (the largest area lies within the Erepeti Scenic Reserve PNA 38). The RAP is an important wildlife habitat with SSWI ranking of 'moderate'.

RAP TIN 137 WOODLANDS

Refer to Map 26 (p. 238)

Study site No. 370

Priority: 3

Grid Reference: NZMS 260 W19 554367

Area: 7.3 ha

Altitudinal range: 140-200 m

Bioclimatic zone: lowland

Vegetation class: conifer/tawa forest

Description

This small triangular shaped RAP lies on a rolling bench and moderate south-facing hill-slopes, c. 2 km east of Fraser's Bush Scenic Reserve (PNA 65). The stream which runs through it is a small true left tributary of the Mohaka River. The vegetation is modified primary forest with large rimu and matai emergent over a tawa-titoki canopy. The understorey of the forest is grazed and very open underneath, with a few scattered ferns, kawakawa, ongaonga and *Oplismenus imbecillis*. There is little regeneration. Common bush birds were recorded including kereru, bellbird, tui and silvereye.

Significance and justification

The RAP is one of the few remaining areas of primary forest on easy fertile slopes in this part of the district. It is also part of the semi-continuous chain of indigenous vegetation that runs for c. 40 km along the Mohaka River. It lies opposite the Willow Flat Conservation Area (within the Maungaharuru Ecological District), providing a seed source of primary forest species for regeneration within the Conservation Area's younger secondary vegetation.

RAP TIN 138 WILLOWFLAT

Refer to Map 27 (p. 244)

Study site No. 394

Priority: 2

Grid Reference: NZMS 260 V19 487366

Area: 68 ha

Altitudinal range: 120-360 m

Bioclimatic zone: lowland

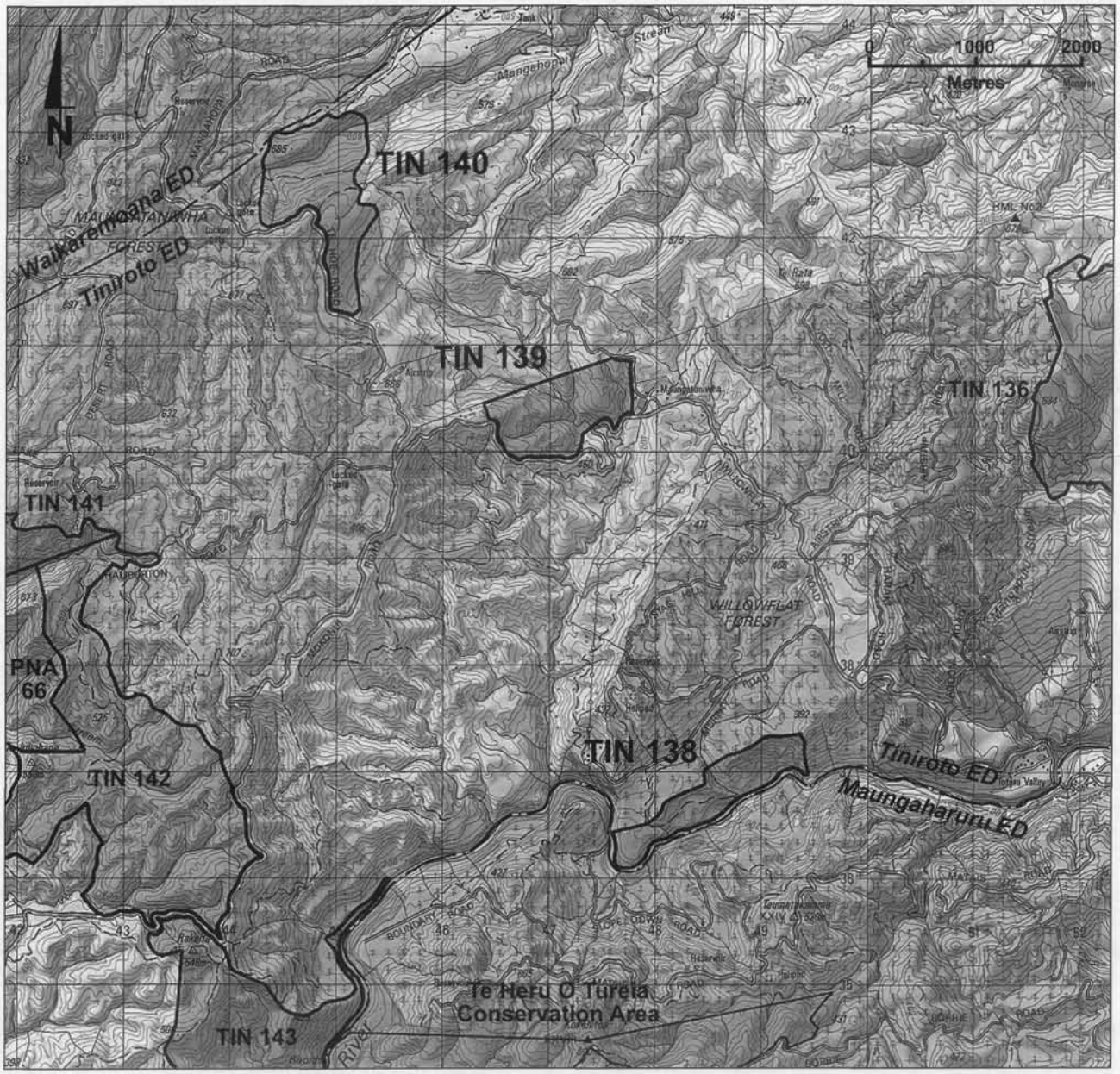
Vegetation classes: conifer/tawa forest
tawa-titoki forest
tawa forest
conifer/broadleaved forest
broadleaved forest
kanuka scrub
manuka scrub

Description

This RAP consists of a band of forest and scrub on narrow alluvial terraces and south-facing moderate to steep slopes, steep ridges and bluffs on the true left of the Mohaka River, c. 3 km upstream of Willowflat. The RAP is dissected into western and eastern halves by the incised stream channel of a true left tributary of the Mohaka River. The RAP is bounded to the north and east by mature pine plantations, generally along a ridgeline except in the tributary stream valley.

The vegetation has been subject to human induced (e.g. logging, burning/clearance) and natural (e.g. erosion of the steep faces) modification, which has created the diversity of vegetation types. The RAP is a complex mosaic ranging from young manuka scrub to kanuka scrub to broadleaved forest to primary conifer/tawa forest. The most extensive vegetation type is primary logged rewarewa/tawa forest, which covers the western half of the RAP. It extends from the narrow alluvial terraces, up moderate slopes to the pine plantation. Occasional matai, totara and kahikatea are emergent over the tawa-dominant canopy, which also includes totara, titoki, kohuhu, ngaio, kowhai and tall kanuka. The slopes at the eastern end of the RAP are steeper, with a more varied mixture of vegetation. Advanced secondary broadleaved forest treeland covers the mid to upper slopes. The canopy is dominated by titoki, kanuka, mahoe, pigeonwood, kowhai, wineberry, totara and young tawa. Amongst the broadleaved forest, on an alluvial terrace and on the slopes of the central stream gully, are several pockets of

Map 27: RAPs TIN 138-140 (NZMS 260 V19 & W19)



primary (matai-totara-kahikatea)/tawa forest. The podocarps are large and abundant. There are also small pockets of primary tawa-titoki forest (in a small stream gully) and totara-broadleaved forest (on a narrow ridge and steep ridge side at the eastern end). The bluffs and old slip faces have manuka scrub, with *Gahnia* sp., tuhara, tutu, whaririki, *Coprosma* sp. and *Hebe stricta*.

Feral goats were recorded within the RAP, but with stock now excluded the vegetation is recovering well. Kereru and common bush birds, including tui and fantail were also noted.

Significance and justification

This RAP is significant for its wide range of vegetation, particularly as it contains primary (matai-totara-kahikatea)/tawa-titoki forest, a vegetation type characteristic of high fertility colluvial and alluvial soils. It is also an important link in a semi-continuous c. 40 km chain of indigenous vegetation along the Mohaka River, extending from just south of the Mohaka's confluence with the Te Hoe River to the Mohaka viaduct.

RAP TIN 139 MAUNGATANIWHA

Refer to Map 27

Study site No.	395
Priority:	2
Grid Reference:	V19 472404
Area:	83 ha
Altitudinal range:	360-580 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest conifer/tawa forest tawa forest

Description

This compact RAP lies on broad moderate hill-slopes and stream gullies in the upper catchment of an unnamed true left tributary of the Mohaka River. The main stream has steeply incised banks and divides the RAP in two. The RAP is bounded by young pine plantations to the north, with Willowflat Rd winding along its southern/southwestern boundary and a logging road forming its northeastern boundary.

The bulk of the RAP has logged rewarewa-(rimu)/tawa forest, with a dense tawa-dominated canopy. On the slopes at the eastern and western ends the forest is similar, but with kamahi and other broadleaved trees making up a great proportion of the canopy. Hinau, titoki and silver fern are present amongst the tawa canopy, with kamahi and black beech forest particularly abundant on the dry ridge tops. A number of large emergent podocarps are also present, including rimu, kahikatea, matai and miro, with a number of younger pole trees. The understorey is dense with supplejack, kanono, hangehange, young fuchsia, hook sedge and ferns (e.g. common shieldfern, crown fern, gully fern, hen and chicken fern, heruheru, hounds tongue, kiwakiwa and nini). The forest merges into young scrub and treeland along its northern boundary.

The high number of healthy palatable shrubs in the understorey suggest that feral goat, deer and possum numbers are low within the RAP. Past logging has removed a number of the large podocarps, however many sizeable trees remain. There are also high number of young podocarps and pole trees. Forest birds including tui, tomtit and kereru have all been recorded within the RAP.

Significance and justification

This RAP is significant as a compact remnant of primary forest in a highly modified part of the district; most of the primary forest has been cleared for farming and exotic forestry. It is also an important wildlife habitat with an SSWI ranking of 'moderate'.

RAP TIN 140 TE HOE ROAD

Refer to Map 27 (p. 244)

Study site No. 839

Priority: 3

Grid Reference: V19 446425

Area: 111 ha

Altitudinal range: 560-820 m

Bioclimatic zone: lowland to montane

Vegetation class: conifer/beech forest

Description

This RAP lies adjacent to the boundary of Waikaremoana Ecological District, on moderate hill-slopes in the upper catchment of the Mangahopai Stream (a true right tributary of the Waiau River), and south-facing slopes draining to the Mohaka River. Te Hoe Rd forms the RAP's south-western boundary, with pine plantations to the north, northwest and east. Two logging roads pass through the RAP's northern half. Other old logging roads are also evident but largely 'filled-in' now with broadleaved trees and shrubs. The vegetation over the rest of the RAP is dominated by primary logged (rimu)/red beech-silver beech forest. Crown fires may also have contributed to the loss of some of the larger podocarps. Kahikatea, hinau, and tanekaha are present amongst the beech, with kamahi, heketara, pate, mountain horopito, haumakaroa, tawheowheo and akepiro abundant in the sub-canopy. The understorey is thick in places with good regeneration.

Significance and justification

This RAP is significant as it is one of the few primary forest areas surviving on moderate terrain in this areas of transitional character near the boundary between the Tiniroto and Waikaremoana Ecological Districts. Little primary rimu/beech forest remains and this is one of the better examples. Although logged it has a largely intact tall canopy, and a diverse understorey despite the presence of some introduced mammals.

RAP TIN 141 TE KOOTI'S LOOKOUT - TE HOE GORGE

Refer to Map 28 (p. 248)

Study site No. 840

Priority: 1

Grid Reference: V19 403385

Area: 699 ha

Altitudinal range: 200-733 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
conifer/tawa-beech forest
conifer/kanuka forest
kanuka forest
manuka scrub

Description

This RAP covers a prominent plateau (700-720 m) and several high points (including Te Kooti's Lookout 733 m), surrounded by steep cliffs/bluffs and debris fans, just upstream of the confluence of the Te Hoe and Mohaka Rivers. It also includes steep slopes and massive sandstone bluffs on both sides of the Te Hoe River, being a c. 3 km length of its gorge. It is continuous with a large QEII covenant (PNA 66) to the southeast, the straight-line boundary of which extends from the Te Hoe River up the general line of a deeply incised true right tributary, and with RAP TIN 142 along the continuation of the same cadastral boundary. Pine plantations form the RAP's southwestern, western, and northeastern boundaries. At the upstream (northern) end it is terminated arbitrarily at the confluence of the Hautapu and Te Hoe Rivers and the approximate line of the Ecological District boundary. Gorge slopes and forest of high ecological value continue up the Te Hoe River into the Waikaremoana Ecological District.

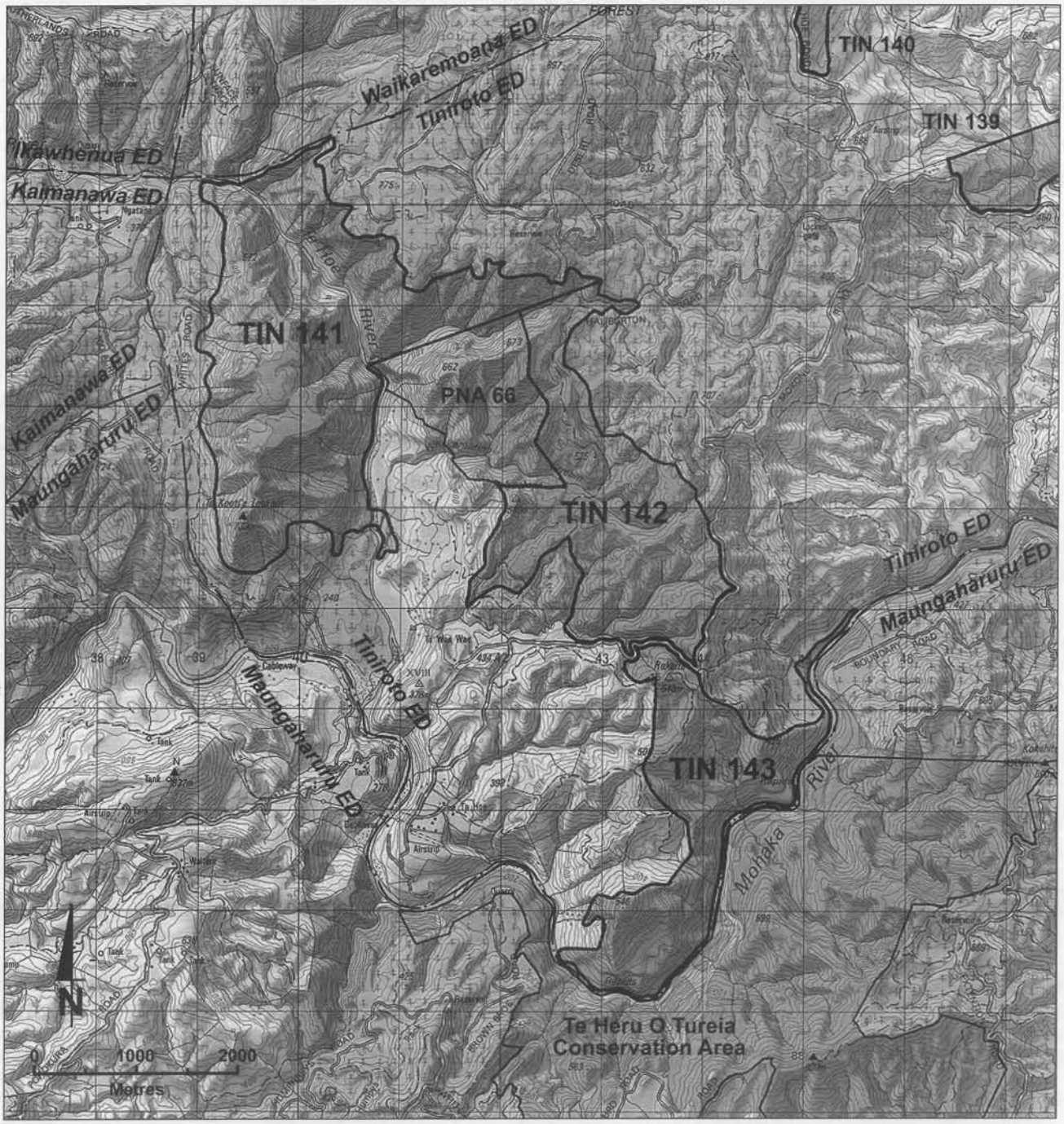
The vegetation within the RAP is a mosaic of varying ages and structures, the result of past burning, clearance and erosion. On the plateau, central upper slopes to the west, and around Te Kooti's lookout red beech-silver beech forest dominates. Pockets of this primary beech forest are surrounded by younger beech, with kanuka, kowhai and other broadleaved trees amongst the low canopy. A small triangular pocket (c. 10 ha) of rimu-kahikatea/beech-tawa forest lies in an east-facing perched gully basin. The upper parts of the gully are dominated by red beech and large podocarps, with tawa dominating the bottom of the gully.

The lower slopes, old slip faces and debris fans below the steep bluffs support young kanuka-dominated vegetation. Two pockets, on lower slopes in the southeast and northeast (on the true right side of the river), have advanced secondary forest dominated by tall kanuka, with a high concentration of young totara. Cabbage tree, young kahikatea, heketara, lancewood and houhere are also present. The remainder of the lower slopes on both sides of the RAP are younger secondary kanuka scrub forest, which merge to younger manuka scrub in patches.

The vegetation at the northern end of the RAP, along the true left steep slopes and bluffs above the Te Hoe River, is a mosaic of young manuka-dominated scrub, advanced secondary kanuka forest with scattered beech, and young pure beech forest (predominantly red beech).

Several small Te Hoe River tributaries have waterfalls that cascade over the bluffs. The damp rock at their margins support tuhara, *Hebe* sp. and whahariki. Kowhai is the dominant tall tree on the steep faces. Scattered wilding pines occur in the young kanuka-dominated and beech-dominated vegetation. Feral goats (able to scale all but the steepest faces) and deer are the main threats to the understorey diversity and regeneration of the RAP.

Map 28: RAPs TIN 141-143 (NZMS 260 V19)



Significance and justification

This striking RAP lies in an area of transitional character at the corner of Tiniroto Ecological District, against the boundary to Waikaremoana Ecological District and within 1-2 km of the Maungaharuru, Kaimanawa and Ikawhenua Ecological Districts. It covers a wide altitudinal gradient (200-733 m) and a range of different landforms including the impressive Te Hoe River gorge. It includes a full range of successional vegetation stages, from young manuka-dominated scrub to primary rimu/beech-tawa forest. It is a significant part of a c. 1600 ha tract of indigenous vegetation, together with PNA 66, and RAPs TIN 142 and 143, and also links with additional forest areas to the north in Waikaremoana Ecological District and the south across the Mohaka River to the Te Heru-o-Tureia Conservation Area which

lies in the Maungaharuru Ecological District. This tract creates a corridor for bird and seed dispersal. The RAP is also a significant wildlife habitat, with tui, tomtit, kereru, grey warbler and rifleman all present. Te Kooti's Lookout is of historic significance.

RAP TIN 142 HALIBURTON

Refer to Map 28

Study site No.	529
Priority:	1
Grid Reference:	V19 430370
Area:	414 ha
Altitudinal range:	300-673 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest conifer/beech forest conifer forest kanuka-manuka scrub

Description

This extensive RAP covers moderate to steep slopes and narrow ridges in the mid to upper headwaters of two stream catchments (including the Whakamarino Stream), both of which are true left tributaries of the Te Hoe River. The RAP abuts pasture along its southwestern margin, with Mokonui Rd forming its southern boundary and mature pine plantations abutting it to the east. It is continuous with a large QEII covenant (PNA 66) along most of its northern boundary (north of Te Ipuohape (568 m)) with RAP TIN 141 bounding it in the north at a rather arbitary cadastral boundary. The old Haliburton Rd, which is now impassable, passes through the RAP.

The vegetation is a complex mosaic reflecting past logging and clearance of part of the RAP. It ranges from primary unlogged podocarp-rich forest to young secondary manuka-dominated scrub. Beech (red, black, occasional silver) is scattered throughout and dominates some ridges/spurs. The gentler slopes to the east, around the upper Whakamarino Stream, have small pockets of rimu/tawa-beech forest. Most of these have had at least partial logging.

On the lower slopes of the upper Whakamarino Stream, northeast of Te Ipuohape Trig (568 m) there is a pocket of dense tanekaha forest. The canopy is almost purely tanekaha, with only occasional rimu, kamahi, red beech and black beech amongst it. This merges into advanced secondary forest, with emergent beech (red, silver and black) over a mixed canopy of tall kanuka, kamahi, young totara and tanekaha.

The moderate slopes beside Mokonui Rd at the southern end of the RAP, have the youngest vegetation that has regenerated following fire. Scattered rewarewa are emergent over a kanuka-dominated canopy, with beech in the gullies and on some ridges. Broadleaved trees and young podocarps are regenerating through the canopy, including mahoe, tree fuchsia, akepiro, totara, rimu and tanekaha. Patches of young manuka-dominated scrub are present, particularly on ridges.

Domestic stock are now excluded from the bulk of the RAP, with occasional stock, feral goats, red deer and possums the main exotic browsers. Their presence was most notable in the forests around Te Ipuohape where large leaved palatable species were scarce amongst the understorey. Possum control operations are carried out at intervals by the Regional Council and the owners of the surrounding pine plantations. No problem weeds were noted.

Significance and justification

This RAP includes a full range of vegetation, from young scrub to impressive primary forest, which occurs on a wide range of landforms. While a substantial area of outstanding primary forest now has formal protection under the QEII covenant, there is much additional area within the RAP. It is of a forest type not well represented in the district, with this the largest and most unmodified example. The RAP contributes to a c. 1600 ha tract of indigenous vegetation, that includes the covenant area and RAPs TIN 141 and 143. It also has important wildlife habitat values, with an SSWI ranking of 'high'. In the 1980s kiwi, kaka and kakariki were all present. However, they were then in decline and few of these are likely to be present now (J. McLennan pers. comm.) Other forest birds including kereru, bellbird, tomtit, rifleman, whitehead and fantail are still abundant.

RAP TIN 143 RAKAITA

Refer to Map 28 (p. 248)

Study site No. 841

Priority: 2

Grid Reference: V19 440340

Area: 321 ha

Altitudinal range: 140-548 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
kanuka forest
kanuka-manuka scrub

Description

This RAP consists of a wide band of vegetation along the true left of the Mohaka River, extending up to the Rakaita high point (548 m) and an unnamed high point on the south-facing slopes to the south (546 m) and the northwest-facing hill-slopes around the Rakaita and 508 m high points. The slopes above the river are moderate to steep, with localised bare rocky bluffs. Mokonui Rd forms the RAP's northern boundary, with pine plantations bounding it to the northeast and young scrub and farmland to the west. Well developed vehicle tracks run through the RAP on the upper ridges around the Rakaita high point.

Past logging and clearance has created a mosaic of mostly secondary kanuka-dominated vegetation, with pockets of older forest closest to the river. The slopes beside Mokonui Rd and around Rakaita high point have young kanuka-manuka

scrub, with scattered broadleaved shrubs and trees (including wineberry, akepiro, mahoe, tutu, tree fuchsia, karamu, cabbage tree and ngaio). The understorey of much of the scrub is lush and diverse, with mingimingi, turutu, crown fern, snowberry, *Haloragis erecta* and waewaekoukou. The slopes above the river are a mosaic of the young secondary scrub, older kanuka forest and primary forest. The kanuka forest varies from pure kanuka, to that with young podocarps, putaputaweta, mahoe, akepiro, kohuhu and kowhai amongst it. The pockets of modified primary forest are dominated by tawa, with scattered emergent podocarps.

Domestic stock have access to the RAP, although grazing was only noted on the margins. No problem weed species were noted.

Significance and justification

This RAP includes a wide range of vegetation types on different landforms from the river side slopes and terraces to ridge crests. Of predominantly shady, southeasterly aspect, it complements the steeper, more bluffy northwesterly aspect faces of the extensive Te Heru-o-Tureia Conservation Area, which lies in the Maungaharuru Ecological District on the opposite side of the Mohaka River. It provides a valuable linkage between the extensive primary and secondary vegetation areas to the north in PNA 66 and RAPs TIN 141 and 142, and Te Heru-o-Tureia Conservation Area across the Mohaka River and it also contributes to the semi-continuous chain of indigenous vegetation that extends for c. 40 km downstream to the Mohaka River viaduct in Waihua Ecological District.

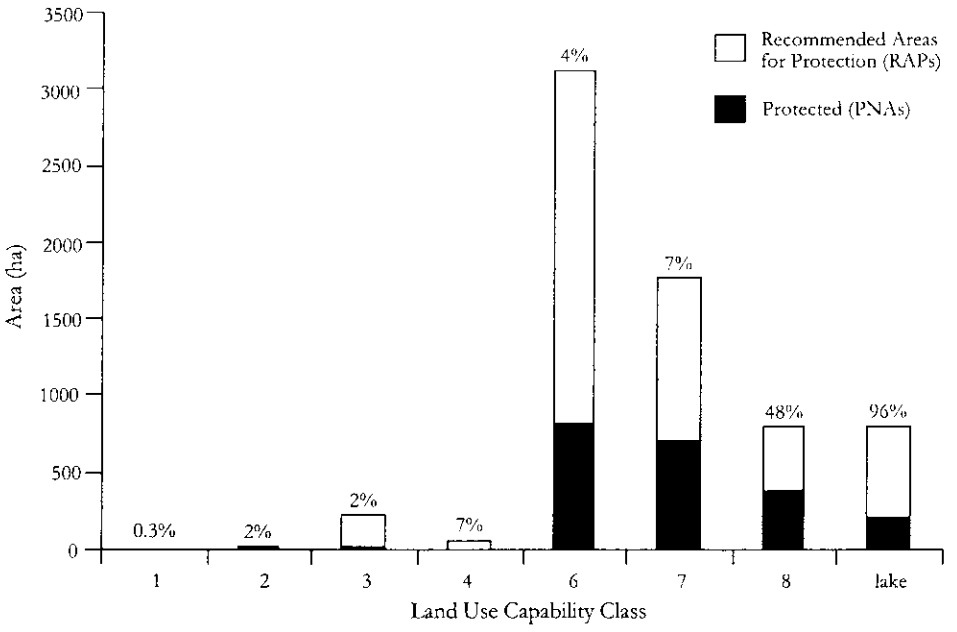
6.2 WAIHUA ECOLOGICAL DISTRICT RAPS

A total of 242 study sites were assessed within the Waihua Ecological District during this study, of which 213 have no formal protection. Of those unprotected study sites all or part of 61, covering a total of 4 955 ha or 3.9% of the ecological district, are now identified within 56 Recommended Areas for Protection (RAPs) and described below. Indicative information on the areas and proportionate representation of the various vegetation/landform classes in the selected RAPs is provided in Appendix 11, Table 2.

The RAPs are well spread throughout the district (Fig. 10) and across the different Land Use Capability Classes (Fig. 12). They also contain substantial proportions of secondary vegetation which is now so much a part of the district's vegetation pattern, and a large percentage (75%) of the saline and freshwater wetlands present along the coast east of Wairoa, recognising the imbalance of these vegetation/landform classes within the existing PNA network. Of the 56 RAPs, 22 are Priority 1, 16 are Priority 2, and 18 are Priority 3.

Those RAPs in the most modified parts of the district, i.e. in the southern section from Putorino south and in the lower Wairoa River valley, are small and scattered. The RAPs on alluvial terraces throughout the district are also very small. Those in the central and eastern sections, between Raupunga and Waikokopu, tend to be larger and have major proportions of secondary and advanced secondary vegetation, with primary vegetation largely restricted to moist stream gullies and south-facing slopes.

FIGURE 12 : DISTRIBUTION OF RECOMMENDED AREAS FOR PROTECTION (RAPs), AND CURRENT PROTECTED NATURAL AREAS (PNAs) IN RELATION TO LAND USE CAPABILITY CLASSES WITHIN THE WAIHUA ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of each LUC Class supporting PNAs and RAPs.

RAP WAH 1 OPOUTAMA

Refer to Maps 29 and 42 (pp. 255 and 323)

Study site No.	579 & 596
Priority:	1
Grid Reference:	NZMS 260 X19 275290
Area:	602 ha
Altitudinal range:	20-300 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation classes:	beech forest conifer/tawa forest tawa/kohekohe forest kanuka forest kanuka-manuka scrub

Description

This large RAP extends for c. 4 km on hill-slopes north of the Opoutama settlement, on the western side of the Opoutama Stream valley. Moderate to steep side-slopes are divided into alternating northerly and southerly aspects by ridges and spurs that extend down from the main north-south ridge to the Opoutama Stream terraces. Some of the spurs end in small rocky bluffs. To the west the RAP covers long parallel ridges and moderate to steep slopes in a sub-catchment of the upper Waimaunu Stream (which flows into the Nuhaka Lagoon and River near its mouth). It also includes much of a narrower catchment in the southwest, that extends from stream side over moderate to steep gully sides to the northwestern ridge crest, in a tributary of Waikokopu Stream. The RAP is fenced along much of its western boundary. The area is underlain by banded sandstone/mudstone.

The vegetation within the main body of the RAP is a mosaic of various aged secondary scrub and forest, with substantial pockets of modified primary broadleaved forest. The secondary scrub varies from very young manuka-tauhinu scrub amongst pasture and swards of hard fern, to groves of treeferns and scattered broadleaved trees amongst a tall kanuka canopy. The pockets of broadleaved forest occur mostly in the moist stream gullies and are remnants of the original coastal/semi-coastal primary forest. They are composed of various mixtures of tawa, pukatea, karaka, titoki, hinau, rewarewa, kahikatea and kohekohe. The largest and most intact area of primary forest lies in an upper stream gully in the southern half of the RAP. Here the canopy is a mosaic of rewarewa and tawa, with pukatea, karaka, ngaio, epiphytic puka and infrequent nikau. A cluster of large rimu are emergent over the mostly intact canopy. The sub-canopy is dominated by kohekohe, with mahoe, pigeonwood and occasional young matai. *Metrosideros diffusa* and aka are the most abundant climbers. All the broadleaved forest areas merge into kanuka scrub-forest.

The southwestern valley includes a c. 10 ha remnant of modified primary semi-coastal forest, isolated from the main body of the RAP by a narrow band of pasture. Tawa dominates the canopy, with kohekohe and scattered pukatea,

nikau, karaka and abundant epiphytic puka. One large original matai (> 1.5 m dbh) several smaller rimu and rewarewa are emergent. The sub-canopy also has kohekohe, along with mahoe, pigeonwood, silver fern and infrequent kiekie. Some of the kohekohe are very large and showing signs of senescence. The understorey is quite sparse with only scattered shrubs, and ferns including kawakawa, hangehange, young nikau, gully fern, nini, smooth shield fern and thread fern. A small patch of black beech forest is also present on a south-facing spur.

Domestic stock and feral goats are both present within the RAP. Domestic stock graze most heavily on the more accessible margins, while the goats appear to penetrate almost the entire RAP. Kereru, tui and fantail were noted.

Significance and justification

The RAP covers a complete set of typical landforms, extending from the coastal to semi-coastal bioclimatic zone. It is the largest area of indigenous vegetation, with some of the best examples of original hill-slope forest, remaining in the eastern end of the ecological district. Of botanical note is the presence of *Pimelea tomentosa*, a coastal shrub that is considered to be 'declining' (de Lange *et al.* 1999), within the scrub of the RAP. The presence of black beech is also important, as this is the most coastal occurrence of this species in the district. The RAP has notable landscape values, as a conspicuous backdrop to Opoutama.

RAP WAH 2 WAIKOKOPU

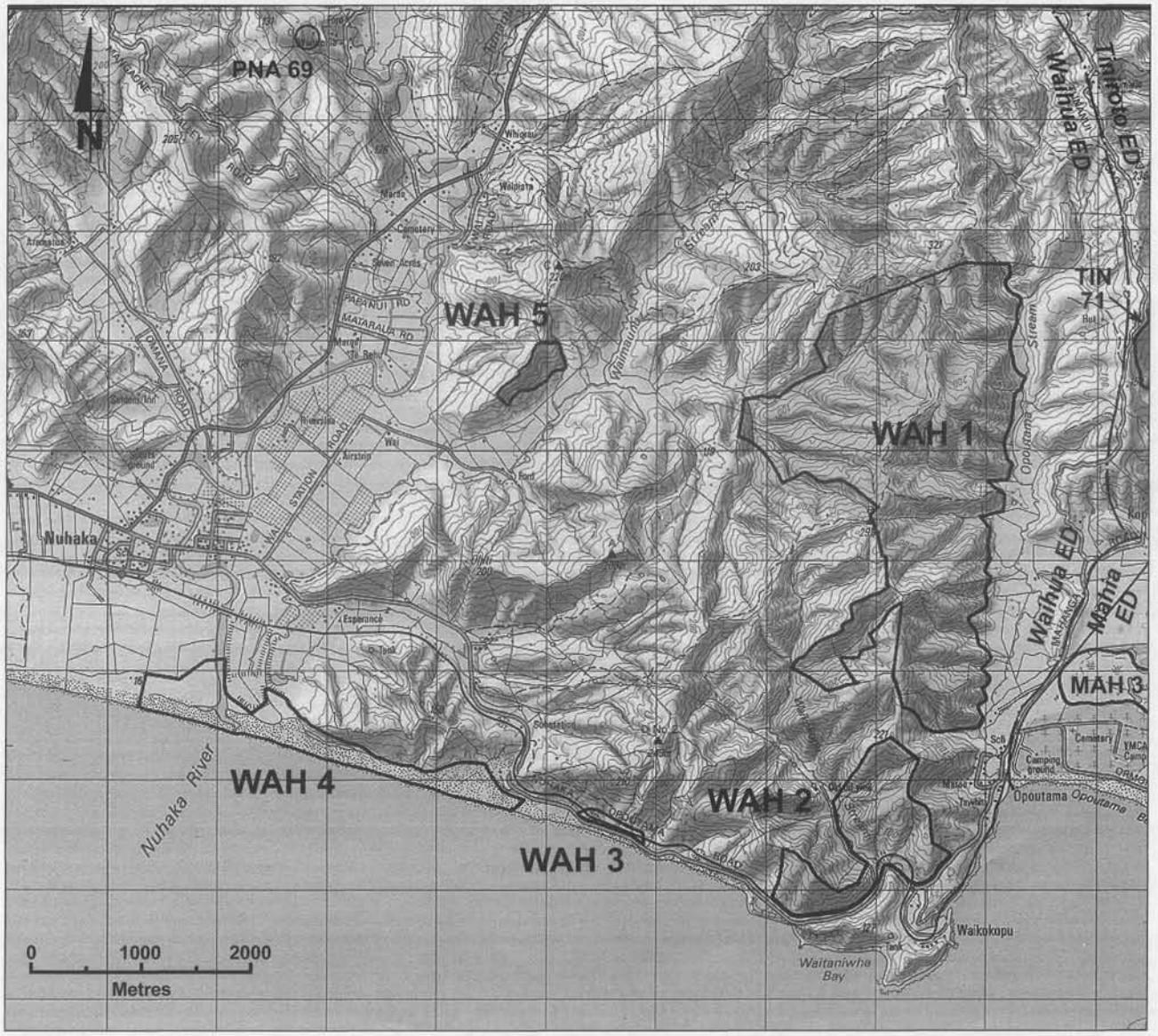
Refer to Maps 29 and 42 (pp. 255 and 323)

Study site No.	449
Priority:	2
Grid Reference:	NZMS 260 X19 270265
Area:	115 ha
Altitudinal range:	10-221 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation classes:	broadleaved forest kanuka scrub forest broadleaved/small-leaved scrub

Description

This RAP lies on moderate to steep west/southwesterly facing hill-slopes in the valley of Waikokopu Stream and moderate to steep south-facing coastal slopes, 1 km southwest of Opoutama. It is bounded to the south by Nuhaka Opoutama Rd, with the Palmerston North-Gisborne railway line running through the RAP just north of the road. A road leading to an oil drill-site runs through the centre of the valley. Oil exploration occurred there in 1967. The narrow valley floor and alluvial stream terraces have weedy vegetation, with pasture grasses, swards of blackberry, giant umbrella sedge, scattered manuka, ragwort, pasture weeds, Japanese honeysuckle, tauhinu, young cabbage tree, occasional kanuka and pohuehue (*Muehlenbeckia complexa*).

Map 29: RAPs WAH 1-5 (NZMS 260 X19)



The slopes above the terraces have a mosaic of indigenous vegetation of various ages, the majority of which is secondary with pockets of modified primary forest in most of the stream gullies. The valley slopes have extensive areas of small-leaved scrub ranging from very young manuka-tauhinu scrub (under 1 m tall), to areas of kanuka-manuka scrub to low forest with a range of broadleaved trees amongst the canopy. The older scrub also has occasional small pockets of broadleaved trees (e.g. karaka, ngaio) and scattered emergent rewarewa. The shrubs present in the low canopy include *Hebe tairawhiti*, mahoe, kawakawa, karamu, kaikomako and cabbage tree. The coastal faces have the youngest tauhinu-dominated scrub, with groves of whaririki and toetoe and a pocket of broadleaved shrubland (including *Hebe tairawhiti*, kawakawa, hangehange and common maidenhair).

The slopes beside the railway line and along Nuhaka Opoutama Rd in the northern corner of the RAP have older shrubland with a patchy canopy. Nearest the railway line the shrubland occurs beneath a taller canopy of silver poplars and *Acacia sp*. Species present include karamu, manuka, putaputaweta,

hangehange, mahoe, *Hebe tairawhiti*, tutu, rewarewa, occasional karaka, kanuka and whau.

The pockets of primary forest in the stream gullies, most of which are southwest facing, are a mosaic of coastal/semi-coastal broadleaved trees, including karaka, tawa, kohekohe, pukatea, ngaio, mahoe and pigeonwood. They vary in species composition from karaka-dominated, through to patches of tawa-pukatea/ kohekohe forest.

The area has been subject to past clearance and burning, with clearance still occurring along the major fence lines. Pigs, feral goats and low numbers of domestic stock are present in the lower valley area. Silver poplar, *Acacia* sp., wilding pines (amongst the scrub) and Japanese honeysuckle are the major weed species. Kereru, grey warbler, fantail and tui were all noted.

Significance and justification

The RAP is significant as it contains a substantial population of *Hebe tairawhiti*, a 'declining' newly described shrub with a limited distribution. It is the largest known population of the shrub within the Waihua Ecological District. The presence of whau, a coastal shrub with a local distribution, is also of significance, as it was recorded at only two other sites in the ecological district during this survey. Although highly modified, especially by fire, this is the largest area of continuous indigenous scrub-forest in the coastal zone of the central-eastern part of the district.

RAP WAH 3 BLACKS BEACH

Refer to Map 29 (p. 255)

Study site No. 484

Priority: 2

Grid Reference: NZMS 260 X19 246266

Area: 6.6 ha

Altitudinal range: 10-40 m

Bioclimatic zone: coastal

Vegetation class: coastal cliff vegetation

Description

This RAP comprises coastal cliffs and steep hill-slopes and narrow stream gullies that extend from the Nuhaka-Opoutama Road, to a little above the Palmerston North-Gisborne Railway line. The RAP is fenced along its upper edge above the railway line. The less steep sections of the coastal cliff faces/slopes have whahariki flaxland. Where streams have cut through the slopes to create steep-sided gullies there is a more diverse shrubland with hangehange, kawakawa, pohuehue (*Muehlenbeckia complexa*), *Hebe tairawhiti*, karamu, common maidenhair, whau and *Senecio banksii*. Up slope, below and above the railway line, the vegetation fades to young tauhinu scrub. The original coastal forests on the hills above the coastal faces would have been affected by clearance and fires.

More recent fires would have been sparked by the steam trains that once used the railway line. The current threats to the RAP are further fires, erosion, storm damage from onshore southerly storm waves, and the possibility that the cliffs/slopes may be damaged by road widening.

Significance and justification

This RAP is an excellent example of coastal cliff vegetation in the eastern part of the ecological district. Also of botanical significance is the presence of whau, a coastal shrub with limited distribution, and *Hebe tairawhiti* a newly described shrub with a threatened species ranking of 'declining'.

RAP WAH 4 NUHAKA LAGOON

Refer to Map 29 (p.255)

Study site No. 586

Priority: 1

Grid reference: NZMS 260 X19 215274

Area: 107 ha

Altitudinal range: 0-40 m

Bioclimatic zone: coastal

Vegetation/landform classes:
duneland
freshwater wetland
saltwater wetland-lagoon

Description

This RAP includes the Nuhaka River mouth and lagoon, fore and back dunes to the east and west, dune hollows, a small lagoon that is fed by the Waimaunu Stream and backwash from the Nuhaka Lagoon, and the lower part of the marine/sea cliffs above it. It extends c. 4 km westwards from the Nuhaka-Opoutama Road.

The foredunes at the eastern end of the RAP and the western end of the small lagoon before the river mouth, have a sparse mosaic of spinifex, sand convolvulus, sand sedge, *Pelargonium capitatum*, and occasional marram (western end only). The more stable dunes back from the coast at the eastern end have greater marram invasion, with *Coprosma acerosa*, bracken, pohuehue (*Muehlenbeckia complexa*), jointed wire rush and *Baumea juncea*. The dunes on the western side of the river mouth are more weedy with marram, boxthorn, blackberry, kikuyu grass, buffalo grass, lupin, giant umbrella sedge, bracken, pohuehue (*Muehlenbeckia complexa*), sand sedge, sand convolvulus, and only a narrow spinifex-dominated foredune. The beach within the RAP consists of gravel and dark sand, with scattered drift wood and debris.

The small lagoon has a narrow band of turf/sea meadow vegetation around the margin at the eastern end, which includes bachelors buttons, selliera and *Lilaeopsis novae-zelandiae*. Towards the western end the margin vegetation

becomes more extensive, with a zone of sea rush rushland and well developed more diverse salt meadow. *Scirpus lacustris*, saltmarsh ribbonwood (occasional shrubs) and marsh clubrush are scattered amongst the sea rush with the latter forming mono-specific stands in parts. The salt meadow has sea primrose, selliera, bachelors buttons, arrow-grass and sea aster. The main lagoon at the river mouth also has areas of turf vegetation, and sea rush rushland around its margins.

The cliffs behind the lagoon have patchy whahariki, *Hebe stricta* var. *macroura*, kiokio, tutu, common maidenhair, tauhinu, karamu, *Coprosma acerosa* x *Coprosma repens* and shore lobelia. Moist seepage areas along the cliffs support *Senecio banksii*, sea primrose, *Nertera depressa* and *Senecio rufiglandulosus*.

Significance and justification

This RAP contains lagoon margin and dune vegetation representative of that along the eastern Wairoa coast line. Of particular note is the occurrence in part of the RAP of foredunes of spinifex without the introduced and highly competitive sand binder marram, and of *Coprosma acerosa* a native shrub dune species now restricted in its distribution. The RAP is also significant as a wildlife habitat with an SSWI ranking of 'moderate to high'; threatened Caspian tern, threatened Australasian bittern, pukeko, red-billed gull, Australasian shoveler and banded dotterel are all present.

RAP WAH 5 WAIMAUNU STREAM

Refer to Map 29 (p. 255)

Study site No. 600

Priority: 3

Grid Reference: NZMS 260 X19 239308

Area: 14 ha

Altitudinal range: 40-140 m

Bioclimatic zone: semi-coastal

Vegetation class: tawa/kohekohe forest

Description

This RAP occupies a southeast facing moderate hill-slope, extending from mid-slope to ridge crest, above terraces of the Waimaunu Stream, a true left tributary of the Nuhaka River that flows in near the river's mouth. The RAP is fenced along its upper margin. The core of the RAP has modified primary semi-coastal forest, with scattered emergent rewarewa and tawa over a mosaic canopy of tawa, titoki, karaka, scattered ngaio, puka and pukatea. The sub-canopy is dominated by kohekohe, with mahoe and pigeonwood. The forest canopy is discontinuous in places with grassy patches, particularly along the main ridge and side spurs. The forest margins merge into a treeland of ngaio, cabbage tree, karaka and titoki.

The RAP has suffered long-term grazing and trampling by domestic stock (sheep and cattle). The kohekohe canopies have a lot of dead wood suggesting possum browse and wind damage.

Significance and justification

Though small and degraded this RAP is significant as one of the largest of the few areas of indigenous primary forest remaining in the eastern section of the Waihua Ecological District's semi-coastal bioclimatic zone.

RAP WAH 6 MANGAPAPA STREAM

Refer to Map 30 (p. 260)

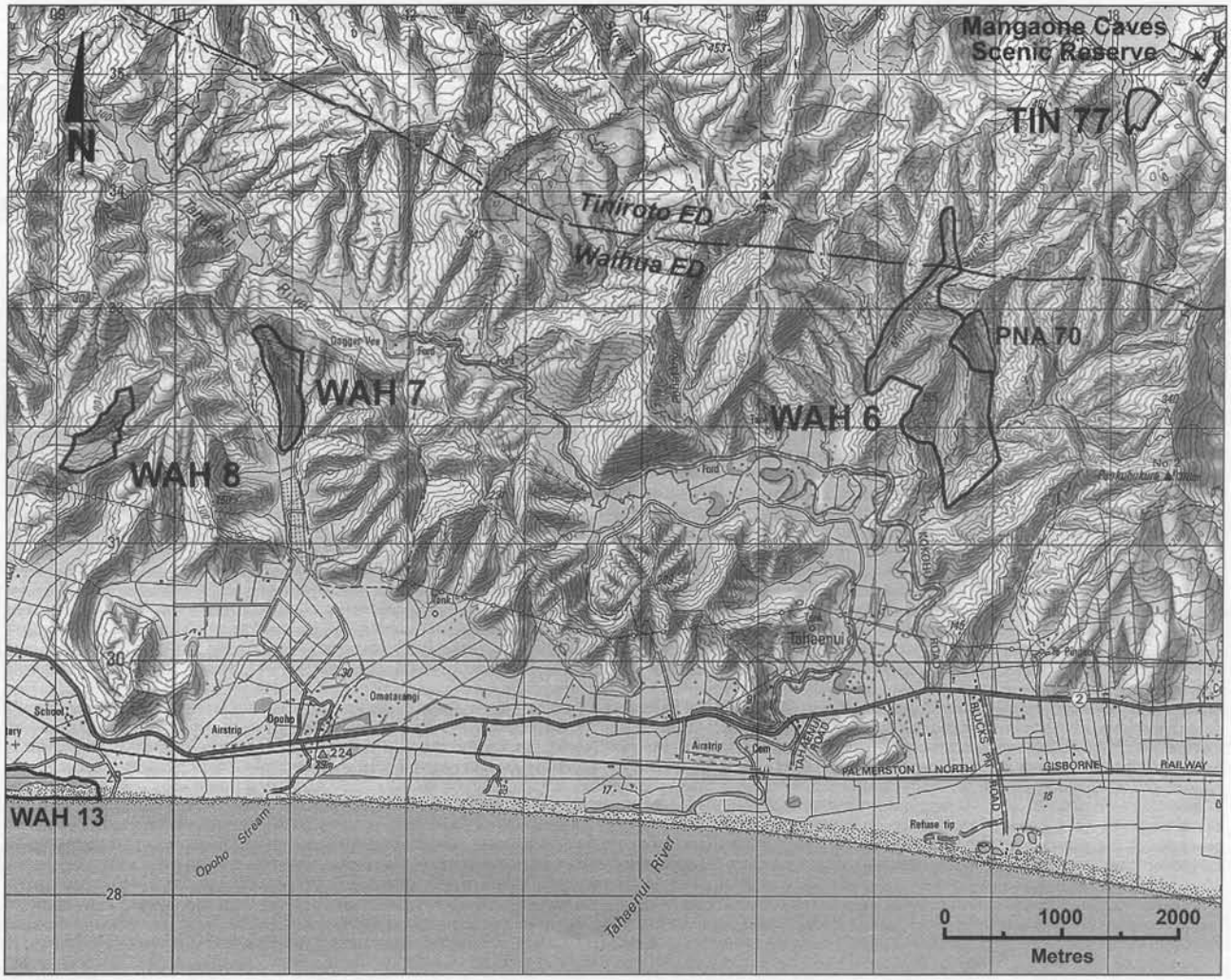
Study site No.	244 & 245
Priority:	2
Grid Reference:	NZMS 260 X19 165325
Area:	114 ha
Altitudinal range:	40-300 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa-titoki/kohekohe forest kanuka forest kanuka-manuka scrub

Description

This RAP covers moderate to steep side-slopes and narrow ridges in the catchments of Mangapapa Stream and an unnamed true left tributary of the Tahaenui River. A small part of it extends across the boundary between the Tiniroto and Waihua Ecological Districts. Farm tracks run along several of the central ridges of the RAP. The oldest most diverse vegetation within the RAP, primary semi-coastal tawa-dominated forest, lies in the lower moist stream gully slopes and in a small side catchment of the Mangapapa Stream. The canopy has tawa, titoki, scattered large pukatea, karaka, ngaio, groves of nikau and scattered emergent rewarewa. Kohekohe is the dominant sub-canopy species. Up-slope to the east the forest merges to secondary kanuka/manuka scrub-forest, with tauhinu and red-fruited karamu. Secondary kanuka scrub-forest also covers the bulk of the unnamed stream catchment. The vegetation there however is slightly older, and has scattered broadleaved trees, particularly in the stream gullies (including karaka, kaikomako, nikau, mahoe and kohekohe). Pasture bounds the RAP at most margins.

Past logging, fire and clearance has resulted in the mosaic of vegetation in this RAP. Feral goats and domestic stock are present, with their browsing maintaining open grassy patches and reducing the diversity and regeneration throughout. Kereru and fantail were recorded.

Map 30: RAPs WAH 6-8 and TIN 77 (NZMS 260 X19)



Significance and justification

This RAP is significant as one of the largest tracts of indigenous vegetation remaining within the semi-coastal bioclimatic zone in the eastern part of the district, with primary forest and advanced secondary forest diversifying the dominant kanuka. It complements the conservation values of, and buffers, two contiguous QEII Open Space Covenants, which are continuous with the RAP in the upper eastern stream gully. The low prevalence of slips in the RAP is in notable contrast to the extreme damage to surrounding pastoral land from slips of thin soils over siltstone bedrock, which occurred in a localised rainstorm in June 1997.

RAP WAH 7 POWDRELL'S BUSH

Refer to Map 30

Study site No. 292

Priority: 1

Grid Reference: NZMS 260 X19 110325

Area:	22 ha
Altitudinal range:	40-200 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa/kohekohe forest kanuka forest manuka scrub

Description

This RAP lies 17 km east of Wairoa, c. 3 km inland from the coast. It encompasses the upper catchment of one of the branches of Opoho Stream, extending from stream side to ridge crest. The RAP is completely fenced. Most of the vegetation is primary semi-coastal forest, which merges to secondary kanuka forest to scrub and manuka scrub at the margins and along the upper slopes.

The oldest and most intact vegetation is that at the head of the stream valley. It consists of tawa-dominated forest, with rewarewa, pukatea, white maire, nikau, hinau and ngaio (on the ridges) amongst it. Kohekohe is the most abundant sub-canopy tree, with pigeonwood, kaikomako, kawakawa, mahoe and putaputaweta also present. *Metrosideros colensoi*, thread fern and kiekie are the most common climbers.

The second ecological unit extends down the stream valley, on the lower slopes and stream side banks. It is also tawa-dominated, but the tawa is younger and pukatea and nikau are more abundant. The forest canopy is open in places, merging to grassy treeland (particularly beside the stream). Other species present in the canopy/sub-canopy are titoki, pigeonwood, wharangi, mahoe, wheki, kawakawa, turepo, gully treefern and karaka. Some of the kawakawa are unusually large and old with trunks up to 15 cm diameter. Ferns clothe the banks of the stream in places and include nini, tarawera, gully fern and rasp fern.

The third unit has the youngest vegetation and occurs along the ridge and upper western slopes of the valley. It is a mosaic of pure kanuka forest, with scattered broadleaved trees and shrubs regenerating amongst it (including mahoe, ngaio, houhere, young tawa, cabbage tree, kohekohe, rewarewa, kaikomako, kohuhu and titoki). In places the kanuka forest merges into treeland with few other species associated with it, except for the low growing shrub red-fruited karamu.

This RAP has been fully fenced since the early 1990s, with some possum control carried out during this time. Feral goats, however, have penetrated the fences and kept the understorey from fully recovering. There are few seedlings or saplings in any of the ecological units and only the least palatable fern species are present. Nikau seedlings, however, are abundant. With exclusion of the goats and continued possum control the understorey would recover and return to a more diverse and natural state. Kereru and fantails were recorded.

Significance and justification

This RAP is significant as one of the largest remnants of primary semi-coastal forest remaining in the eastern part of the district. Already fenced, the vegetation has huge potential to recover to a more natural state. The RAP also lies in a cluster with five other RAPs (WAH 8-12) providing a network of forest habitat in

the largely denuded semi-coastal zone. Of botanical significance was the presence of wharangi, a coastal shrub that now has a limited distribution within the ecological district. This is likely due to its palatability to feral goats which are abundant through much of the district.

RAP WAH 8 MAUNGATIAKI ROAD

Refer to Maps 30 and 31 (pp. 260 and 264)

Study site No.	285
Priority:	2
Grid Reference:	NZMS 260 X19 094317
Area:	20 ha
Altitudinal range:	30-200 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa/kohekohe forest conifer/kanuka-kohekohe forest kanuka forest manuka scrub

Description

This RAP extends from stream side to both ridge crests in a moderate to steep-sided sheltered stream gully, c. 15 km east of Wairoa. The northern (south-facing) slopes of the gully are moderate to steep, while the southern side of the gully has a stream terrace which rises to a long moderate slope. The stream has been channelised downstream from the RAP and flows into Rahui Channel (which connects Whakaki Lagoon to the sea). During the summer it is largely reduced to pools and trickles. The RAP is fenced along the northwestern ridge.

The gentle terrace and lower slopes on the southern side of the RAP have advanced secondary kahikatea/kohekohe-kanuka forest treeland, with some primary trees. Past logging has removed most of the large podocarps. Matai, tawa, titoki, nikau and pukatea are scattered through the canopy. The understorey is largely open and grassy with occasional shrubs and ferns (e.g. kaikomako, red-fruited karamu, common maidenhair, gully fern and nini). The banks of the stream are steeply incised in places with lush swards of ferns and palatable shrubs (including hangehange, whau). The forest merges into secondary kanuka forest and treeland, on the mid to upper sunny north-facing slopes and the head of the stream gully. The canopy is almost pure kanuka with occasional young kahikatea and matai, mahoe, kohekohe, kaikomako, lancewood and kohuhu. Red-fruited karamu is the only abundant shrub in the understorey. The south-facing moderate to steep slopes have primary logged tawa-(pukatea-karaka)/kohekohe forest. Tawa is absent from the toe of the slope, with putaputaweta, kanuka, kohekohe and mamaku dominating the canopy. On the northwestern margin the vegetation merges into young secondary manuka scrub.

Domestic stock and feral goats are present within the RAP. Grazing and browsing damage is most notable on the stream terrace and moderate north-facing slopes where few palatable species remain in the understorey.

Significance and justification

This RAP is significant as it contains an area of semi-coastal primary alluvial forest, albeit degraded, little of which remains in the eastern part of the district. The presence of the coastal shrub whau is also significant, as it now has a restricted and local distribution within the Waihua Ecological District. It was only recorded in two other sites within the district during this survey, both of which are also RAPs (WAH 2 and 3). Also of interest is the presence of small-leaved kowhai, which is also local in its distribution and noted in only a few sites.

RAP WAH 9 HEREHERETAU ROAD

Refer to Map 31 (p. 264)

Study site No.	284
Priority:	3
Grid Reference:	NZMS 260 X19 075325
Area:	148 ha
Altitudinal range:	40-308 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa/kohekohe forest kanuka forest kanuka/manuka scrub

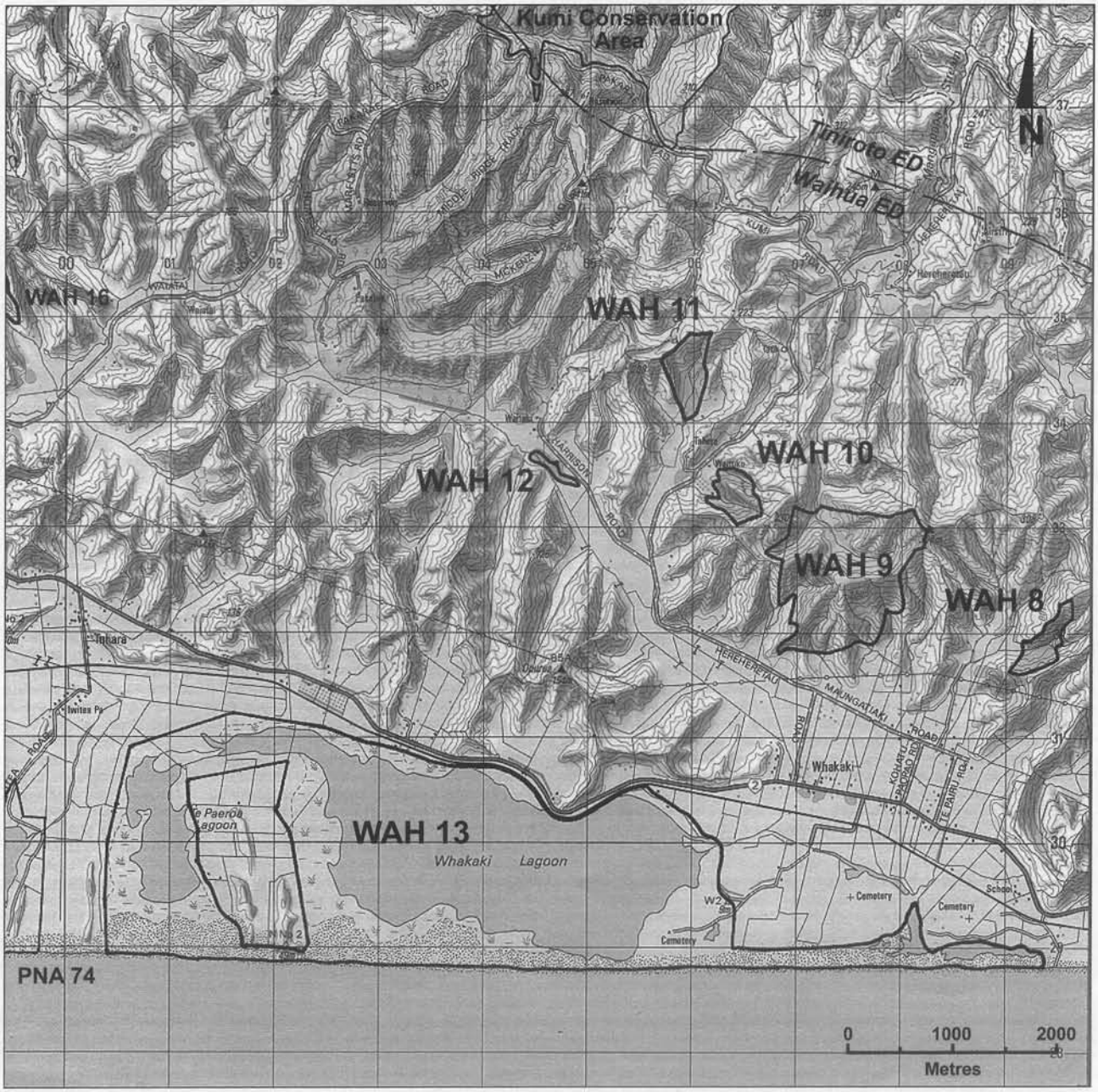
Description

This RAP covers moderate to steep stream gully slopes and narrow to wide ridges on both the inland and coastal faces of the hills inland of Whakaki, c. 12 km east of Wairoa. The inland slopes to the north lie in the headwaters of a small tributary of the Tahaenui River, while the southern more coastal slopes flow into drains that run into the Rahui Channel.

The vegetation within the RAP is a mosaic of various aged secondary scrub and broadleaved forest. The bulk of the RAP is kanuka/manuka scrub, which ranges from young pure manuka scrub with tauhinu, to older pure kanuka low forest. Many of the ridges are open and grassy with only scattered manuka and tauhinu. Amongst the scrub, in the mid to lower stream gully slopes there are pockets of degraded primary forest. Most have tawa in their canopy, with different combinations and abundance of karaka, titoki, rewarewa, kohekohe and karaka, apart from a pocket of kohekohe-dominated forest in the southwestern corner. Ngaio, nikau, kohuhu, occasional kahikatea (young pole trees) and mahoe are also present. All forest merges to kanuka scrub forest at its margins.

Possums are present, with heavy browse noted on kohekohe. Feral goats are also present in high numbers, with a mob of more than 20 seen during the survey. Blackberry was the most conspicuous weed species, with pasture species

Map 31: RAPs WAH 8-13 (NZMS 260 X19)



throughout. Birds recorded include fantail, Australasian harrier, grey warbler, kereru, NZ pipit and tui.

Significance and justification

This RAP is significant as the second largest area (after RAP WAH 1) of indigenous vegetation in the semi-coastal zone, in the eastern part of the district. Despite strips and patches of rough pasture it is essentially continuous, with numerous patches of primary and advanced secondary broadleaved forest, in a high diversity mosaic with kanuka forest and manuka-kanuka scrub. It is in the centre of a cluster of six RAPs (with WAH 7, 8, 10, 11, 12) which provide a network of forest habitat in the highly modified semi-coastal part of the district. An old pa site and evidence of old house sites and trenches along some of the wide ridges facing the coast were noted.

RAP WAH 10 WAITUKU

Refer to Map 31

Study site No.	194
Priority:	2
Grid Reference:	NZMS 260 X19 064333
Area:	17 ha
Altitudinal range:	40-160 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	conifer/tawa-kohekohe tawa/kohekohe forest kanuka forest

Description

This RAP covers stream terraces and the moderate slopes of two parallel stream gullies with a wide ridge between them, c. 3 km inland of Whakaki. The southern stream is incised towards the gully bottom (about 5 m) with ferns and shrubs on the banks, where grazing is prevented by the steepness.

The gentle to moderate slopes of the southern stream gully have modified primary (rewarewa-pukatea)/tawa- titoki-(karaka-kohekohe) forest. Nikau is also present in the canopy. The forest merges to secondary kanuka forest treeland on the steeper north-facing slopes. The upper slopes/ridges have almost pure kanuka, with scattered kowhai, young tawa and broadleaved trees on the mid-slopes. Kanuka forest also dominates the northern stream gully, with karaka, pukatea, ngaio, young tawa and titoki amongst the canopy. At the upper end of the gully, on the gentle slopes and stream terrace, there is a small patch of primary forest-treeland with scattered emergent matai and kahikatea, over a mixed canopy of titoki, karaka, tawa and kohekohe. It is grazed and trampled, but with many nikau seedlings.

The RAP is grazed and browsed by domestic stock and feral goats, with much of the understorey bare and trampled. Past logging and clearance has created a mosaic of degraded primary forest and secondary kanuka-dominated vegetation. Blackberry occurs in patches throughout, with willow planted along the stream edges at the bottom of the gully. Forest birds recorded include tui, kereru, fantail and kingfisher.

Significance and justification

This RAP is significant as one of the better areas of semi-coastal forest in the eastern half of the district and is one of a cluster of RAPs (including WAH 7, 8, 9, 11 and 12), that provide a network of forest habitat in a largely modified agricultural landscape. Of botanical significance is the presence of wharangi, a coastal tree species which is now uncommon in the Waihua Ecological District. This is probably due to its palatability to feral goats that are abundant in the district.

RAP WAH 11 TAHERE

Refer to Map 31 (p. 264)

Study site No.	189
Priority:	1
Grid Reference:	NZMS 260 X19 059345
Area:	21 ha
Altitudinal range:	20-150 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	conifer/tawa forest tawa/kohekohe forest broadleaved forest

Description

This RAP covers alluvial flood plain and stream terraces and the moderate to steep slopes comprising most of the upper catchment of a channelised stream that flows into Whakaki Lagoon (RAP WAH 13). It lies c. 14 km northeast of Wairoa and 5 km inland.

The stream terraces and lower stream side slopes support kahikatea-dominated modified primary forest, with pukatea, tawa and nikau. This forest has been extensively grazed and pugged by domestic stock (cattle and sheep). The understorey has numerous young nikau and kahikatea seedlings, with scattered *Coprosma areolata*, kiekie, kaikomako and mapou. This forest merges into tawa-(pukatea-titoki)/nikau-kohekohe forest on the lower to mid-slopes. Emergent kahikatea, rewarewa and a single matai are scattered over the tall tawa-dominated canopy. On the steeper upper slopes the forest canopy is lower, with less tawa and a greater kohekohe and titoki component; kohekohe-titoki-(tawa)/wharangi-kohuhu-mahoe forest. It merges to treeland and kanuka scrub-forest. The understoreys of both slope forests are quite open to c. 3 m, with only kawakawa, *Oplismenus imbecillus* and scattered ferns, young seedlings and nikau.

Domestic stock and feral goats graze the entire RAP, with the most extensive damage on the lower slopes and terraces. Logging has removed many of the original podocarps with only occasional large trees remaining. The only weeds noted were pasture grasses and patches of blackberry in open areas. The stream floods in winter, eroding the stream banks and depositing fresh silt on the terraces. Kereru and common bush birds were recorded, including tui.

Significance and justification

This compact RAP is significant as the largest remnant of largely primary semi-coastal forest in the eastern part of the district. It is intact and diverse, covering several stream gullies and a full range of landforms, from alluvial terrace to ridge crest, with a consequent variation in forest type. This includes a sizeable area of kahikatea-dominated forest, one of the few examples of this vegetation type remaining in this part of the district. Together with RAPs WAH 7-10 and 12 it contributes to a network of forest habitat in a modified part of the district.

RAP WAH 12 HARRISON ROAD

Refer to Map 31 (p. 264)

Study site No. 191

Priority: 3

Grid Reference: NZMS 260 X19 047336

Area: 4.5 ha

Altitudinal range: 10-15 m

Bioclimatic zone: semi-coastal

Vegetation class: conifer/broadleaved forest

Description

This RAP consists of a small forest remnant on alluvial stream terraces beside Harrison Rd, c. 12 km east of Wairoa. The unnamed stream which flows through it has been channelised and flows into Whakaki Lagoon (RAP WAH 13). The vegetation is primary/advanced secondary kahikatea-pukatea/titoki-(tawa) forest. It has been logged in the past with most of the large original podocarps removed. Kahikatea and pukatea are the most abundant trees, with scattered titoki, tawa, matai, totara, karaka, ngaio and lancewood. The canopy is pure even-aged pole kahikatea in parts. The understorey is very open and grazed, with only scattered shrubs (including kaikomako, shrubby mahoe, rohutu and turepo), seedlings, ferns and pasture species. Regeneration has been largely halted by grazing. However, with the recent fencing of the remnant to exclude stock, seedlings and understorey species can now re-establish. Willows have been planted along the stream banks in places to ameliorate erosion.

Significance and justification

Despite being small and highly modified, this RAP is significant as the largest area of kahikatea-dominated alluvial forest remaining in the semi-coastal bioclimatic zone in the eastern part of the ecological district. It is currently being processed as an Open Space Covenant with the QEII National Trust.

RAP WAH 13 WHAKAKI, TE PAEROA AND PATANGATA LAGOONS

Refer to Map 31 (p. 264)

Study site No. 813

Priority: 1

Grid Reference: NZMS 260 X19 040299

Area: 1060 ha

Altitudinal range: 0-10 m

Bioclimatic zone: coastal

Vegetation/landform classes:

saltwater/freshwater wetland vegetation
turffield
duneland

Description

This RAP includes extensive lagoons and associated wetlands and the sand dune system and barrier beach enclosing and linking them, c. 8-14 km east of Wairoa. The Gisborne-Palmerston North railway line and SH2 forms much of the RAP's inland boundary. The lagoons were formed c. 4000 years ago by the closing of an estuary by a sandy barrier (Ota *et al.* 1989). They were originally part of a continuous wetland that extended from Opoho in the east through to the Waiatai valley in the west. This has now been reduced by drainage to a number of separate wetlands (including Big and Little Ohuia Lagoons (RAPs WAH 14 & 15), Wairau Lagoon (PNA 74), Rahui Channel, Patangata, Te Paeroa and Whakaki Lagoons). Patangata Lagoon flanks the Rahui Channel outlet east of Whakaki Lagoon. Te Paeroa Lagoon lies c. 1 km to the west of Whakaki Lagoon - separated from it by a series of bedrock ridges (not included in the RAP). It is linked to Whakaki Lagoon at its northern/inland end at times of high water, while at low water level during dry spells this connecting wetland area becomes semi-firm 'dryland'. Water levels and salinity within Whakaki Lagoon used to fluctuate to a high degree owing to direct breaching of the barrier near its eastern end by bulldozer at times of flood. This allowed major saltwater incursions through the deeply scoured channel. Recent excavation of the older Rahui Channel to the east is intended to restore a more consistent and natural hydrology dominated by freshwater inflow, although significant brackish water content is expected to persist.

Whakaki lagoon has a mosaic of different bands/zones of vegetation around its margins, depending on salinity, water level fluctuation etc. The vegetation on the inner zone of the lagoon, between the drier outer margins and deeper water varies in width and exact composition - ranging from pure sea rush, to a sea rush-saltmarsh ribbonwood mosaic with varying amounts of *Bolboshoenus medianus* (concentrated in monospecific stands at the western end), sharp spiked-sedge, Mercer grass, knobby clubrush, and reed-grass amongst it. A small clump of harakeke and the occasional cabbage tree grow along the seaward margin of the lagoon amongst the reedland.

Saline turf vegetation occurs in places where the sea rush-rushland is narrow or absent, amongst the rushland, and in the damp dune hollows/shallow saline ponds which are extensive amongst the inner dunes particularly just east of Whakaki Lagoon. The turf is a low mosaic of bachelors button, selliera, sea primrose, *Lilaeopsis novae-zelandiae*, zoysia, and Indian doab. There is some trampling and pugging of the turf vegetation by cattle.

Te Paeroa Lagoon is generally shallower than Whakaki and more markedly affected by fluctuations in water level, but is otherwise of generally similar character Patangata Lagoon, east of the Rahui Channel outlet, has very limited wetland margins, but a smaller lagoon immediately west of the channel is shallow with extensive areas of wetland vegetation extending inland of the dunes.

The foredunes along the seaward side of the lagoons are dominated by spinifex, with marram invasion limited to a few discrete patches on the western end. The vegetation is a sparse mosaic of harestail, sand convolvulus, lupin, sand sedge, pohuehue and musky storksbill. The inner dune slopes around Whakaki Lagoon have an extensive area with coastal scabweed in association with zoysia. The eastern end of the dunes and lagoon are more weed infested with gorse, boxthorn and blackberry. Sea rush and many of the turf species are present amongst the weedy lagoon margins. The barrier beach is narrowest and most frequently subject to washover of storm waves near the eastern end of Whakaki and at Patangata Lagoon. Consequently these areas are very sparsely vegetated.

All of the lagoons support a large numbers of wader and waterfowl species including white heron, Australasian bittern, NZ dabchick, spotless crake, grey teal and Australasian shoveller. Seasonal visitors include wrybill, Pacific golden plover and sandpiper species. Different parts of the lagoons and their margins are used by different species, or at different times or conditions. Patangata Lagoon for example, offers much less feeding area for waterfowl than the larger lagoons with extensive wetland margins, but complements them by providing a better refuge when conditions are windy. Short-finned eels and inanga are also present within the lagoons.

Cattle (especially in the inland edge adjacent to the railway line), feral goats, hares and rabbits currently graze the lagoon margins and surrounding areas. Some pugging was noted. There are also problems of nutrient enrichment, from freezing-works by-products that are spread on adjacent land and the domestic and feral stock that graze the lagoon. With the original forest vegetation around the lagoons removed, there is no longer a natural filtering of the nutrients and sediments that enter Whakaki Lagoon in particular. Increased salinity levels have also affected the plant and animal communities of the lagoon.

A revegetation programme is currently being initiated around Whakaki Lagoon margin, as it has been identified as the wetland of highest priority for restoration in the Hawke's Bay Regional Council area. Appropriate native species, including harakeke, cabbage tree, ngaio, taupata, akeake, *Coprosma* sp. and kahikatea will be planted.

Significance and justification

The lagoons are significant as they contain extensive areas of wetland vegetation, of a wide range of types. Whakaki Lagoon is also significant as the largest freshwater lagoon on the east coast of the North Island. All of the lagoons are also significant as wildlife habitats; Whakaki Lagoon has an SSWI ranking of 'high', while Te Paeroa and Patangata Lagoons have SSWI rankings of 'moderate-high'.

The RAP also includes the highest ranking beach of the Waihua Ecological District in the New Zealand duneland inventory (Partridge 1992). This ranking was given as the beach is relatively weed-free, dominated by spinifex, and has little marram invasion. There is also a substantial population of coastal scab-weed, a cushion-forming daisy which reaches its northern limit within this RAP (Partridge 1992). This plant is also uncommon in the district with this being the only site where it was recorded in abundance.

Whakaki and associated lagoons also have significant recreational/cultural values, as they are used for hunting (e.g. mallard ducks and Canada geese) and the harvesting of eels and kaimoana.

RAP WAH 14 OHUIA LAGOON

Refer to Map 32

Study site No. 602

Priority: 3

Grid Reference: NZMS 260 X19 978299

Area: 52 ha

Altitudinal range: 0-5 m

Bioclimatic zone: coastal

Vegetation/landform classes:
saltwater/freshwater wetland
barrier beach

Description

This RAP consists of a lagoon and gravel barrier beach, c. 5 km east of Wairoa. It is one of a series of extensive freshwater/saline lagoons and wetlands along the coast from Wairoa to Nuhaka. Moderate hills bound the lagoon to the east and west, with a stop bank constructed along its northern end. A narrow coarse sand and gravel barrier beach separates the lagoon from the sea, with periodic washover of storm waves contributing saltwater to the predominantly freshwater inflows.

Clearance, grazing and trampling has reduced the vegetation along much of the lagoon margin to clumps of *Juncus* sp., giant umbrella sedge, swards of blackberry, pasture weeds and grasses, and *Mazus novae-zeelandiae*. There is a small area of purely turf vegetation at the southern end of the lagoon near the beach, with bachelors button, buck's horn plantain, Mercer grass, and Indian doab. At the inland end of the lagoon, near the stop bank, there are bands and patches of pure raupo reedland, and raupo with willow weed, umbrella sedge, water pepper, bamboo spiked-sedge, giant umbrella sedge and sharp spiked-sedge around and amongst it. The appearance of more salt tolerant species (e.g. sea rush) is correlated with the gradient of salinity within the lagoon. The water is more saline towards its southern end. The coarse sand and gravel barrier beach has much driftwood and sparse vegetation, with scattered spinifex and sand convolvulus.

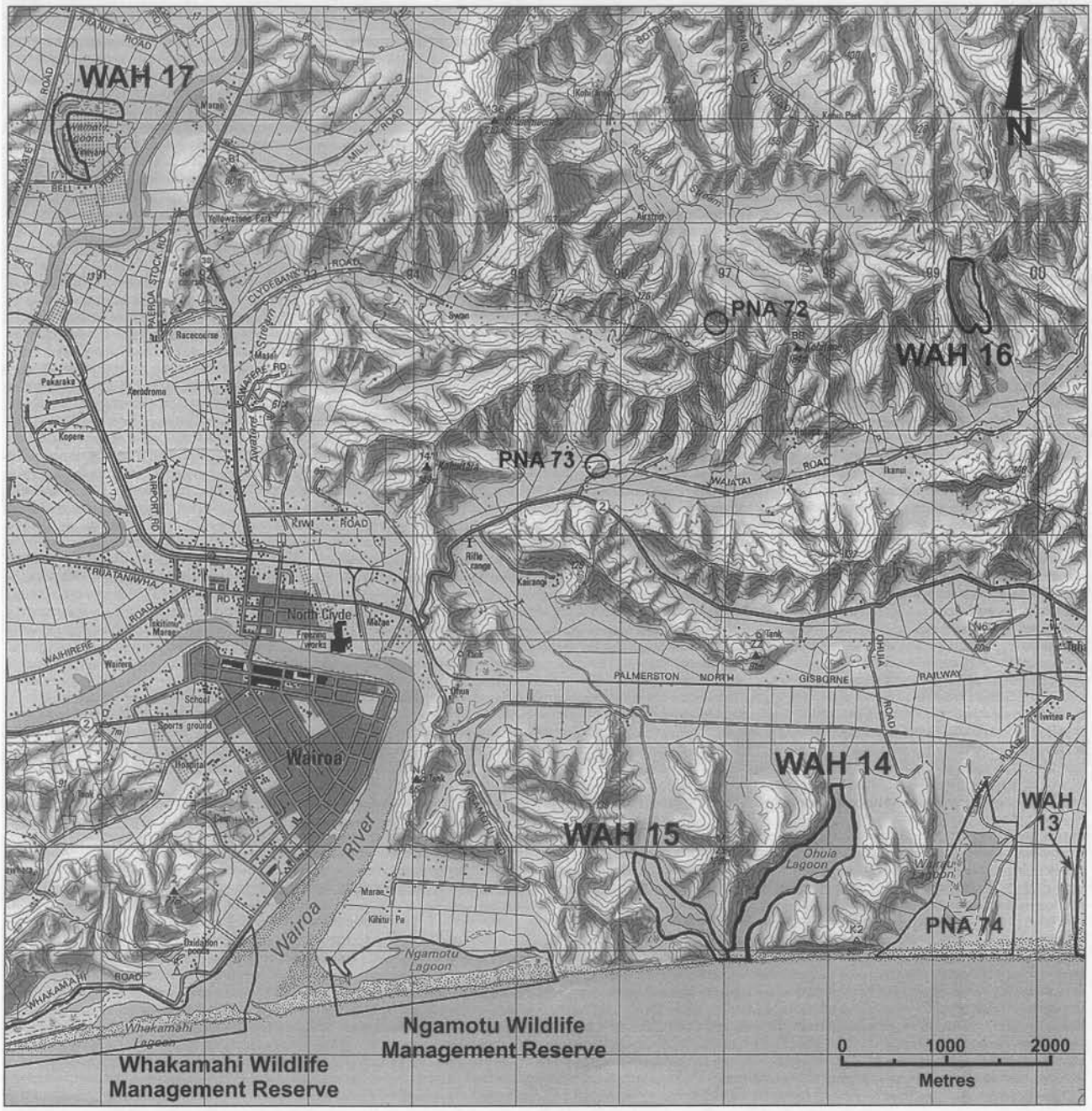
All of the original coastal forest has been cleared from the surrounding hills with only scattered cabbage trees and a small clump of ngaio, titoki and karaka high on an east-facing slope (not in RAP). The lagoon is grazed and trampled around much of its margin by domestic stock. Feral goats also browse in the area. A stop bank and flood gate has been constructed at the northern inland end of the lagoon to protect farmland adjacent to it from flooding. The sand/gravel bar is also periodically opened by bulldozer to drain excess water at times of flooding.

Nutrification, from domestic stock and fertilizer may also be altering the water quality of the lagoon. Pukeko, pied stilt, black swan, banded dotterel, paradise shelduck, black shag and Canada goose have all been recorded within the RAP.

Significance and justification

The RAP is significant as a wildlife habitat, with an SSWI ranking of 'moderate-high'. Of botanical significance is the presence of several populations of the small perennial rosette herb *Mazus novae-zeelandiae* (endangered: de Lange *et al.* 1999).

Map 32: RAPs WAH 14-17 (NZMS 260 X19)



RAP WAH 15 LITTLE OHUIA LAGOON

Refer to Map 32 (p. 271)

Study site No. 604

Priority: 1

Grid Reference: NZMS 260 X19 966295

Area: 32 ha

Altitudinal range: 0-5 m

Bioclimatic zone: coastal

Vegetation/landform class:
saltwater wetland

Description

This RAP consists of a long narrow lagoon, with a narrow beach at the southern end separating it from the sea, c. 4 km east of Wairoa. The beach has coarse dark sand and gravel with scattered driftwood. The lagoon is one of a series of freshwater/saline lagoons/wetlands along the coast from Wairoa to Nuhaka, that were originally connected to form one huge wetland complex. The lagoon is fed by streams that flow from Waiatai valley, and washover of sea water across the beach. At times of flood following buildup of the beach, the barrier is breached to allow water from surrounding farmland to drain away. The lagoon is bounded on both sides by a series of low hills. A farm tracks runs along the northeastern side of the lagoon.

The vegetation around the northern and eastern two-thirds of the lagoon margin is intact. It is dominated by pure sea rush rushland nearest the lagoon, with pockets of saltmarsh ribbonwood-(sea rush) shrubland-reedland outside it. The outer margins of the shrubland have Mercer grass, giant umbrella sedge, *Juncus* sp., Indian doab, clover and pasture species amongst them. The shrubland merges to pasture with scattered giant umbrella sedge. There are big piles of driftwood and debris along the water's edge and amongst the vegetation that has been washed in during storms. The southern end of the lagoon has small areas of turf vegetation (3-6 cm high) at the water's edge, with bachelors button, *Mazus novae-zeelandiae*, zoysia, Indian doab, Mercer grass and *Lilaeopsis novae-zelandiae*. The small ledges that the turf vegetation occurs on are not stable as they are subject to erosion by wave action and fluctuating water levels. There is so much driftwood amongst the reedland and shrubland that few turf species are present there.

Hill-slope erosion is a major problem at the southeastern end of the lagoon. Trees have recently been planted to try to consolidate the lagoon walls. Cattle and feral goats graze and trample the vegetation at the outer margins of the lagoon, with tracks noted through the shrubland. Despite their presence the saltmarsh ribbonwood, which is palatable, is healthy and largely unbrowsed. Swards of blackberry occur around the outer edges of the lagoon and out into the surrounding paddocks.

Significance and justification

The lagoon is significant as one of a series of lagoons and wetlands along the Wairoa coastline. The lagoon vegetation is extensive and largely intact over c. two-thirds of the margin and is representative of typical saline lagoon vegetation in the district. It has large healthy populations of saltmarsh ribbonwood, a species that has suffered moderate to severe cattle browsing at other sites within the district. Also of significance is the presence of a small population of *Mazus novae-zeelandiae*, a small rosette herb that is now considered endangered (de Lange *et al.* 1999).

RAP WAH 16 WAIATAI BUSH

Refer to Map 32 (p. 271)

Study site No.	182
Priority:	2
Grid Reference:	NZMS 260 X19 993353
Area:	17 ha
Altitudinal range:	60-200 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa-kohekohe forest kanuka-broadleaved forest kanuka forest

Description

This RAP lies on moderate slopes in the head of a small tributary to the Waiatai valley, c. 7 km northeast of Wairoa and 6 km inland from the coast. The stream flows into Little Ohuia Lagoon (RAP WAH 15). Three vegetation types were identified within the RAP. The most extensive is primary tawa-dominated forest, with kohekohe, titoki and tall kanuka. One rimu and several large old pukatea are emergent. In several places the canopy is broken with dense patches of solely treeferns. Wharangi, pigeonwood, mahoe and kiekie are all present in the understorey.

On the eastern slopes of the remnant the forest merges into younger mixed secondary kanuka forest, with a mosaic of broadleaved tree species including lancewood, kohuhu, cabbage tree, rewarewa, kowhai, ngaio and houhere amongst it. Tawa is absent. On the western slopes the forest merges to the youngest and most open unit of kanuka scrub and treeland, with tauhinu.

All of the vegetation within the RAP is quite open and grazed, with both domestic stock and feral goats present. Few seedlings or saplings were seen indicating little regeneration is occurring.

Significance and justification

This RAP is significant as it contains a substantial area of well buffered semi-coastal forest, of which very little remains in the central part of the Waihua Ecological District.

RAP WAH 17 AWAMATE LAGOON

Refer to Map 32 (p. 271)

Study site No. 901

Priority: 3

Grid reference: NZMS 260 X19 905370

Area: 18 ha

Altitudinal range: 20 m

Bioclimatic zone: lowland

Vegetation/landform class:
freshwater wetland

Description

This RAP contains an oxbow wetland, that was formed when a meander loop of the Wairoa River was cut off by the creation of a new natural channel. Raupo reedland is the dominant vegetation, with about 40-55% open water. Crack willow, an invasive weed of wetlands, is scattered along the RAP's margin. The lagoon is completely surrounded by pasture, with some paddock fencing.

Significance and justification

The lagoon is a significant wildlife habitat with an SSWI ranking of 'moderate'; numerous water fowl including spotless crake and the Australasian bittern. It is also an interesting landscape feature, as the only oxbow wetland on the wide alluvial terraces in the Wairoa River valley.

RAP WAH 18 MANGAARUHE STATION (1)

Refer to Map 33 (p.276)

Study site No. 588

Priority: 1

Grid Reference: NZMS 260 X19 984486

Area: 2.9 ha

Altitudinal range: 30-50 m

Bioclimatic zone: lowland

Vegetation class: conifer forest
tawa-titoki forest
kanuka forest

Description

This small RAP lies on a colluvial toe-slope and alluvial terrace on the true right of the Wairoa River, c. 18 km inland of Wairoa. It has been completely fenced for c. 10 years, although the fence has been breached by stock in the last few years.

The terrace riser behind the remnant has a pine plantation (planted in the late 1980s), with various other exotics planted around the forest's eastern margin.

The vegetation is predominantly advanced secondary forest dominated by kahikatea, with totara and matai and scattered large original podocarps. Tawa-titoki forest is present on the colluvial toe-slope, along with a small pocket of kanuka forest. Pukatea, white maire, putaputaweta, mapou, lancewood, mahoe and cabbage tree are present as minor component of the canopies/sub-canopies. The understorey has a diverse array of small-leaved and divaricate shrubs and ferns including *Coprosma areolata*, *C. rotundifola*, mingimingi, poataniwha, pokaka, *Pseudopanax anomalus*, red-fruited karamu, rohutu, shrubby mahoe, turepo, gully fern, kiwakiwa, common maidenhair, rasp fern, shaking brake and tarawera. Vines are also abundant in the forest with kohia, *Clematis cunninghamii*, *Metrosideros colensoi*, pohuehue, *Metrosideros diffusa* and both species of native jasmine.

This RAP has been logged in the past with most of the present kahikatea, matai and totara trees having established since that time. The major threat to the integrity and diversity of the RAP is continued stock grazing and trampling. Ensuring that the fence is again stock proof should be a management priority. Weeds identified within the RAP include blackberry, hawthorn and *Prunus* sp. Several kauri have been planted, however this is well outside the species' natural distribution. Kereru, fantail and tui were recorded during this survey.

Significance and justification

All of the original podocarp-rich alluvial forest of the Wairoa River valley within the Waihua Ecological District has been logged and cleared, leaving only two small remnants of advanced secondary kahikatea-dominated forest with scattered original trees. This RAP is highly significant as the largest of those two remaining remnants; the other being Huramua Nature Reserve (PNA 77) which is only 0.25 ha. The RAP, while similar in botanical composition to the Huramua site, has more species including several lowland species absent from Huramua, e.g. karaka and kiekie.

RAP WAH 19 MANGAARUHE STATION (2)

Refer to Map 33 (p. 276)

Study site No. 412

Priority: 1

Grid Reference: NZMS 260 X19 957478

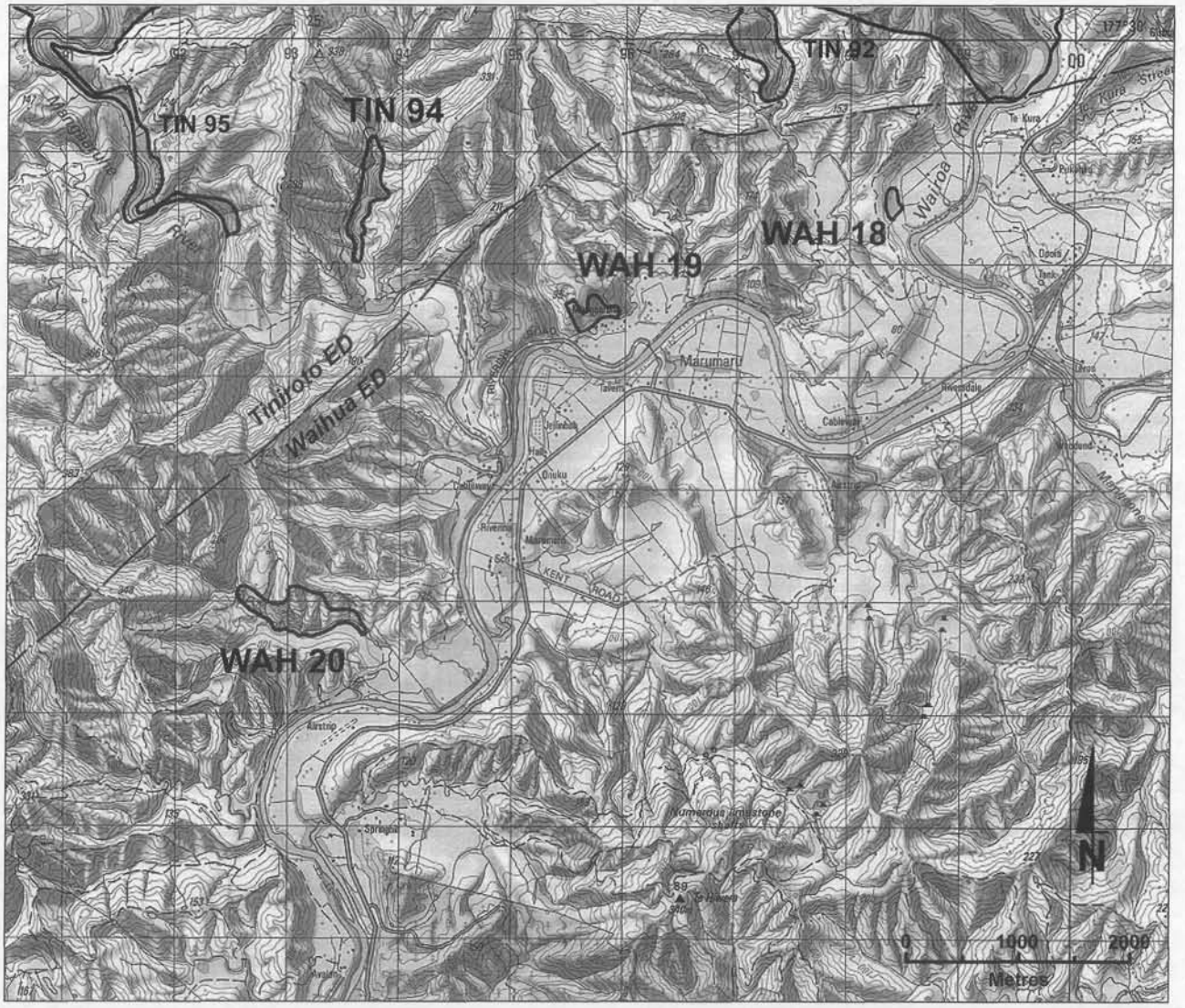
Area: 6.9 ha

Altitudinal range: 30-100 m

Bioclimatic zone: lowland

Vegetation class: conifer/tawa forest

Map 33: RAPs WAH 18-20 and TIN 94 (NZMS 260 X19)



Description

This RAP covers stream banks and southeast-facing moderate to steep hill-slopes on the true right of the Wairoa River valley, c. 16 km inland of Wairoa. There is a block of mature pines along the RAP's upper edge and northern margin, with tall kanuka forest along the mid-slope margins. The RAP is completely fenced, because the stream that flows through the RAP is used as the house water supply.

The vegetation within the RAP is modified primary (kahikatea-rimu-rewarewa)/ tawa forest. Titoki, tree ferns, kohuhu and tall kanuka (near the margins) are also present in the canopy. The understorey is lush and diverse with abundant large hen and chicken fern, young supplejack, many young silver fern, healthy tree fuchsia seedlings, young NZ broom, turepo, kawakawa and kanono. There are also carpets of tawa and kahikatea seedlings. The banks of the main stream are clothed in forest oat grass, mahoe, hangehange, rangiora, NZ convolvulus, nini, heruheru, gully fern, pate, *Jovellana sinclairii*, hook sedge, silver fern, mamaku and young rimu. The banks nearest the house are severely infested by the ground creeper wandering willie and montbretia, with Virginia creeper amongst the low stream-side canopy. The carpets of wandering willie are preventing seedling establishment.

There are a number of invasive problem weed species within the RAP, including wandering willie, Virginia creeper, hawthorn, montbretia, *Prunus* sp. and blackberry. Control of all species would be desirable, however the first two are likely to present the greatest threat to the forest's long-term viability. Grazing has occurred in the past, however stock are now excluded and goats and possums are controlled. The forest along the upper and northern margins of the RAP may be at risk of damage when the pines are logged. Kereru and common forest birds including tui and fantail were recorded.

Significance and justification

This RAP is significant as the largest area of primary hill-slope forest remaining in the lower Wairoa River valley. It also has the most intact understorey of any similar remnant in the valley, with high numbers of palatable species including NZ broom, tree fuchsia saplings, young supplejack and kanono.

RAP WAH 20 AVALON

Refer to Map 33

Study site No.	788
Priority:	2
Grid Reference:	NZMS 260 X19 931448
Area:	26 ha
Altitudinal range:	50-180 m
Bioclimatic zone:	lowland
Vegetation class:	broadleaved forest kanuka forest-scrub manuka scrub

Description

This RAP covers south-facing moderately steep dissected side-slopes above a small unnamed tributary of the lower Wairoa River. The lower slopes are very sharply incised, with riparian bluffs and occasional narrow terraces lining the narrow stream course.

The mid to lower slopes in the upstream two-thirds of the RAP support patches of advanced secondary broadleaved forest with tawa and titoki, amongst advanced secondary podocarp-dominated forest, with kahikatea, totara, matai and rimu. The forest on the mid to upper slopes has tall kanuka amongst it, with patches of kanuka-dominated forest also present. Young manuka scrub occurs along parts of the upper ridge. The slopes in the downstream third of the RAP are primarily kanuka-manuka scrub with scattered broadleaved trees and tree ferns. The riparian slopes and stream banks have a mixture of kanuka, young podocarps (primarily kahikatea and totara) kowhai, mahoe, mapou and heketara. *Dactylanthus taylorii* has been recorded in the broadleaved forest.

Significance and justification

The RAP is significant as it contains diverse indigenous vegetation on fertile side slopes and steep riparian bluffs, in the largely deforested lower reaches of the Wairoa River catchment. It also contains the only recorded population of the recovering but 'conservation dependent' parasitic plant *Dactylanthus taylorii*, within the Waihua Ecological District.

RAP WAH 21 HUKEWAKA

Refer to Map 34

Study site No.	300
Priority:	3
Grid Reference:	NZMS 260 W19 855398
Area:	81 ha
Altitudinal range:	40-200 m
Bioclimatic zone:	lowland
Vegetation classes:	kanuka-broadleaved forest kanuka forest

Description

This RAP lies in the upper catchment of an unnamed true right tributary of the Waiau River, c. 10 km northwest of Wairoa. It covers a series of stream gullies, extending from stream side to ridge crest. It is partially fenced along its north-eastern boundary, with young scrub and pasture along its other boundaries. The vegetation in the stream gullies is advanced secondary putaputaweta-titoki-kanuka-rewarewa forest, with tawa and karaka also present in the canopy. Mahoe, pigeonwood, silver fern and wheki dominate the sub-canopy. The understorey is quite open and grazed with scattered ferns and shrubs (rasp fern, hen and chicken fern, common shieldfern, common maidenhair, tarawera, turepo, rangiora, and red-fruited karamu). The upper hill-slopes and ridges support kanuka-(manuka) shrubland and kanuka forest with scattered broadleaved trees. The scrub merges to young shrubland and rough pasture in places, particularly towards the eastern end. Wild pigs, feral goats and domestic stock are all present within the RAP. Common bush birds were recorded including tui and fantail, with kiwi reported in the past but unlikely to still be present.

Significance and justification

This RAP is significant as it contains a sizeable area of diverse secondary forests in near complete sub-catchments. It is also a significant wildlife habitat with an SSWI ranking of 'moderate'.

Map 34: RAPs WAH 21-25 (NZMS 260 W19)



RAP WAH 22 MANGAWHERO STREAM

Refer to Map 34

Study site No.	304
Priority:	3
Grid Reference:	NZMS 260 W19 830411
Area:	58 ha
Altitudinal range:	30-140 m
Bioclimatic zone:	lowland
Vegetation class:	conifer/kanuka forest conifer/small-leaved scrub

Description

This RAP forms a riparian band along the lower reaches of the Mangawhero Stream, a true right tributary of the Waiau River. It covers moderate to steep stream banks and the gentle to moderate southeast-facing hill-slopes above them. The stream banks are clothed in totara-kanuka forest, with kowhai, other broad-leaved species (including putaputaweta, mahoe, wineberry and heketara) and occasional large conical kahikatea on the lower stream slopes. The understorey on the steeper slopes is quite diverse with hangehange, raspfern, kiokio, hook sedge, common shieldfern, rangiora and hen and chicken fern. This merges to totara-manuka-kanuka scrub on the upper hill-slopes. This vegetation is heavily grazed and open, with only pasture species, red-fruited karamu and scattered ferns beneath. Kanuka replaces totara as the dominant canopy species in western section of the RAP, while totara is more dominant to the east.

The original vegetation has been cleared from the stream system, with all the vegetation in this RAP secondary/advanced secondary. Domestic stock and sheep graze the accessible upper slopes, with most parts of the stream banks protected by their steepness. No problem weed species were noted.

Significance and justification

This RAP is significant as it contains the largest area of totara-kanuka dominated secondary vegetation within the Waihua Ecological District; the 24 ha within the RAP is 68% of the total recorded. This vegetation type is restricted to the fertile sites in the lowland bioclimatic zone of the district. It is also one of the few sizeable tracts of indigenous vegetation remaining within the lower Waiau River valley.

RAP WAH 23 GADDUM ROAD

Refer to Maps 34 and 36 (pp. 279 and 286)

Study site No. 845

Priority: 1

Grid Reference: NZMS 260 W19 791376

Area: 32 ha

Altitudinal range: 150-320 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
kanuka forest

Description

This RAP covers moderate north and south-facing stream gully slopes and long narrow ridges in the upper catchment of the Tutaekuri River, a true right tributary of the Waiau River. It is partially fenced along its eastern and southern boundaries. To the north the RAP is continuous with the Tutaekuri Conservation Area.

The lower stream slopes and south-facing hill-slopes support modified primary tawa forest. Tawa is the dominant canopy tree, with titoki, hinau, nikau, pukatea, ngaio, kowhai and scattered emergent matai, miro and rewarewa. The sub canopy and understorey are diverse with a range of tree, shrub and fern species (including mahoe, putaputaweta, pigeonwood, heketara, pate, kanono, kamahi, kawakawa, hangehange, common maidenhair, heruheru and nini). The north-facing slopes, ridges and southern margin of the RAP have secondary kanuka forest, with rewarewa, mapou, kohuhu, heketara, putaputaweta, silver fern, kowhai and kaikomako amongst the canopy. There are some locally dense stands of rewarewa and groves of tree ferns.

Feral goats and domestic stock graze the area, with damage worst nearer the RAP's margins. Pasture species, blackberry and occasional patches of gorse were the main weeds noted with none thought to threaten the integrity of the RAP.

Significance and justification

The RAP is significant both for its diverse primary and secondary forests on a range of landforms and because it is continuous with the Tutaekuri Conservation Area (PNA 78), buffering it along its southern boundary. The entire tract of forest (110 ha including the conservation area) is also significant wildlife habitat with an SSWI ranking of 'moderate-high': kereru, whitehead, fantail, grey warbler and tui have been noted. Kiwi were present in the 1980s, with calls heard in 1987, but there have been no recent records.

RAP WAH 24 MID-TUTAEKURI

Refer to Map 34 (p. 279)

Study site No.	310
Priority:	2
Grid Reference:	NZMS 260 W19 823378
Area:	28 ha
Altitudinal range:	80-240 m
Bioclimatic zone:	lowland
Vegetation classes:	tawa forest broadleaved/small-leaved scrub-forest

Description

This RAP lies on moderate to steep hill-slopes, extending from stream side to narrow ridges to include a full sub-catchment area and adjacent southwest-facing slopes, in a small unnamed true left tributary of the Tutaekuri River. The vegetation is bounded on all margins by pasture, with partial paddock fencing and a farm track along the top (eastern) ridge. The lower slopes of the south-facing moderate hill-slopes support modified primary rewarewa-tawa forest, with titoki, kanuka, lancewood, nikau and mamaku in the canopy and several emergent kahikatea. The understorey is moderately grazed, but is still quite diverse with gully fern, common maidenhair, rasp fern, tarawera, hangehange,

kawakawa, rangiora, hook sedge and pate. The rest of the vegetation, on the north and southwesterly facing hill-slopes is secondary kanuka-broadleaved scrub-forest. The broadleaved species include karaka, titoki, mahoe, putaputa-weta, lancewood, cabbage tree and houhere. Red-fruited karamu is the only abundant shrub in the understorey, which is grazed and open. The upper spurs support younger manuka scrub.

Feral goats, pigs and domestic stock all graze/browse the understorey with the most notable damage in the younger vegetation. Infrequent wilding pines were recorded amongst the younger scrub vegetation and were the only conspicuous weed species. Bird species present included shining cuckoo, kereru, tui, fantail, grey warbler and bellbird.

Significance and justification

This RAP is significant for its high proportion of primary tawa-dominated vegetation, with Tutaekuri Conservation Area (PNA 78) and RAP WAH 23 the only other remnants of primary forest in the Tutaekuri River catchment. The primary forest is complemented by varied secondary vegetation on different slope/aspects, in a compact area covering a full range of ridge-valley landforms in a complete sub-catchment. Nikau was recorded here near its inland limit.

RAP WAH 25 SMALE BUSH

Refer to Maps 34 and 35 (pp. 279 and 283)

Study site No. 309

Priority: 3

Grid Reference: NZMS 260 W19 827354

Area: 13 ha

Altitudinal range: 70-200 m

Bioclimatic zone: lowland

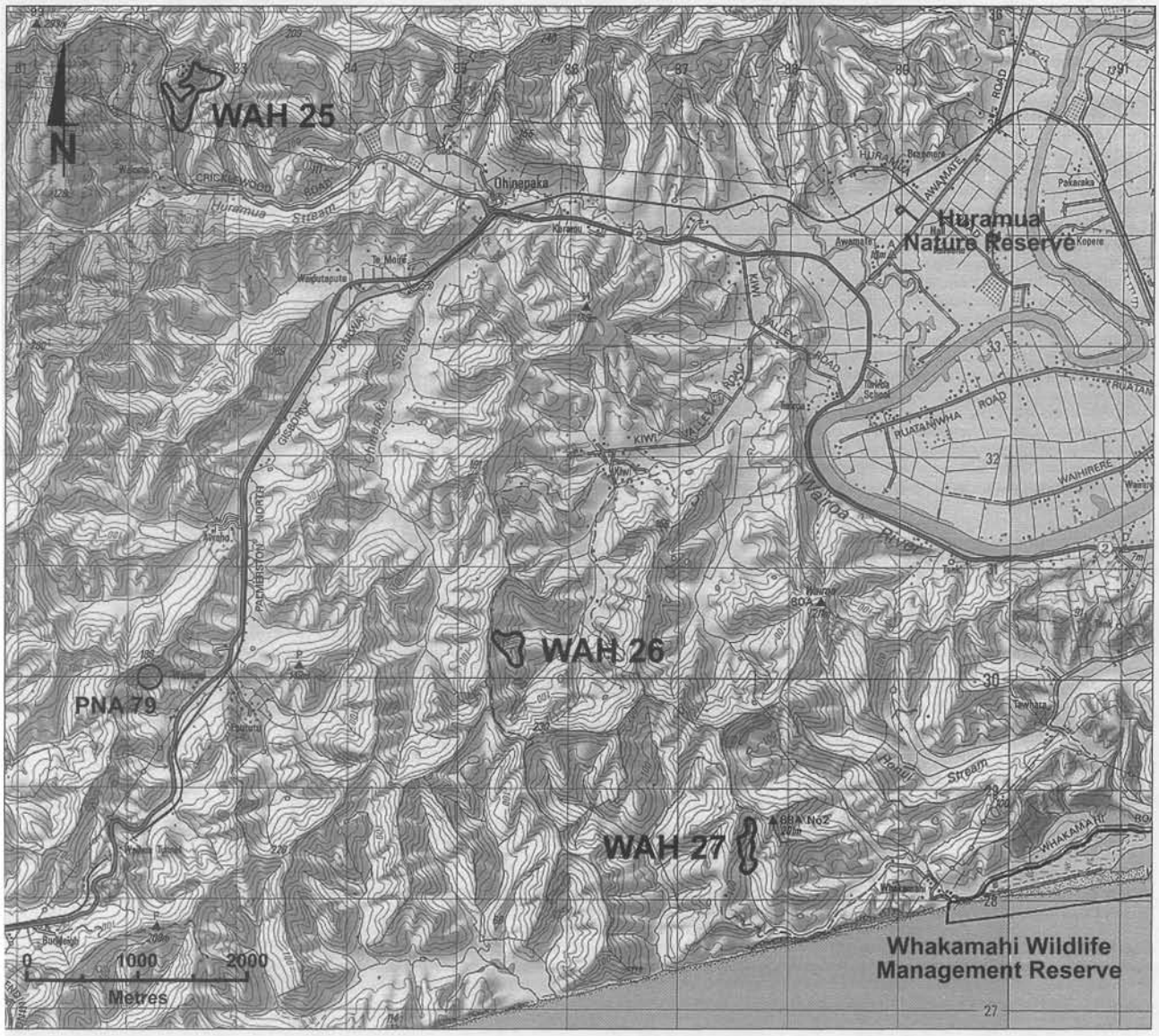
Vegetation class: tawa forest

Description

This RAP lies in moderate to steep stream gullies and narrow ridges, in the upper catchment of the Hurumua Stream. Cricklewood Rd bounds the RAP to the west, with the RAP fading to treeland and pasture on all other margins. The core of the RAP is logged primary tawa-(pukatea)-(titoki) forest, with several large kahikatea on upper slopes. The understorey is fairly open and grazed, but with good species diversity (including kawakawa, silver fern, aka, red-fruited karamu, *Metrosideros diffusa* and supplejack).

Kereru and common bush birds including fantail were recorded. The area is currently bring processed for legal protection by QEII open space covenant.

Map 35: RAPs WAH 25-27 (NZMS 260 W19)



Significance and justification

This RAP is significant as the only remnant of indigenous vegetation remaining in the upper Huramua Stream catchment and the second largest remnant of primary forest left in the entire catchment. Waitangi Covenant (PNA 79) at 9 ha is the largest.

RAP WAH 26 KIWI STATION

Refer to Map 35

Study site No. 491

Priority: 1

Grid Reference: NZMS 260 W19 854303

Area: 5.0 ha

Altitudinal range: 60-140 m

Bioclimatic zone: semi-coastal

Vegetation/landform classes:

tawa forest
kanuka forest
freshwater wetland

Description

This RAP consists of a small forest and treeland remnant on moderate hill-slopes in the head of Kiwi valley (a true right tributary of the Wairoa River) and a small wetland in a perched basin, c. 7 km southwest of Wairoa. The forest remnant has a central core of primary tawa forest with several young kahikatea, karaka, mahoe, titoki and lemonwood. This merges into a secondary treeland of kanuka, kowhai, ngaio, cabbage tree, mapou and putaputaweta. The kowhai and ngaio are concentrated on the upper slopes and steeper parts of the gully. The wetland lies in a basin to the south above the treeland. It is fairly natural, retaining a predominantly native flora - apart from the encroachment of pasture weeds around the outer margin and slight pugging/trampling by domestic stock. The outer edges of wetland have scattered swamp kiokio, *Juncus novae-zelandiae*, *Juncus planifolius*, soft rush, *Carex maorica*, giant umbrella sedge, water forget-me-not and willow weed, with patches of pure bamboo spiked-sedge. This is surrounded by a narrow band of open water, with duckweed and mud pondweed. The inner core of the wetland has a mosaic raupo reedland, with purei and burr-reed.

Long term grazing by domestic stock and feral goats has opened the understorey of the forest treeland, with only scattered shrubs and ferns dominated by red-fruited karamu. No problem weeds were recorded.

Significance and justification

This RAP is significant as it contains one of the least modified and diverse freshwater wetlands remaining within the Waihua Ecological District's semi-coastal bioclimatic zone. It was the only wetland where burr-reed was recorded, a species that appears to be indicative of wetland health and that has been lost from wetlands through most of the district (Guthrie-Smith 1953). The wetland's direct association with the forest area enhances these values.

RAP WAH 27 PEACOCK BUSH

Refer to Map 35 (p. 283)

Study site No. 806

Priority: 3

Grid Reference: NZMS 260 W19 876285

Area: 4.9 ha

Altitudinal range: 60-160 m

Bioclimatic zone: coastal to semi-coastal

Vegetation class: broadleaved forest

Description

This RAP lies 1 km from the coast on moderate hill-slopes in the upper catchment of a small unnamed stream that flows into the sea just west of Whakamahi Lagoon. The vegetation is degraded primary titoki-karaka /mahoe-(kohekohe) forest and treeland. The upper slopes have scattered ngaio, with occasional kawakawa, mapou, putaputaweta, houhere, tree ferns, young tawa and rewarewa. Climbers present include aka, NZ convolvulus, *Metrosideros diffusa* and pohuehue. The understorey has suffered long-term heavy grazing, by both domestic stock and feral goats. The forest floor is cracked and reduced to bare soil in places.

Significance and justification

Though the forest is fragmented, heavily grazed and degraded, this RAP is significant as one of only three sizeable primary forest remnants remaining in the coastal bioclimatic zone of the Waihua Ecological District (the others being in Waipatiki Domain (PNA 92) and, straddling the boundary of Earthquake Slip Conservation Area and RAP WAH 45).

RAP WAH 28 MID-WAIHUA RIVER

Refer to Map 36 (p. 286)

Study site No. 319, part 345

Priority: 1

Grid Reference: NZMS 260 W19 720360

Area: 319 ha

Altitudinal range: 40-298 m

Bioclimatic zone: lowland

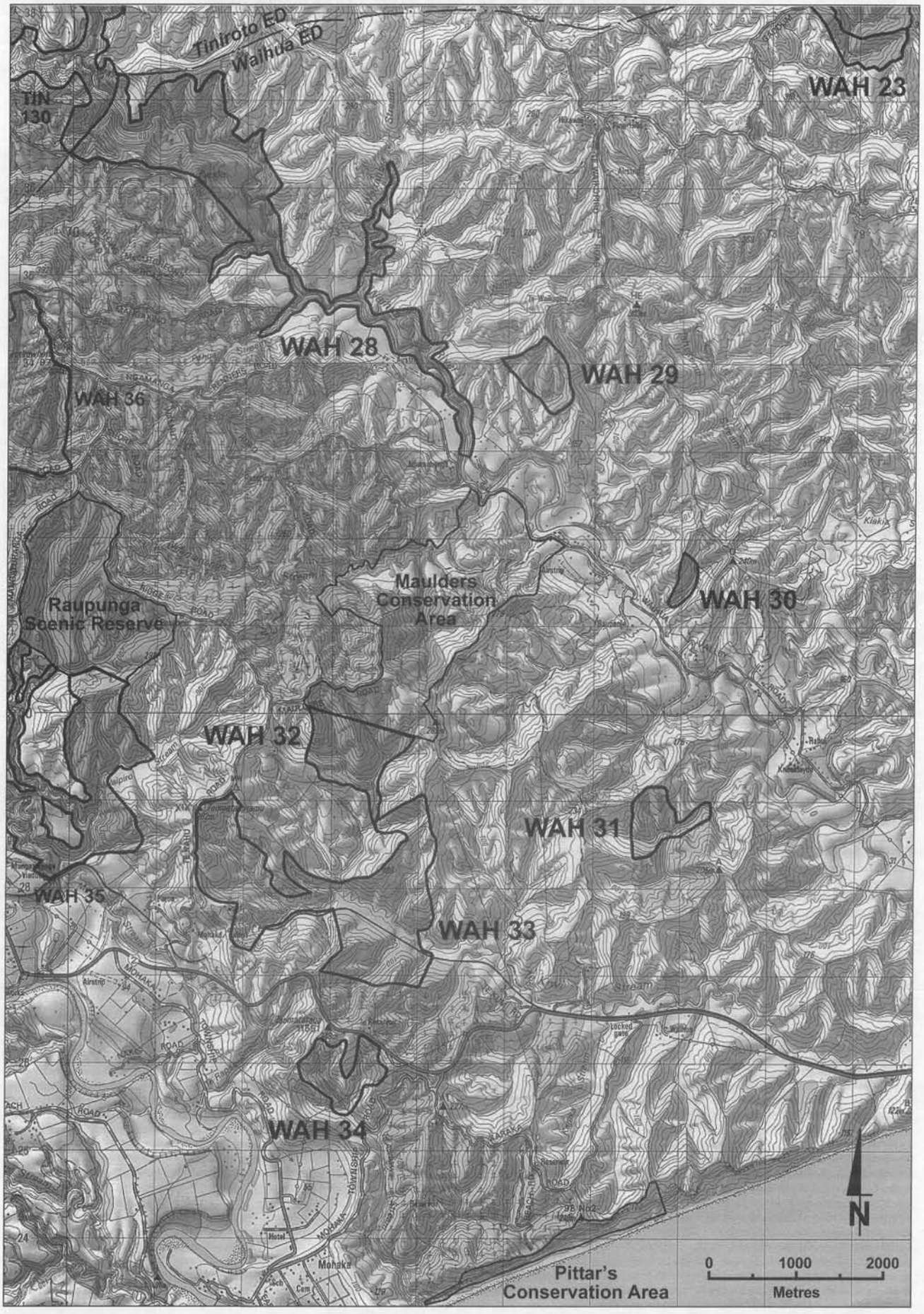
Vegetation classes:
tawa forest
tawa-titoki forest
kanuka forest
broadleaved scrub-shrubland
manuka-kanuka scrub
cliff vegetation

Description

This extensive RAP forms a band of vegetation (100-1000 m wide) along an 8 km length of the Waihua River and its tributaries (including the Waihi, Waitahora and Pohue Streams). The river gorge is steeply incised, with steep scarp faces, narrow terraces along some stretches of the river and moderate to steep hill-slopes. Part of the upper southern boundary lies on ridges with pine plantations adjacent. Some stretches of the other boundaries are fenced against pasture. At its upstream end, the RAP abuts against the (somewhat arbitrary) boundary to the more inland Tiniroto Ecological District and RAP TIN 130.

The RAP is a complex mosaic of secondary, advanced secondary and a small amount of primary vegetation ranging from manuka-kanuka scrub to kanuka

Map 36: RAPs WAH 28-34 & 23 (NZMS 260 W19)



scrub to kanuka forest to kanuka-broadleaved forest to broadleaved forest to tawa-dominated primary forest. Kanuka forest is the most abundant vegetation type. The primary forest occurs in small pockets in the stream gullies and on the moist lower slopes, with only scattered emergent podocarps remaining (kahikatea, miro, rimu). Other abundant species include titoki, pukatea, kowhai, hinau, pigeonwood, ngaio and kohuhu. Some of the terraces close to the river are grazed and open, with pasture grasses and weeds and only scattered young scrub. Some, however, support pockets of young podocarps and an area of primary forest survives on north-facing foot-slopes and terraces near the upstream end of the RAP. The steep cliff faces and bluffs within the gorge support a range of flaxland, scrub and shrubland, with *Pittosporum ralphii*, tuhara, whahariki, kowhai, kanuka, manuka, tauhinu and *Gahnia* sp. all common.

The area has a small population of red deer, which move throughout the river system. Feral goats are also present, but were not seen in high numbers. The cliffs on the gorge sides provide a natural barrier to domestic stock. Kereru, tui and fantail were recorded during the survey.

Significance and justification

This RAP is significant as it covers a substantial length and area of diverse primary and secondary vegetation along the Waihua River on a diverse range of valley-focused landforms, including alluvial terraces and terrace risers, moderate to steep hill-slopes and bluffs, with both sunny and shady aspects. Together with RAP TIN 130, it extends over 13 km of the river's c.40 km extent, and in some parts from ridge to ridge across the river valley, forming an important environment for wildlife. At its downstream end, the RAP is very close to Maulders Conservation Area, with links through there to semi-coastal forest in RAPs WAH 32 and 33.

RAP WAH 29 HIKAWAI

Refer to Map 36

Study site No. 318

Priority: 3

Grid Reference: NZMS 260 W19 755338

Area: 39 ha

Altitudinal range: 90-230 m

Bioclimatic zone: lowland

Vegetation class: kanuka-broadleaved forest
kanuka forest
manuka scrub

Description

This RAP lies in the upper catchment of a small true left tributary of the lower Waihua River. It covers moderate stream gullies, from stream side to narrow ridges. The RAP boundary is completely fenced. The vegetation within the RAP

is secondary manuka scrub on the ridges, with kanuka forest on the mid to upper slopes and kanuka-broadleaved forest on the lower slopes/stream gullies. Broadleaved species amongst the kanuka include kohuhu, nikau, karaka, mamaku, wheki, cabbage tree and putaputaweta. Some of the stream gullies also have dense groves of treeferns. The understorey is patchy, with shrubs and ferns more abundant in the stream gullies and lower slopes (including crown fern, common maidenhair, gully fern, hard fern, hook sedge, hangehange, mingimingi and red-fruited karamu). There are open grassy patches and animal tracks particularly along the ridges.

Although the area has been fenced for c. 40 years, feral goat and domestic stock access has kept the understorey quite open and restricted regeneration. The numbers of palatable broadleaved species in the understorey is low.

Significance and justification

This RAP is significant as a compact area of diverse secondary forest on varied topography within complete sub-catchments. It has been fenced for a substantial period of time, but stock and feral goat access has prevented the understorey from making a full recovery. With their exclusion the vegetation would develop to a more diverse and natural state.

RAP WAH 30 LOWER WAIHUA (1)

Refer to Map 36 (p. 286)

Study site No. 333

Priority: 3

Grid Reference: NZMS 260 W19 770315

Area: 11 ha

Altitudinal range: 40-180 m

Bioclimatic zone: semi-coastal

Vegetation classes: tawa-titoki forest
kanuka-broadleaved forest
kanuka forest

Description

This RAP lies on a southeast-facing slope in the mid-reaches of a small true left tributary of the lower Waihua River. The slope is irregularly benched, from gentle to moderate to steep, with the stream steeply incised in parts. The RAP is only partially fenced along its northwestern boundary.

The steep south-facing stream bank/hill-slope nearest the road has a scattered open primary treeland of titoki, tall kanuka, abundant kowhai, houhere, putaputaweta, kohuhu and infrequent tawa with an open grazed understorey. This merges into modified primary tawa-(titoki)/mahoe forest on the more moderate slopes to the east. Hinau, nikau, karaka and one large podocarp are present amongst the canopy, with mahoe, kohekohe and pigeonwood most abundant in the sub-canopy. The forest merges into younger scrub on the

margins, dominated by kanuka, with cabbage tree, houhere, kohuhu and tauhinu.

The RAP has had long-term grazing by stock and feral goats. However, recent establishment of pine plantations on pastoral land surrounding the area, anticipated at the time of survey, should result in less goat and stock pressure on the RAP. Kereru, tui and fantail were all recorded.

Significance and justification

This RAP is significant for its content of modified primary forest, one of very few areas remaining in the semi-coastal bioclimatic zone of the district where nearly all of the original forest vegetation was cleared. It is one of the larger and more diverse of these remnants, with the additional value of the buffering secondary forest.

RAP WAH 31 LOWER WAIHUA (2)

Refer to Map 36 (p. 286)

Study site No.	332
Priority:	2
Grid reference:	NZMS 260 W19 768289
Area:	38 ha
Altitudinal range:	40-140 m
Bioclimatic zone:	semi-coastal
Vegetation class:	tawa forest kanuka scrub-forest

Description

This RAP includes two complete, south-facing sub-catchments of generally moderate slope, in the upper reaches of a tributary of the lower Waihua River, c. 4 km inland. Also included are contrasting steep riparian slopes of the main stream channel and an opposing north-facing slope. The RAP is fenced along part of its eastern and northern boundaries.

The upper south-facing slopes support a remnant of degraded primary tawa-dominated forest, with scattered pukatea, conical young kahikatea and karaka. Mahoe, kohekohe, pigeonwood and heketara are all present in the sub-canopy. The forest merges on all margins to secondary kanuka scrub-forest. Kanuka also dominates the vegetation on the lower south-facing slopes and slopes of the main stream channel, with scattered broadleaved trees and treeferns amongst the canopy and on the north-facing slope opposite. There are open and grassy patches and shrubland amongst the scrub. The understorey of the forest is grazed and open with domestic stock and feral goats present.

Significance and justification

This RAP is significant as it contains a sizeable area of primary semi-coastal forest, in a part of the district that is now largely cleared of its original forest cover. The kanuka-dominated surrounding area adds complementary diversity and a degree of buffering to the primary forest.

RAP WAH 32 MAULDERS ROAD

Refer to Map 36 (p. 286)

Study site No.	677
Priority:	1
Grid Reference:	NZMS 260 W19 732295
Area:	79 ha
Altitudinal range:	70-280 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa forest kanuka forest

Description

This RAP covers a series of moderate stream gullies and narrow ridges in the upper catchment of the Te Kiwi Stream, a true right tributary of the Waihua River. To the northeast it abuts Maulders Conservation Area, along an arbitrary straight line boundary that cuts across the topography. Much of the rest of the RAP's boundaries are fenced, with the remainder merging into kanuka scrub-treeland and pasture.

The stream gully slopes support modified primary tawa-dominated forest with scattered emergent kahikatea, rimu and miro. Titoki, ngaio, nikau, hinau and young podocarps are present in the canopy. The sub-canopy is dominated by kohekohe, pigeonwood, mahoe, mamaku and heketara. The understorey is quite open, with scattered ferns (hen and chicken fern, thread fern, nini and gully ferns) shrubs and seedlings. The upper slopes and ridges, and riparian slopes at the downstream end of the RAP, have kanuka forest with scattered treeferns and broadleaved trees amongst the canopy (including houhere, mahoe, pate, young podocarps, titoki, rewarewa and putaputaweta). Red-fruited karamu, mingimingi and crown fern are abundant in the understorey.

Domestic stock graze the margins of the RAP, with high numbers of feral goats browsing throughout. Pasture species and blackberry in some marginal locations were the only weeds noted. Kereru and common bush birds including tui, grey warbler and fantail were recorded.

Significance and justification

The RAP is significant as it is continuous with, and complements, Maulders Conservation Area (PNA 80), buffering it along its southern margin. It substantially improves the representation of primary forest already protected

within the Conservation Area, at the inland margin of the semi-coastal bioclimatic zone with abundant kohekohe. It is continuous with RAP WAH 33 to the south, so is an important link between extensive natural areas of the semi-coastal zone and interior.

RAP WAH 33 TE KIWI STREAM

Refer to Map 36 (p. 286)

Study site No.	336
Priority:	3
Grid Reference:	NZMS 260 W19 735279
Area:	291 ha
Altitudinal range:	40-282 m
Bioclimatic zone:	semi-coastal
Vegetation class:	tawa forest kanuka forest kanuka/manuka scrub-forest

Description

This RAP lies in an upper branch and the meandering mid-catchment of Te Kiwi Stream. It covers the incised stream banks, broad terraces and gentle to moderate stream gullies and hill-slopes around it rising to the Taumatakaramu trig (282 m) to the west. Te Kahu Road forms the RAP's western boundary, with a pine plantation to the south. The Palmerston North-Gisborne railway line and Mohaka Tunnel runs through the centre of it. Most of the vegetation within the RAP is secondary, ranging from young kanuka-manuka scrub (around the margins) to solid even-aged kanuka forest, with scattered broadleaved trees and groves of treeferns on the lower slopes and in the stream gullies. Kowhai are present on some of the steeper upper slopes and beside the stream. Some of the ridges are open and grassy, with swards of young manuka and hard fern. In the northeastern corner of the RAP on a south-facing slope there is a remnant of modified primary tawa-dominated forest.

High numbers of feral goats were observed during the survey, with stock adding to the grazing/browsing pressure in parts. Kereru and common bush and field birds have been recorded including whitehead and fantail. The area supported kiwi up until sometime in the last two decades.

Significance and justification

This sizeable RAP is significant as the largest area of indigenous vegetation in the semi-coastal zone in the central part of the Waihua Ecological District, covering a full range of landform types including slopes with both sunny and shady aspects and, most unusually, a broad terraced valley floor. Though largely dominated by secondary vegetation of only limited diversity, the RAP has much potential for future enhancement, especially with its close proximity to substantial areas of primary forest in RAP WAH 32 and Maulders Conservation Area (PNA 80) to

which it is joined by a corridor of forest. As such, it forms an important link in the chain of indigenous vegetation and habitat from the coastal/semi-coastal (RAP WAH 34, Pittar's Conservation Area (PNA 84)) to the lowland bioclimatic zones (e.g. RAPs WAH 36 and 28 and TIN 130).

RAP WAH 34 TAUMATATAUA

Refer to Map 36 (p. 286)

Study site No.	504
Priority:	1
Grid Reference:	NZMS 260 W19 731255
Area:	49 ha
Altitudinal range:	90-220 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa-titoki/kohekohe forest kanuka scrub kanuka-manuka scrub

Description

This RAP covers moderate stream gully slopes of the two branches at the head of the Te Awaawa Stream, c. 5 km seaward of Raupunga and 3 km inland. SH2 bounds the RAP to the northeast. The mid to lower gully slopes support primary rewarewa/tawa-titoki/(kohekohe-mahoe) forest. Emergent rewarewa are scattered over the tawa-dominant canopy that also includes titoki, puka, ngaio, karaka, lemonwood and willow-leaved maire. Kohekohe and mahoe are the most abundant species in the sub-canopy, along with putaputaweta, *Cyathea* sp. and young tawa. The understorey is very open with few ferns or seedlings. The forest grades to treeland on some boundaries, but more generally into kanuka-manuka forest-scrub. The kanuka has scattered broadleaved trees amongst its canopy, including kohuhu, mapou, lancewood and karaka.

Feral goats and domestic stock both graze and browse the understorey which is open to c. 4 m. Possums are also present with severe damage noted on some kohekohe. Kereru and common bush birds are present.

Significance and justification

This RAP is significant as it has the largest area of primary forest this close to the sea in the semi-coastal zone of the central-eastern Waihua Ecological District. This appears to be the southern limit of kohekohe in the Hawke's Bay, as it does not occur in the drought-prone lower humidity conditions to the south. The RAP can be viewed from a lookout beside SH2 just above its upper boundary.

RAP WAH 35 MANGATURANGA STREAM

Refer to Map 37 (p. 294)

Study site No.	807
Priority:	2
Grid Reference:	NZMS 260 W19 700289
Area:	287 ha
Altitudinal range:	30-280 m
Bioclimatic zone:	lowland
Vegetation classes:	tawa forest kanuka forest kanuka-manuka scrub

Description

This RAP covers parts of the mid to lower catchments of the Mangapikopiko, Mangaturanga and Waipiro Stream catchments. The lower reaches of the streams have cut deeply into old high alluvial terraces of the Mohaka River, creating incised meandering courses. The RAP covers the steep riparian slopes above the streams and some parts of the terraces. It is more extensive in the Waipiro Stream catchment, covering predominantly south-facing moderate slopes and long ridges. Much of the RAP's inner northern boundary is fenced, with pine plantations abutting a small section of the northwestern boundary and Raupunga Scenic Reserve continuous with it to the northeast. The Palmerston North-Gisborne Railway line and Mangaturanga viaduct form the RAP's downstream (southeastern) boundary.

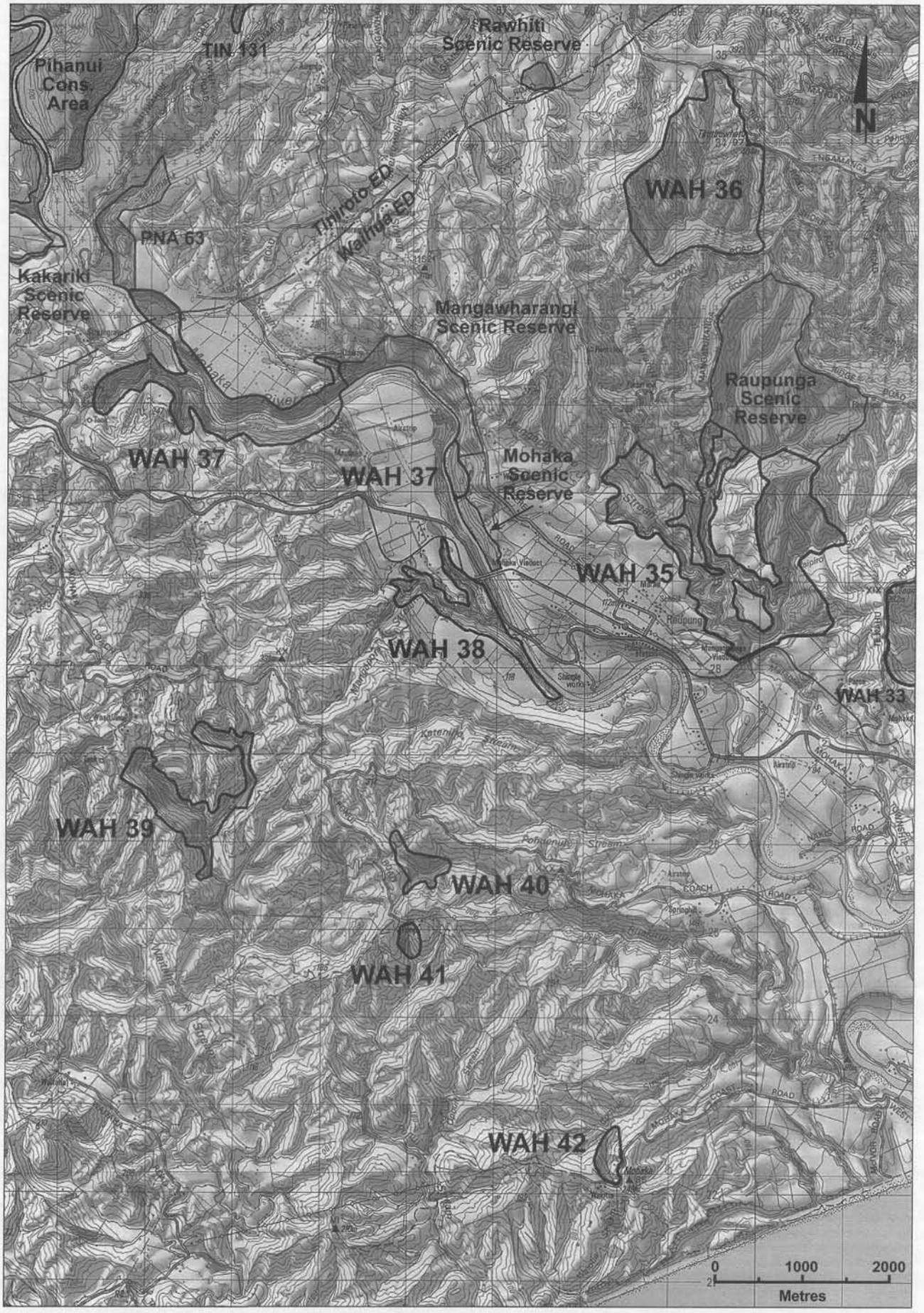
The vegetation on the terraces is secondary, ranging from young manuka scrub with scattered gorse, to kanuka forest with broadleaved trees amongst it and pockets of broadleaved forest. The steep riparian slopes have mainly scrub on the sunny northerly faces and mixed broadleaved mosaic on the moister southerly faces. The south-facing slopes in the Waipiro catchment have tall kanuka forest and some younger manuka scrub on the ridges and upper slopes, with groves of tree fernland and pockets of modified primary tawa-dominated forest on the mid to lower slopes in the lower reaches of the Waipiro, Mangaturanga and Mangapikopiko Streams.

High numbers of feral goats were observed. The most conspicuous weeds are scattered wilding pines and gorse mainly amongst the younger secondary vegetation on the old river terraces. Gorse however is a good nurse crop for regenerating native trees and shrubs, providing there is a seed source near by. In this case the pockets/ribbons of broadleaved shrubland forest in the stream gullies will contribute the seeds needed for native vegetation to re-establish.

Significance and justification

This RAP contains a diverse range of indigenous vegetation from young secondary manuka scrub to primary tawa-dominated forest, on a range of landforms and aspects. The old alluvial terraces of the Mohaka River, deeply dissected by meandering stream courses, are striking landform features, and the

Map 37: RAPs WAH 35-42 (NZMS 260 W19)



western end of the RAP includes the largest area of indigenous vegetation on these distinctive high terrace surfaces in the Mohaka system. With its extensive lower valley reaches, the RAP complements and enhances the conservation values of the Raupunga Scenic Reserve (PNA 81), with which it is continuous along its northern boundary. Like RAP WAH 33 it also provides linkages between the coastal and lowland bioclimatic zones.

RAP WAH 36 TIROTIROWHETU

Refer to Map 37

Study site No.	342
Priority:	1
Grid Reference:	NZMS 260 W19 695335
Area:	228 ha
Altitudinal range:	180-404 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest broadleaved forest kanuka forest manuka scrub

Description

This RAP lies c. 5 km north of Raupunga, in the upper reaches of the Mangaturanga Stream catchment flowing from Tirotirowhetu (404 m). It extends from stream side to ridge crest, in several complete headwater sub-catchments, repeating the pattern of the nearby Raupunga Scenic Reserve. The RAP is bounded on its northern to northeastern boundary by Ridge Rd, with pine plantations to the south and east. Obvious tracks run along several of the main ridges within the RAP.

The head of the main catchment and lower stream gully slopes throughout support primary forest with scattered large rimu and occasional kahikatea over a tawa-dominated canopy (cf. forest type D. of Nicholls 1976). Titoki, hinau, kohuhu, mamaku, silver fern and kowhai are also present in the canopy. Advanced secondary forest (with scattered emergent rewarewa over a broadleaved mosaic, with mahoe, pigeonwood, ngaio, putaputaweta and treeferns) occurs on the lower to mid-slopes where primary forest is absent. The mid to upper slopes and ridges/spurs between the stream gullies support young manuka scrub, with kanuka, tauhinu, scattered treeferns and rewarewa. The southwestern stream gully and slopes around the trig support older secondary vegetation, dominated by kanuka, with scattered broadleaved trees and shrubs particularly in the moist gullies. The broad terraced lower valley floor and north-facing slope at the southern edge of the RAP has kanuka-(manuka) scrub-forest. Wilding pines were the only conspicuous weed species recorded, scattered lightly among scrub mainly in the eastern half of the area. Hunters have reduced the numbers of goats, and domestic stock access is largely confined to the westerly margins.

Significance and justification

The RAP covers a range of landforms in several complete sub-catchments, and supports a full range of different successional stages, from very young scrub to primary forest. It also lies within a 4 km radius of six other RAPs and five PNAs, which together total c. 2000 ha. Pine plantations between these areas link the vegetation into an almost continuous tract. The RAP supports a rich birdlife with kereru, tui, grey warbler, fantail, rifleman and whitehead all recorded during this survey. The high degree of faunal diversity is probably contributed to by the close proximity of surrounding forests.

RAP WAH 37 MOHAKA RIVER

Refer to Map 37 (p. 294)

Study site No. 775 & 852

Priority: 1

Grid Reference: NZMS 260 W19 638308, 665302

Area: 169 ha

Altitudinal range: 20-220 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
kanuka-broadleaved forest
kanuka forest
kanuka scrub
cliff vegetation

Description

This RAP consists of two discrete parts that buffer and connect the Mohaka River and Mangawharangi Scenic Reserves, 1-7 km upstream from the Mohaka Viaduct and SH2. The upstream part of the RAP is the more extensive, covering narrow to broad alluvial terraces and terrace risers and steep river side banks/scarp faces along both sides of the Mohaka River, and the deeply entrenched lower reaches of two tributaries (Kiwi and Pakihikura Streams). It overlaps the nominal boundary to the Tiniroto Ecological District and is continuous with Tutumaru Stream Conservation Covenant (PNA 63) at its upstream boundary. The smaller part of the RAP covers southwesterly facing slopes and a narrow strip of alluvial terrace further down river on the true left. The upstream part of the RAP is largely fenced along its up-slope margin on the true left, with recently established pine plantation abutting it along almost all its boundaries on the true right side.

Substantial patches of modified primary tawa-dominated forest occur on the true left side of the RAP, mainly on the mid to upper slopes, less steep terrace risers and in the stream gullies. Kahikatea, rimu, matai and rewarewa are scattered above the canopy. In areas where tawa is absent the vegetation is dominated by treeferns and other broadleaved species (including titoki, mahoe, kohuhu and pigeonwood) or advanced secondary kanuka-broadleaved forest. Kowhai and

Pittosporum ralphii are present on the steep banks/bluffs. The vegetation on the sunny, drier north and northeast-facing true right banks of the river (in the upstream part of the RAP) is dominated by kanuka scrub-forest.

Much of the RAP has been burnt in the past, with complete clearance of the vegetation on the true right. Feral goats and possums are the main browsers within the RAP, with fencing and the steep terrain limiting stock access. Kereru and common bush birds are present, including tui, bellbird, grey warbler and fantail. The RAP also contains a large population of rooks.

Significance and justification

This RAP is important as it contains spectacular landforms (deeply intrenched stream courses between broad flat terraces) areas of primary forest that have survived mainly by virtue of their inaccessibility, varied secondary forest and scrub and cliff vegetation on both sunny and shady faces. Also because it connects three PNAs: Tutumaru Stream Conservation Covenant (PNA 63) Mohaka River and Mangawharangi Scenic Reserves (PNAs 82 and 83), creating a continuous c. 7 km long riparian/ wildlife corridor along the Mohaka River. It also forms an important link in a semi-continuous chain of indigenous vegetation that extends for c. 40 km upstream to the Mohaka River's confluence with the Te Hoe River.

RAP WAH 38 MANGAPORA STREAM

Refer to Map 37 (p. 294)

Study site No.	775c
Priority:	3
Grid Reference:	NZMS 260 W19 669284
Area:	61 ha
Altitudinal range:	20-160 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	kanuka-broadleaved forest kanuka forest-scrub manuka scrub

Description

This RAP covers all of the moderate to steep slopes in the mid to lower catchment of the Mangapora Stream and steep northeasterly facing riparian slopes and bluffs downstream of that tributary's confluence with the Mohaka River. The RAP is bounded on part of its northeastern margin by SH2 adjacent to the Mohaka River Viaduct, with fencing around much of the remaining margins where steeply incised slopes abut against high Mohaka River terraces.

The vegetation within the RAP is predominantly secondary kanuka-dominated scrub and forest, with broadleaved trees amongst it on the lower slopes including kowhai, kohuhu, cabbage tree, mahoe, silver fern, mamaku, houhere

and young podocarps. Manuka scrub is present in places around the margins, and sparse shrubland on the steepest dry faces.

Significance and justification

This RAP is significant for its sizeable area (notably 2 km length) and diversity of secondary vegetation, including that on the extreme environment of steep dry faces. Of the chain of natural areas that extends for some 40km down the Mohaka River from its confluence with the Te Hoe River, this is the most coastal recognised as an RAP, though smaller areas do occur further downstream.

RAP WAH 39 WHAITIRINUI

Refer to Map 37 (p. 294)

Study site No.	509
Priority:	1
Grid Reference:	NZMS 260 W19 636263
Area:	81 ha
Altitudinal range:	60-240 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa-titoki forest kanuka-broadleaved forest kanuka forest

Description

This RAP lies 5 km southwest of Raupunga, in an extensive moderate to steep sided stream gully system, part of the upper catchment of the Waitaha Stream. The western portion of the RAP (c. 45 ha) is fenced off and has been stock-free since 1986. Goat and possum control are carried out regularly.

Within the fenced portion, the upper catchment area consists of modified primary tawa-titoki forest, with mahoe (abundant), pigeonwood, heketara, raurekau, pate, mamaku and tree fuchsia present in the sub-canopy. Large kowhai grow on the steepest slopes, with tall nikau and hinau scattered amongst the canopy. The understorey is thick and varied with hangehange, kawakawa, gully fern, young nikau, hen and chicken fern and tangles of supplejack. Kiekie, bush lawyer, native jasmine, *Metrosideros diffusa* and aka are also abundant. Many of the species abundant in the understorey would be infrequent or absent if animal numbers were high e.g. pate, tree fuchsia, young nikau, hen and chicken fern and supplejack.

The banks of the stream running through the fenced area are clothed in ferns, mosses, broadleaved trees and shrubs (gully fern, hen and chicken fern, heruheru, irirangi, nini, pate, tree fuchsia, young nikau, putaputaweta and mahoe). At one point the stream plunges over a spectacular 30-35 m waterfall.

The surrounding fenced slopes have kanuka forest with scattered emergent rewarewa and abundant broadleaved trees throughout (mahoe, houhere, heketara,

rangiora, titoki, putaputaweta, pigeonwood and kanono). The understorey is thick with hangehange, *Helichrysum aggregatum*, kawakawa and red-fruited karamu. Large kowhai are dotted amongst the kanuka on the steepest slopes and bluffs. The unfenced parts of the RAP, in the eastern stream branch of the catchment, are also kanuka-dominated, but are less diverse. The understorey is more open, with the unpalatable red-fruited karamu the most abundant shrub.

Significance and justification

This RAP is notable for the diversity and condition of the modified primary forest, and is unique within the semi-coastal bioclimatic zone of the Waihua Ecological District as it contains the only piece of fenced strongly regenerating kanuka forest. Virtually all other kanuka forest on private land is heavily grazed and open, with little or no regeneration occurring. Over time the fenced kanuka will develop to resemble the primary forest in the catchment head. The RAP is also significant as a wildlife habitat. Kereru, morepork, NZ falcon (seen occasionally), fantail, tui, grey warbler, rifleman, kingfisher and silvereye have all been recorded.

RAP WAH 40 RUAKITURI STREAM

Refer to Map 37 (p. 294)

Study site No. 506

Priority: 2

Grid Reference: NZMS 260 W19 662257

Area: 21 ha

Altitudinal range: 140-220 m

Bioclimatic zone: semi-coastal

Vegetation classes: tawa-titoki forest
kanuka scrub-forest

Description

This RAP lies in the upper catchment of the Ruakituri Stream, a true right tributary of the Mohaka River, c. 3 km southwest of Raupunga. The incised stream runs through the centre of it, with gentle to moderate northerly and southerly-facing hill-slopes on either side. The bulk of the RAP is modified primary tawa-(titoki) forest, with a high number of large hinau in the canopy, particularly down the main spurs. Mahoe and putaputaweta are the main sub-canopy trees. The tawa forest merges into tall kanuka forest, with younger kanuka scrub on all margins. There are scattered rewarewa, cabbage tree, putaputaweta and kohuhu amongst kanuka-dominated canopy.

Domestic stock (mainly goats and sheep) graze the area, reducing the abundance and diversity of the understorey. Gorse was the only problem weed noted, occurring around the scrub margins.

Significance and justification

This RAP has significance as one of only a few areas with primary forest on easy terrain remaining in the semi-coastal zone of the central part of the district. Despite modification, the primary forest remnants retain an intact, diverse and healthy canopy, and they are linked and buffered by secondary vegetation.

RAP WAH 41 PONUI

Refer to Map 37 (p. 294)

Study site No. 507

Priority: 3

Grid Reference: NZMS 260 660248

Area: 8.3 ha

Altitudinal range: 140-240 m

Bioclimatic zone: semi-coastal

Vegetation classes: tawa-titoki forest
kanuka-broadleaved forest

Description

This RAP encompasses moderate south-facing slopes and a wide gully, in the head of Ponui Stream, c. 4 km southwest of Raupunga. The core of the RAP is modified primary tawa-titoki forest, with hinau and nikau also present in the canopy and mahoe and putaputaweta abundant in the sub-canopy. This forest merges to kanuka/broadleaved forest at the southern end of the RAP and on the upper slopes, with kowhai, nikau, titoki (abundant on the lower slopes), putaputaweta, karaka, ngaio, houhere, lancewood and mahoe. The RAP is grazed by both feral goats and domestic stock, with the understorey fairly open in parts.

Significance and justification

This RAP, though small, is significant as it contains diverse modified primary forest, one of only a few remnants in the semi-coastal zone of the central part of the district.

RAP WAH 42 COQUET STREAM

Refer to Map 37 (p. 294)

Study site No. 501

Priority: 2

Grid Reference: W19 683225

Area: 15 ha

Altitudinal range: 100-200 m

Bioclimatic zone: semi-coastal

Vegetation classes: tawa-titoki forest
kanuka scrub-forest

Description

This RAP lies little more than 1 km inland. It extends from stream side to moderate mid-slopes and spurs in a north-facing headwater sub-catchment of Coquet Stream, a true right tributary of the Ruakituri Stream which flows into the Mohaka River near its mouth. Mohaka Coast Rd forms the RAP's southern and eastern boundaries, with the other margins bounded by treeland or pasture. The lower slopes have patches of modified primary tawa-(titoki-karaka) forest, with epiphytic puka, and mahoe, putaputaweta, lancewood and pigeonwood in their sub-canopies. These patches are surrounded by tall kanuka forest, which has scattered broadleaved trees amongst its canopy (including kowhai, young tawa, rewarewa, karaka, lancewood, kohuhu and akeake). The understorey of both vegetation types is open and grazed with scattered ferns, shrubs and climbers (including gully fern, hard fern, red-fruited karamu, supplejack and *Metrosideros diffusa*). The margins fade to younger kanuka scrub, with mingimingi and tauhinu. Kereru and fantails were recorded.

Significance and justification

This RAP features one of few examples of semi-coastal primary forest remaining within the central part of the district. Among these, it is exceptional in its generally northerly aspect. The surrounding kanuka forest has good potential to continue its succession to more complex forest if stock and feral goats are excluded, with the core patches of primary forest providing a seed source.

RAP WAH 43 WAIKARI RIVER

Refer to Map 38 (p. 303)

Study site No. 864

Priority: 1

Grid Reference: NZMS 260 W19 556228

Area: 4.3 ha

Altitudinal range: 40-80 m

Bioclimatic zone: lowland

Vegetation classes: tawa-titoki forest
broadleaved forest
kanuka scrub

Description

The RAP lies beside SH2 on a narrow river terrace, moderate to steep terrace risers and south-facing riparian cliffs of the Waikari River. Awatotara Conservation Area is essentially continuous with it on the opposite site of the road and upstream in this sharply entrenched section of the river.

The south-facing terrace and terrace riser above the river supports a small area of modified primary tawa/(titoki) forest, with kowhai (on the upper terrace), hinau, mamaku and young kahikatea amongst the canopy. Mahoe and putaputaweta dominate the sub-canopy, with kawakawa abundant in the understorey. The steep slopes above the river have kohuhu-broadleaved shrubland treeland. Other species in the shrubland include rangiora, *Gahnia* sp., five finger, NZ broom, wineberry, manuka and hangehange. A waterfall tumbles over the south-facing bluffs with tuhara, whahariki, *Jovellana sinclairii*, pate, kiokio and moss around it.

The vegetation on the steepest slopes and bluffs within the RAP is very lush and natural, with no browsing animals able to reach it. The tawa forest has had some grazing, but the understorey is still largely intact.

Significance and justification

The RAP complements and enhances the values of the Awatotara Conservation Area (PNA 87), which lacks any primary forest and lies only on the southern side of SH2. Together they form a highly scenic corridor on either side of the road. Of botanical note is the presence of NZ broom, a shrub that is highly susceptible to browsing by feral goats and domestic stock. Its distribution within the district is now local. The RAP also has some of the largest tawa trees seen in the southern drier third of the Waihua Ecological District.

RAP WAH 44 MATAHORUA STREAM

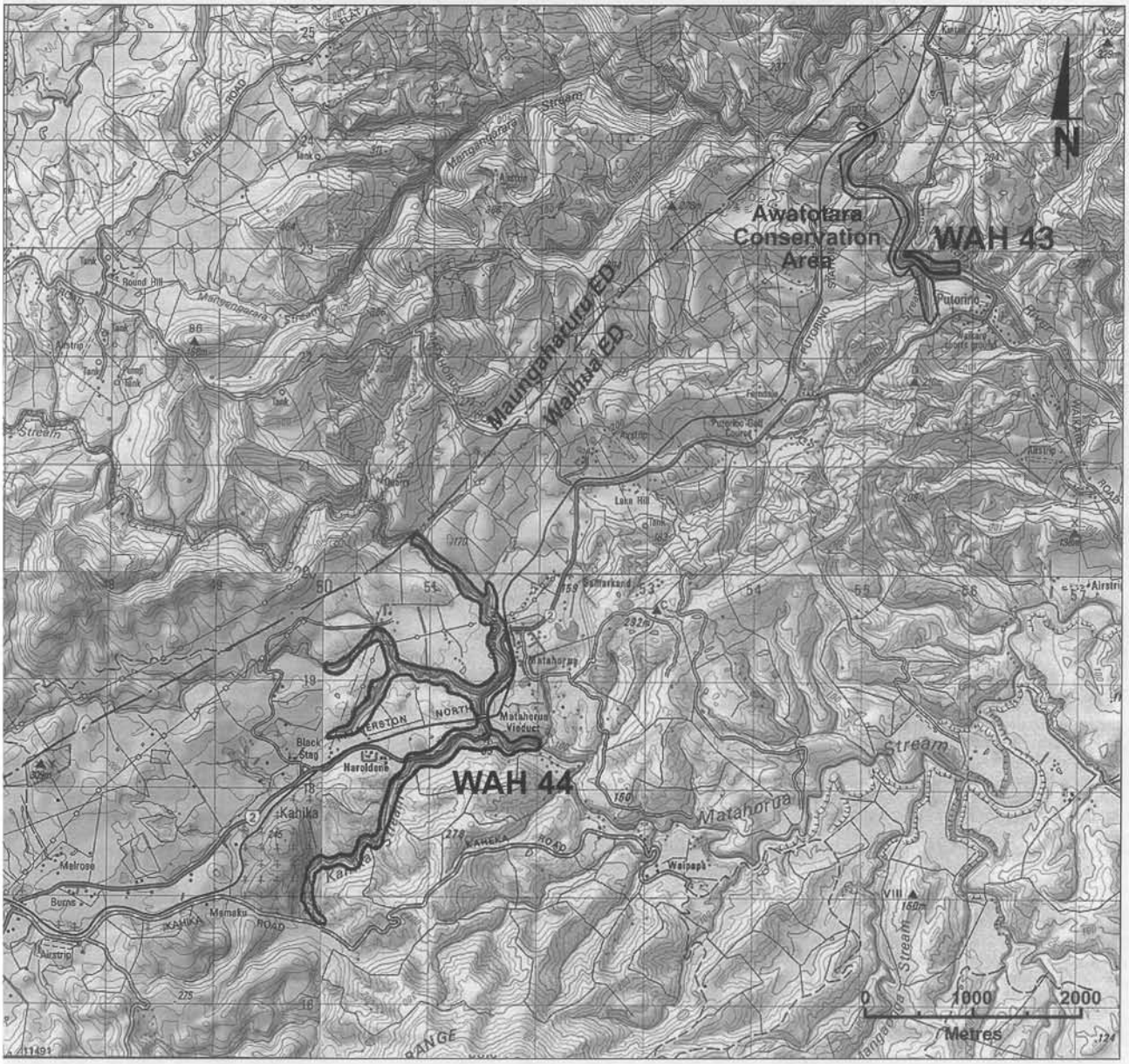
Refer to Map 38

Study site No.	835
Priority:	1
Grid Reference:	NZMS 260 W20 515184
Area:	88 ha
Altitudinal range:	50-140 m
Bioclimatic zone:	lowland
Vegetation class:	broadleaved shrubland-forest kanuka-manuka scrub cliff vegetation

Description

This RAP includes an extensive band of riparian vegetation along the moderate to steep banks of the Kahika Stream downstream of Kahika Rd with similar riparian bands in a parallel stream to the north, and in the Matahorua Stream which they are both tributary to, in the vicinity of SH2 and the Matahorua railway viaduct. The streams are deeply incised in places, with some parts of the stream banks unstable with bare scarp faces/bluffs. The Kahika Stream has several small waterfalls along its length. The upstream end of the Kahika Stream portion has young pine plantations flanking both sides, with pine plantations also on the south side of the lower reaches near the viaduct. A formal marginal strip, that encompasses

Map 38: RAPs WAH 43 & 44 (NZMS 260 V19, V20, W19 & W20)



a 20 m strip on either side of Matahorua Stream channel, is incorporated into the RAP.

Sections of the riparian slopes have *Pittosporum ralphii*-(kowhai-broadleaved) low forest, shrubland and treeland, in particular on the lower slopes and those with shady (more southerly) aspects. In these areas the understorey is lush, with rangiora, mahoe, koromiko, hangehange, kaikomako, young *Pittosporum ralphii*, tuhara, whaririki, gully fern and kiokio. Kowhai and *Pittosporum ralphii* are the only large trees. On the steep slopes on both sides of SH2, just south of the viaduct, the shrubland has small intermittent waterfalls flowing through it. The lower stream slopes north of the viaduct and down stream of the SH2 road bridge have more diverse broadleaved forest with modified primary elements, including scattered tawa, titoki and young kahikatea. The low forest- treeland is in mosaic with young secondary kanuka-manuka scrub and kanuka forest throughout the stream systems. Cabbage tree, toetoe, young *Pittosporum ralphii*, tutu, whaririki and blackberry are present amongst the scrub.

The easier upper slopes, particularly on the sunny aspects, have been grazed by domestic stock and feral goats, with the most diverse vegetation in the steeper inaccessible sections of the streams. Blackberry is the most conspicuous weed species in the southern part of the RAP (nearest Kahika Rd), with swards of it in places along the upper edges of the bank and where the scrub vegetation is open. The slopes near the viaduct are more weedy with large wattle (*Acacia* sp.) Japanese honeysuckle and scattered wilding pines amongst the secondary scrub. Willows are also present along the stream edge beside SH2. Small birds were noted to be abundant, including fantail and silvereye.

Significance and justification

This RAP has the highest natural values of all the areas of narrow deeply entrenched inner valleys that are characteristic at the southern end of the district, particularly for its *Pittosporum ralphii*-dominated stream side vegetation and small patches of modified primary tawa-titoki forest. A scenic corridor along SH2 below the Matahorua viaduct is included. The formal marginal strip defined in the Matahorua segment of the RAP encompasses only the inner part of the valley system and does not offer full protection to its conservation values.

RAP WAH 45 EARTHQUAKE SLIP

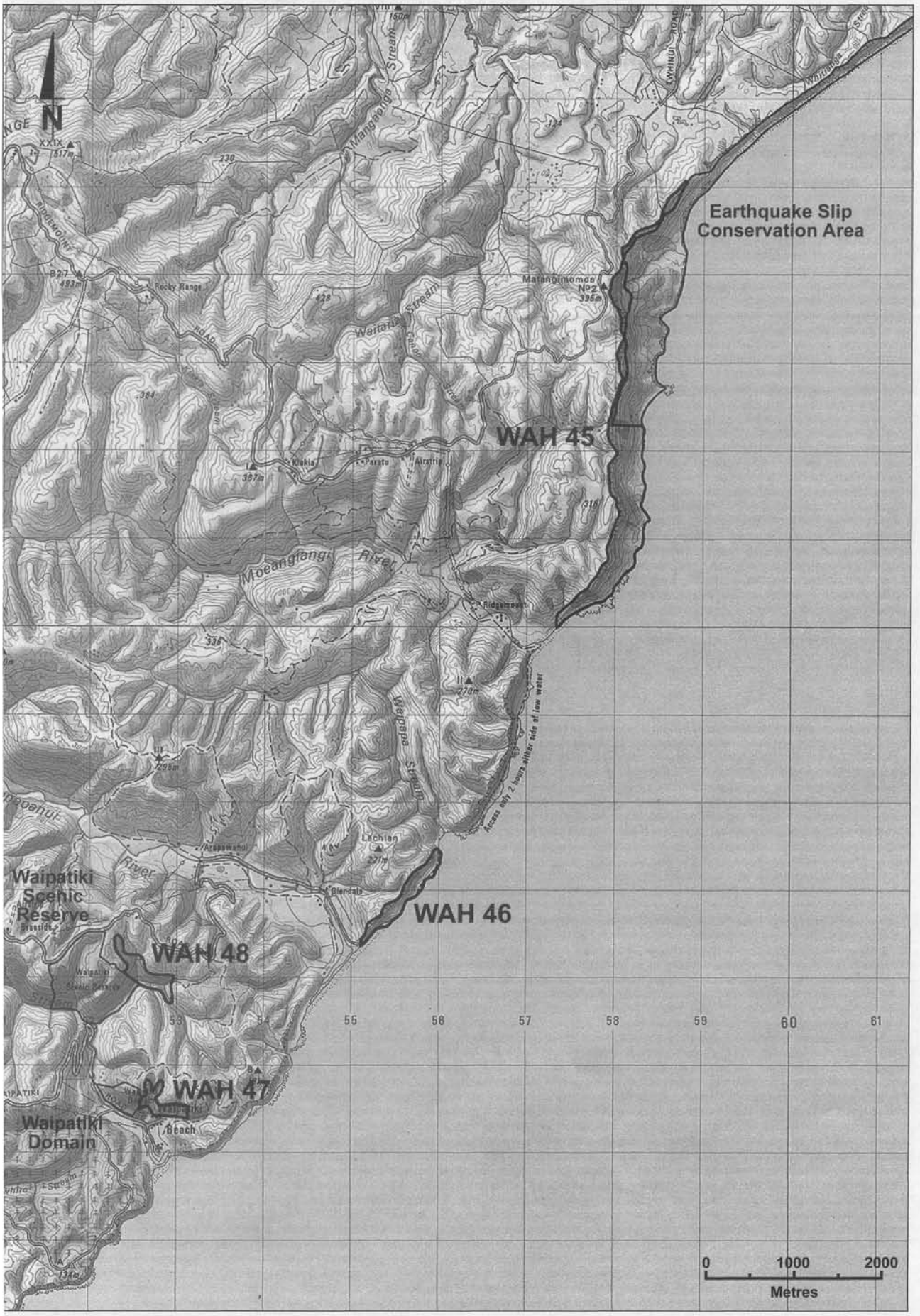
Refer to Map 39

Study site No.	675
Priority:	1
Grid Reference:	NZMS 260 W20 582118
Area:	90 ha
Altitudinal range:	0-390 m
Bioclimatic zone:	coastal
Vegetation classes:	broadleaved forest cliff vegetation tauhinu-manuka scrub shrubland

Description

This area lies on debris fans steep faces, and high multi-tiered sea cliffs, the main body of the RAP extending from just north of the Moeangiangi River mouth c. 2.5 km north to the southern boundary of the Earthquake Slip Conservation Area (EQSCA, PNA 88). It forms a ribbon along the coast which varies in width from 100-400 m. The debris fans were created by the collapse of the former sea cliffs during the 1931 Napier earthquake. As a result, the sea no longer attacks the older marine cliffs, but is actively cliffing into the toe of the debris fans. Discontinuous segments of the upper cliffs extending a further 2 km north above the EQSCA are included within the RAP. These areas represent places where the legal boundary of the conservation area is not along the cliff top, because of cliff collapse in 1931 or subsequently.

Map 39: RAPs WAH 45-48 (NZMS 260 W20)



The debris fans and gentle slopes that extend to the sea support secondary vegetation that ranges from young tauhinu scrub amongst rough pasture grasses, to manuka-tauhinu scrub. The moderate mid-slopes (particularly around seepage areas) have swards of tuhara, whaririki, tutu, karamu and ongaonga. The upper cliffs are most mobile and as such have only sparse vegetation, including scattered *Hebe parviflora*, *Senecio banksii*, tauhinu and pasture grasses. A small remnant of primary coastal titoki-karaka forest and treeland lies on a shelf of moderate to steep slopes, straddling the boundary between the RAP and EQSCA, with most of it lying within the RAP. The core of the forest has an intact canopy, merging to treeland at the margins. Ngaio occurs on the upper margins of the forest area, with mahoe and pigeonwood dominating the forest's sub-canopy. The understorey is grazed and open, with only scattered shrubs and ongaonga.

Fencing along most of the cliff top and Department of Conservation control operations have significantly reduced the feral goats numbers in the area. However, many were noted during the survey and long shelves of steep slopes between the bands of cliffs provide access for them to graze over nearly all the area. Erosion occurs particularly on the mobile upper cliffs, with evidence of fresh debris on the fans below. Skeletons of older manuka above the scrub canopy in places suggest past burning, and a c. 10 ha area of debris fans in the centre of the RAP was burnt in 1999.

Significance and justification

The RAP complements the existing Conservation Area by including the balance of the cliff-debris fan landform-ecological system above it and along the shore to the south. Association with the 1931 Napier earthquake gives the area additional national significance. The RAP contains the bulk of one of only three remnants of primary coastal forest remaining in the Waihua Ecological District; the others being in Waipatiki Domain (PNA 92) and RAP WAH 27.

RAP WAH 46 GLENDALE CLIFFS

Refer to Map 39 (p. 305)

Study site No.	789
Priority:	2
Grid Reference:	NZMS 260 W20 556069
Area:	19 ha
Altitudinal range:	0-180 m
Bioclimatic zone:	coastal
Vegetation classes:	manuka scrub dune vegetation cliff vegetation

Description

This RAP lies on the steep and cliffed coast between the mouths of the Aropaoanui River and Waipapa Stream. Coastal walkways, on the line of the old coach road, pass through the lower slopes and dunes of the RAP. It includes bands of limestone and sandstone cliffs, interspersed/interlayered with steep, finely dissected slopes. An area of duneland abuts the slope at the southern end, with spinifex, knobby clubrush, harestail and pasture grasses. There are extensive areas of manuka scrub, with *Pimelea prostrata* common in the ground layer and manuka-tauhinu shrubland on the steep slopes, with localised broadleaved shrubs (karamu, tutu, hangehange) and whaririki and more localised ngaio and karaka trees (including large ones of 70 cm dbh and more) amongst it. There is also a small area of ngaio treeland on a small terrace a few metres a.s.l. near the RAP's northern end.

There are a variety of cliffs within the RAP, both moist and dry, with a range of vegetation. Species present include whaririki, kiokio, *Nertera* sp., tuhara, common maidenhair, and on the lower cliffs, sea primrose.

Goats graze all but the least accessible areas of the RAP.

Significance and justification

This RAP contains a good diversity of indigenous vegetation, reflecting the variety of cliffs, hill-slopes and dunelands. After Earthquake Slip Conservation Area (PNA 88), this RAP contains the most substantial area of dense indigenous cover on coastal cliffs in the southern part of the Waihua Ecological District.

RAP WAH 47 WAIPATIKI BEACH

Refer to Maps 39 and 40 (p. 305 and 310)

Study site No.	885
Priority:	1
Grid Reference:	NZMS 260 W20 528045
Area:	9.7 ha
Altitudinal range:	10-110 m
Bioclimatic zone:	coastal
Vegetation classes:	broadleaved forest kanuka scrub-forest

Description

This RAP consists of two remnants of coastal forest in moderate stream gullies, in the Waipatiki Stream valley. The forest is connected by a pocket of secondary kanuka scrub-forest on a spur. The westerly remnant is continuous with the Waipatiki Domain (PNA 92), extending in narrow ribbons up two parallel tributary gullies. The remnant to the east extends from stream side to south-facing mid-slope along an unnamed tributary of the Waipatiki Stream. A pine plantation has recently been established on the surrounding hill-slopes, with

some clearance of young scrub at the upper margins of the forest. To the south the RAP is abutted by the sections of bach owners.

The advanced secondary coastal forest in both remnants is similar in composition. The canopy is a mosaic of karaka, titoki and tall kanuka, with occasional tawa, rewarewa, nikau and young conical kahikatea on the lower gully slopes. The canopy is discontinuous with areas of treeland throughout, most notably along the margins. The vegetation in the upper western gullies is particularly patchy. The secondary kanuka scrub-forest is almost pure kanuka, with scattered broadleaved trees (including mahoe, kaikomako, young karaka and putaputa-weta).

The vegetation within the RAP is all secondary, having established following some disturbance (probably logging in the late 1880s). It has also been grazed in the past, but with the recent conversion of the surrounding farm to forestry, stock pressure will now be reduced. Feral goats are occasional visitors. The margins of the RAP may be threatened when the pines are logged, with care needed to minimise the impact of any logging operation. Kereru, fantail, tui and morepork were all recorded in the vicinity.

Significance and justification

This RAP is significant for the area of coastal forest it contains. Only three areas of primary forest survive in the coastal bioclimatic zone of the Waihua Ecological District, and this advanced secondary forest is continuous with the largest and best of these areas in the Waipatiki Domain, providing a buffer along its coastal margin. The RAP would if protected be a valuable addition to the domain, doubling its lateral extent across the slopes behind the settlement and increasing its ecological diversity to include gully forest. The presence of the domain and RAP containing indigenous forest beside it enhances the landscape of Waipatiki Beach.

RAP WAH 48 WAIPATIKI

Refer to Maps 39 and 40 (pp. 305 and 310)

Study site No.	866
Priority:	1
Grid Reference:	NZMS 260 W20 525061
Area:	14 ha
Altitudinal range:	40-200 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	conifer/tawa forest broadleaved forest kanuka forest

Description

This RAP lies on narrow alluvial stream terraces and moderate hill-slopes in the upper Ruatoitoi Stream catchment, 2 km inland of Waipatiki Beach. It is enclosed by recently established pine plantations, except on its southwest boundary, where it abuts the Waipatiki Scenic Reserve (PNA 91). A section of the old Napier-Wairoa Road, on a route initially used by pre-European Maori, lies along the eastern edge of the RAP.

The vegetation on the alluvial terraces and lower slopes is primary kahikatea/tawa-(titoki) forest, with occasional emergent matai. Kowhai, mahoe, tree fuchsia, pigeonwood and putaputaweta are abundant in the sub-canopy. The understorey has a diverse range of shrubs, ferns, herbs and lianes including ongaonga, kawakawa, turepo, hangehange, *Coprosma areolata*, hen and chicken fern, jointed fern, nini, thread fern, *Jovellana sinclairii*, kohia, supplejack and *Metrosideros diffusa*. The Ruatoitoi Stream appears to have good water quality. Its banks are clothed in ferns (nini, gully fern, common shieldfern, *Pteris macilenta*), tuhara, mosses, *Jovellana sinclairii*, Mexican daisy, abundant young nikau, tree fuchsia and pukatea.

The south-facing hill-slopes have more modified advanced secondary low forest with nikau, rewarewa, titoki, karaka, tall kanuka, tawa, conical kahikatea, putaputaweta, ngaio, mahoe, pigeonwood and tree ferns forming a sometimes discontinuous canopy. The understorey has abundant nikau of all ages, with young seedlings carpeting the forest floor in places. Kiekie, kohia, aka, nini, common maidenhair, hen and chicken fern, hangehange and forest oat grass are also present in the understorey. Kanuka forest dominates the upper slopes on the drier northern side of the RAP, with fingers of it extending up the two main tributaries on the upper southern side of the RAP.

Feral goat browse is an ongoing problem, however control in the Scenic Reserve is likely to be reducing numbers within the RAP. Mexican daisy and pasture species were the only weeds noted. Kereru and fantails were recorded during the survey.

Significance and justification

This RAP is significant for the areas of diverse primary semi-coastal forest on fertile terraces and foot-slopes within it. As such, it complements and extends the values in the Waipatiki Scenic Reserve (PNA 91) into the upper valley system. The reserve and RAP together contain the most intact and diverse piece of semi-coastal alluvial kahikatea-dominated forest left in the southern end of the ecological district.

RAP WAH 49 UPPER WAIPATIKI STREAM

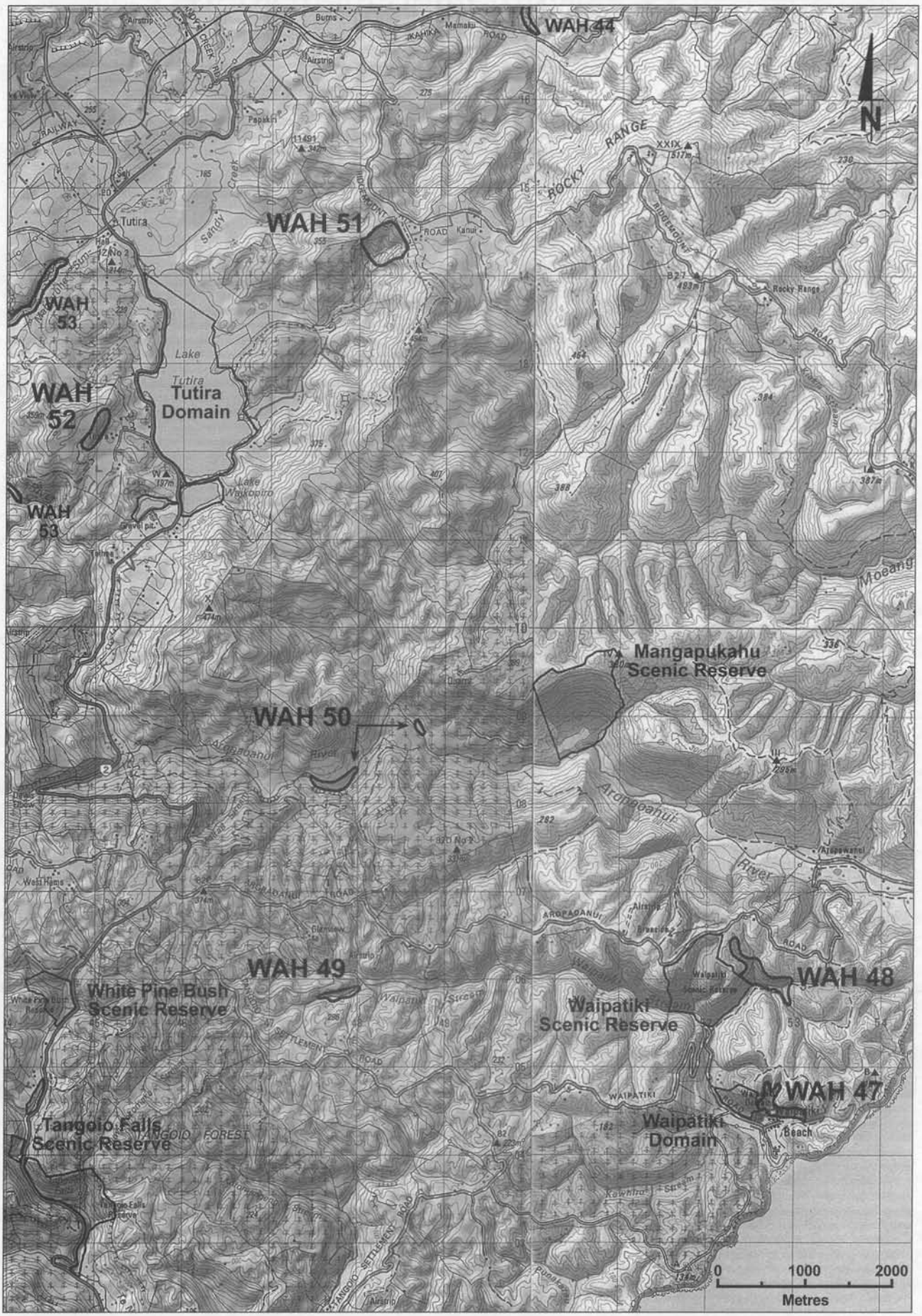
Refer to Map 40 (p. 310)

Study site No. 629

Priority: 3

Grid Reference: NZMS 260 V20 477058

Map 40: RAPs WAH 47-52 (NZMS 260 V20 & W20)



Area: 5.3 ha

Altitudinal range: 200-240 m

Bioclimatic zone: lowland

Vegetation classes: (conifer)/tawa forest

Description

This RAP consists of a long narrow strip of modified primary (kahikatea-rimu)/ tawa-titoki forest, with mahoe abundant in the sub-canopy, on the fertile lower slopes of a perched valley in the upper Waipatiki Stream catchment. There are a number of large kahikatea and one large rimu emergent over the tawa-titoki canopy. Much of the forest grows amongst limestone boulders derived from bands of limestone higher on the side-slopes. The remnant is unfenced and grazed by both feral goats and domestic stock.

Justification and significance

This primary forest area, though small and degraded, is of a distinctive type and one of the few remnants of primary forest remaining in the perched valley landscape at the drier southern end of the Waihua Ecological District.

RAP WAH 50 AROPAOANUI RIVER

Refer to Map 40

Study site No. 639, 640

Priority: 1

Grid Reference: NZMS 260 V20 477083/ 488089

Area: 7.0 ha

Altitudinal range: 40-80 m

Bioclimatic zone: lowland

Vegetation class: conifer forest
tawa-titoki forest

Description

This RAP consists of two forest remnants on the true left of the Aropaoanui River, c. 7 km north of Tangoio. The westerly (upstream) remnant lies on a narrow alluvial terrace and moderate to steep terrace riser on the inside of a bend in the river. The terrace is dissected by incised stream beds. Newly planted pines abut the remnant on its up-slope margin. The easterly (downstream) remnant lies on an alluvial terrace and low terrace riser, on a straight stretch of the river. It is also surrounded on three sides by mature pine plantation, with the river to the southwest.

The 20 m strip closest to the river in both cases is included within a formal marginal strip.

The western remnant has an area of modified primary (conifer)/tawa-titoki forest on the eastern half of the terrace, with mahoe abundant in the sub-canopy. Logged kahikatea-matai forest dominates the rest of the remnant. The understorey of the remnant is recovering following long-term grazing/browsing, with swards of ongaonga, thickets of young rohutu, putaputaweta, hangehange, lots of ferns (including *Asplenium hookerianum*, tarawera, *Pteris macilenta*, shaking brake, common shieldfern, hen and chicken fern) and hook sedge. Seedlings present include titoki, tawa, mahoe, kahikatea and matai. Along river edge tuhara, *Gunnera monoica*, *Jovellana sinclairii*, *Nertera* sp. giant umbrella sedge and *Carex* sp. are all common.

The easterly remnant contains primary logged tawa-titoki-kahikatea-(matai) forest on the upper terrace and terrace riser. Tawa is more dominant on the upper slope/terrace, with greater amounts of titoki, kahikatea and matai on the terrace itself. The sub-canopy is quite open with mahoe, kaikomako, putaputaweta, pigeonwood and scattered ngaio (most on the terrace). The understorey, which is also recovering following long-term heavy grazing, has a high number of seedlings (titoki, tawa, mahoe, kaikomako, rohutu, kahikatea and matai), scattered shrubs (turepo, kawakawa, ongaonga, rohutu) and ferns (common shieldfern, nini and *Lastreopsis glabella*). *Jovellana sinclairii* is present in damper areas. The forest merges into more modified and open treeland over the lower part of the terrace with tall kanuka, scattered pole kahikatea and clumps of titoki nearest the river.

Both forest remnants within the RAP have been grazed for long periods in the past, but both are now stock-free with significant recovery of the understorey noted. Feral goat sign and tracks were noted within the forest, but browsing does not appear to be severe. The forest may be threatened during the logging of the surrounding pines and care will need to be taken to minimise any damage. Blackberry and Mexican daisy were the main weeds noted. Kereru, paradise shelduck and common forest birds including fantail, grey warbler and tui were recorded. The water quality of the river appears to be quite high with eels and many small native fish noted.

Significance and justification

Although small, the forest remnants within this RAP are significant as very little predominantly primary alluvial terrace/terrace riser forest remains in the southern dry section of the Waihua Ecological District. Currently only about 20% of the forest within the remnants is nominally protected within the Waikoau River marginal strip. They are the only sizeable areas of riparian/alluvial forest within the marginal strip, with the rest of the vegetation being either exotic grassland, planted forest, or kanuka-dominated secondary scrub-forest.

RAP WAH 51 EASTERN TUTIRA

Refer to Map 40 (p. 310)

Study site No. 632

Priority: 3

Grid Reference: NZMS 260 V20 483144

Area:	17 ha
Altitudinal range:	220-340 m
Bioclimatic zone:	lowland
Vegetation classes:	tawa forest kanuka-manuka scrub

Description

This RAP lies on moderate to steep slopes in the head of a stream valley, just south of Ridgemount Rd. The stream flows west into Lake Tutira. Tutira Walkway runs along the RAP's northwestern margin, with a newly planted pine plantation to the west.

The vegetation on the lower south-facing slopes of the stream gully is advanced secondary/degraded primary rewarewa/putaputaweta-mahoe-(tawa-titoki) forest treeland. Mahoe, putaputaweta, ngaio (along the mid-slope) and pigeonwood are most abundant in the canopy/sub-canopy with occasional primary tawa and titoki trees in the bottom of the gully. The upper slopes have younger secondary putaputaweta-(kanuka)/manuka-mingimingi scrub shrubland, with mahoe, houhere and treeferns. The understorey is largely open and grazed with ongaonga, *Coprosma rigida*, bracken, hard fern and pasture species. Vines present throughout include aka, kohia, *Clematis* sp., *Rubus schmidelioides* and supplejack. The upper margins grade to manuka-mingimingi scrub with swards of hard fern. Young manuka-kanuka shrubland occupies the steeper northwest-facing side of the gully.

The RAP has suffered long-term grazing by domestic stock and feral goats. Their exclusion would enhance the conservation values of the RAP, allowing understorey recovery and regeneration to occur. Grey warbler were recorded during the survey.

Significance and justification

Although small and very modified, this is the largest of very few forest remnants on the upper slopes of the main ridges in the southern part of the Waihua Ecological District. This RAP provides an opportunity to protect an essentially complete catchment head with contrasting sunny and shady aspects. It has historical significance as it lies on part of the original Tutira Station, the natural history of which was thoroughly described by Guthrie-Smith (1953). It also has importance as it lies in the watershed of Lake Tutira, which is a significant wildlife habitat. The RAP contributes to the aesthetic values and diversity of the landscape, which is appreciated by people using the Tutira Walkway.

RAP WAH 52 THE HANGER

Refer to Maps 40 and 41 (pp. 310 and 315)

Study site No.	631
Priority:	3
Grid Reference:	NZMS 260 V20 450123

Area:	7.5 ha
Altitudinal range:	220-280 m
Bioclimatic zone:	lowland
Vegetation class:	broadleaved forest

Description

This rectangular RAP lies on moderately steep east-facing slope, underlain by mudstone-siltstone, c. 500 m west of Lake Tutira. Perennial springs within the RAP provide water for Tutira Station on which it lies. Mature pines and eucalypts grow along the northern margin, with macrocarpa abutting the RAP to the southeast. The RAP is completely fenced.

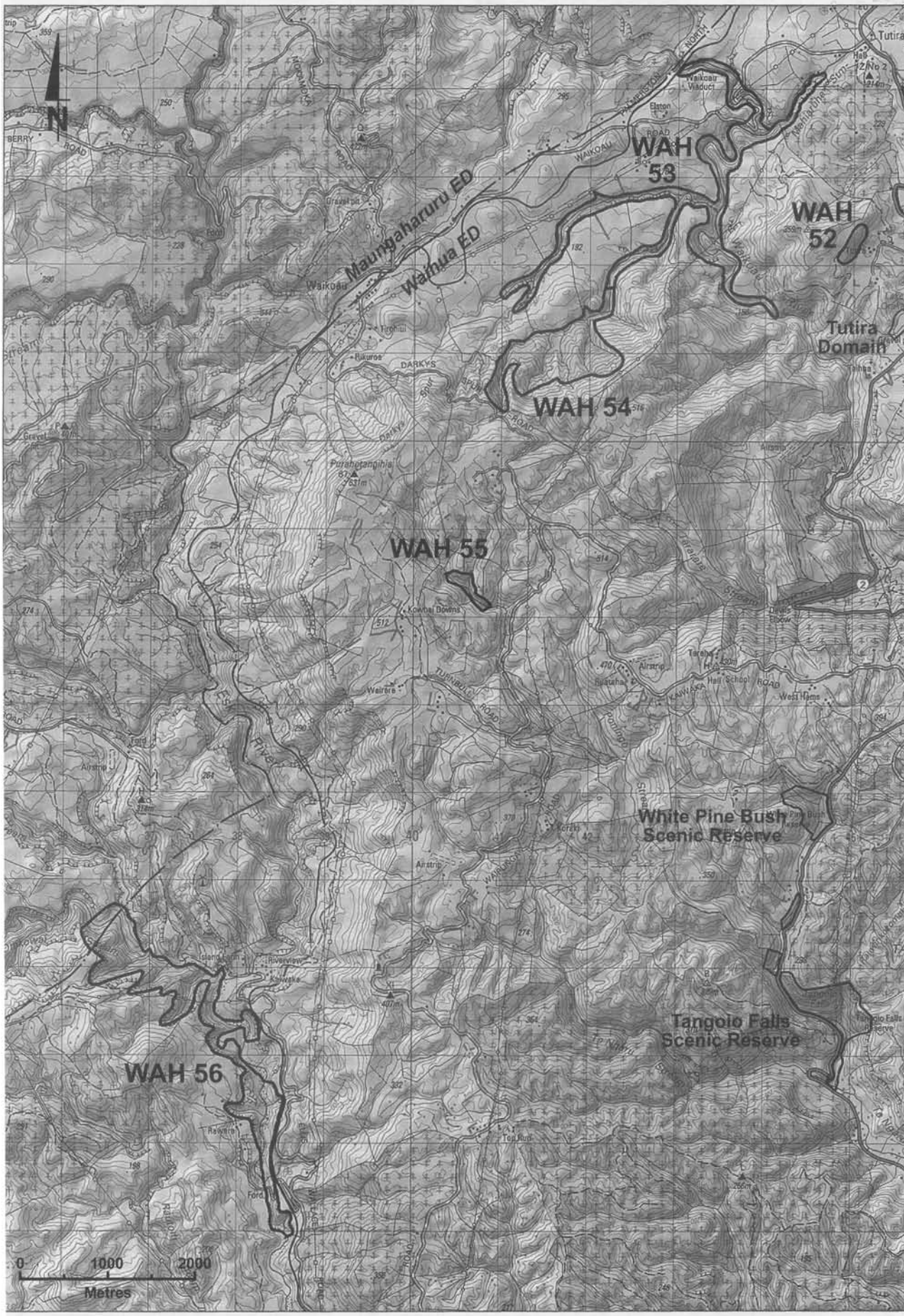
The RAP is composed of secondary vegetation that has reverted from pasture/ scrub since being removed from grazing and fenced in the late 1890s. The vegetation within the RAP has progressed along a successional path from burnt pasture to bracken fernland to manuka scrub to mixed advanced secondary broadleaved forest. The last fire swept through the area in 1893. The northern half of the RAP has a tall canopy of mahoe, pigeonwood, mamaku, flowering cherry and five finger. Rangiora, kawakawa, mahoe, pigeonwood, young miro, kaikomako, kahikatea and silver fern are abundant in the sub-canopy/under-storey. Ferns present include sickle spleenwort, shaking brake, common shieldfern and common maidenhair. The southern half is weedier with slips caused by Cyclone Bola providing open sites for weed invasion. Weeds present include Japanese honeysuckle, blackberry and old man's beard.

A total of 193 vascular plant species have been recorded in the Hanger (Wassilieff 1986). However, 43% of these are adventives, including invasive Japanese honeysuckle, jasmine, flowering cherry, blackberry and old man's beard. Many of these are garden escapes. The arrival of each of the exotic species during the first c. 40 years of the Hanger's existence is well documented (Guthrie-Smith 1953). The kauri within the RAP was planted some time in the 1940s, though the species is not native to Hawke's Bay. Possums are present, with browse noted on five finger, tree fuchsia, mahoe and the mistletoe *Tupeia antarctica*. Grey warbler and fantail were both noted.

Significance and justification

This RAP is important, both from a historical and botanical perspective. It is unique amongst the secondary vegetation of the district, as the history of its establishment and succession is well documented. Herbert Guthrie-Smith, the notable early ecologist who farmed Tutira and fenced the RAP, closely observed the evolution of the vegetation within the Hanger over a period of some 50 years (Guthrie-Smith 1953). The presence of the 'declining' mistletoe *Tupeia antarctica* (de Lange *et al.* 1999) is also significant, with this being the only record for Waihua Ecological District.

Map 41: RAPs WAH 52-56 (NZMS 260 V20)



RAP WAH 53 WAIKOAU RIVER

Refer to Map 41 (p. 315)

Study site No.	698
Priority:	2
Grid Reference:	NZMS 260 V20 435130
Area:	130 ha
Altitudinal range:	80-210 m
Bioclimatic zone:	lowland
Vegetation class:	broadleaved scrub kanuka-manuka scrub

Description

This RAP is a narrow riparian band of mainly steep slopes above the Waikoau River where it is sharply incised and gentle terrain and terraces where it has a more meandering course. It also extends in narrow riparian bands up the Mahiaruhe Stream (mainly on its true left) and both branches of an unnamed tributary on the true right of the river. Waikoau Road, including a bridge over the river, passes through the RAP. Some of the upper stream banks are fenced, with other sections naturally protected from stock by steep bluffs. A formal marginal strip, encompassing a 20 m strip on either side of the Waikoau River, is incorporated into the RAP. The RAP is arbitrarily truncated at its upstream end on the Waikoau River at the Waikoau railway viaduct essentially at the ecological district boundary.

The vegetation within the RAP is a mosaic of secondary kanuka-manuka scrub and shrubland, with patches of broadleaved shrubland treeland dominated by large *Pittosporum ralphii* (6-12 m). The shrubland also has kowhai, koromiko, houhere, kaikomako, swards of tuhara, rangiora, kiokio and karamu.

Japanese honeysuckle, an invasive climber, is smothering some areas of the RAP, particularly along the road side. Parts of the RAP are grazed, in particular the unfenced gentle upper terraces.

Significance and justification

This RAP is significant as is contains a diverse range of secondary and advanced secondary riparian vegetation in a substantial length of the narrow entrenched valleys characteristic of the southern end of the district. The formal marginal strip defined in the main Waikoau segment of the RAP encompasses only the inner part of the valley system and does not offer full protection to its conservation values. The RAP includes all of the more diverse and advanced broadleaved vegetation, particularly around the bridge, extending up from the river to the break in slope at the edge of the gentle terrain and terrace high above the Waikoau River. As riparian vegetation the RAP also contributes to erosion control and enhanced water quality.

RAP WAH 54 DARKY'S SPUR

Refer to Map 41 (p. 315)

Study site No. 697

Priority: 2

Grid Reference: NZMS 260 V20 415110

Area: 86 ha

Altitudinal range: 160-480 m

Bioclimatic zone: lowland

Vegetation class: kanuka scrub forest

Description

This RAP covers moderate to steep stream banks and moderate to steep northerly-facing hill-slopes in the upper catchment of an unnamed true right tributary of the Waikoau River, c. 4 km southwest of Tutira. The vegetation within the RAP ranges from kanuka scrub to kanuka forest and treeland. Some of it is discontinuous, particularly along the stream and lower hill-slopes. The hill-slopes have extensive areas of solid kanuka with only scattered broadleaved trees and shrubs, including mahoe, kowhai, cabbage tree, putaputaweta, houhere, kohuhu and red-fruited karamu. Trees and shrubs amongst the patchy stream-side kanuka are similar but also include *Pittosporum ralphii*, young conical kahikatea, rangiora, kaikomako and tutu. There are patches of younger kanuka-manuka scrub in places. The steep stream-side banks are afforded some natural protection from grazing by domestic stock, which have access to the entire RAP.

Significance and justification

This RAP is significant as the largest area of indigenous vegetation on generally north-facing (sunny aspect) slopes in the southern drier section of the district. It covers a wide altitudinal and landform gradient, from stream side to high spur, with waterfalls and bluffs. It is continuous with RAP WAH 53 along the main stream gully to the northeast.

RAP WAH 55 KOWHAI DOWNS

Refer to Map 41 (p. 315)

Study site No. 696

Priority: 3

Grid Reference: NZMS 260 V20 406083

Area: 7.7 ha

Altitudinal range: 380-440 m

Bioclimatic zone: lowland

Vegetation class: conifer/broadleaved forest

Description

This RAP lies on lower stream valley slopes in the upper Poningo Stream catchment, c. 10 km northwest of Tangoio. The core of the RAP is degraded primary kahikatea-(rewarewa)/tawa-titoki-broadleaved forest, which merges to treeland on the margins. All but two of the original kahikatea (25-30 m tall) have been logged from the forest. These are the likely parents of the younger conical kahikatea surrounding them. Other trees present in the canopy/sub-canopy include kohuhu, mahoe, lancewood, tall kanuka and kowhai. The RAP is grazed, with an open understorey.

Significance and justification

Despite the high degree of modification, this RAP is significant as it contains one of the larger areas of kahikatea-dominated fertile slope forest, of which only c. 79 ha remains in the southern part of the ecological district; 50 ha of it is protected within the Waipatiki Domain and Scenic Reserve (PNA 91 and 92).

RAP WAH 56 ESK RIVER

Refer to Map 41 (p. 315)

Study site No.	692
Priority:	2
Grid Reference:	NZMS 260 V20 377033
Area:	147 ha
Altitudinal range:	40-220 m
Bioclimatic zone:	lowland
Vegetation class:	kanuka-manuka scrub-forest wetland vegetation

Description

This RAP lies on either side of the Esk River on alluvial terraces, gentle to steep terrace risers and small incised stream gullies south of its confluence with Otakowai Stream. It also covers mainly north-facing slopes and tributary gullies (including some very steep slopes and bluffs) in the lower Otakowai Stream gorge, to abut Otakowhai Stream Bush to the west (RAP 11 in the Maungaharuru Ecological District; Townsend 1996). The Gisborne-Palmerston North railway runs along part of the RAP's eastern margin.

The vegetation within the RAP ranges from young secondary kanuka-manuka scrub to older secondary kanuka forest treeland with scattered tree ferns and broadleaved trees, most of which occur in the tributary gullies. These include kohuhu, mahoe, koromiko, houhere, putaputaweta, tree fuchsia, kowhai, tutu, titoki, occasional NZ broom and pigeonwood. The understorey is relatively open and grazed, with only scattered red-fruited karamu, little hard fern, common shieldfern, *Helichrysum aggregatum* and ongaonga. The bluffs have scattered kiokio, tuhara, *Pittosporum ralphii*, tutu, rangiora and five finger. The alluvial terraces are largely open and grassy, with only scattered scrub and treeland. A

small wetland/lake with adjoining shrubland, lies on a low terrace in the centre of the RAP, on the true right side of the river.

All the vegetation within the RAP has established following the clearance of the original cover. There are scattered wilding pines locally on the upper margins and patches of blackberry in the more open areas. Pasture species occur throughout. Feral goats, sheep and possums all browse/graze the RAP.

Significance and justification

This RAP extends across the boundary between the Waihua and Maungaharuru Ecological Districts. It lies in a lowland valley floor and sunny face system close to the driest extremity of the Waihua Ecological District, representing an ecological extreme. It is the only area with high coverage of indigenous vegetation in the lower valley systems of this dry zone, other than that in the narrow solely very steep/bluffy incised gorges. It also forms part of a semi-continuous riparian/ wildlife corridor with RAP 11 of the Maungaharuru Ecological District (Townsend 1996) extending a further 5 km up Otakowai Stream. This corridor is also significant as a wildlife habitat, with shining cuckoo, grey warbler, fantail, kingfisher and paradise shelduck all recorded in the vicinity.

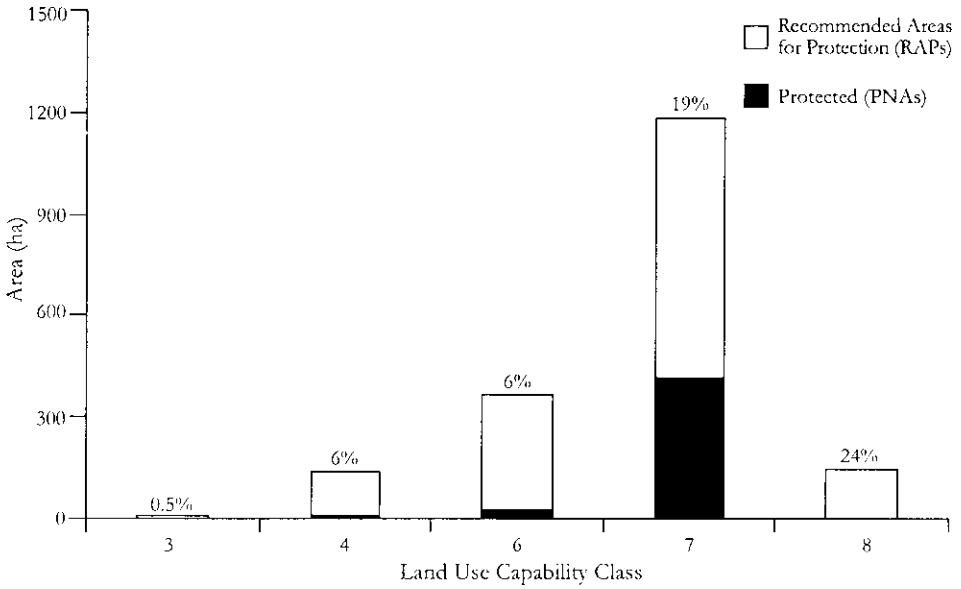
6.3 MAHIA ECOLOGICAL DISTRICT RAPS

A total of 93 study sites were assessed within the Mahia Ecological District during this study, of which 89 have no formal protection. Of those unprotected study sites all or part of 30, covering 1469 ha or 8.6% of the ecological district, are now identified within 25 Recommended Areas for Protection (RAPs) and are described below. Indicative information on the areas and proportionate representation of the various vegetation/landform classes in the selected RAPs is provided in Appendix 11, Table 3.

The RAPs have good geographical/spatial distribution over the district (Fig. 10), extending from its northern boundary to Portland Island. They recognise a number of the imbalances of the existing PNA network. For example on the modified eastern plateau of the district where there are currently no PNAs, nine RAPs have been selected and a number of the RAPs include secondary vegetation, which is now an integral part of the vegetation pattern of the district, e.g. kanuka, manuka, and tauhinu-dominated scrub. There are also a number of RAPs on Land Use Capability Classes 3, 4 and 6, i.e. those classes which are most desirable for farming, and that support only a small area of protected vegetation (Fig. 13). Of the 23 RAPs, nine are Priority 1, nine are Priority 2 and seven are Priority 3.

The character of the RAPs ranges from extensive areas of secondary-dominated vegetation e.g. Waipapa Stream (RAP MAH 22) through to smaller compact blocks of modified primary forest, e.g. Ormond Forest (RAP MAH 14). Most are a mosaic of both, with primary forest largely confined to moist gully sites. The recommended freshwater and saltwater wetlands all lie on the isthmus (RAP MAH 1, 2 and 3), with recommended duneland on the isthmus (RAP MAH 2), at the southeastern end of the peninsula (RAP MAH 24) and on the northern end of Portland Island (RAP MAH 25).

FIGURE 13 : DISTRIBUTION OF RECOMMENDED AREAS FOR PROTECTION (RAPs), AND CURRENT PROTECTED NATURAL AREAS (PNAs) IN RELATION TO LAND USE CAPABILITY CLASSES WITHIN THE MAHIA ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of each LUC Class supporting PNAs and RAPs.

RAP MAH 1 MAHANGA WETLANDS

Refer to Maps 42 and 11 (pp. 323 and 161)

Study area No. 909

Priority: 3

Grid Reference: NZMS 260 Y19 323314

Area: 22 ha

Altitudinal range: 0-20 m

Bioclimatic zone: coastal

Vegetation/landform class:
raupo reedland
freshwater wetland

Description

This RAP consists of four discrete freshwater wetlands, informally referred to as a) to d) in order from south to north, adjoining Mahanga Beach settlement. They lie very close to the boundary between the Mahia and Tiniroto Ecological Districts. Wetlands a) and b) formed in hollows between the dune systems parallelling Pukenui Beach and small alluvial fans/foot-slopes of the main hill-slopes behind and south of Mahanga Beach, and c) and d) formed in hollows in

the hummocky debris of a large ancient landslide off the same hill-slopes a little to the north (Lake Rotopounamu is a larger deeper hollow formed in the same way). Raupo reedland is the dominant vegetation type. Wetland b) behind the township also has a zone of manuka scrub around the wetland edge. Cabbage tree, blackberry and pampas grass are also present around the margins of all four.

All four are grazed and trampled around their margins to some extent by domestic stock and occasional feral goats. All of the original coastal vegetation has been cleared from around the wetlands, with some invasion by poplar and willows at some margins. They have been further modified by drainage - a) and b) in particular.

Significance and justification

The wetlands are significant for their wildlife habitat values (Australasian bittern have been recorded utilising all four wetlands) and typical vegetation of wetlands and their margins. Although each wetland is small individually, their collective value is enhanced by their closeness as a near continuous chain.

RAP MAH 2 MAUNGAWHIO LAGOON/PUKENUI BEACH

Refer to Map 42

Study area No. 451

Priority: 1

Grid Reference: NZMS 260 Y19 331266

Area: 415 ha

Altitudinal range: 0-10 m

Bioclimatic zone: coastal

Vegetation/landform classes:

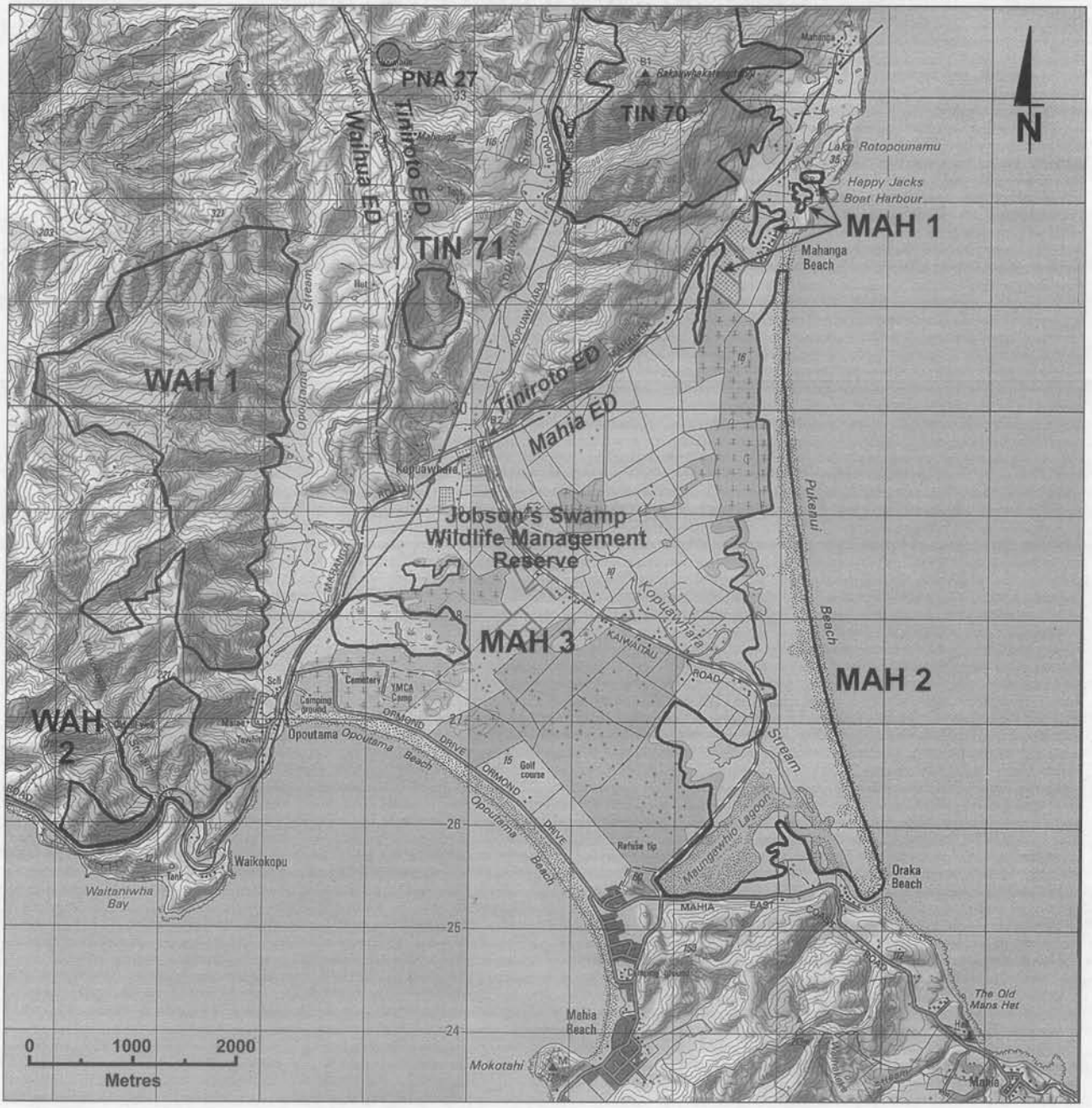
saltwater estuarine vegetation
raupo reedland
freshwater lakes
duneland

Description

This RAP lies on the eastern side and southeastern end of the Mahia isthmus, between the settlements of Mahia Beach, Oraka Beach and Mahanga Beech. It includes the estuary at the mouth of the Kopuawhara River, including Maungawhio Lagoon[1], the dune systems of Pukenui Beach and several other associated wetlands. Kopuawhara Stream, which deposited the alluvium that infilled the centre of the isthmus between its bounding dune systems, flows into the lagoon. Another lagoon, separated from the main one by the causeway of Kaiwaitau Rd, generally has markedly lower salinity than the more open estuary.

[1] While referred to as a lagoon, this is technically an estuary, defined by Johnson & Brooke (1989) as a body of water partially enclosed by land, open to the sea, salty or brackish, and subject to regular flow and fluctuations of the tides.

Map 42: RAPs MAH 1-3, WAH 1 & 2 and TIN 71 (NZMS 260 X19 & Y19)



Because of a flap-gate on the culverts, it is usually predominantly freshwater. Two intermittent lakes and other wetlands lie on the inland side of the RAP behind Pukenui Beach. The lakes connect to the Kopuawhara Stream and have variable salinity, from essentially fresh after sustained wet periods, to essentially saline after occasional inundations by high spring tides.

The lagoons are surrounded almost entirely by extensive areas of indigenous wetland vegetation, varying according to the frequency and degree of inundation and salinity. Sea rush rushland dominates the tidal lagoon edges (middle to upper marsh of Wardle 1991) with knobby clubrush, bands of jointed wire-rush and sea primrose-selliera-glasswort turf field. The inner margins that are completely submerged at high spring tides support populations of salt-tolerant three-square and patches of raupo reedland (western corner of the lagoon). The dry outer

edges of the lagoon, beside Kaiwaitau and Mahia East Coast Rd have low patchy shrubland of saltmarsh ribbonwood, pohuehue, blackberry, bracken, harakeke and cabbage trees.

The native sand-binder spinifex dominates sections of the foredune of Pukenui Beach. Marram, the competitive introduced sand-binder, is well established however and appears to be extending its range. Three small populations of pingao are also present, two of which occur around the mouth of a large blowout on Pukenui Beach. Species in the rear dune systems include sand pimelea, sand sedge, lupin, harestail, sea rocket and sand convolvulus. Damp dune hollows between the dunes support zoysia, sand sedge, sand convolvulus and clumps of marram.

The lakes lie in the extensive inland dune system to the north of the lagoon. Despite having had long term grazing and trampling around their margins, both retain bands of wetland vegetation around them. This vegetation is in two distinct zones; raupo reedland in the deeper water with clumps of *Isolepis prolifer* amongst it and sea rush rushland in the shallower margins. The dunes surrounding the lakes are highly modified with rough pasture, harestail and lupin.

Grazing by stock has an ongoing impact on the dunes and wetlands. These animals not only browse the most palatable dune and wetland plants, but compress and trample the lagoon and lake margins, disturb the fragile dune system and enrich the waters of the lagoon and lakes.

Significance and justification

The RAP is significant as the largest and most diverse estuary-duneland system in the Mahia Ecological District, and the most natural of such systems in the Wairoa Ecological Region. It contains a number of plant species and communities which are almost entirely restricted to it, e.g. sea rush rushland, and glasswort-sea primrose-selliera turf field. Of botanical importance too is the presence of pingao, a native sand binder that is largely dependent on the continuation of conservation measures for survival (recovering but 'conservation dependent': de Lange *et al.* 1999). The RAP is also significant as a wildlife habitat with an SSWI ranking of 'outstanding'. Numerous waterfowl, both resident and migratory, inhabit the lagoon including Australasian bittern, spotless crake, banded rail, banded dotterel, black-backed gull and Caspian tern. NZ dotterel have been resident and breeding near the tip of Pukenui Beach in recent years and fernbird occupy some of the wetland margins. The estuary and beach are also important as sites for harvesting kaimoana.

RAP MAH 3 OPOUTAMA WETLAND

Refer to Map 42 (p. 323)

Study area No. 608

Priority: 1

Grid Reference: NZMS 260 X19 295279

Area: 55 ha

Altitudinal range: 0-5 m

Bioclimatic zone: coastal

Vegetation/landform class:

blackberry-bracken-umbrella sedge scrub-sedgeland
manuka scrub
Isolepis prolifer-jointed twig-rush-raupo rushland-reedland
raupo reedland
freshwater pond

Description

This RAP is part of a series of inter-dunal wetlands at the northwestern end of the Mahia Isthmus. It is enclosed between two dune systems parallelling Opoutama Beach on the southwestern side of Mahia isthmus. It lies 1 km northeast of Opoutama township and drains into the Opoutama Stream. Mahanga Road and the Palmerston North Gisborne railway line form the RAP's northwestern boundary. Blocks of mature pines (*Pinus radiata* to the north, *P. pinaster* to the south) grow along the northern and southern margins of the wetland. The pines along the northern boundary separate the RAP from Jobson's Swamp Wildlife Management Reserve (PNA 96).

Raupo reedland is the most extensive vegetation type, and covers most of the southern half of the wetland and patches out amongst a central area of open water (c. 1 ha). *Baumea juncea*, *Isolepis prolifer*, jointed twig-rush, sharp spiked-sedge and lake clubrush occur amongst and at the margins of the raupo. Manuka scrub, harakeke and cabbage tree occur in clumps along the southern half of the wetland margin and on several small low islands. The northern, southern and parts of the western margins are grazed right to the wetland margin with scattered giant umbrella sedge, rank pasture grasses, bracken, lupin, swards of blackberry and clumps of *Juncus* sp.

The northern half of the wetland is an intricate mosaic of predominantly native vegetation types. *Isolepis prolifer* rushland dominates the very wet flats in the northwest. The central northern section has sedge-rush-flaxland containing a mixture of raupo, jointed twig-rush, harakeke, *Isolepis prolifer* and purei. The northeastern end of the wetland is a mosaic of manuka scrub (3-6 m tall) with scattered cabbage trees and low manuka scrub with knobby clubrush, blackberry, lupin and scattered pines where a fire c. 10 years ago burnt taller manuka communities that have subsequently regenerated. The dry eastern sand ridges have knobby clubrush rushland with pohuehue, jointed rush, blackberry, lupin and scattered pines.

A number of weed and pasture grass species have invaded the wetland, including lupins, blackberry, pampas, willows and young pine seedlings. Control, particularly of the pampas, pines and willows, would be desirable in the future. Cattle, which occupy the area for much of the year, have a major effect on the vegetation, browsing, trampling and perpetuating the 'weed' species (Walls 1994). The water table has been lowered by drains dug in the northwestern outlet and the water level fluctuates during time of flood. As the result of farming and forestry there is an input of artificial nutrients, animal wastes and sediment that may also be affecting the plant and animal communities present.

Significance and justification

This RAP is the largest and most intact of the freshwater wetlands remaining on the Mahia Isthmus. It also has the greatest diversity and complexity of wetland communities. The RAP was given an 'outstanding' SSWI ranking for its significance as a wildlife habitat, with Australasian bittern, pukeko, spotless crake, fantail, Australasian harrier, grey duck, NZ scaup, banded rail, fernbird and mallard all recorded.

RAP MAH 4 TE HOE

Refer to Map 43

Study area No.	430
Priority:	2
Grid Reference:	NZMS 260 Y19 312209
Area:	18 ha
Altitudinal range:	20-140 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation classes:	tawa forest tawa/kohekohe forest kanuka forest

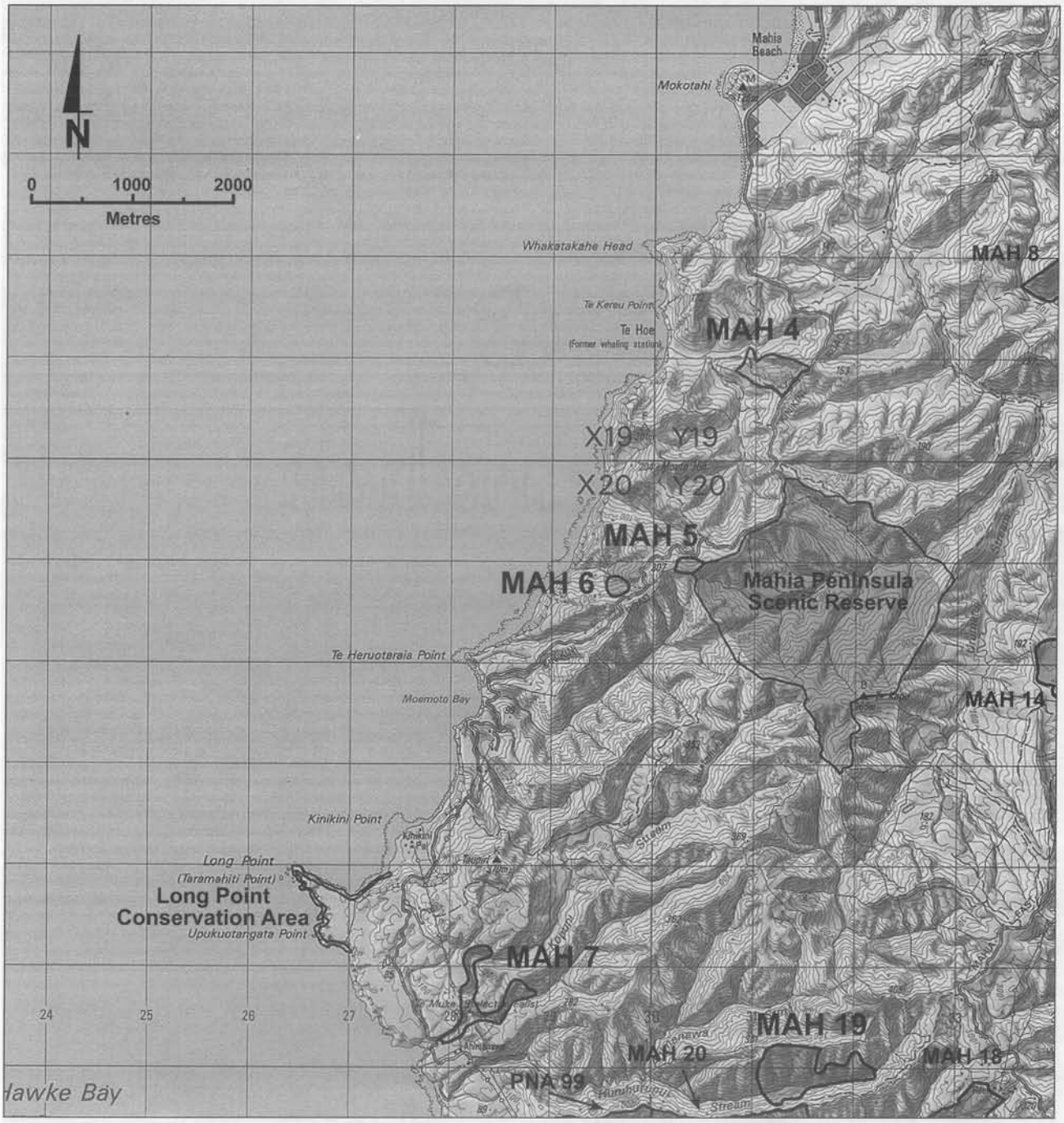
Description

This RAP lies 3 km south of Mahia Beach, on the moderate to steep stream valley slopes and ridges of a complete sub-catchment of the stream draining to the former Te Hoe whaling station. The upper slopes support modified primary tawa-kohekohe forest, with pockets of taller tawa forest in the stream gullies. Rewarewa is emergent over the primary tawa-dominant canopy, with scattered pukatea in the gullies. The lower slopes support kanuka forest at different stages of regeneration. On the upper mid-slopes older kanuka forest has emergent rewarewa and a diverse range of broadleaved trees and young rimu amongst its canopy. The younger scrub vegetation on the lower slopes has an almost purely kanuka canopy. A farm track descends from Kinikini Rd through the RAP near and at its southern edge. Feral peacock occupy the area. Long-term grazing by both domestic stock and feral goats have damaged and opened the understorey.

Significance and justification

This RAP is significant as it contains a range of primary and secondary forests in a complete sub-catchment of warm coastal aspect. It is the largest area of forest remaining on the northwest edge of the peninsula. It is also an important wildlife habitat with an SSWI ranking of 'potential', with common bush and field birds recorded.

Map 43: RAPs MAH 4-7 & 19 (NZMS 260 X19, X20, Y19 & Y20)



RAP MAH 5 KINIKINI ROAD (1)

Refer to Map 43

Study area No.	910
Priority:	3
Grid Reference:	NZMS 260 Y20 303190
Area:	3.9 ha
Altitudinal range:	200-280 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation classes:	tawa/kohekohe forest

Description

This RAP lies on a moderate to steep north-facing hill-slope above Kinikini Road, on the western side of Mahia Peninsula. It abuts against Mahia Peninsula Scenic Reserve at the ridge on the RAP's southeastern boundary. The vegetation is modified primary (rewarewa-pukatea)/tawa/kohekohe forest-treeland, with puka, nikau, titoki and lemonwood also amongst the canopy. The sub-canopy is dominated by kohekohe, along with mahoe and pigeonwood. The understorey is open and grassy with scattered red-fruited karamu and ferns.

Many of the trees in the canopy exhibit windshear, as they are exposed to the onshore westerly winds. Feral goats are numerous in the area, browsing the understorey which is largely open and grazed.

Significance and justification

This RAP is significant as it is continuous with Mahia Peninsula Scenic Reserve, buffering it along part of its northwestern margin. Lying on coastal northerly facing slopes, the RAP complements the scenic reserve, which is predominantly semi-coastal and protected from direct coastal influence, e.g. salt spray. Despite browsing, the canopy is diverse and intact. The RAP also lies near RAP MAH 6, providing a link for wildlife and seed dispersal from the reserve.

RAP MAH 6 KINIKINI ROAD (2)

Refer to Map 43 (p. 327)

Study area No. 435

Priority: 3

Grid Reference: NZMS 260 X20 297188

Area: 4.4 ha

Altitudinal range: 100-200 m

Bioclimatic zone: coastal

Vegetation classes: tawa/kohekohe forest
kanuka forest

Description

This RAP lies on moderate to steep northwesterly facing slopes in a small stream catchment on the western side of the peninsula, in the coastal bioclimatic zone. The vegetation is predominantly degraded primary titoki-ngaio/kohekohe forest, with tawa, rewarewa, karaka, nikau and scattered kanuka also present in the intact canopy. A band of kanuka forest-treeland occurs along the RAP's western edge. The RAP is grazed by domestic cattle and sheep and feral goats, with the understorey consequently quite open.

Significance and justification

Although small, this RAP is significant as it contains predominantly primary forest on steep northwesterly facing slopes in the coastal bioclimatic zone. Little primary vegetation remains on slopes of this aspect in the coastal zone of the district; they tend to be dry and hot, representing an environmental extreme.

RAP MAH 7 TE MUKA

Refer to Maps 43 and 45 (pp. 327 and 340)

Study area No.	614, 615 & 616
Priority:	2
Grid Reference:	NZMS 260 Y20 283146
Area:	22 ha
Altitudinal range:	80-220 m
Bioclimatic zone:	coastal-semi-coastal
Vegetation classes:	tawa/kohekohe forest broadleaved forest cliff vegetation kanuka scrub manuka scrub tauhinu-(manuka-kanuka) scrub

Description

This RAP lies on the western side of Mahia Peninsula, near Long Point Conservation Area. It covers limestone outcrops and bluffs on either side of Te Muka (Stalactite Falls), and the moderate slopes of Kopuni Stream and the stream up from the falls. The stream disappears underground between the two sections of the RAP and reappears above the falls. The outcrops and bluffs support a diverse shrubland of koromiko, mahoe, rangiora, whau, hangehange, *Libertia grandiflora*, *Pittosporum ralphii*, NZ broom and whahariki. Karaka dominates the treeland along the banks and upper slopes of the streams, with titoki, tawa, pukatea, kohekohe, ngaio and nikau throughout. The RAP is surrounded by, and the two sections joined by, kanuka scrub, kanuka-manuka scrub and patchy younger tauhinu-(manuka-kanuka) scrub.

The original forest of the surrounding hill-slopes has been cleared and burnt at various times in the area's history. Long-term grazing by feral goats and domestic stock have left the understorey of the broadleaved treeland along the stream open and bare with only scattered shrubs and ferns.

Significance and justification

Though small this RAP is significant as it contains a number of palatable species that are uncommon within the ecological district: *Libertia grandiflora*, NZ broom, sickle spleenwort and whau. These species have persisted solely because the steep bluffs/outcrops on which they grow are inaccessible to the domestic stock and feral goats that have removed them from much of their range. The

limestone-dominated karst landforms (steeply incised rocky slopes and bluffs and underground draining) on which the RAP lies are also notable. They are representative of the landscape atop the narrow band of coquina limestone laid down in the Pliocene (Kingma 1964) which extends down the most westerly section of the peninsula, between Kinikini Point and the Turanganui Stream. Fencing against stock and feral goats would enhance the botanical values of this RAP, allowing regeneration to occur in the open and grazed treeland. It would also allow the palatable species to establish on other sites.

RAP MAH 8 UPPER WHANGAWEHI STREAM

Refer to Map 44

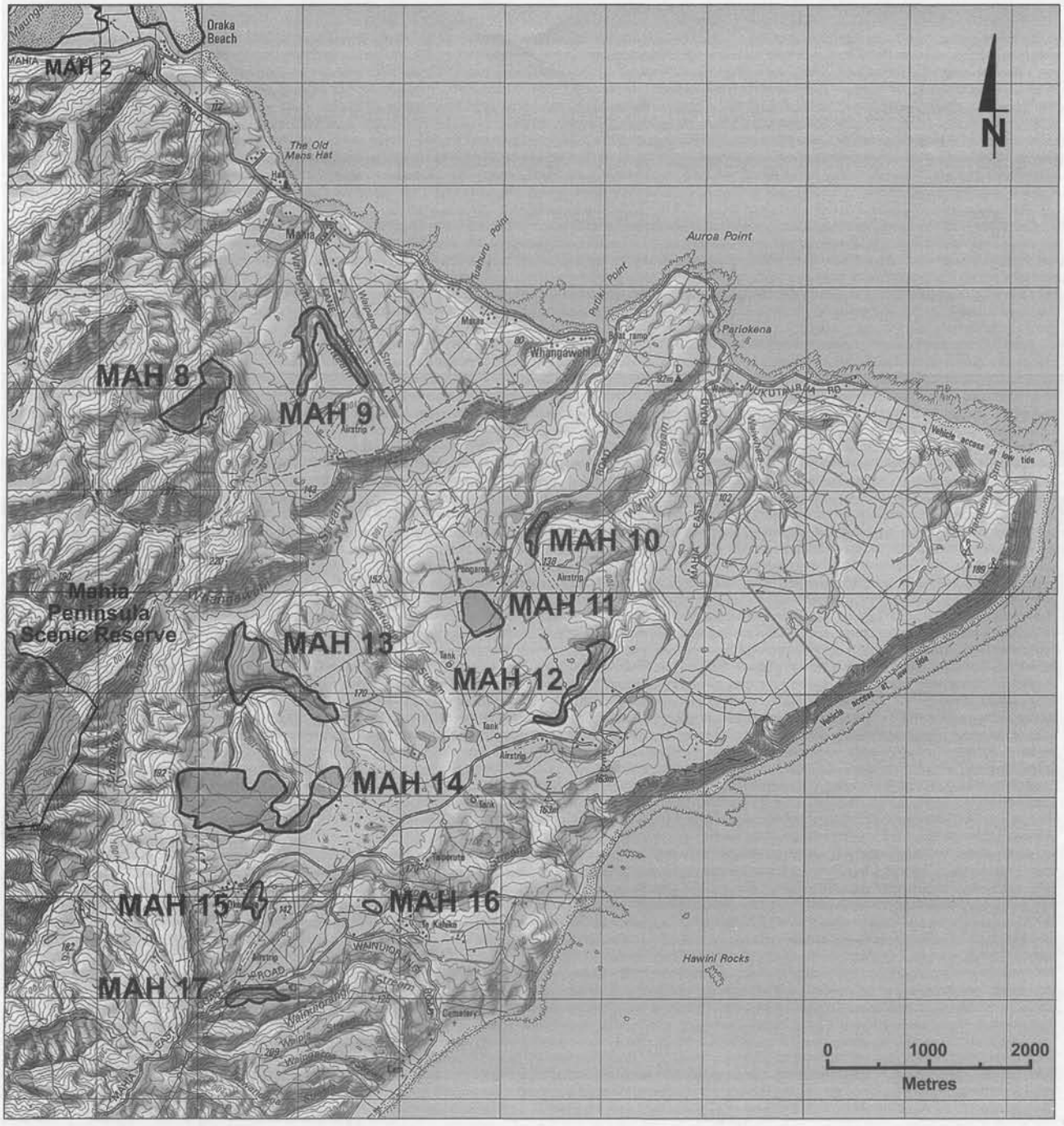
Study site No.	475
Priority:	2
Grid Reference:	NZMS 260 Y19 340219
Area:	20 ha
Altitudinal range:	100-220 m
Bioclimatic zone:	semi-coastal
Vegetation class:	tawa-kohekohe forest

Description

This RAP covers northeasterly to southeasterly facing slopes in the upper catchment of the Whangawehi Stream, c. 2 km southwest of Mahia settlement. The main part of this RAP is modified tawa-dominant primary forest with scattered rewarewa and a single large rimu emergent (the forest type would have been rimu/tawa forest before logging or crown fires removed most of the rimu). Pukatea and karaka are also present in the canopy. Kohekohe is the dominant sub-canopy tree (some of which are very large) with mahoe and pigeonwood less frequent. The upper slopes are steep and rocky and support a greater diversity of seedlings and ferns in the understorey (including kohekohe, mahoe, pigeonwood, nikau, kawakawa, forest oat grass, thread fern, hen and chicken fern and common shield fern) than do the lower slopes. Ongaonga is present in small groves throughout. The southern end of the remnant supports younger forest of very similar composition, but with smaller tawa in the canopy and a larger number of emergent rewarewa, suggesting the influence of past burning. Pukatea is also more abundant here than in the older forest. The understorey is similar to that described above, but slightly less diverse.

Grazing by domestic stock and feral goats has opened up the understorey, removing palatable seedlings and saplings in parts of the area. Wind damage was observed in some of the older tree crowns, with newly fallen branches and debris in the understorey. Kereru, fantail and silvereye were recorded.

Map 44: RAPs MAH 8-17 (NZMS 260 Y19 & Y20)



Significance and justification

This RAP is important because it is the largest and most intact piece of semi-coastal forest remaining on the northern end of the peninsula. Although on slopes of very predominantly shady southeasterly aspect, the RAP includes a complete section from ridge crest to riparian margin.

RAP MAH 9 WAITUPATU STREAM

Refer to Map 44 (p. 331)

Study site No. 477

Priority: 3

Grid Reference: NZMS 260 Y19 351227

Area: 17 ha

Altitudinal range: 40-100 m

Bioclimatic zone: coastal to semi-coastal

Vegetation classes: tawa/kohekohe forest
manuka-kanuka scrub-forest

Description

Lying c. 1 km south of Mahia township, this RAP covers the riparian zone and side slopes of two branches of the Waitupatu Stream, which is incised into the marine terrace surface of Mahia's northeastern plateau. It also includes a small lake in the western branch of the stream, either the direct result of damming by an old landslide from the true right side, or artificial blocking of a channel cut through the natural debris-dam. The riparian vegetation along the stream is a mosaic of primary tawa-dominant forest patches in the lower gully slopes, with kanuka scrub forest amongst the broadleaved forest and on the upper slopes. The tawa forest has the usual suite of semi-coastal trees amongst its canopy: karaka, kohekohe, titoki and nikau. Stock tracks pass through the gullies. Blackberry and gorse are both present, in the younger scrub and at the gully edges.

Significance and justification

Although highly modified, this RAP is significant as the most diverse area of forest in the many stream gullies incised into the northern edge of the marine terraces of the northern peninsula and further diversified by the small lake. It has an SSWI ranking of 'potential', with kereru and common bush birds present.

RAP MAH 10 WAINUI STREAM (1)

Refer to Map 44 (p. 331)

Study site No. 444

Priority: 3

Grid Reference: NZMS 260 Y19 373206

Area: 4.0 ha

Altitudinal range: 60-130 m

Bioclimatic zone: semi-coastal

Vegetation classes: tawa-titoki/kohekohe forest

Description

This RAP encompasses a small remnant of modified primary semi-coastal forest below Pongaroa Rd, on moderate easterly-facing side slopes of a small tributary of the Wainui Stream incised into a step in the marine terraces on the northeast coast of the peninsula. The upper slopes are dominated by tawa and kohekohe, with titoki, pukatea and kohekohe more common in the gully bottom. Titoki is also more abundant at the upper end of the gully. A small number of exotic trees (pines and probably *Juniperus* sp.) have been planted along the southwestern gully edge. Long-term grazing by domestic stock has left the understorey largely bare and open and reduced some of the margins to treeland.

Significance and justification

This RAP is important as one of the best examples (albeit small and degraded) of the original forests of stream gullies incised into the northeastern marine terrace plateau of the peninsula.

RAP MAH 11 PONGAROA

Refer to Map 44 (p. 331)

Study site No. 443

Priority: 1

Grid Reference: NZMS 260 Y20 368198

Area: 13 ha

Altitudinal range: 140-150 m

Bioclimatic zone: semi-coastal

Vegetation classes: (conifer)/tawa-kohekohe forest
tawa/kohekohe forest

Description

This RAP lies on the very gentle northeast sloping marine terrace surfaces of Mahia Peninsula's northeastern plateau c. 4 km southeast of Mahia settlement. Eucalypts have been planted around the southeastern corner of the RAP, with fencing along the western boundary. A tributary of the Wainui Stream runs through the RAP's southeastern end, with swampy ground and areas of standing water surrounding the tributary. The forest on this swampy ground has large buttressed pukatea and young kahikatea amongst a low open tawa-dominated canopy. Kohekohe is the most abundant understorey tree, with dense kiekie and supplejack vines in places. The forest floor, though showing obvious signs of stock presence, has a diverse range of ferns, herbs, seedlings and saplings including thread fern, forest oat grass, *Oplismenus imbecillis*, hook sedge, hangehange, pukatea and kawakawa.

The rest of the RAP lies on the drier upper surfaces. There the forest is primary logged tawa/kohekohe forest with scattered emergent rewarewa and occasional pukatea. The canopy is intact; however, kohekohe and kawakawa form a low windshorn canopy along the margins and fallen tawa trees and branches attest to

the wind damage occurring in the main forest. Mature eucalypts and pines along the remnant's southeastern edge afford some protection from onshore winds. Weed species and pasture grasses have established where canopy openings have provided a higher light environment. Kereru and common forest birds including fantail were recorded.

Significance and justification

This RAP is the second largest area of primary forest surviving on the marine terrace surface of the northeastern plateau and contains one of the few examples of swamp forest left on the peninsula.

RAP MAH 12 WAINUI STREAM (2)

Refer to Map 44 (p. 331)

Study site No.	446
Priority:	2
Grid Reference:	NZMS 260 Y20 378192
Area:	12 ha
Altitudinal range:	70-160 m
Bioclimatic zone:	semi-coastal
Vegetation class:	tawa-titoki-kohekohe forest broadleaved shrubland

Description

This RAP, visible from Mahia East Coast Rd, lies c. 5 km southeast from Mahia settlement. It covers an incised gully system in the upper Wainui Stream catchment, one arm of which has been planted in pines. The RAP contains a mosaic of tall semi-coastal forest dominated by tawa, with patches of broadleaved shrubland and scrub amongst it and at the margins. Pukatea, hinau, titoki, nikau, ngaio and lemonwood are all present amongst the tawa, with kohekohe dominating the sub-canopy. The broadleaved shrubland is dominated by kohuhu, with mahoe, cabbage trees, pigeonwood and kaikamako. One large kahikatea occurs at the northern end of the RAP. Gorse, wilding pines and blackberry are the main problem weeds. However, the dense patches of gorse and blackberry probably restrict stock access to the main gully. Kereru and tui were recorded during this survey.

Significance and justification

This RAP is important as a good example of original vegetation in the incised stream gullies of the northeastern plateau, of which little remains. It also contains a representative range of successional stages. Past logging and forest clearance have resulted in this mosaic of vegetation of different ages, from young scrub to logged primary forest.

RAP MAH 13 MID-WHANGAWEHI

Refer to Map 44 (p. 331)

Study site No.	611
Priority:	2
Grid Reference:	NZMS 260 Y20 346192
Area:	33 ha
Altitudinal range:	30-140 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	conifer-tawa/kohekohe forest tawa/kohekohe forest kanuka-broadleaved forest manuka scrub

Description

This RAP covers mainly west and south-facing side slopes of a stream valley which joins the mid-reaches of Whangawehi Stream and broad gentle north-facing ridges on the dissected edge of the marine terrace/plateau on the northeastern side of the Mahia Peninsula. Most of the forest lies on the true right of the stream, extending from stream side to the upper edges of the gully. It contains a remnant of logged primary semi-coastal tawa forest with scattered emergent rewarewa, matai and kahikatea. Pukatea, karaka, titoki, white maire and nikau are also present in the canopy. Kohekohe dominates the sub-canopy, along with mahoe, pigeonwood and silver fern. The understorey is open and grazed, with groves of ongaonga and red-fruited karamu. Vines include kiekie, aka, *Metrosideros colensoi*, *Metrosideros diffusa* and heavily browsed supplejack. Large puka are prominent as epiphytes in the canopy. The banks beside the stream are clothed in places with gully fern, nini, common shield fern and tarawera.

To the northeast the upper edge of the primary forest grades abruptly at the ridges to secondary kanuka forest and manuka-kanuka scrub mosaic, with patches of broadleaved shrubs (including cabbage tree, pigeonwood, putaputaweta and mahoe) in moister sites. Scattered rewarewa are emergent over the oldest secondary forest.

Large rotting stumps provide evidence of the past logging that removed most of the big podocarps from the gully. Domestic stock have trampled and browsed the understorey and stream margins. Kereru and fantail were recorded.

Significance and justification

This RAP has a substantial area of primary forest - the least modified and most diverse primary forest in the incised stream gullies on the northeastern plateau. This RAP complements the values of RAP MAH 14 which lies 1 km south on the upper plateau. Its significance is enhanced by the inclusion of varied secondary vegetation on the ridges/terrace surface, contiguous with the primary forest.

RAP MAH 14 ORMOND FOREST

Refer to Map 44 (p. 331)

Study site No. 612

Priority: 1

Grid Reference: NZMS 260 Y20 346180

Area: 68 ha

Altitudinal range: 110-180 m

Bioclimatic zone: semi-coastal

Vegetation classes: conifer/tawa-kohekohe forest
tawa-kohekohe forest

Description

Lying c. 6 km south of Mahia this RAP consists of a large solid forest remnant and several small patches of primary semi-coastal forest on the gentle surface of the highest marine terrace, with shallowly incised valleys, on the northeastern plateau of Mahia Peninsula. Tawa dominates the forest's canopy, with pukatea, rewarewa, nikau, kohekohe and occasional titoki amongst it. Past logging has left only scattered large podocarps (mainly kahikatea and matai). The majority of the kahikatea present are young conical trees which are likely to have established following logging disturbance. Linking the forest patches across narrow gaps are treeland and secondary shrubland. On other forest margins there is commonly a narrow band of treeland, with groves of nikau. The forest has suffered from long term grazing and as a consequence has an open understorey. The canopy however is largely intact. Wind damage is also evident at the margins of the forest. Kereru and common bush and field birds including tui and morepork have been recorded.

Significance and justification

This RAP is significant as it contains the largest tract of forest left on Mahia's northeastern plateau, and the second largest area of continuous primary forest remaining in the ecological district, after Mahia Peninsula Scenic Reserve.

RAP MAH 15 OKEPUHA

Refer to Map 44 (p. 331)

Study site No. 448

Priority: 3

Grid Reference: NZMS 260 Y20 346169

Area: 3.7 ha

Altitudinal range: 110-150 m

Bioclimatic zone: semi-coastal

Vegetation classes: tawa/kohekohe forest
broadleaved scrub

Description

This RAP covers moderate gully slopes at the head of the Taiporutu Stream, at the southern corner of the northeastern plateau of Mahia Peninsula. The gully is a mosaic of tall tawa-dominated logged primary forest, with patches of blackberry, bracken and broadleaved shrubs. Most of the forest lies on the easterly-facing slopes and in the stream gully head. Titoki, nikau and rewarewa are all present amongst the tawa. Kohekohe dominates the sub-canopy and forms a low canopy where tawa is absent. The broadleaved shrubland includes wineberry, pigeonwood, putaputaweta and kanuka. The vegetation that lies along the upper gully edges and extends east onto the plateau surrounding the gully is very degraded and reduced to treeland. Most of the tree canopies are thin, with many exhibiting wind shear. Along the western side of the gully a small area has been fenced off (as an addition to the owner's garden) with a marked increase in the number and diversity of seedlings and ferns in the understorey. This area illustrates well what would occur if this gully were completely fenced off from domestic stock and feral goats. Blackberry and Mexican daisy were the main weed species recorded. Tui, grey warbler, kereru and fantail were all recorded during this survey.

Significance and justification

This RAP includes a notable area of primary forest on fertile slopes, together with a range of vegetation at earlier successional stages. It lies between two larger RAPs, MAH 14 and 17, providing a link for wildlife and seed dispersal.

RAP MAH 16 TE KAHIKA

Refer to Map 44 (p. 331)

Study site No. 455

Priority: 3

Grid Reference: NZMS 260 Y20 357169

Area: 1.5 ha

Altitudinal range: 130-150 m

Bioclimatic zone: semi-coastal

Vegetation classes: tawa/kohekohe treeland

Description

This RAP contains a small remnant of modified primary forest that has largely been reduced to treeland, on moderate to gentle slopes and a rolling ridge near the southern corner of Mahia Peninsula's northeastern plateau. Tawa dominates the canopy, with scattered emergent rewarewa and kohekohe most abundant in the sub-canopy. There is one large puriri tree. Other species present include mahoe, nikau, karaka, titoki and the vines NZ jasmine and supplejack. The

treeland is heavily grazed, with the roots of some trees exposed by erosion and trampling. Kereru were observed visiting the puriri and tawa.

Significance and Justification

The significance of this RAP lies in the fact that it contains the only puriri tree remaining within the Mahia Ecological District (and Wairoa Ecological Region); a species that was formerly more widespread. This is the most southerly occurrence of this major forest species on the eastern side of the North Island.

RAP MAH 17 WAINUIORANGI STREAM

Refer to Map 44 (p. 331)

Study site No.	458
Priority:	2
Grid Reference:	NZMS 260 Y20 345160
Area:	6.5 ha
Altitudinal range:	140-200 m
Bioclimatic zone:	semi-coastal
Vegetation class:	tawa/kohekohe forest broadleaved scrub manuka scrub

Description

This RAP covers moderate to steep-sided slopes along the Wainuiorangi Stream, beside the Mahia East Coast Rd at the southern corner of the northeastern plateau of Mahia Peninsula. The core is logged primary tawa forest with scattered emergent rewarewa. Karaka, pukatea, hinau, nikau and ngaio (upper slopes) also occur in small numbers amongst the canopy. One large rimu remains in the eastern end of the gully, with a large kahikatea in the western end. The sub-canopy is dominated by kohekohe, with mahoe, kawakawa, heketara and pigeonwood. Large numbers of nikau are also present in the canopy/sub-canopy (4-10 m tall). Despite heavy grazing, the understorey has a number of seedlings, ferns and herbs on the inaccessible parts of the slope (including thread fern, common maidenhair, common shieldfern, gully fern, hen and chicken fern, heruheru, nini and tarawera).

Along the upper margins of the gully the forest merges to treeland, and secondary scrub dominated by manuka and broadleaved shrubs (mingimingi, kohuhu, mamaku, putaputaweta, lancewood and scattered kohekohe). Young podocarps also occur amongst the low scrub, including rimu, matai and kahikatea, most of which are 3-4 m tall. Stumps in the understorey are evidence of past logging.

Significance and justification

This RAP is significant as one of the few remnants within the Mahia Ecological District that is exhibiting strong podocarp regeneration; large numbers of young

podocarps are emergent along the upper margins of the gully in the low secondary scrub treeland vegetation.

RAP MAH 18 REEF STATION

Refer to Map 45 (p. 340)

Study site No.	471
Priority:	1
Grid Reference:	NZMS 260 Y20 333135
Area:	27 ha
Altitudinal range:	160-300 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa/kohekohe forest tawa-titoki-kohekohe forest

Description

This compact RAP is located towards the southern end of Mahia Peninsula, on moderate slopes in the upper catchment of the west-flowing Mangatea Stream. The stream is deeply incised in places; where it passes through the RAP the northern-facing banks are open and rocky, while those facing south are clothed in places with shrubs, herbs and ferns (including *Jovellana sinclairii*, ongaonga and young heketara).

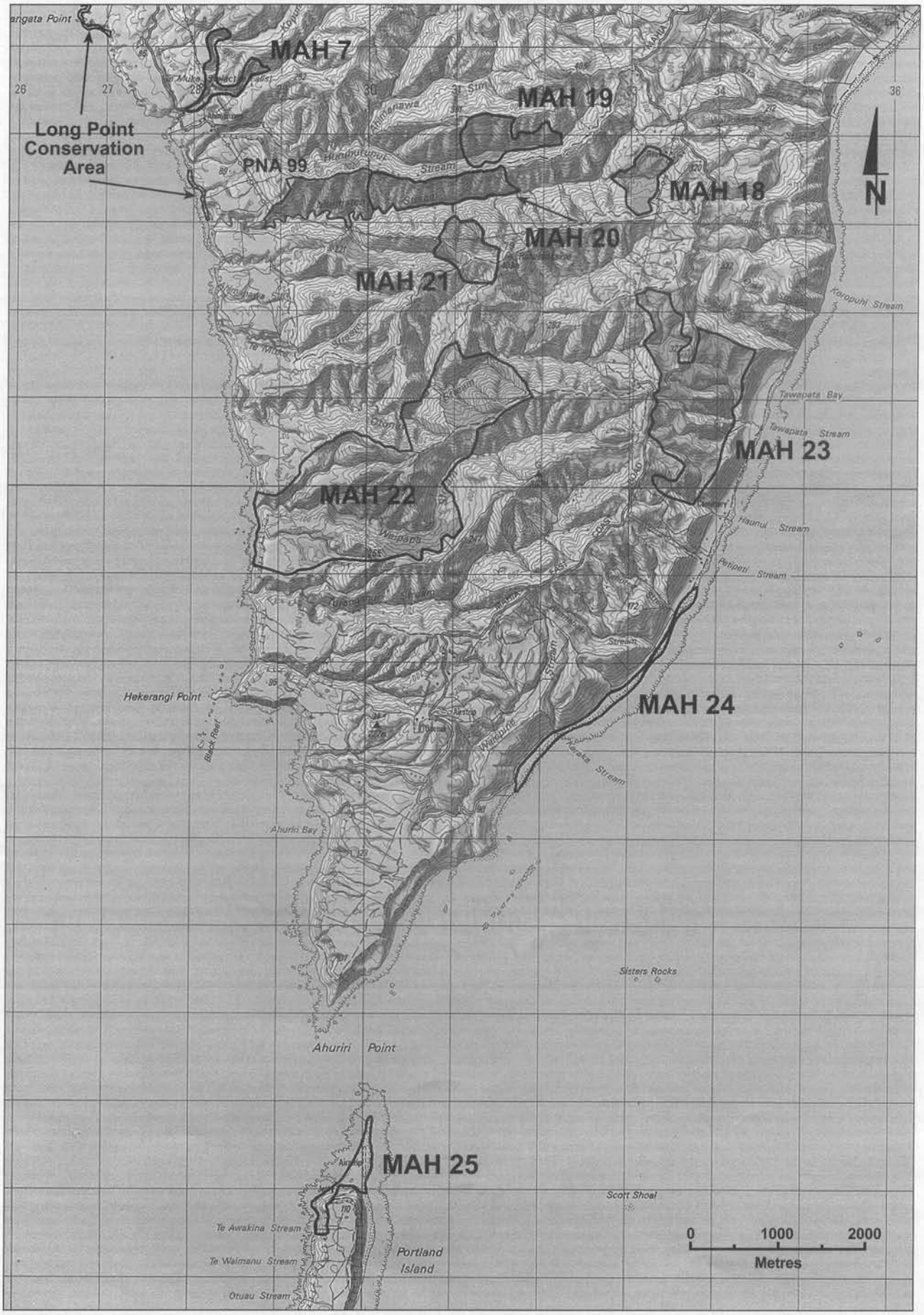
The north-facing slopes have tall modified primary forest. Tawa and titoki dominate the canopy, with pukatea and large hinau occurring throughout. Mahoe and kohekohe dominate the sub-canopy. The canopy is patchy in places, fading to treeland over pasture, blackberry and red-fruited karamu. Where the canopy is closed, the understorey is grazed and open to 4 m, with bare litter and only scattered seedlings and ferns.

On the moister south-facing slopes the vegetation is younger advanced secondary forest. Young tawa and titoki are emergent over a mosaic of broad-leaved shrubs and trees dominated by kohekohe. The forest floor has carpets of thread fern, hen and chicken fern, *Oplismenus imbecillis*, hook sedge and seedlings (including titoki, rangiora, pigeonwood, kawakawa and hangehange). Young nikau are abundant. The canopy is broken in places, with swards of hard fern and red-fruited karamu. Kereru and fantail were recorded during this survey.

Significance and justification

This RAP is significant as the second largest area of semi-coastal modified primary forest on the southern end of Mahia Peninsula, lying on easier more fertile slopes compared with most of the other remnants at the end of the peninsula. It is also valuable as part of a semi-continuous chain of native vegetation along the Mangatea Stream valley which includes RAP MAH 20 and PNA 99.

Map 45: RAPs MAH 18-25 & 7 (NZMS 260 X20 & Y20)



RAP MAH 19 HURUHURUNUI STREAM

Refer to Maps 45 and 43 (pp. 340 and 327)

Study site No. 442

Priority: 2

Grid Reference: NZMS 260 Y20 313140

Area: 39 ha

Altitudinal range: 120-340 m

Bioclimatic zone: semi-coastal

Vegetation class: tawa/kohekohe forest
tauhinu-(manuka-kanuka) scrub

Description

This RAP contains two remnants of semi-coastal forest, connected and enclosed by secondary shrubland-scrub, which lie on moderate to steep slopes at the upper end of the Huruhurunui Stream valley. The lower slopes of the larger forest area (c. 10 ha) to the west support modified primary tawa-pukatea/ kohekohe forest with emergent rewarewa. The upper slopes have more modified low tawa-kohekohe forest that fades to patchy treeland particularly along the drier spurs, with groves of nikau and cabbage trees along the western margin. Large lancewood, lemonwood, karaka and ngaio are also present amongst the canopy.

The smaller forest area, which lies upstream on the south-facing slope, is also tawa-dominated with kohekohe the main sub-canopy tree and nikau present throughout. Karaka and ngaio are also present in the canopy, which is broken in places by large patches of cabbage trees and nikau at the upper margins. The shrubland-scrub connecting the forest is predominantly tauhinu, with kanuka, manuka, mingimingi and red-fruited karamu. The canopies of both forest remnants are largely intact. However, both have quite open grazed understoreys. Kereru and common bush birds were recorded.

Significance and justification

This RAP contains some of the best semi-coastal primary tawa/kohekohe forest remaining in the southern half of the ecological district; covering c. 30 ha, and extending from stream side to ridge top, on steep, finely dissected slopes characteristic of the area. It lies within 1.5 km of three other RAPs and a covenant area, creating a habitat link for both wildlife and seed dispersal.

RAP MAH 20 MANGATEA STREAM

Refer to Map 45

Study site No. 440

Priority: 2

Grid Reference: NZMS 260 Y20 307134

Area:	52 ha
Altitudinal range:	70-260 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa/kohekohe forest manuka-kanuka scrub

Description

This RAP lies in the Mangatea Stream valley and covers a south-facing moderate to steep finely dissected slope, from stream side to ridge top. The bulk of the RAP is young secondary scrub dominated by tauhinu, with kanuka, manuka, scattered karaka and cabbage trees amongst it. Smaller moderate to steep stream gullies at intervals along the slope support pockets of modified primary semi-coastal tawa/kohekohe forest, with groves of nikau and karaka. Long term heavy grazing has opened the understorey and thus far largely halted regeneration. The RAP is partially fenced, along the top ridge and eastern boundary.

Significance and justification

This RAP complements the values of the 48 ha covenanted area (PNA 99) with which it is contiguous. Together they cover c. 100 ha on south-facing slopes along the Mangatea Stream valley, and support a range of successional vegetation from young tauhinu scrub through to modified primary tawa/kohekohe forest. The pockets of older vegetation amongst the young scrub of the RAP, and forest in the adjacent covenant, would provide seed sources for regeneration. The RAP also has significance as part of a semi-continuous chain of indigenous forest patches along the stream valley - along with RAPs MAH 18, 19, 21 and 22.

RAP MAH 21 RAHUIMOKAIROA

Refer to Map 45 (p. 340)

Study site No.	441 & 469
Priority:	2
Grid Reference:	NZMS 260 Y20 312127
Area:	36 ha
Altitudinal range:	120-380 m
Bioclimatic zone:	semi-coastal
Vegetation classes:	tawa/kohekohe forest kanuka-broadleaved forest kanuka forest

Description

This RAP lies on north to northwesterly facing moderate to steep slopes below Rahuimokairoa trig (403 m), midway up the Mangatea Stream valley, and on moderate south-facing slopes which form a wide basin in the head of an unnamed true right tributary of the Otunua Stream. The north-facing and south-

facing parts of the RAP are separated by a ridge with a well-developed farm track. The bulk of the northern part is kanuka scrub and forest with tauhinu amongst it, particularly at the margins. The northeastern portion of the kanuka forest is the most diverse with scattered trees of ngaio, karaka, nikau and tawa. The moist upper gullies support several pockets of degraded primary tawa/kohekohe forest, connected by the younger kanuka-dominated vegetation. Ngaio, nikau, lancewood, mamaku, heketara and *Metrosideros diffusa* are also present. The south-facing slopes have advanced secondary or primary rewarewa-tawa/ kohekohe forest-treeland, with titoki, nikau, karaka and epiphytic puka amongst the canopy. This merges to broadleaved treeland and groves of nikau at the bottom of the slope.

Feral goats and domestic stock graze much of the vegetation within the RAP. Subsequently the understorey in places is quite open and bare. The secondary vegetation within the RAP has the potential to regenerate, with older areas acting as seed sources.

Significance and justification

This RAP is significant for the diversity of primary and secondary vegetation on a ridge-focussed area with slopes of all aspects. It is part of a semi-continuous chain of indigenous vegetation along the Mangatea and Otunua Stream valleys (including RAP MAH 18 and PNA 99).

RAP MAH 22 WAIPAPA STREAM

Refer to Map 45 (p. 340)

Study site No.	467 & 524
Priority:	1
Grid Reference:	NZMS 260 Y20 305100
Area:	380 ha
Altitudinal range:	0-340 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation types:	tawa/kohekohe forest kanuka forest manuka-kanuka forest

Description

This extensive RAP lies towards the southern end of Mahia Peninsula. It covers much of the catchment of the Waipapa Stream and a segment of the mid-reaches of the Otunua Stream valley. The stream catchments consist of moderate to steep, finely dissected valley sides and narrow ridges. There is a landslide-dammed lake about 50 m long in the mid-reaches of Waipapa Stream, but this may not last all that long. In their lower reaches the main streams are deeply incised into a broad very gently sloping marine terrace, at 80-130 m altitude, which is truncated by a sparsely vegetated sea cliff. Streamlets with very small catchments are only slightly incised into the marine terrace.

The vegetation of the RAP is a mosaic of coastal/semi-coastal primary forest remnants connected by tracts of young tauhinu-manuka-kanuka scrub and older even-aged kanuka forest. The primary forest is tawa-dominated, with emergent rewarewa over a mix of kohekohe (most abundant), karaka, titoki, ngaio, kowhai, mahoe, nikau and treeferns. Patches of pure kanuka occur on the ridges amongst it. The extensive areas of secondary scrub and forest have potential to regenerate with the pockets of primary forest within the RAP and nearby RAP MAH 23 providing seed sources.

The RAP has suffered clearance and burning in the past, with most of the primary forest restricted to the moist stream gullies. Long-term grazing by feral goats and domestic stock has kept the understorey of much of it open and reduced its diversity. No problem weed species were noted.

Significance and justification

This RAP is important as it is the largest continuous tract of indigenous vegetation in the Mahia Ecological District, outside of Mahia Peninsula Scenic Reserve. It contains considerable areas of modified primary forest (c. 84 ha). Some of these lie on dry north-facing slopes, most of which have succumbed to burning and clearance in other areas on the peninsula. It also covers a wide altitudinal range (10-340 m) and a wide range of landforms from steep sea cliffs to inland steep stream gullies and ridge crests. The extensive areas of kanuka and manuka scrub on the marine terraces within this RAP are the only notable areas of indigenous vegetation on marine terraces at the southern end of the peninsula.

RAP MAH 23 TAWAPATA STREAM

Refer to Map 45 (p. 340)

Study site No.	463 & 464
Priority:	1
Grid Reference:	NZMS 260 Y20 337111
Area:	165 ha
Altitudinal range:	20-340 m
Bioclimatic zone:	coastal to semi-coastal
Vegetation classes:	tawa/kohekohe forest broadleaved forest kanuka forest manuka-kanuka scrub

Description

Lying on the southeast coast of the Mahia Peninsula, this RAP covers most of the catchments of the Tawapata and Haunui Streams which drain to the east and the upper reaches of Otunua Stream which drains to the west. The RAP is divided by the Mahia East Coast Rd. On both sides of the road the slopes are generally only

moderately steep, but the gullies become more sharply incised towards the eastern coast, with very steep lower side slopes.

The upper moist gully slopes east of the road support primary tawa-dominated forest, with emergent rewarewa and scattered pukatea. Kohekohe dominates the sub-canopy with mahoe and ngaio on the upper slopes. Kanuka forest with emergent rewarewa and scattered broadleaved trees occurs on the spurs between the tawa gullies, and along the RAP's northern edge. To the south the forest merges into younger secondary scrub dominated by kanuka, with manuka, tauhinu, kaikomako, putaputaweta and kohuhu. Patches of pasture occur on the ridges.

On the western side of the road there is an extensive area of primary forest on both northerly and southerly aspects, mixed with some advanced secondary forest on the upper slopes. The primary forest is tawa-dominated with scattered rewarewa, matai, young kahikatea and pukatea on the lower slopes and in the stream gullies. Kohekohe and mahoe are again most abundant in the sub-canopy. On the upper slopes the forest is younger, with a low canopy of kohekohe, young tawa (absent in places), titoki, puka and scattered rewarewa. On the margins the forest grades to treeland, or young tauhinu-manuka scrub.

Logging and past clearance for pasture have created the mosaic of primary and various aged secondary vegetation. Long-term grazing and browsing by stock and feral goats have left the understorey of both areas open, with few seedlings and saplings. Kereru and common bush and field birds were recorded.

Significance and justification

This RAP is the third largest tract of remaining forest on Mahia Peninsula and the largest area on the peninsula's steep southeastern coast. It is also the largest continuous tract of indigenous vegetation within the coastal bioclimatic zone. It contains a high diversity of vegetation types extending over a wide range of terrain and altitude, from the coastal to semi-coastal bioclimatic zones.

RAP MAH 24 ONENUI DUNELAND

Refer to Map 45 (p. 340)

Study site No. 930

Priority: 1

Grid Reference: NZMS 260 Y20 330077

Area: 29 ha

Altitudinal range: 0-5 m

Bioclimatic zone: coastal

Vegetation class: duneland

Description

This RAP includes a narrow stretch of dunes and raised beaches or rock benches uplifted by earthquakes over the last few thousand years, on the southeastern

coast of Mahia Peninsula. It also includes small seepage areas amongst the dunes and above the intertidal shore platform that skirts the coast, where the streams (e.g. Karaka, Waimahaki and Kahotea Streams) from the hill-slopes flow out to the sea.

Spinifex dominates the foredune, with scattered sand tussock and several small pingao populations on the blow outs and less stable foredune areas. Sand sedge sandfield and harestail grassland dominate the weedier and more consolidated and stable back dunes. Other species present include knobby clubrush, pohuehue (*Muehlenbeckia complexa*), tauhinu, boxthorn, perennial ryegrass, Indian doab and catsear. The damp seepage areas amongst the dunes have sea primrose, knobby clubrush, shore lobelia, giant umbrella sedge, native celery, sand buttercup, and *Epilobium* sp. The vegetation on steep coastal slopes above the dunes is sparse and dominated by pasture grasses with scattered tauhinu and whaririki on the rocky outcrops (not included within the RAP).

The dunes have wildlife habitat values, with banded dotterel and variable oystercatcher noted during this survey.

Significance and justification

This RAP is significant as the most natural area of the narrow raised bench area that skirts much of the eastern coast of Mahia Peninsula. It contains a large population of the 'declining' (de Lange *et al.* 1999) sand tussock (*Austrofestuca littoralis*). This is only the fourth record of this species on the East Coast and one of only c. 10 occurrences in dunelands throughout the North Island. It is also present in RAP MAH 25. The dunelands also support three small clumps of the 'local' native sandbinder pingao, that occurs in only one other site within the district (RAP MAH 2). Of importance is the fact that the RAP has not been invaded by the exotic sandbinder marram, a highly competitive species that usually suppresses pingao, spinifex and sand tussock.

RAP MAH 25 PORTLAND ISLAND

Refer to Map 45 (p. 340)

Study site No. 846

Priority: 1

Grid Reference: NZMS 260 X20 299022

Area: 22 ha

Altitudinal range: 0-90 m

Bioclimatic zone: coastal

Vegetation class: cliff vegetation
duneland
exotic grassland

Description

Portland Island, the only island within the Mahia Ecological District, lies off the southern tip of Mahia Peninsula. Most of the island is a slightly tilted steep-sided

tableland, a fragment of uplifted marine terrace. Most of the RAP consists of the low sandspit at the northern end of the island extending towards the mainland, together with a smaller area of steep coastal slopes and cliffs below the northwestern corner of the high marine terrace. Most of the sandspit area has adventive pasture species, but the edges and tip feature spinifex, a few pingao plants and sand tussock. The steep faces have scattered whahariki, toetoe and ngaio.

Significance and justification

Despite the severe modification that has occurred on the island, it is still highly significant with high wildlife values particularly on the northern spit area identified as an RAP. A wide variety of bird species breed here including NZ dotterel, black-winged petrel, banded dotterel, Caspian tern, white-fronted tern, white-faced storm petrel, pied stilt and variable oystercatcher. In addition, with the absence of mammalian predators (except mice), this island has excellent potential for ecosystem restoration, or as a site for the release of endangered species, which has recently been demonstrated by the successful introduction of shore plover. Among the small area of indigenous vegetation, the occurrence of sand tussock is particularly significant because this is one of only four sites where it occurs on the east coast of the North Island.

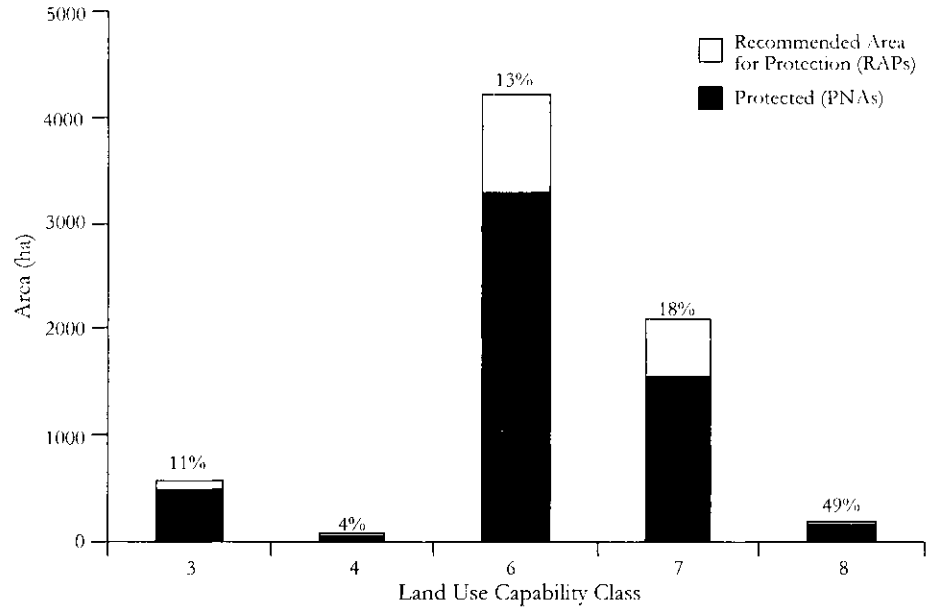
6.4 MATAWAI ECOLOGICAL DISTRICT RAPS

A total of 87 study sites were assessed within the southern half of the Matawai Ecological District during this study, of which 73 have no formal protection. Of those unprotected study sites all or part of 25, covering a total of 1568 ha or 3.1% of the southern half of the ecological district, are now identified within 22 Recommended Areas for Protection (RAPs) and are described below. Indicative information on the areas and proportionate representation of the various vegetation/landform classes in the selected RAPs is provided in Appendix 11, Table 4.

The RAPs have a good geographical spread across the southern half of the district (Fig. 10) and go a long way towards recognising the imbalance of the current PNAs' focus towards higher altitude steepland vegetation. Most of the remaining primary forest on the highly modified rolling hill country in the southeastern part of the district is recommended, along with the most diverse and intact of the lowland freshwater wetlands (Fig. 14).

The character of the RAPs ranges from areas of predominantly primary forest, e.g. Pembroke RAP MAT 33, to areas of secondary broadleaved scrub and manuka scrub, e.g. Oliver Road (2) RAP MAT 26, and freshwater wetlands on alluvial terraces (RAPs MAT 15 and 17). Of the RAPs, eight are Priority 1, nine are Priority 2 and five are Priority 3.

FIGURE 14 : DISTRIBUTION OF RECOMMENDED AREAS FOR PROTECTION (RAPs), AND CURRENT PROTECTED NATURAL AREAS (PNAs) IN RELATION TO LAND USE CAPABILITY CLASSES IN THE SOUTHERN HALF OF THE MATAWAI ECOLOGICAL DISTRICT.



Figures above each bar indicate the percentage of each LUC Class supporting PNAs and RAPs.

Fourteen RAPs previously identified within the Waiapu PNAP survey report (Leathwick *et al.* 1995) lie within the northeastern half of the newly defined Matawai Ecological District. They are re-numbered MAT 1-14 and their descriptions are reproduced in Appendix 2.

RAP MAT 15 MOTU WETLAND

Refer to Map 46 (p. 351)

Study site No. 6

Priority: 1

Grid Reference: NZMS 260 X16 070165

Area: 24 ha

Altitudinal range: 480 m

Bioclimatic zone: lowland

Vegetation/landform classes:

conifer forest
manuka scrub
freshwater wetland

Description

This RAP is located c. 1 km southwest of Motu in a broad hollow in the alluvial terraces of the Motu River. The area consists of a large central zone of manuka/sphagnum scrub-swamp and low vegetation where the water table lies closest to the surface and four areas of primary/advanced secondary kahikatea forest around the margin: two at the northern end, one along the eastern side and the largest at the southern end of the RAP. The forest is predominantly kahikatea, with occasional Hall's totara, lancewood and putaputaweta in the canopy/sub-canopy, and divaricating and small-leaved shrubs dominating the understorey (including *Coprosma rotundifolia*, kaikomako and poataniwha). The understoreys also have occasional patches of sphagnum. They have obvious sign of domestic stock impact with tracks, trampling and grazing. Willow and blackberry are the most conspicuous weed species.

Significance and justification

This is the largest wetland remaining on the wide alluvial terraces flanking the Motu River. Despite major modification, including logging, the establishment of drainage ditches (along the eastern and western sides and at intervals in the interior - seemingly being actively drained at the time of survey), cattle and sheep browsing and trampling and willow encroachment along some of the margins, the wetland retains a high diversity of wetland species, including *Blechnum minus*, *Carex virgata*, *Drosera binata*, *Gleichenia dicarpa*, *Juncus planifolius* and *Sphagnum cristatum*. Exclusion of domestic stock, control/removal of willow and cessation of drainage would enhance the botanical and ecological values of this RAP.

RAP MAT 16 WHAKAPAUPAKIHI

Refer to Map 46

Study site No.	934
Priority:	2
Grid reference:	NZMS 260 X16 043137
Area:	96 ha
Altitudinal range:	500-760 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/tawa forest conifer/broadleaved forest conifer forest

Description

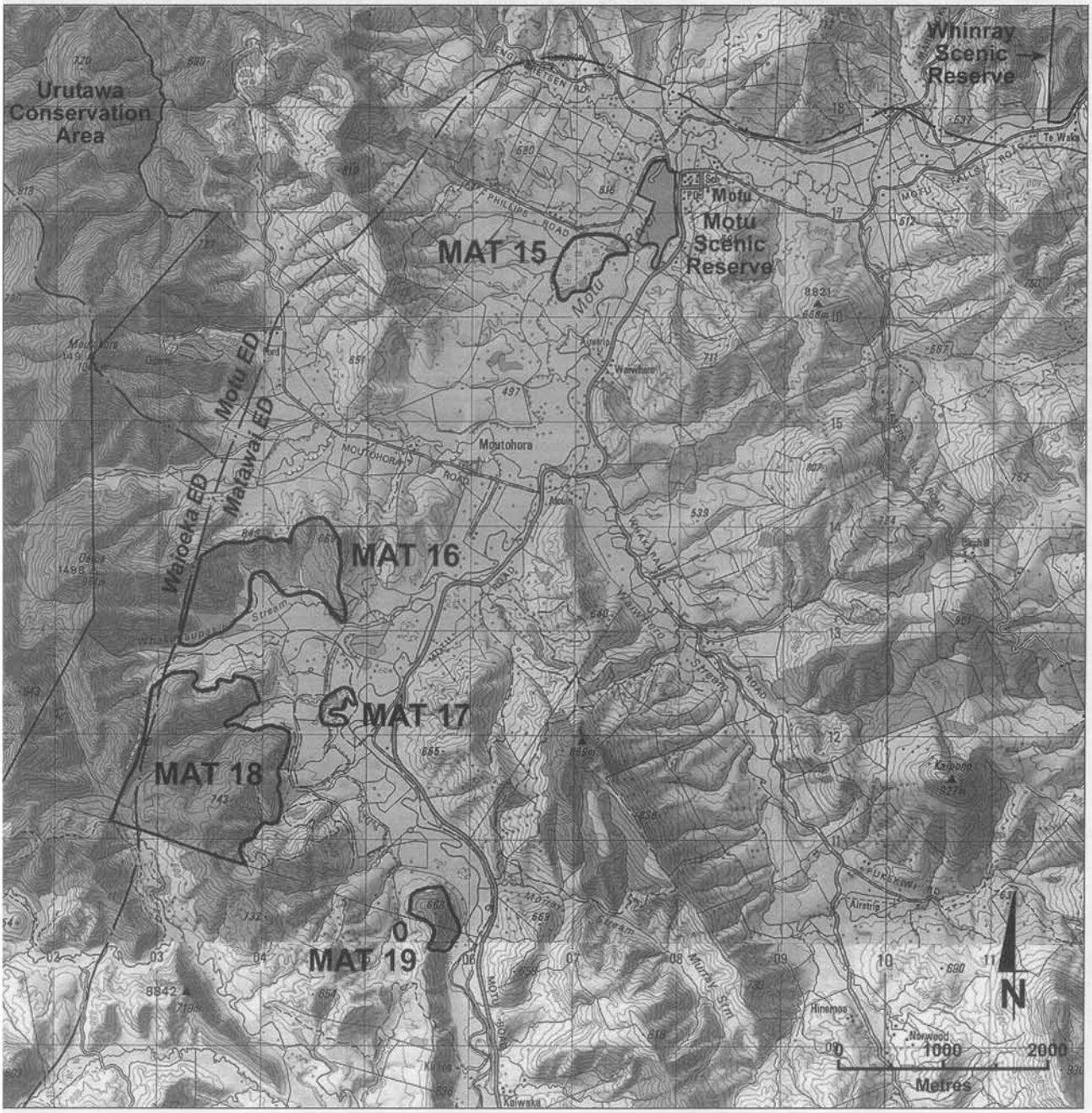
This RAP extends from alluvial terrace to ridge crest in the Whakapaupakihi Stream valley, c. 5 km southwest of the Motu settlement. The upper slopes are steep to moderate, becoming gentle on the foot-slopes which merge into the terrace. The RAP has a predominantly southerly aspect. The ridge crest and eastern margin are fenced with the vegetation along the terrace merging into pasture. The RAP is arbitrarily truncated by the ecological district boundary in the west, where there is a band of primary forest 800-1000 m wide linking the RAP with the extensive Urutawa Conservation Area.

Primary rimu/tawa forest dominates the hill crests and upper slopes. Hinau, rewarewa, kamahi, tawari, tanekaha and occasional silver and red beech are also present. The mid-slopes support logged rimu/broadleaved low forest, with a canopy of houhere, treeferns, silver fern, mahoe wao, broadleaf, putaputaweta, lancewood and abundant young podocarps (rimu and kahikatea towards the lower slopes). There are also occasional silver beech amongst the canopy and along the stream gully margins.

The lower slopes and fringes of the eastern half of the RAP have secondary dense young kahikatea (more abundant on terrace and slope fringes) and rimu (on the lower slopes) regeneration, with scattered young Hall's totara, matai, kaikomako and lancewood forming a low forest shrubland. *Coprosma* sp. (t) is the dominant understorey shrub forming a low canopy in breaks between the dense young podocarps. There are also grassy patches and areas of bracken fern particularly on the terrace. The terraces further up the valley also support similar young kahikatea forest, but with a few patches of taller primary forest amongst it.

Past logging has removed many of the large podocarps from the primary forest on the upper slopes. Domestic stock have access to the RAP along its southern boundary, with grazing and trampling most notable along the terrace fringe. Kereru and tui are abundant.

Map 46: RAPs MAT 15-19 (NZMS 260 X16 & X17)



Significance and justification

This RAP is significant as it contains forest vegetation on a complete landform sequence characteristic of the ecological district, extending from broad alluvial terraces to ridge crest. Although very modified from the primary forest cover, the advanced secondary/secondary vegetation on the mid to lower slopes is notable for the abundant podocarp regeneration including kahikatea, rimu, Hall's totara and matai. The area linking the RAP to Urutawa Conservation Area would be appropriately identified as an RAP in the Waioeka Ecological District context.

RAP MAT 17 ALCUIN WETLAND

Refer to Map 46 (p. 351)

Study site No. 2

Priority: 2

Grid reference: NZMS 260 X16 048122

Area: 6.5 ha

Altitudinal range: 490-500 m

Bioclimatic zone: lowland

Vegetation/landform classes:

conifer forest
broadleaved shrubland-low forest
freshwater oxbow wetland

Description

This RAP lies on alluvial terraces in the Motu River valley, 6 km south of Motu settlement. It consists of a complex of several wetlands and small ponds in a set of old river meander oxbow loops, with a ring of low terrace risers behind them to the west.

There are two small areas of advanced secondary kahikatea-dominant forest on the outer edges of the river channel. One black maire is present amongst the canopy of the southern remnant, with *Coprosma rotundifolia* the most abundant sub-canopy species along with houhere, broadleaf, kaikomako and tree fuchsia. The northern remnant has a lower more broken canopy also with abundant *Coprosma rotundifolia* and kohuhu, young kahikatea, miro, matai, wineberry, cabbage tree and houhere. The understoreys of both have suffered long term grazing and pugging and are very open with only scattered divaricating shrubs (including *Coprosma rubra*, swamp coprosma, *Pseudopanax anomalus*, young *Coprosma rotundifolia*, and kaikomako), ferns (kiwakiwa, little hard fern and swamp kiokio) and pasture weeds.

The terrace risers to the west support a band of advanced secondary low forest with kohuhu, tree fuchsia, wineberry, five finger, houhere, broadleaf, karamu, wheki, lancewood and scattered young kahikatea and totara. Ferns and shrubs in the understorey include kiokio, kiwakiwa, mingimingi and snowberry.

The forests are partially surrounded by the lakes/wetlands, whose margins are dominated by raupo reedland with *Carex virgata*, purei, soft rush, common water milfoil, duckweed and cabbage tree (on the edges). The drier areas have purei-toetoe sedgeland. The vegetation on the bluffs/slopes behind the wetlands is predominantly a broadleaved mosaic of houhere, tree fuchsia, young totara, kohuhu, five finger, snowberry, broadleaf and swards of hanging kiokio.

The two wetlands were once connected but a recently constructed access track now separates them. Much of the wetland's margins have been heavily trampled and grazed, but are natural in places where the water depth has prevented animal access. Clumps of crack willow are present in the northern of the two lakes.

Significance and justification

This RAP contains a significant landscape feature with predominantly indigenous vegetation; old river meander loops with kahikatea-dominated forest and freshwater lakes/wetlands. It is one of the few largely intact wetlands along the extensive alluvial terraces of the upper Motu River. The terraces would once have supported a continuous complex of podocarp-dominated forest and freshwater wetlands/lakes, most of which has now been cleared and drained.

RAP MAT 18 ALCUIN FOREST

Refer to Map 46 (p. 351)

Study site No.	1
Priority:	1
Grid reference:	NZMS 260 X16 035115
Area:	204 ha
Altitudinal range:	540-743 m
Bioclimatic zone:	lowland
Vegetation classes:	conifer/beech forest tawa forest broadleaved forest

Description

This RAP extends from alluvial terrace to broad ridge crest, covering moderate to steep slopes over a full range of aspects in the Motu River valley, 5 km north of Matawai. It includes the headwaters of three true left tributaries of the Motu River. The southern boundary of the RAP is fenced, while the western boundary is arbitrarily placed, essentially on the ecological district boundary, beyond which is a band c. 1 km wide of mainly primary forest linking the RAP with the extensive Urutawa Conservation Area. Other RAP margins merge into secondary vegetation and pasture.

The vegetation within the RAP ranges from young secondary shrubland to primary forest. The bulk of the primary vegetation on the upper to lower slopes is rimu-northern rata/tawa forest with occasional miro, rewarewa, hinau, tawari and kamahi. Pate, heketara and tree fuchsia are all common in the sub-canopy. On the upper slopes and ridges to the west the primary vegetation is rimu-beech forest, with occasional emergent rimu, miro and Hall's totara, over red and silver beech, tawari and kamahi. Pure tawari forest occurs on some ridges and spurs throughout. In areas of past logging/burning/clearance, particularly in the north and east, the primary forest merges into secondary broadleaved low forest with treeferns and young podocarps amongst it. The lower stream side terraces support stands of kahikatea forest, most of which appear to be advanced secondary with occasional primary trees.

Stock have access to the RAP with grazing most noticeable in places along the margins, lower slopes and spurs. Pigs are also present within the RAP.

Significance and justification

This RAP is significant as it covers a full range of aspects and landforms from terrace to ridge, with a corresponding diversity in vegetation type, characteristic of the Motu valley portion of the Matawai Ecological District. The forest area immediately to the west, which links the RAP to the extensive tract of forest further west that includes the Urutawa Conservation Area (21 674 ha) and Waioeka Gorge Scenic Reserve (18 928 ha), would appropriately be regarded as an RAP in the Waioeka Ecological District context.

RAP MAT 19 MOTU VALLEY

Refer to Map 46 (p. 351)

Study site No.	22, 23
Priority:	2
Grid Reference:	NZMS 260 X16 053101/057102
Area:	21 ha
Altitudinal range:	500-668 m
Bioclimatic zone:	lowland
Vegetation class:	conifer forest conifer/broadleaved forest tawa forest

Description

This RAP includes two forest remnants: one on gentle west-facing slopes and a narrow swampy stream terrace in the bottom of a sheltered valley, and one on the moderate hill-slopes and rounded spur above it to the east, c. 4 km north of Matawai. The stream that flows through the valley is a small true left tributary of the Motu River.

The terrace forest is dominated by kahikatea, with four large original trees emergent over a stand of younger pole trees. Young rimu and totara are also present. The forest floor is swampy with many of the trees on hummocks, with pools of standing water and patches of sphagnum moss in between. Despite cattle pugging and browsing, the understorey vegetation is still largely dominated by native species: mingimingi, kiokio, kohuhu, poataniwha, *Pseudopanax anomalus* and *Sphagnum cristatum*.

The remnant above has rimu-tawa/tawari-(mahoe-treefern) forest on the northern, western and upper eastern slopes. The understorey is diverse and dense in places. There are large numbers of young rimu, miro and tawa. Along the dry spur tawari forest with young rimu and Hall's totara predominates. The northern end of the ridge has a large area where the canopy is almost solely tawari, but with several groves of young rimu and Hall's totara. Tall *Dracophyllum traversii* occurs beneath the dense tawari canopy. The mid-slopes of the eastern side of the RAP, visible from Motu Rd, are most modified. There, the tawa forest fades to a low broadleaved shrub-treefern mosaic, with scattered kahikatea towards the bottom of the slope and pasture at the margins.

Kereru and common bush birds including grey warbler and tui were recorded. Despite past logging having removed most of the large rimu and kahikatea, several still remain. Stock tracks are evident throughout both remnants. However, stock impact is most noticeable in the understorey of the lower hill-slope forest and particularly the smaller remnant. Without fencing the viability of this forest is at risk.

Significance and justification

Although small, this RAP is significant as it forms part of a sequence of forest from valley bottom to ridge top and contains one of only a few remnants of kahikatea-dominant forest in the Motu River valley. Part of the RAP is prominent from Motu Rd.

RAP MAT 20 MOTU BRIDGE FOREST

Refer to Map 47 (p. 356)

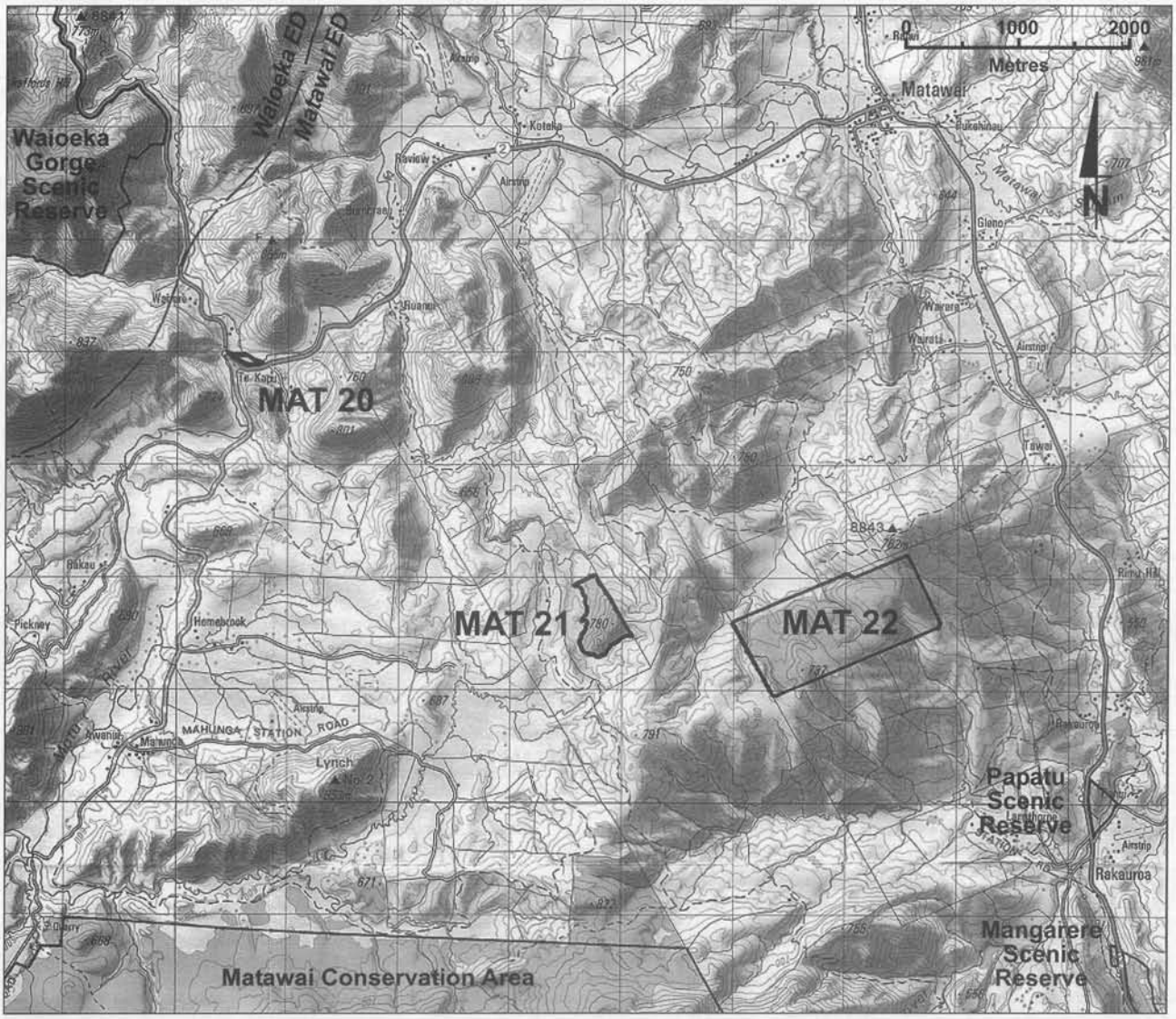
Study site No.	915
Priority:	2
Grid reference:	NZMS 260 X17 005039
Area:	2.0 ha
Altitudinal range:	540-560 m
Bioclimatic zone:	lowland
Vegetation class:	conifer-beech forest

Description

This small RAP lies on narrow alluvial terraces and slopes between the Motu River and SH2 c. 6 km west of Matawai. The vegetation is primary kahikatea-silver beech forest, with emergent matai and rimu. Some of the podocarps, particularly rimu and kahikatea, are very large trees (>2 m dbh). Low numbers of tawa and white maire are also present in the canopy, with pohuehue blanketing some canopy trees, particularly along the road margin. The sub-canopy is a mosaic of houhere, kohuhu, lancewood, young kahikatea, tawari, kamahi, mapou, wheki-ponga, tree fuchsia, mahoe wao, putaputaweta and kaikomako. The understorey supports an array of small-leaved and divaricating shrubs that include *Coprosma rotundifolia*, mingimingi, poataniwha, pokaka, *Pseudopanax anomalus* and red-fruited karamu. Crown fern, hook sedge, forest oat grass, *Astelia fragrans*, and kahikatea and silver beech seedlings are present in the ground layer. Tall kanuka are present along the western and eastern margins.

The forest is in excellent condition with no evidence of recent stock browsing. Weeds are the main threat to the integrity of the RAP with poplar (on the southwestern margin), crack and grey willow (to the west and east beside the river), cotoneaster and Japanese honeysuckle (in the early stages of invasion - mainly along the roadside and amongst the broadleaved trees along that margin) present. Common forest birds including grey warbler and fantail were recorded.

Map 47: RAPs MAT 20-22 (NZMS 260 X17)



Significance and justification

This RAP has a significance out of proportion with its small size as it contains an excellent example of primary kahikatea-silver beech forest on riparian slopes and terraces, with a largely intact understorey of high diversity. Apart from that within the Matawai Conservation Area (PNA 8), no other intact remnant of this forest type occurs along the Motu River within this ecological district.

RAP MAT 21 RUANUI

Refer to Map 47

Study site No. 920

Priority: 3

Grid Reference: NZMS 260 X17 038016

Area: 23 ha

Altitudinal range: 620-780 m

Bioclimatic zone: lowland

Vegetation class: conifer-beech forest
conifer/tawa forest

This RAP lies in the headwaters of a true right tributary of the Motu River, c. 6 km southwest of Matawai township. It extends from alluvial stream terrace/valley floor to ridge top, with moderate slopes ranging in aspect from northwesterly to southeasterly. The RAP is fenced to the north and east, with riparian slopes on both side of the tributary included along the western to southwestern boundary.

The vegetation within the RAP is a mix of modified primary forest and advanced secondary forest. The pockets of primary forest, on the lower slopes and in the stream gullies, are dominated by tawa with occasional emergent rimu, with silver beech and kahikatea a feature of the forest on the alluvial terraces. There are scattered grassy patches where the forest canopy is broken.

Significance and justification

This RAP is significant as it contains vegetation on a range of landforms, including alluvial terraces that support primary silver beech and associated forest that is characteristic of the ecological district.

RAP MAT 22 RAKAUROA STATION

Refer to Map 47

Study site No. 18

Priority: 1

Grid Reference: NZMS 260 X17 060015

Area: 119 ha

Altitudinal range: 580-737 m

Bioclimatic zone: lowland

Vegetation class: tawa forest
manuka scrub

Description

This sizeable compact RAP lies on rolling hill-slopes on the crest of the main divide between the Waikohu and Motu River catchments, c. 4 km south of Matawai township. Deeply incised headwater streams expose layered mudstone/sandstone beds. Selective logging over 80 years ago and crown fires removed most of the large podocarps, with some of the larger tawa trees succumbing to Cyclone Bola in 1988.

Tawa dominates the forest of this RAP, although it has abundant tawari and kamahi amongst it. Large rimu, northern rata and rewarewa are scattered throughout the canopy. Other species present include heketara, kanono, mahoe, pate, silver fern and lowland horopito. Along stream courses and where the original tall forest has been cleared (particularly in the centre of the RAP), there is a low mosaic of young tawa and broadleaved species. The vegetation grades

into low scrub and shrubland on the margins with manuka, mingimingi and bracken.

The area is fenced, however stock are permitted access and cause moderate to severe damage to the understorey. Possum browsing was evident on tree fuchsia and kamahi. Despite these modifying factors species diversity remains relatively high and there is potential for the undergrowth to re-establish if stock are excluded.

Significance and justification

This is the largest and most compact remnant of a forest type that was once widespread on the rolling hill-slopes of the southeastern part of the district; rimu/tawa forest (cf. forest type D14 of Nicholls 1976). Also of note are the presence of several large healthy northern rata. Kereru and common forest birds including tui are present.

RAP MAT 23 LOWER KUKUPARA STREAM

Refer to Map 48

Study site No. 27

Priority: 2

Grid Reference: NZMS 260 X17 135015

Area: 53 ha

Altitudinal range: 180-320 m

Bioclimatic zone: lowland

Vegetation classes: conifer/broadleaved forest
broadleaved/small-leaved scrub

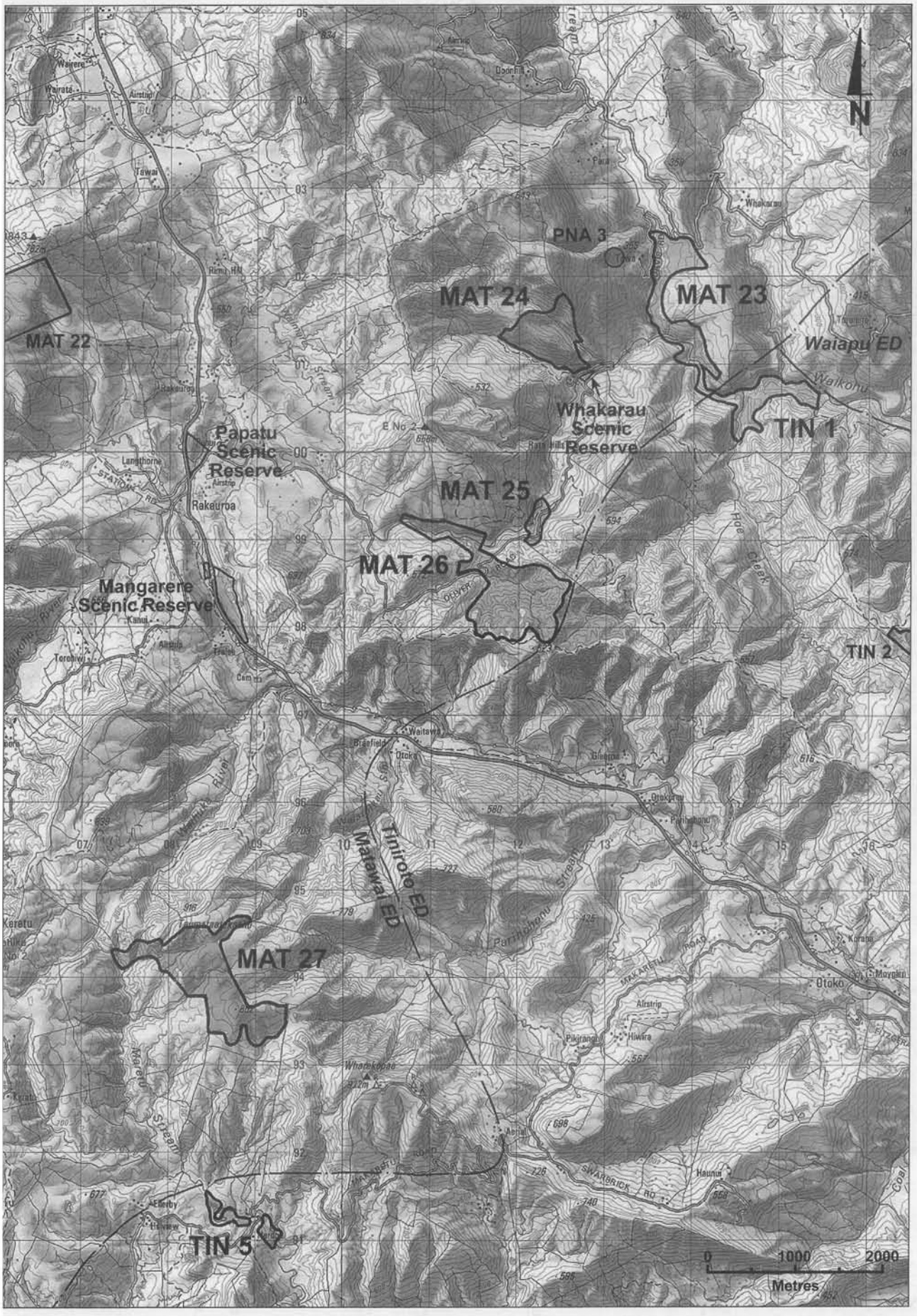
Description

This RAP lies on moderate slopes in the lower reaches of the Kukupara Stream, and Waikohu River as far downstream as the point where it is arbitrarily truncated by the boundary to the Tiniroto Ecological District. Containing at least three distinct plant communities, it is a good example of the secondary vegetation types of the Matawai Ecological District. The largest area comprises kanuka/manuka scrub with associated species typical of regenerating forest such as five finger, kamahi, lancewood, kohuhu and lemonwood. Young kahikatea, totara and tanekaha are scattered throughout. Occasional wilding pines were noted. On the west-facing slope, there is an area of rewarewa/kamahi forest with marginal invasion of silver poplar and a eutrophic wetland dominated by raupo on the valley floor.

Significance and justification

This RAP contains secondary vegetation representative of that on stream and river slopes in the southeastern part of the district and also forms part of a semi-continuous chain of indigenous vegetation along the Waikohu River, along with RAPs TIN 1 and 2.

Map 48: RAPs MAT 23-27 and TIN 1 & 5 (NZMS 260 X17)



RAP MAT 24 RATA HILLS

Refer to Map 48 (p. 359)

Study site No. 40

Priority: 1

Grid Reference: NZMS 260 X17 124012

Area: 48 ha

Altitudinal range: 240-390 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
broadleaved scrub-shrubland

Description

This RAP lies on moderate southwest to northeast-facing hill-slopes along a tributary of the Waikohu River and the river itself. The southern face supports primary pukatea-(rewarewa)/tawa/mahoe forest in which totara, kahikatea and hinau are also present. Large podocarps are now absent from the remnant, probably removed by either logging or crown fires. The slopes to the north, on either side of the stream, have low secondary broadleaved scrub-forest with mahoe, mapou, kohuhu, putaputaweta, pukatea and mamaku. Although subject to grazing at its margins with significant incursions into the interior in places, particularly along the central ridge, the canopy of the vegetation in the gullies and mid-slopes is largely intact.

Significance and justification

This RAP is significant as the largest tract of forest remaining on the low altitude southeastern edge of the district and the only sizeable area of primary pukatea-(rewarewa)/tawa/mahoe forest (cf. forest type D13 of Nicholls 1976). The RAP also complements the values of the Whakarau Scenic Reserve (PNA 4), with which it is contiguous on the other side of the Waikohu River.

RAP MAT 25 OLIVER ROAD (1)

Refer to Map 48 (p. 359)

Study site No. 41

Priority: 3

Grid Reference: NZMS 260 X17 122993

Area: 8.4 ha

Altitudinal range: 330-390 m

Bioclimatic zone: lowland

Vegetation class: tawa forest
broadleaved forest

Description

This riparian RAP lies on both banks of a section of the upper Waikohu River and on either side of Oliver Rd. It contains a remnant of primary tawa-dominant forest, with some matai and a range of other primary tree (pukatea, hinau, titoki) species. The remainder of the vegetation within the RAP is secondary broad-leaved forest, with emergent rewarewa, mahoe, putaputaweta, mamaku, houhere, ngaio, lemonwood, mapou, cabbage tree, lancewood and kanuka, and minor manuka (at the southern end).

Significance and justification

The area has been degraded by grazing, erosion and stock and farm tracks, but contributes to the semi-continuous corridor of native vegetation along the Waikohu River, and is an attractive scenic feature in a highly modified part of the district. Whio were present until 1988 on this stretch of the river.

RAP MAT 26 OLIVER ROAD (2)

Refer to Map 48 (p. 359)

Study site No. 43

Priority: 2

Grid Reference: NZMS 260 X17 118985

Area: 103 ha

Altitudinal range: 280-600 m

Bioclimatic zone: lowland

Vegetation classes: tawa forest
broadleaved scrub-shrubland
manuka scrub

Description

This RAP covers north and south-facing slopes on both sides of the Waikohu River and most of a small branched tributary of the river (from toe-slope to ridge crest). Oliver Rd passes through the centre of the RAP. The larger part of the RAP, above the road, is a tract of manuka scrub in the tributary valley, with other associated species typical of regenerating forest such as rewarewa, lancewood, heketara and kohuhu emerging. A smaller area of secondary scrub-forest dominated by five finger and kohuhu occur on south-facing slopes. Other species present here include rewarewa, houhere, lemonwood, lancewood, mahoe, cabbage tree and putaputaweta. The RAP also contains several small remnants of primary forest along the river bank: tawa-dominant forest on the true left river bank with scattered matai and kahikatea, and small areas of podocarp-dominated forest upstream.

A few wilding pines are present amongst the younger vegetation. Domestic stock graze much of the RAP, which is largely unfenced.

Significance and justification

The RAP is significant as part of a semi-continuous chain of wildlife habitat along the Waikohu River, along with RAPs MAT 23, 24, 25 and TIN 1 and 2. Prior to Cyclone Bola (1988), the upper reaches of the Waikohu River in the vicinity of Oliver Rd were a noted habitat of whio and the scrub and riparian forest remain good weka habitat. The primary forest within the RAP (near the river) and that which occurs in RAP MAT 24 (250 m downstream) will provide seed sources for regeneration of canopy species in the extensive areas of secondary vegetation. Manuka-dominated early successions are characteristic of Matawai Ecological District (in contrast to kanuka in the adjoining parts of the Tiniroto and Waiapu Ecological Districts) and this is the largest area of manuka scrub in the district.

RAP MAT 27 MANUEL'S BUSH

Refer to Map 48 (p. 359)

Study site No. 57

Priority: 2

Grid Reference: NZMS 260 X17 085940

Area: 106 ha

Altitudinal range: 700-900 m

Bioclimatic zone: lowland to montane

Vegetation classes: conifer/tawa forest
conifer/broadleaved forest

Description

Known locally as Manuel's Bush, this large conspicuous strip of partially logged tall forest occupies the broad, rolling ridge crest south of Taumataatekaahu. Four small tributaries of Maretu Stream flow from it. The central portion of the RAP comprises logged and degraded primary rimu-miro/tawa-tawari forest with a wide range of other species including matai, Hall's totara, black maire, red beech and tree fuchsia present. The upper slopes reach the altitudinal limit of tawa. The northern and southern ends contain a logging and exposure-degraded variant ((rimu)-(miro)/houhere-kaikomako-heketara/mountain horopito forest) of it, locally degraded further to kaikomako-heketara/mountain horopito scrub-forest.

Standing dead red beech spars and fallen logs in the paddocks surrounding the RAP are evidence of past logging and burning in the area.

Significance and justification

Although partially logged and degraded, this RAP is significant as one of the larger tracts of podocarp/broadleaved forest (forest types D & M of Nicholls 1976) remaining in the southern part of the district, and for covering the transition from lowland to montane zones with a variety of primary and secondary forests. Although stock are present, the canopy of the central core of the RAP remains intact. The RAP is also likely to be an important habitat for forest birds.

RAP MAT 28 TE RAWHITI

Refer to Map 49 (p. 365)

Study site No. 11

Priority: 1

Grid Reference: NZMS 260 X17 968964

Area: 32 ha

Altitudinal range: 560-750 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
conifer-beech/tawa forest
conifer/tawa forest

Description

This RAP lies on a moderate to steep southeast facing hill-slope c. 14 km southwest of Matawai, along Te Wera Rd. A small tributary of the Koranga Stream runs through the foot-slopes of the RAP. It contains three forest types which cover a range of altitudes and landforms, from stream side to ridge top. Red beech-silver beech forest dominates the lower and upper thirds of the RAP (stream terrace, lower hill-slopes, upper steep slopes and spurs), with kamahi, tree fuchsia, *Coprosma tenuifolia*, pokaka, kamahi and wineberry associated with the lower third and kamahi, tawari and mountain horopito associated with the upper third. Tawa-dominant forest with beech amongst it occurs on the mid-slopes. Occasional emergent rimu are scattered throughout all units. Other species present include tawari, kamahi, tree fuchsia, kanono, young miro and kahikatea. The stream banks are relatively undisturbed with a diverse array of ferns, herbs and shrubs. Scattered large red beech and rimu stumps and logs provide evidence of past logging, however there is a largely intact tall canopy.

Significance and justification

Though small compared with nearby PNAs, this RAP is significant as one of the most intact and diverse examples of partially logged rimu/tawa-beech forest in this part of the district. The steep southeast aspect slope complements the large Matawai Conservation Area (PNA 8) opposite across Te Wera Rd. Almost complete fencing has limited stock access within it, permitting a dense understorey with good regeneration of most species. Forest birds present include kereru, tui, fantail, grey warbler and bellbird.

RAP MAT 29 RAKAUROA

Refer to Map 49 (p. 365)

Study site No. 895 & 15

Priority: 2

Grid Reference: NZMS 260 X17 006933

Area:	80 ha
Altitudinal range:	690-800 m
Bioclimatic zone:	lowland to montane
Vegetation classes:	beech forest conifer/tawa-beech forest conifer/tawa forest tawa forest broadleaved forest

Description

Approximately 8 km southwest of Rakauroa, this RAP covers gentle to moderate predominantly southwesterly facing hill-slopes, in the headwaters of the Wharekopae River. The northern end of the RAP is a small area of gentle north-facing slopes at the head of the Motu River catchment, abutting a straight line boundary to the Matawai Conservation Area (PNA 8). Rakauroa Scenic Reserve (PNA 9) adjoins the RAP to the east.

Tawa dominates the forest on the lower slopes, with tawari, kamahi, and occasional young rimu, miro and kahikatea. The forest on the mid-slopes is also tawa/tawari-dominant, but with scattered large emergent rimu and miro. The narrow steep-sided streams with layered mudstone beds are pristine in places, with ferns, mosses and broadleaved shrubs clothing their banks (e.g. *Blechnum colensoi*, gully fern, hen and chicken fern, pate, Prince of Wales' feathers, kanono, tree fuchsia and wineberry).

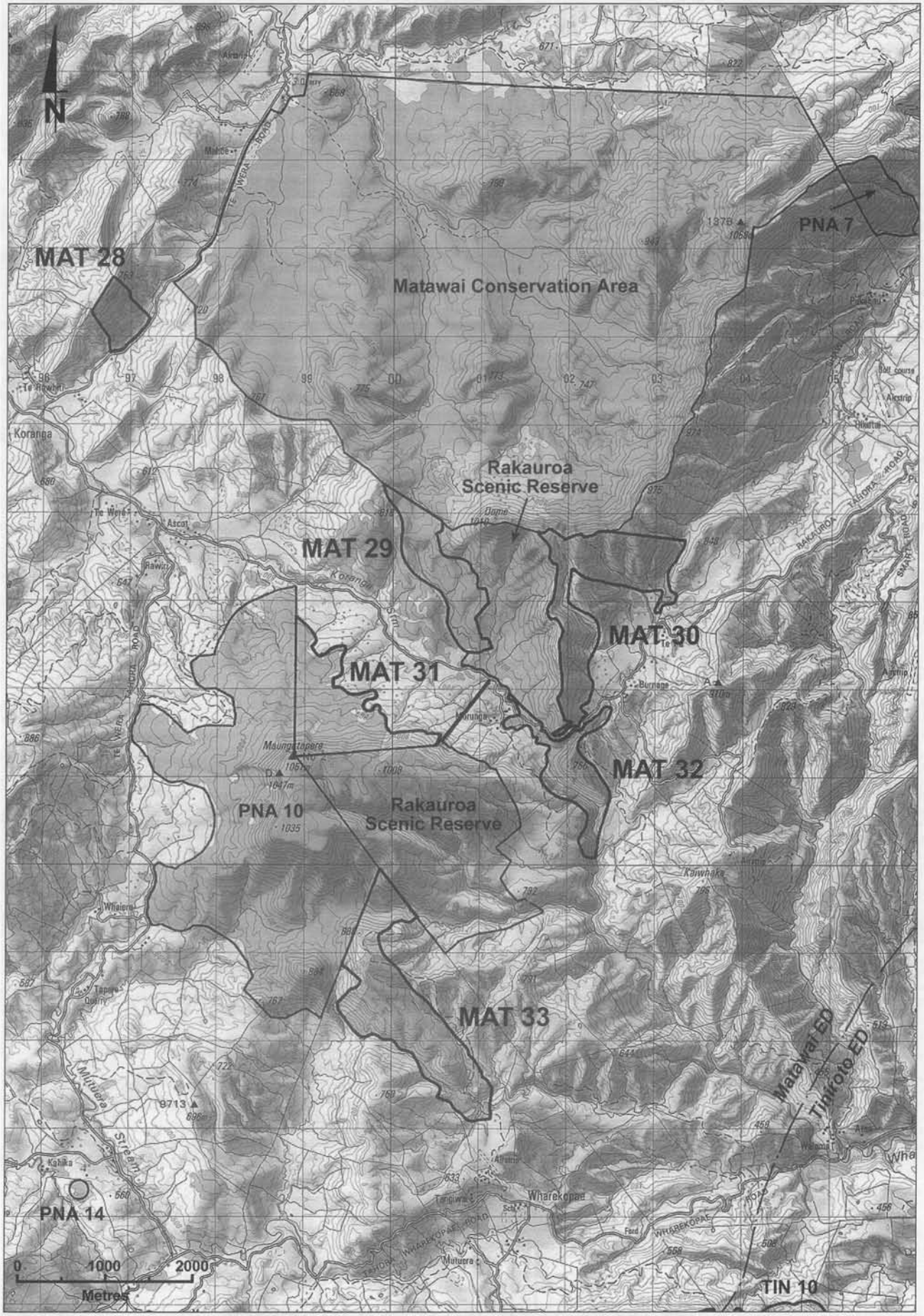
The upper slopes support primary logged rimu-(miro)/tawa-(beech) forest which fades to treeland in places. Tawari, kamahi, broadleaf, Hall's totara, mahoe wao and white maire are all present. Tawa becomes less abundant at the higher altitudes, with red and silver beech a significant component (on the steeper faces and ridges), and rimu becoming more stunted.

Selective logging has occurred, with old logging tracks and sawn stumps still evident on the lower slopes. Only scattered large podocarps remain. The area is also grazed by both sheep and cattle, with most notable damage on the lower slopes.

Significance and justification

This RAP contains a range of vegetation types, mainly primary forest, on a range of landforms. It is also important as it is continuous along its eastern and northern boundaries with two PNAs, the Rakauroa Scenic Reserve and Matawai Conservation Area, which have arbitrary cadastral boundaries cutting across the topography within the main forest tract. Bird life is diverse (e.g. tomtit, tui, rifleman, kereru and shining cuckoo) partly as a consequence of it being part of this larger forest tract.

Map 49: RAPs MAT 28-33 (NZMS 260 X17)



RAP MAT 30 BURNAGE

Refer to Map 49 (p. 365)

Study site No.	785
Priority:	3
Grid Reference:	NZMS 260 X17 024933
Area:	129 ha
Altitudinal range:	740-970 m
Bioclimatic zone:	lowland to montane
Vegetation classes:	beech forest tawa-beech forest broadleaved shrubland-forest

Description

This RAP lies on moderate to steep slopes with occasional slips in the upper catchment of the Wharekopae River. The slopes are dissected by a series of incised stream gullies. It is continuous with the Matawai Conservation Area to the north and Rakauroa Scenic Reserve to the west. Rakauroa-Tahora Rd runs along the bottom of the hill-slope. Farm and stock tracks are evident in parts of the RAP.

The upper slopes support logged primary red beech-silver beech forest, that would originally have been rimu/beech forest (cf. forest type I18 of Nicholls 1976). Broadleaved species, including mountain horopito, tawari, kamahi, lancewood, mahoe wao, mountain cabbage tree and wheki, dominate where the beech is patchy. There are also abundant young podocarps amongst the beech (rimu, miro, and Hall's totara). Amongst the forest on the upper slopes there are a number of exposed rocky bluffs and outcrops. These have sparse low scrub vegetation that includes snowberry, turutu, *Raoulia glabra*, *Gahnia* sp., *Leucopogon fraseri*, waewaekoukou, mingimingi, mountain horopito and broadleaf. The vegetation on the lower slopes is a mosaic of red beech-broadleaved low forest and treeland and broadleaved scrub. The broadleaved species are the same as those above but with occasional tawa and young kahikatea.

The RAP has been heavily logged and partly burnt in the past, with old logging tracks still evident throughout. Large stumps and red beech spars are obvious reminders of the original forest. The bird life in the area is rich, with NZ falcon, tui, bellbird, tui, kereru, shining cuckoo, fantail and grey warbler present.

Significance and justification

This RAP is significant for its variety of mainly advanced secondary vegetation and as it is continuous with the Rakauroa Scenic Reserve (PNA 9) and Matawai Conservation Area (PNA 8). It complements these areas with its east-southeast aspect on the 'outside' of the ridge system culminating at the Dome (1010 m). Together with these PNAs and PNA 10 and RAPs MAT 29, 31, 32, 33 they form a c. 4500 ha semi-continuous tract of indigenous vegetation, the largest tract within the southern half of the district.

RAP MAT 31 MAUNGATAPERE

Refer to Map 49 (p. 365)

Study site No.	921
Priority:	2
Grid Reference:	NZMS 260 X17 994916
Area:	103 ha
Altitudinal range:	670-1040 m
Bioclimatic zone:	lowland to montane
Vegetation classes:	beech forest conifer/general hardwoods-beech forest tawa forest broadleaved scrub-shrubland

Description

This RAP includes a small part of the edge of the summit and steep to moderate north-facing slopes of Maungatapere (1051 m), a dramatic plateau landform with an easterly dipping summit of c. 1 km across. Only the northern edge of the summit plateau falls within the RAP. The RAP is continuous with the Rakauroa Scenic Reserve along its southern boundary, with the rest of the mountain to the west recently protected under a Nga Whenua Rahui Kawenata (PNA 10).

The forest within the RAP covers an altitudinal range straddling the transition from lowland to montane bioclimatic zones. The lowland zone is dominated by tawa up to about 800 m, with silver beech dominating the montane zone above 900 m; between them is a transition zone. This pattern is complicated by details of terrain and disturbance factors (e.g. erosion and landslides, animal browsing, past logging and fire). The lower slopes of the RAP are the more highly modified.

The summit edge supports predominantly silver beech forest, with Hall's totara and a sub-canopy of tawari, broadleaf, neinei, haumakaroa, mountain horopito and tawheowheo. Stumps and standing spars of red beech indicate its former presence. Below the plateau edge the steep upper slopes support some areas of rimu/silver beech/tawari forest, in mosaic with successional broadleaved shrubland and low forest mostly colonising old landslide scars. The shrubland contains a mixture of broadleaf, pate, mountain horopito, hupiro, putaputaweta, kanono, raukawa, tree fuchsia, young silver beech and tawari. On the moderate mid-slopes (800-900 m) there are patches of forest, amongst similar shrubland, where rimu and miro are the dominant emergent trees, over a canopy of silver beech, tawari and locally kamahi. The steep to moderate slopes in the eastern part of the RAP have fire-induced secondary broadleaved scrub-forest.

The moderate to gentle lower slopes in the northwest, below 800 m, support logged primary tawa-dominated forest with patches of secondary broadleaved forest and only occasional pockets of the original rimu/tawa forest. The forest canopy/sub-canopy contains varying amounts of kamahi, tawari, hinau, rewarewa, northern rata and kahikatea (in moist hollows). On the lower slopes in the central part of the RAP the modified primary forest becomes patchy and merges into treeland among pasture.

Stock are impacting substantially on the forest understorey of the mid to lower slopes, preventing canopy regeneration in damaged areas and hastening the degradation of tawa forest into treeland.

Significance and justification

This RAP is significant as a part of Maungatapere, a distinctive feature very characteristic of the Matawai Ecological District. It includes a variety of primary and secondary vegetation types, relating to altitudinal range, geological and topographic diversity and human induced and natural disturbances. Together with RAPs MAT 29, 30, 32 and 33, Maungatapere Kawenata (PNA 10), Matawai Conservation Area (PNA 8) and Rakauroa Scenic Reserve (PNA 9), the RAP contributes to a c. 4500 ha semi-continuous tract of indigenous forest. This large tract is a significant wildlife habitat, supporting a range of bird species, e.g. tui, kereru, tomtit, whitehead, rifleman, silvereye, fantail, grey warbler, long-tailed cuckoo and shining cuckoo, and invertebrates and lizards (not assessed).

RAP MAT 32 GORGE BUSH

Refer to Map 49 (p. 365)

Study site No. 10

Priority: 1

Grid Reference: NZMS 260 X17 021910

Area: 70 ha

Altitudinal range: 580-756 m

Bioclimatic zone: lowland

Vegetation classes: conifer/tawa forest
broadleaved forest
broadleaved scrub-shrubland

Description

This RAP lies beside the Rakauroa-Tahora Rd, c. 10 km southwest of Rakauroa. It covers moderate to steep hill-slopes and a prominent gorge with sandstone bluffs/outcrops in the headwaters of the Wharekopae River. The forest which covers most of the RAP is partially logged primary rimu/tawa, retaining numerous large original rimu, miro, matai and Hall's totara. Where tawa is absent, tawari forms a pure low canopy along the ridges, with mixtures of broadleaved species and young podocarps (rimu, miro, matai and Hall's totara) on the moderate hill-slopes. The lower reaches of the gorge support a mosaic of broadleaved species, including mahoe, tree fuchsia, tawari, pate, putaputaweta, young tawa, pukatea and lemonwood.

Domestic stock graze and trample parts of the understorey, particularly along the margins. Kereru and common forest birds including tui, tomtit and fantail are present.

Significance and justification

This RAP is continuous with the northern half of the Rakauroa Scenic Reserve (PNA 9). Together they contribute to a large semi-continuous forested area of c. 4500 ha (including the Matawai Conservation Area, Maungatapere Kawenata and RAPs MAT 29, 30, 31 and 33). Of this tract only c. 400 ha is of a similar original forest type (rimu/tawa forest) as that within this RAP and this is the most intact and diverse example. Despite past and ongoing modification the species diversity (in the emergent tiers, canopy and understorey) remains high and the forest displays abundant young podocarp regeneration (rimu, miro, matai and Hall's totara). The area also has high scenic value, with the dramatic steep gorge visible from the Rakauroa-Tahora Rd.

RAP MAT 33 PEMBROKE

Refer to Map 49 (p. 365)

Study site No.	59
Priority:	1
Grid Reference:	NZMS 260 X17 000884
Area:	164 ha
Altitudinal range:	640-888 m
Bioclimatic zone:	lowland to montane
Vegetation classes:	conifer/tawa forest conifer/broadleaved forest

Description

This RAP covers steep scarps and gentle dip-slopes dissected by tributaries of the Wharekopae River, c. 1 km northwest of Wharekopae. The central ridge is a drainage divide, with tributaries of the Mutuera Stream flowing to the south to the Wairoa River system and tributaries of the Wharekopae River flowing to the northeast to the Waipaoa River system. The RAP is continuous with the Maungatapere Kawenata (PNA 10) along its northwestern boundary and Rakauroa Scenic Reserve (PNA 9) to the northeast.

The majority of the RAP is rimu/tawa forest, although selective logging has removed most of the larger rimu. Other species present include pigeonwood, kamahi, tawari, mapou, kanono, heketara and hinau. Young rimu are also abundant. The upper slopes merge into a low patchy forest shrubland dominated by Hall's totara and mountain horopito, with broadleaved shrubland-scrub with treeferns, young beech and podocarps on the north-facing slopes nearest the Scenic Reserve.

Grazing by domestic stock for several months of each year within the main forest area has ensured that many of the old logging tracks have remained open and grassy.

Significance and justification

This RAP is important as part of a 4500 ha semi-continuous tract of forest, that includes the Rakauroa Scenic Reserve, Matawai Conservation Area and Maungatapere Kawenata and RAPs MAT 29-32. It complements the adjoining areas by including a fragment of the gently sloping plateau surface and steep scarps down to lowland altitudes with diverse primary forest. It is significant as a wildlife habitat. The abundant bird life recorded e.g. kereru, grey warbler, riflemen, tui, threatened NZ falcon and shining cuckoo reflects its close proximity to other large and diverse forest tracts.

RAP MAT 34 RAMOE

Refer to Maps 50 and 3 (pp. 371 and 101)

Study site No.	39
Priority:	3
Grid Reference:	NZMS 260 X17 000830
Area:	15 ha
Altitudinal range:	540-610 m
Bioclimatic zone:	lowland
Vegetation class:	conifer/tawa forest tawa forest

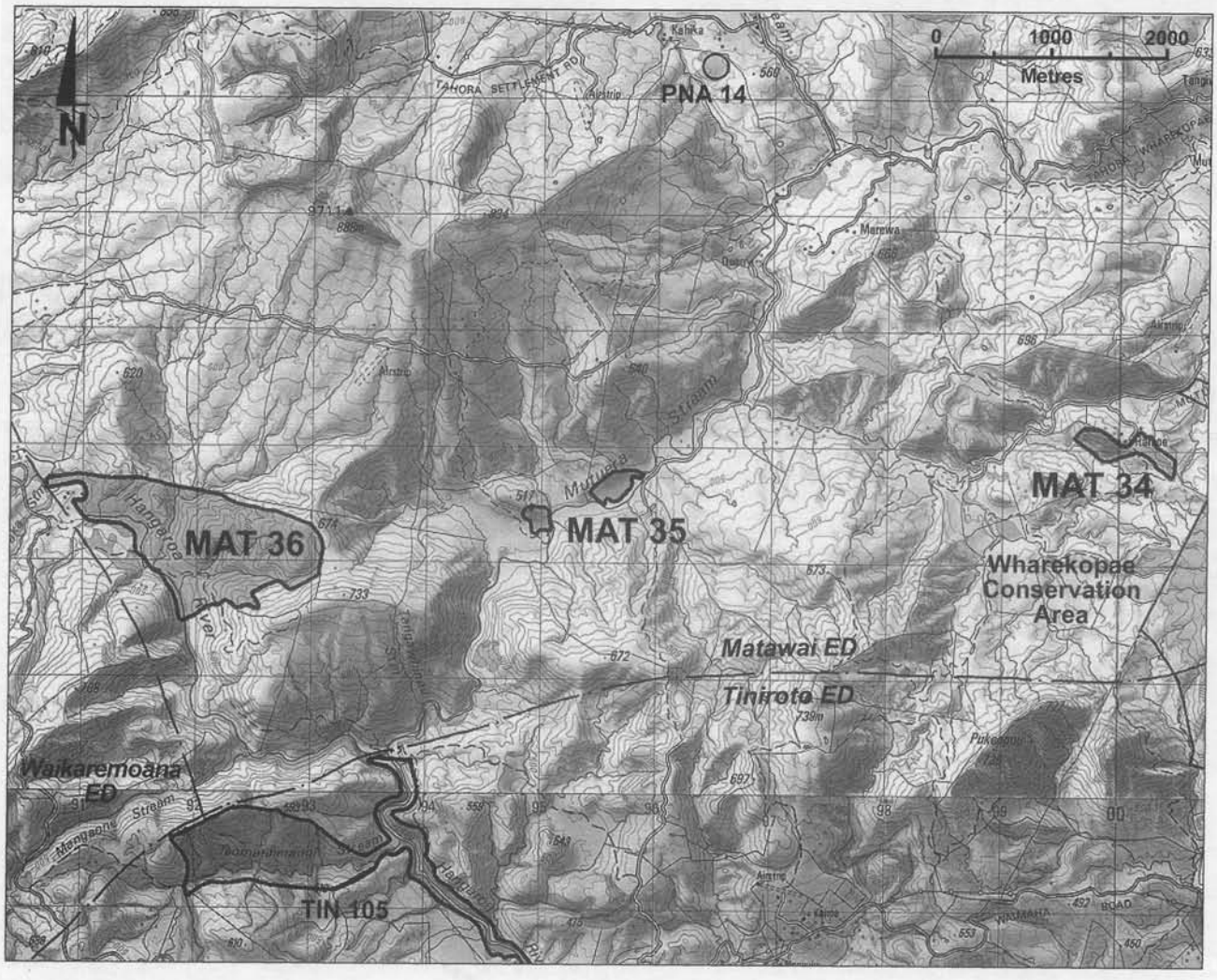
Description

This RAP lies on moderate south-facing slopes dropping from ridge crest to stream terraces c. 300 m from Wharekopae Conservation Area (PNA 15), at the end of Mutuera Road. Tall primary rimu/tawa forest dominates the mid to upper slopes of the RAP, with some tawa reaching over 25 m in height. Very few species occur in the understorey, the result of long-term trampling and grazing. The forest on the lower slope is younger, logging having removed most of the large podocarps. The tawa canopy is lower and patchy with a mosaic of tawari, kamahi, lemonwood, houhere and pate amongst it. Young rimu, matai and kahikatea are scattered throughout, with the latter more common on the stream terrace. Dense even-aged stands of these young podocarps also occur on the lower slopes with *Coprosma rotundifolia*, poataniwha and *Neomyrtus pedunculata* beneath. Common forest birds were recorded.

Significance and justification

Although extensively grazed and with limited regeneration, this RAP is significant as it includes one of few examples of unlogged primary rimu/tawa forest remaining in the district. It also lies close to a large protected area (Wharekopae Conservation Area PNA 15). With fencing the forest understorey and ground cover would regenerate rapidly.

Map 50: RAPs MAT 34-36 (NZMS 260 X17 & X18)



RAP MAT 35 MUTUERA STREAM

Refer to Map 50

Study site No.	168, 169
Priority:	3
Grid Reference:	NZMS 260 X17 957827/950823
Area:	9.3 ha
Altitudinal range:	430-480 m
Bioclimatic zone:	lowland
Vegetation classes:	beech forest conifer forest conifer/broadleaved forest tawa forest

Description

This RAP contains two discrete remnants in the mid-reaches of the Mutuera Stream, a true left tributary of the Hangaroa River. The upstream remnant lies on

a broad alluvial terrace, moderate terrace riser and ridge above. The terrace supports a mix of degraded primary and advanced secondary kahikatea-dominated forest and treeland. Denser patches have a tangle of small-leaved and divaricating shrubs (including *Coprosma rotundifolia*, rohutu, kaikomako, poataniwha, weeping mapou, young kowhai and matai) in the understorey. This merges into advanced secondary kahikatea/kohuhu forest on the terrace riser/lower slopes, with tawari, mahoe, houhere, totara, and kaikomako also present amongst the low canopy. Young rimu, kahikatea and totara dominate the ridge.

The downstream remnant extends from stream side across an alluvial terrace, to moderate hill-slopes and wide ridges. The alluvial terrace supports patches of advanced secondary kahikatea-dominated forest over small-leaved and divaricating shrubs. The terrace riser and lower slopes have kahikatea/broadleaved mosaic (including kaikomako, putaputaweta, rohutu, tawari, broadleaf and houhere), with modified primary tawa-dominated forest on the upper slopes and silver beech-totara forest on the ridges. The tawa forest has mahoe, white maire, young kahikatea, matai and miro amongst the canopy. Several large rimu and red beech trees occur along the stream bank. Only the central core of the remnant is intact, with the margins fading to treeland and pasture.

Both remnants are grazed by cattle, with pugging on the terraces and wetter parts of the slopes. Stumps from past logging and burning are still evident. Kereru and tui were recorded in both areas.

Significance and justification

The RAP is significant as it contains remnants of primary/advanced secondary podocarp-rich forest on fertile alluvial terraces, very little of which remains in the southwestern part of the district. These are complemented by different forests on adjoining slopes and small ridges.

RAP MAT 36 UPPER HANGAROA RIVER

Refer to Map 50 (p. 371)

Study site No. 77

Priority: 1

Grid Reference: NZMS 260 X17 920822

Area: 152 ha

Altitudinal range: 420-674 m

Bioclimatic zone: lowland

Vegetation classes: beech forest
conifer forest
tawa forest

Description

This sizeable RAP has continuous forest from rolling ridge line to alluvial terraces beside the Hangaroa River at the southwestern end of the ecological district. Old stumps, logs and logging tracks are evidence of past timber removal, and areas of

different-aged secondary forest suggest past fires (likely pre-European). The vegetation of the RAP is complex due to this past modification. Red beech-silver beech forest occurs on the highest ridge and in a riparian strip along the Hangaroa River with large kahikatea amongst it. Tawa forest dominates on the slopes between, with kowhai forest on the steep upper slopes. Scattered rimu and miro are emergent over the tawa canopy in places. One west-facing slope in the centre of the RAP supports low forest with abundant young rimu, kahikatea, rewarewa and broadleaved trees (including mahoe wao, tawa and lancewood). The alluvial terrace has scattered patches of kahikatea forest treeland, with divaricating and small-leaved shrubs abundant in the understorey (including red-fruited karamu, *Coprosma* sp. (t), kaikomako, poataniwha, mingimingi, pokaka, *Pseudopanax anomalus* and rohutu). Steeper, more unstable riparian slopes and bluffs at the western (up-river) end of the RAP support manuka scrub.

Regeneration of podocarps and other primary tree species within the RAP is strong, but would be greatly enhanced with the exclusion of browsing animals. Domestic stock have access to the entire RAP, however the terraces appear to be most heavily grazed, with tracks and grassy patches throughout.

Significance and justification

This RAP contains a diversity of primary forest that retains good forest structure despite logging and old advanced secondary forest on the full ranges of landforms from broad ridge to alluvial flats. The RAP also has significant value as a wildlife habitat, with tui, silvereye, grey warbler and kereru all present.

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Appendix 1

A BRIEF DESCRIPTION OF STUDY SITES SURVEYED, BUT NOT IDENTIFIED AS RECOMMENDED AREAS FOR PROTECTION.

Table on the following pages.

APPENDIX 1: A BRIEF DESCRIPTION OF STUDY SITES SURVEYED, BUT NOT IDENTIFIED AS RECOMMENDED AREAS FOR PROTECTION

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
Tintiroto Ecological District					
44	483 Peak	X17 217957	260-420	11.3	An area of predominantly secondary kanuka forest with totara co-dominant on the lower-slopes to the north. A small wetland occurs at the head of one of the small streams.
46	Stream system from SH2 toward 483m peak	X17 232955	90-190	25.3	An area of secondary forest covering the lower hillslopes and stream gullies of two small tributaries of the Waihuka River. Secondary kanuka forest is dominant in lower valleys with tawa forest on the upper slopes. Heavily grazed.
51	Otoka	X17 118962	320-580	53.8	This site is predominantly secondary kanuka forest with open areas dominated by pasture grasses. Wilding pines are invading the remnant from the surrounding plantation.
52	Daks Station	X17 083907	560-620	5.6	Two areas dominated by primary rimu-tawa forest with mahoe common in the understorey. The area is surrounded by pine plantations and pasture. The remnant is grazed with a partially open canopy.
60	Kohanga Station	X17 170905	220-400	31.4	This remnant is predominantly secondary kanuka forest and treeland. It is heavily grazed with a very sparse understorey. Wilding pine invasion.
61	317 Trig	X17 233890	180-320	12.9	An area dominated by secondary kohuhu-mahoe forest. The understorey is sparse and grazed by domestic stock.
62	Pikirangi Station (a)	X17 115943	400-450	15.4	A mosaic of secondary broadleaved scrub-forest dominated by putaputaweta, kohuhu, lancewood, houhere, mahoe, kahikatea and treeferns. The forest has been clear felled in some areas and is now dominated by rough pasture. Grazed by feral goats and domestic stock.
63	Pikirangi (b)	X17 128938	300-400	9.0	An area of secondary kanuka forest.
64	Hihiroroa Stream	X17 180905	120-200	14.0	Secondary kanuka-kowhai forest, with a sparse understorey due to domestic stock grazing. Regeneration and understorey diversity may improve as stock have recently been excluded. Problem weed species present include radiata pine and Robinia.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
66	Hihiroroa	X17 183918	220-320	15.2	Secondary kanuka forest surrounded by pine plantation and pasture.
71	Mokonui Station (a)	X17 058859	410-440	5.3	A remnant of modified primary tawa-titoki forest, with scattered emergent pukatea. Mahoe and pigeonwood are common in the understoreysubcanopy. Part of the remnant has recently been cleared. Grazing.
72	Mokonui Station (b)	X17 062861	400-440	8.8	A remnant of modified primary northern rata/pukatea-titoki-tawa forest. The northern rata are large and healthy. Grazed by feral goats and domestic stock.
73	Mokonui Station (c)	X17 067862	290-340	3.4	A remnant of modified primary tawa-titoki forest with emergent rewarewa and pukatea, and secondary kanuka forest dominating the northern side. The understorey is very bare, with intense grazing pressure.
74	Mokonui Station (d)	X17 064865	420-480	5.6	A remnant of modified primary tawa-pukatea forest with scattered emergent kahikatea.
82	Point 520	X18 067768	320-520	8.2	An area of logged primary forest dominated by black beech, with tawa, pukatea, and rewarewa. Grazed.
83	Tahunga Station	X18 034765	240-300	14.2	This remnant is advanced secondary totara forest with scattered emergent kahikatea over a canopy of mainly kowhai and kohuhu. The area has been fenced with recent stock removal. Robinia has been planted around the boundary.
84	Hangaroa	X18 067745	240-420	81.7	Areas of almost pure secondary kanuka forest with scattered cabbage tree, putaputaweta, mahoe, kowhai, young totara, and rewarewa.
87	Tangihau Station	X18 150795	280-330	5.0	Logged primary tawa-titoki forest with scattered emergent rewarewa and pukatea. Feral goats and domestic stock graze the area.
88	Tangihau (b)	X18 160790	300-420	10.3	A mosaic of logged primary (pukatea-rewarewa)/tawa forest with patches of secondary broadleaved shrubland dominated by putaputaweta, mahoe and kanuka.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
90	Poariki	X18 075737	420-516	14.1 5.1 1.0 2.9	Four small areas which lie on moderate northerly to east-facing slopes around and east of Poariki summit. All have secondary kanuka-dominated vegetation, with mixed broadleaved-small leaved treeland-forest on the lower slopes/stream gullies. Other species present include kowhai, kohuhu, totara, houhere, kanuka, kahikatea, ngaio, cabbage tree and lancewood. The areas are unfenced and grazed.
93	Waikura Hillside	X18 135757	260-400	16.5	Secondary kanuka-dominated forest on moderate east-facing hillslopes above the Waikura River. Other species present include young matai, mahoe, houhere, kohuhu, and cabbage tree. It is unfenced and grazed by domestic stock.
94	Tangihau (3)	X18 130793	300-500	38.6	Manuka scrub on the upper valley sides with scattered broadleaved species throughout. Grazed. Exotic weed numbers high.
95	Pehiri (3)	X18 110742	220-280	4.5	Secondary kowhai-kohuhu-totara forest with scattered broadleaved species throughout.
98	Waterfall Bush	X18 961742	330-400	9.9	An area dominated by advanced secondary beech forest with broadleaved species scattered throughout, and patches of dense pole kahikatea on the stream terrace. The area includes a spectacular waterfall.
99	Waimaha Station (a) & (b)	X18 956790	440-520	20.9	These remnants are dominated by advanced secondary kamahi forest on the lower hillslopes and stream gullies, with patchy manuka scrub on the upper slopes.
102	Papokeka Stream	X18 046790	280-450	11.7	Dominated by a mosaic of secondary manuka scrub and secondary rewarewa/kanuka-kohuhu forest and shrubland. Grazed by feral goats.
103	Hangaroa River Gorge	X18 993761	280-300	7.6	A mosaic of secondary forest dominated by kowhai, kohuhu, kanuka and mahoe. Feral goats observed.
104	Hangaroa River - Hebron Station	X18 974755	300-320	12.9	A mosaic of low secondary kanuka-kowhai forest with locally dense secondary pole kahikatea and totara stands.
105	Waimaha Rd South	X18 986785	400-520	15.8	A mosaic of logged primary tawa forest and secondary rewarewa/ (putaputaweta)-kanuka forest.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
106	Waimaha Rd North	X17 000805	580-720	17.9	Primary black beech forest dominates with patches of secondary kamahi-heketara low forest and secondary manuka scrub.
113	Bushy Knoll (b)	X18 996705	340-440	7.9	An area of logged primary tawa forest and treeland with emergent rewarewa, and large pukatea scattered throughout.
114	Bushy Knoll (a)	X18 998708	360-500	11.4	An area dominated by pukatea/tawa forest treeland. Small area of secondary manuka scrub. Kereru recorded.
115	Bushy Knoll Treeland	X18 012705	370-580	45.0	Broadleaved treeland with an understorey dominated by scattered ferns and pasture on steep slopes with secondary manuka-kanuka scrub around the margins. Grazed.
118	Mangapoike (a)	X18 157510	260-290	2.5	A small remnant of primary forest on an alluvial terrace of the Mangapoike River. The lower terrace supports kahikatea-totara/tawa forest, with rimu-kahikatea/tawa forest on the upper slopes. The entire area is grazed. Willows occur along the river bank.
123	Ngamarua Lake	X18 232575	240-280	3.7	A small lake used for both duck shooting and as a stock water supply. A small area of the lake margin has raupo-dominated vegetation around it. The vegetation around the outer lake edge is dominated by logged primary titoki forest with occasional large pukatea and scattered pole kahikatea close to the lake margin, and advanced secondary black beech forest on the upper hillslopes.
124	Kauwaewaka Stream	X18 240580	120-220	55.8	Logged primary tawa-titoki forest dominates the midslopes, with secondary kahikatea treeland on the occasional alluvial terraces, advanced secondary black beech forest on the ridges, and secondary kanuka - broadleaved forest surrounding the remnant. High numbers of exotic weed species occur throughout the area e.g. cotoneaster, Robinia, garden nasturtium, barberry, old man's beard, blackberry. Regeneration is good, with several areas fenced against grazing. Kereru were recorded.
127	Tahungataua Bush	X18 025725	380-430	11.2	Logged primary black beech forest along a 1km stretch of the Tahungataua Stream, with small areas of low secondary kanuka/broadleaved forest. This study site is continuous with the Tahungatawa Scenic Reserve (PNA 19). Low numbers of feral goats graze the area.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
130	Strathleven (b)	X18 958703	600-610	0.7	An area of partially logged primary tawa forest with emergent rimu, kahikatea, and rewarewa. Several large northern rata are emergent through the canopy. The understorey is bare with high numbers of feral goats and domestic stock. Kereru were recorded.
131	Kohirikiriki Bush	X18 028722	440-500	2.8	Modified primary rimu/tawa forest with black beech on the ridges, and a small area of kahikatea treeland on lower slopes. Grazed by domestic stock.
132	Bushy Knoll House Bush	X18 992707	440-560	12.9	Logged primary pukatea-tawa forest with several emergent rimu in the centre of the remnant. Kereru recorded.
134	Rockburn (b)	X18 118726	190-210	4.0	A long thin ribbon of advanced secondary totara-kahikatea-matai forest along the Hangaroa River. This remnant is heavily grazed by domestic cattle with an open understorey.
136	Mangamoteo (a)	X18 043703	300-400	4.4	A mosaic of logged primary rimu/tawa forest with black beech on ridges merging into secondary broadleaved treeland on mid slopes. Grazed by both feral goats and domestic stock.
138	Mangamoteo (c)	X18 036715	500-600	9.4	Logged primary tawa forest and treeland with black beech on ridges merging into secondary broadleaved scrub with emergent rewarewa. Kereru recorded.
144	Mangawehi Trib.	X18 192697	300-440	19.5	A mosaic of logged primary tawa forest, secondary broadleaved forest and manuka scrub. Parts of the manuka scrub have been recently cleared and burnt.
146	Mangaihu Stream Awatahi (a)	X18 108660	190-280	10.8	Partially logged primary forest dominated by kahikatea, matai, and totara over a canopy of kowhai and kohuhu with occasional gullies of tawa. Light grazing by both domestic stock and feral goats has left the understorey open. Kereru recorded.
147	Tahungataua Stream	X18 015735	440-600	54	A mosaic of secondary manuka scrub and broadleaved scrub with pockets of black beech treeland on the ridges, and pockets of logged tawa-beech-podocarp forest.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
152	Lower Kaikoura Stream	X18 093642	140-220	6.4	A mosaic of advanced secondary low broadleaved forest dominated by *Pittosporum ralphii*, kanuka, cabbage tree, mahoe, kowhai, and tree fuchsia. Surrounded by pine plantation. Waterfall visible. Kereru and tui observed.
153	Awatahi (b)	X18 113665	200-360	5.2	A mosaic of advanced secondary broadleaved forest with kowhai, *Pittosporum ralphii*, and kohuhu on steep hillslopes and stream sides. Poplars are scattered through the lower hillslopes.
154	Te Houopuanga (c)	X18 167537	360-450	5.1	Secondary to advanced secondary forest on a moderately steep slope dominated by kanuka at the margins and broadleaved species in the core. Tawa and pole kahikatea are regenerating strongly. The remnant is grazed by both domestic stock and feral goats.
155	Ngamarua	X18 212582	320-460	11.2	This study site covers moderate to steep slopes in the headwaters of a true left tributary of the Kauwaewaka Stream. The vegetation is a mosaic of broadleaved low forest and small-leaved scrub. Pines have been planted along all but the areas north-western margin.
162	Wharekopae River	X17 050865	300-380	12.5	A mosaic of advanced secondary forest and logged primary forest dominated by titoki and kowhai. The understorey is patchy with large areas dominated by pasture grasses, and grazed by both domestic cattle and feral goats. Exotic weeds are common around the margin e.g. cotoneaster, buddleia, radiata pine.
163	Waioma	X17 045867	300-420	8.6	Situated beside the Wharekopae River this study site has advanced secondary rimu-kahikatea/broadleaved forest on an alluvial terrace, with rewarewa/tawa-titoki forest on the terrace riser.
172	Gillingham Bush (2)	X18 230690	480-520	7.5	Secondary broadleaved vegetation of mainly houhere, wineberry, putaputaweta, lancewood, mahoe, kanono, and karamu. Hawthorn throughout, with canopy gaps common.
196	Hereheretau Gully	X19 100360	180-220	1.7	This site is a compact remnant of modified primary rewarewa/tawa-titoki forest with infrequent pukatea in the canopy, and nikau and mahoe common in the subcanopy. Understorey open and grazed.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
199	Tangiwai (a)	X19 110385	190-396	59.2	This site is dominated by young secondary vegetation; mostly manuka scrub with kanuka scattered through it. Small scattered pockets of older tawa forest with nikau, and other broadleaved trees occur throughout. It is grazed by domestic stock and large numbers of feral goats. Adjacent and continuous with RAP TIN 79 Mangaone Valley.
202	Tangiwai (b)	X19 095402	200-280	2.5	Modified primary tawa-titoki forest, with emergent rewarewa, scattered pukatea and hinau. In the understorey mahoe is dominant, with tree fuchsia, kahikatea saplings, and ferns also present amongst blackberry. Large amounts of native jasmine are present. A mixture of kanuka and manuka scrub/treeland surrounds the primary forest. Kereru were recorded. The understorey is lightly grazed.
204	Bluff Bush	X19 040415	160-360	20.3	A very steep east-facing slope above Hereheretau Rd dominated by low kanuka forest on its upper two-thirds, with manuka scrub covering the actively eroding lower slopes. Five finger, cabbage tree, and mahoe are scattered amongst the kanuka. There is a narrow bluff system with tutu, tuhara and kiokio.
216	Anewa Gully	X19 029415	140-200	3.2	Small remnant of logged primary pukatea-tawa-titoki forest. Very open and grazed understorey. Scattered young rimu and matai.
217	Lake Gully	X19 017428	120-160	1.8	An area of logged primary rewarewa/tawa-(titoki-pukatea) forest with several large kahikatea and a matai. The area fades to manuka-kanuka scrub. The understorey is open with some recent regeneration. Domestic stock graze the area.
219	Area 219	X19 017430	120-160	1.6	Small area of advanced secondary rewarewa/tawa-kanuka forest. Grazed by both domestic stock and feral goats. Open understorey.
221	Waimata Stream	X18 218645	160-350	94.4	A large area of almost solely secondary kanuka forest (and treeland), with scattered broadleaved species e.g. cabbage tree, putaputaweta, and mahoe. Pines planted to the west. Feral goats were recorded.
222	Point 472	X18 206654	400-460	6.1	An area of low secondary forest and treeland with kohuhu, mahoe, five finger, and rangiora the dominant species, and scattered emergent rewarewa.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
223	Parikanapa Gully	X18 203655	390-410	3.2	Logged primary tawa forest with broadleaved shrubs in the understorey. Moderate numbers of pole kahikatea are scattered throughout. The understorey is grazed and open.
224	Point 420	X18 200664	400-420	1.6	A remnant of logged primary tawa treeland with low broadleaved shrubs forming a sparse subcanopy, located in the head of a small gully. Grazed by both domestic stock and feral goats.
225	Tahunui (a)	X18 193648	500-540	1.8	Low secondary forest-treeland dominated by broadleaved shrubs and treeferns with scattered emergent rewarewa. Understorey bare.
226	Hukanui House Bush	X18 186638	460-564	7.4	A mosaic of logged primary tawa forest and treeland with emergent rewarewa, with a small stand of pole kahikatea on the lower slopes.
227	Hukanui Station	X18 180640	460-540	4.6	A mosaic of advanced secondary forest dominated by rewarewa with small scattered pockets of logged primary tawa forest. Grazed by both feral goats and domestic stock, with wilding pines throughout.
228	Parikanapa Road Gully	X18 190633	500-540	1.0	A mosaic of scattered logged primary tawa forest-treeland, with secondary broadleaved forest mainly along the stream side. Very exposed to westerly winds, with large amounts of canopy damage evident. The understorey is open with grazing by both domestic stock and feral goats.
229	Upper Mangahauhau Gully	X18 189628	500-540	2.5	A remnant of secondary broadleaved forest along a small narrow gully. The understorey is grazed and open.
230	Parikanapa Road (a)	X18 187625	540-630	2.9	Logged primary tawa forest-treeland with emergent rewarewa and occasional hinau, with several small areas of secondary broadleaved scrub shrubland dominated by wineberry, pate, tree fuchsia and tutu along the margins. Understorey grazed and open.
231	Parikanapa Wetland	X18 174622	590	3.0	This wetland has a mosaic of three distinct vegetation types; manuka shrubland, sedge-rushland and willow/sedgeland (raupo, *Carex* spp.). All of these types are modified by cattle that graze around the margin of the wetland. The manuka shrubland is the least modified. The wetland as a whole is in good condition. Half of the wetland is standing water over the winter.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
232	Parikanapa Station Wetland	X18 171621	580-600	0.7	Secondary manuka-dominated wetland surrounded by a narrow band of *Juncus* spp. dominated rushland. The area is heavily grazed and trampled up to the margin, but the interior is relatively unmodified.
233	Parikanapa Lake	X18 163624	420-480	5.2	A lake with a raupo fringe (1-2 m wide) continuous with two small areas of forest, an area of advanced secondary pole kahikatea with a scattered broadleaved understorey and an area of secondary kanuka forest. The lake edge has been grazed and trampled by deer, sheep, feral goats, and cattle.
234	Parikanapa Station Bush	X18 166627	480-540	1.2	Logged primary tawa forest-treeland with emergent rewarewa over a subcanopy of broadleaved trees and shrubs. Manuka scrub around the margins. Understorey reduced to bare soil.
235	Parikanapa Station Gully	X18 155631	340-460	15.5	An area of secondary kowhai-dominated treeland along 1.5km of a very steep stream valley, surrounded by manuka treeland especially on the north-western hillslopes. The understorey is grazed and open. Kereru recorded.
237	Parikanapa Forest	X18 188618	600-690	8.1	A small mosaic of partially logged primary rimu/tawa forest and advanced secondary broadleaved forest. The remnant is completely fenced and surrounded by pine plantations. The understorey is dense with many palatable species represented. No goats were observed. High numbers of young podocarps and several very large rimu are scattered throughout. Tawa is dominant on the lower slopes. Kereru recorded.
239	Airstrip Gully	X18 166617	500-560	3.8	Logged primary tawa forest-treeland, with titoki, hinau, and scattered young rimu in the canopy. Grazed understorey.
240	Parikanapa Road (b)	X18 141608	400-520	4.6	A gully of partially logged primary rimu/tawa-hinau forest. Large emergent rimu are scattered throughout. On the lower hillslopes tawa dominates with high numbers of emergent pole rimu and kahikatea. The understorey is grazed and bare. High numbers of kereru were observed.
241	Kaikoura Stream	X18 135625	300-419	16.9	A mosaic of logged primary tawa forest along stream gullies, with secondary broadleaved forest on the ridges and steep upper hillslopes. Kowhai are scattered along western end, concentrated along the main ridge. Pole kahikatea and rimu are scattered throughout the remnant. The understorey is grazed and bare with both feral goats and domestic cattle present.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
242	Upper Kaikoura Stream	X18 140641	360-560	33.7	Several patches of secondary broadleaved treeland with a mosaic of species including kohuhu, cabbage tree, rewarewa, tawa, putaputaweta, kowhai, and mahoe. Amongst the remnants are small patches of secondary pole kahikatea forest treeland. All of the areas are grazed with bare, open understoreys.
256	Tutaematuatua Stream Bush	X19 200405	300-600	62.8	Large area of logged primary (rimu)/tawa forest with pukatea and rewarewa locally abundant. Occasional very large hinau and rimu are amongst the oldest vegetation. There are areas of younger secondary forest scrub dominated by tauhinu and scattered broadleaved trees over exotic grassland. Kereru were observed.
257	Pukeorapa Wetland	X19 193403	540-550	2.6	A small wetland with swards of *Isolepis* sp., *Juncus* spp., and *Eleocharis acuta*. Patches of watercress and sphagnum occur in wetter seepage areas. Vegetation around the wetland margins has been heavily browsed and trampled.
259	Boundary Gully	X19 179349	320-380	1.9	This small remnant of modified primary tawa-pukatea-titoki forest and treeland is located on a north-east facing hillslope on the Mangaone Stream valley 6 km north west of Nuhaka. The understorey is grazed by both domestic stock and feral goats.
260	Moumoukai Gully	X19 235380	260-400	8.7	This small remnant contains mainly secondary broadleaved shrubland to low forest dominated by five-finger and mahoe, with scattered kohekohe and pukatea along the stream sides and gully bottoms. There are high numbers of seedlings (nikau and tree fuchsia) and ferns in the understorey especially concentrated around the stream. Kereru were recorded. Old man's beard is present.
267	Clonkeen Station	X19 a) 189341 b) 187342 c) 188337	340-400	 3.1 2.2 3.8	Three discrete remnants of partially modified semi-coastal forest; a) Scattered tawa-rewarewa/kohekohe-mahoe forest. b) Rewarewa/tawa-pukatea/kohekohe-mahoe forest. c) A thin ribbon of scattered rewarewa/tawa-pukatea/kohekohe forest. All of the remnants are grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
268	McIntyres Bush	X19 185343	370-380	1.4	This remnant of degraded primary semi-coastal tawa-dominated forest lies on gentle rolling slopes. Other species present include several very large puka, rewarewa, kohekohe, pukatea, hinau, mahoe, titoki and miro. Feral goats and domestic cattle graze the area, with the understorey consequently bare and open. A dam lake extends to the base of the remnant. Paradise ducks were recorded.
274	Mangaone Scrub	X19 161358	280-437	90.3	Secondary vegetation dominated by kanuka; a mosaic of ages ranging from rough pasture/kanuka treeland to kanuka/manuka scrub to kanuka forest with emergent rewarewa. Some scattered wilding pines. Recent clearance of some scrub for pasture.
275	Pukeorapa Gully	X19 179379	460-500	4.3	A mosaic of secondary forest-shrubland dominated by treeferns and broad-leaved species and logged primary rewarewa/tawa forest over a sub-canopy of mahoe and pigeonwood. The understorey is grazed but maintains a good diversity of fern and ground cover species. Some recent clearance has occurred around the margins. Kereru were recorded.
276	Pukeorapa Station	X19 183374	400-500	4.5	This area is dominated by partially logged primary (rimu-rewarewa)/tawa-hinau forest. It is fully fenced and completely buffered by a tall pine plantation. Although low numbers of feral goats are present the understorey is quite diverse with many seedlings. Kereru were recorded.
277	Mangaone Stream Gully	X19 170375	300-500	83	A mosaic of different aged secondary vegetation ranging from rewarewa/ kanuka-treefern forest to kanuka-manuka scrub-forest. Some scattered large pukatea and tawa. Half of the block is fenced and not grazed. Some areas recently cleared.
281	Makaretu Stream Tributary	X19 122362	180-400	67.6	An area of secondary scrub to low forest dominated by manuka with older areas of low kanuka forest. Scattered pole kahikatea at the bottom of the slope. Grazed by both domestic stock and feral goats.
282	Travencore	X19 129372	280-370	7.9	A remnant of logged primary tawa forest with scattered emergent rewarewa and large pukatea. The canopy is intact with a diverse range of species. The understorey is bare and open. Feral goats observed.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
283	Mangaone Valley Ford	X19 149365	280-450	99.7	An area of solely kanuka/manuka scrub with some open areas dominated by pasture grasses. Grazed by both feral goats and domestic stock.
295	Makaretu Stream (a)	X19 076411	180	0.8	A small remnant of alluvial terrace forest and treeland dominated by kahikatea and totara over kanuka. The understorey is open and dominated by pasture grasses. Grazed by both feral goats and domestic stock. Scattered wilding pines.
297	Anewa Station (1)	X19 040405	140-360	76.4	A remnant with a mosaic of young secondary kanuka/manuka scrub, and secondary rewarewa/kanuka forest, with scattered pockets of tawa and pukatea and regenerating broadleaved trees. A small grove of secondary totara occurs along the alluvial terraces. The understorey is grazed by both feral goats and domestic stock.
298	Anewa Station (2)	X19 049400	310-340	0.8	A small remnant of primary rimu-pukatea/tawa-(titoki) forest perched on a westerly-facing shallow hillslope. Very open understorey. One very large emergent rimu.
299	Anewa Forest	X19 038397	160-280	8.7	A remnant of partially logged primary (rimu-rewarewa-pukatea)/tawa forest merging to kanuka treeland along the bluff system. The understorey is relatively open and bare except close to the stream where the understorey is diverse. Feral goats and domestic stock graze the area.
306	T5	W19 795408	160-280	17.9	This area is dominated by young secondary manuka scrub with secondary kanuka forest in the gullies. Podocarp regeneration is strong. Grazed by feral goats.
307	Matai Station	W19 790415	40-280	77.4	This area is dominated by secondary (rewarewa)/kanuka forest with a central area of advanced secondary rewarewa/(tawa)-kanuka forest. Scattered open areas dominated by pasture grasses. Grazed by feral goats.
308	Matai Small Bush	W19 805415	60-200	12.6	An area of secondary kanuka-(kowhai-putaputaweta-cabbage tree) forest and treeland. Highest species diversity is in the stream gullies. Heavily grazed by both feral goats and domestic stock. Understorey dominated by exotic pasture grasses.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
315	Benmoore	W19 787402	120-180	4.3	An area of logged primary tawa-(kahikatea)/(titoki-rewarewa) forest. One large emergent matai remains in the remnant. Grazed by both feral goats and domestic stock, kereru recorded.
316	Thomson's Small Bush	W19 774407	140-240	7.1	A small area of logged primary tawa forest with scattered emergent pole rimu. Grazed by both feral goats and domestic stock.
317	Thompson's Big Bush	W19 780390	100-300	51.5	This area is dominated by secondary kanuka forest with logged primary tawa forest in the gullies. Grazed by feral goats and domestic stock. Kereru recorded.
344	Rohepotae Bush	W19 668342	280-320	5.7	The vegetation along the flat valley floor is dominated by dense pole kahikatea with small amounts of tawa. Exotic grassland dominates the understorey. Secondary manuka-tree-fern scrub dominates the area around the ridge. Adjacent to Rawhiti Scenic Reserve (PNA 62). Straddles the Tiniroto - Waihua Ecological District Boundary.
362	Upper Waihua River	W19 625386	300-400	10.8	A small remnant of modified primary black beech forest-treeland. Patches of secondary kanuka-broadleaved scrub with scattered treeferns surround the main area. A few scattered rewarewa and tawa occur amongst the beech trees. The understorey is bare due to high of feral goats numbers.
366	Woodlands Track	W19 560390	460-500	1.3	A small area of modified primary rewarewa/tawa treeland-forest. The understorey is bare with high numbers of feral goats.
367	Woodlands (a), (b) & (c)	W19 a) 545390 b) 544385 c) 545381	220-480	 6.5 4.1 4.7	Three small patches of tawa forest, with emergent rewarewa and titoki and mahoe also present in the canopy. All three of the remnants are grazed by both domestic stock and feral goats, and have very open understoreys. Occasional pole kahikatea, rimu and matai occur around their margins. Area b) is mostly an open treeland, with the only ground cover around the stream edge. Several very large rimu and matai occur in area c).
368	Woodlands Boundary	W19 554400	360-420	7.7	Logged primary tawa forest with titoki, and scattered emergent rewarewa and rimu. Surrounded and sheltered by steep ridges to the north and south. High feral goat numbers.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
369	Woodlands (d)	W19 545374	140-160	1.8	Logged primary rewarewa/tawa-titoki forest on an alluvial terrace of the Whenanui Stream with mahoe dominating the subcanopy. The understorey is very open with exotic grasses the main ground cover. No regeneration, although grazing has recently ceased with the establishment of pines in the surrounding pasture. Occasional large matai.
372	Cricklewood	W19	80-280		Four small remnants: a) Logged primary kahikatea-titoki treeland
		(a) 748391		1.3	b) Logged primary tawa treeland with a dense clump of titoki, big kahikatea
		(b) 750384		1.4	c) Logged primary tawa treeland with titoki, scattered kahikatea
		(c) 756389		2.3	d) Secondary broadleaved-kanuka mosaic with pockets of tawa amongst it.
		(d) 761392		5.2	Grazed, open and grassy understorey. All areas have been modified in past to some extent.
373	Cricklewood Road	W19 739385	200-260	5.1	A narrow strip of advanced secondary/modified primary titoki/broadleaved forest (with treeferns, rewarewa, cabbage tree, putaputaweta, and tawa) in the upper reaches of the Waitahora Stream. The canopy is a mosaic with no one species dominant. Intense grazing has reduced the area to treeland. The area is not fenced.
376	Wahanui Lake Bush	W19 695383	230-240	1.3	Small block of logged primary tawa forest near a small manmade lake. Few other species in canopy. Very open and grassy underneath.
377	Wahanui Gully	W19 698393	260-320	3.5	A remnant of logged primary rewarewa/tawa-titoki forest, mahoe, pigeonwood, and scattered treeferns common in the sub-canopy. Several mature kahikatea area present and scattered pole trees. Very open understorey with high numbers of feral goats observed. Kereru observed.
378	Paerau	W19 708389	260-280	1.8	A small patch of logged primary tawa-titoki forest-treeland, located on a broad ridge top. High feral goat numbers.
379	Aratiti	W19 677395	360-390	3.4	A small patch of logged primary tawa-titoki-rewarewa forest-treeland located on a gentle south-facing dip-slope. The understorey is dominated by exotic grasses. The canopy is largely open. Feral goat numbers high.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
381	Pihanui Treeland	W19 a) 655398 b) 658394	280-350	 1.6 1.7	Two small areas of logged primary kahikatea-tawa-titoki treeland at the base of a steep sided stream gully. Kahikatea is scattered along the stream edge with tawa and titoki dominating further up the stream banks. The under-storey is bare with only scattered ferns along the stream bank. Close to eastern edge of RAP TIN 129.
382	Cricklewood Hidden Bush	W19 703404	200-340	7.0	Small area of young secondary kanuka forest-treeland with some kowhai in the canopy in the upper catchment of Mangapirita Stream. Steep slopes and ridges surround it on all sides except to the north. Very open and grassy understorey. Grazed by both feral goats and domestic stock.
383	Pihanui Remnants	W19 a) 630394 b) 627390 c) 625393 d) 639393	380-470	 3.2 1.9 0.5 1.5	This area includes 4 discrete remnants of advanced secondary forest and modified primary forest in the upper reaches of the Waihua River catchment. a) Modified primary rewarewa/tawa-titoki forest. Located in a small moderately steep stream gully. b) Secondary rewarewa/treefern-kanuka shrubland forest. Located on a moderately steep easterly facing hillslope, and on the ridges. c) Modified primary rewarewa/tawa forest treeland. The understorey is completely bare. d) Modified primary rewarewa/tawa-titoki forest, with a high number of other broadleaved species amongst the canopy e.g. pigeonwood, hinau, mahoe, and treeferns.
384	Kerepehi Road	W19 595413	450-570	21.8	An area of predominantly secondary broadleaved forest-scrub, with a mosaic of treeferns, houhere, mahoe, kohuhu, five-finger, pate, cabbage tree, and scattered rewarewa . It extends from ridge top to stream gully, with a large pine plantation bordering the southern edge. Open understorey with areas of exotic grasses.
386	Rotongaio Bush	W19 581428	350-400	3.8	This study site is located in a small tributary of Lake Rotoroa, c. 400 m west of the lake; logged primary kahikatea-tawa forest with black beech on the southern ridges. Kowhai and other broadleaved species are scattered throughout. The understorey is open and grazed by both domestic stock and feral goats.
388	Pukematai	W19 533442	340-370	2.3	The study site extends from stream edge to gently sloping south-facing hill slopes. Modified primary (kahikatea-rewarewa)/tawa forest. The under-storey has been browsed in the past by both domestic stock and feral goats. The area is surrounded by a young pine plantation, with stock now excluded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
391	Woodlands Waihore	W19 542390	380-560	23.3	In the west the area is advanced secondary rewarewa/broadleaved mosaic (mahoe, houhere, kohuhu, and five-finger) forest. The rest of the vegetation is younger with kanuka locally common amongst broadleaved scrub. Scattered tawa occur along the stream gully. The understorey is open and grazed.
392	Mohaka River	W19 538372	70-190	7.1	This forest remnant contiguous with Fraser's Bush Scenic Reserve (PNA 65) to the west and adjoining the Mohaka River, has two distinct vegetation types: 1. Logged primary tawa forest with very occasional pole matai, rewarewa in the canopy with mahoe and treeferns dominate in the understorey. 2. Advanced secondary titoki-tawa-kanuka forest. Grazed.
393	Totara Valley	W19 518372	80-360	46.6	This area includes secondary broadleaved scrub-forest with patches of modified primary tawa forest along the Mohaka River, and extending well up Mangapuru Stream. Kowhai is scattered throughout and is common on the steeper areas. Some large totara, matai and kahikatea are scattered along the river side, and scattered pole totara and kahikatea throughout. Open and grassy in places.
396	Upper Mohaka Tributary	V19 475395	320-380	3.8	The area contains a streamside treeland of scattered kowhai, young pole kahikatea, rimu, matai and totara, and a small area of black beech. The surrounding pasture has recently been planted in pines. Adjacent to RAP TIN 139 Maungataniwha.
397	Mangahopai Stream	V19 474442	300-420	21.9	This area lies on south-easterly facing slopes in the catchment of Mangahopai Stream. The bulk of the vegetation is modified tawa-titoki forest with broadleaved shrubland over the rest of the area. The understorey is bare. Scattered mature emergent rimu and kahikatea occur throughout the tawa forest, with a small patch of black beech forest on one of the steep ridges. Kereru and tomtit present.
398	Point 508	V19 486448	300-508	91.9	This area is predominantly advanced secondary forest; rewarewa over a mixed canopy of kanuka and broadleaved species. The forest is bounded by streams to the east and west, and on the northern edge runs up to a ridge with paddock fencing. Grazed by domestic stock, deer, and pigs.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
399	Mangahopai Tributary	V19 482432	360-420	5.5	Small patch of logged primary tawa-beech forest with scattered podocarps, and black beech in strips on the drier ridges. Merges into secondary kanuka scrub at margins. Evidence of recent logging i.e. matai stumps. Grazed by both feral goats and domestic stock.
400	Mangapoike River	X19 124497	170-260	4.3	This area lies on moderate to steep riparian slopes beside the Mangapoike River, just north of its confluence with Mangarangiora Stream. It contains partially modified primary (rimu-matai)/tawa-(pukatea-titoki) forest. The understorey is relatively diverse supporting high numbers of ferns and seedlings. Feral goats were observed. Kereru were recorded in the forest, with grey ducks and pied stilts observed on the river.
403	Te Puna	X19 097459	110-130	6.6	An area of logged primary kahikatea-(totara-tawa-pukatea) forest an the alluvial terraces of the Mangapoike River, on both sides of the Te Puna Rd. Large numbers of logged totara stumps still evident throughout. Several stands of pole kahikatea occur next to the river. Heavily grazed by both feral goats and domestic stock. Kereru recorded.
404	Tena Koe	X19 045442	80-180	10.0	This remnant, located along the Makaretu Stream, is dominated by partially logged primary rewarewa-kahikatea/tawa-(pukatea) forest treeland. Black beech-kanuka forest treeland occurs on the ridges, bluff edges, and steep hillslopes. Buffered in places along the margin by tall kanuka. High numbers of young podocarps including kahikatea and matai are emerging through the canopy. Kereru, tui, kingfisher, and fantail were recorded.
405	Tukemokihi (a)	X19 070470	80-680	599	A large patch of kanuka/manuka scrub to kanuka forest with scattered pockets of logged primary tawa/titoki forest in sheltered gullies. Limestone bluffs border it to the north, with the bluff vegetation dominated by *Pittosporum ralphii*, mahoe, *Hebe* sp., harakeke and kowhai. Some recent clearance along the southern boundary. Kereru recorded. Grazed by both feral goats and domestic stock.
406	Tukemokihi (b)	X19 103452	200-340	29.4	An area of solely kanuka forest, with some recent clearance. Grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
407	Tukemokihi Gully	X19 075444	180-320	8.6	A small area with two patches of forest joined by scrub and treeland. Tawa dominates the forest canopy with some large pukatea, hinau, scattered large podocarps, nikau, and kowhai on the steeper upper slopes. The area is grazed by both feral goats and domestic stock and has an open understorey.
414	Mangaaruhe Gully (b)	X19 943483	40-120	8.3	A long narrow strip of logged primary kahikatea-(totara)/(tawa) forest and treeland. The lower section of the gully has several large/mature kahikatea, and high numbers of pole kahikatea and totara. Grazed by both feral goats and domestic stock. Pines have been planted along the northern boundary.
419	Mahurangi Gully	X18 025520	30-160	61.6	Covering a 3 km stretch of a true left tributary of the Wairoa River this long narrow remnant is dominated by kanuka forest with young kanuka/manuka scrub on the margins. In places high numbers of pole totara are emergent through the canopy. Grazed.
478	Mahanga Road	Y19 a) 312317 b) 318316 c) 320314	20-160	 6.7 2.3 0.8	Three small remnants of partially logged primary coastal forest and treeland on very rocky limestone/papa slopes dominated by titoki and tawa with emergent rewarewa and pukatea. Kohekohe, karaka and mahoe are common in the subcanopy. All the remnants are heavily grazed by both goats and domestic stock.
480	Mahanga Treeland	Y19 331340	120-180	3.7	An area of logged primary tawa forest-treeland with emergent rewarewa, fading to kanuka scrub to the north. The understorey is grazed by both goats and domestic stock.
481	Mahanga Road (d)	Y19 322318	40-100	5.5	An area of coastal tawa/kohekohe forest treeland. Kohekohe is dominant in some areas. Part of a larger semi-continuous chain of indigenous vegetation on the slopes north and south of Mahanga. The understorey is grazed and open. Partially fenced.
483	Mahanga Bike Track Bush	Y19 335360	240-320	4.9	An area of primary coastal tawa forest-treeland with rewarewa and pukatea in the canopy, and kohekohe common in the subcanopy. The forest merges into manuka-dominated scrub around the margins. Although the area is grazed by both sheep and feral goats the understorey is relatively diverse.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
488	Mangahua Stream	X19 255428	310-340	3.7	A narrow strip of modified primary rimu-totara forest on the lower slopes and narrow terraces beside the Mangahua Stream. Tawa is common at the western end only. Newly planted pine plantation surrounds the remnant, in some places the pines are planted amongst the treeland. Rimu and totara are very large.
489	Mangahua Station (a)	X19 247426	320-340	1.2	A small block of logged primary (rewarewa-pukatea)/tawa forest-treeland. Grazed by deer, stock, and feral goats. Old man's beard occurs in patches along roadside.
530	Timatanga (a)	X19 234419	180-300	21.1	Covers alluvial terraces and terrace risers on either side of the Nuhaka River, and hillslopes up a true right tributary. Three distinct vegetation types: 1. logged primary tawa forest, with pukatea and titoki scattered throughout the canopy on south-west facing slopes up the tributary, 2. partially logged rimu-kahikatea/tawa forest (large emergent rimu and kahikatea) on the alluvial terraces on the true right, and, 3. secondary broadleaved forest of rewarewa over a mosaic of five-finger and kohuhu, over the rest of the area. The understorey is moderately dense and diverse with good regeneration of podocarp and broadleaved species, and many ferns. Many weed species recorded including old man's beard, Mexican daisy, ivy, acacia, Robinia and wandering willie. Tui, bellbird and kereru were recorded.
532	Timatanga (b)	X19 228421	220-380	8.4	An area of logged primary rewarewa-pukatea/tawa forest, with mahoe and pigeonwood common in the subcanopy. Several large pukatea, hinau and kahikatea. Patches of low secondary broadleaved forest scattered throughout, dominated by wineberry, cabbage tree, kohuhu, treeferns, mahoe. Invasive weeds present include Robinia, *Acacia* sp., and old man's beard. The understorey is open, with light grazing from feral goats, stock have recently been excluded. Kereru recorded.
533	River Park	X19 229413	200-260	4.1	Modified primary (rewarewa)/tawa-pukatea forest with some very large hinau, pukatea and tawa. The understorey is recovering after recent stock exclusion. Almost completely surrounded by young exotic plantations. Threat from surrounding occurrences of old man's beard.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
536	Manganuiawea Stream	Y18 352505	60-180	41.0	A mosaic of kanuka forest and young kanuka-manuka scrub. Broadleaved trees and shrubs including pukatea, mahoe, wineberry, kohuhu, and houhere, are scattered throughout with larger trees confined to the stream gullies. Radiata pine plantations abut the northern and southern boundaries.
544	Kaikoura Stream	X18 124599	300-620	29.7	Advanced secondary broadleaved forest and treeland on the steep slopes and razor back spurs, with scattered large pukatea, kahikatea and young pole podocarps on the lower slopes. Along the lower slopes is an area of secondary totara-kanuka treeland with scattered wilding pines amongst it. The understorey is grazed and open.
545	Ahimanu	X18 116595	530-671	71.3	A mosaic of young secondary manuka-broadleaved scrub, and advanced secondary broadleaved forest with a mixture of species in the canopy including kohuhu, wineberry, rewarewa, five-finger and kamahi. It is grazed with farm tracks throughout and has had some recent damage from logging. Kereru and tui were recorded. Abuts Local Purpose Reserve (study site 875).
546	Whakapunake Station	X18 100588	510-620	7.5	An area mainly of logged primary rimu/tawa forest (two rimu remain in the remnant), with several patches of broadleaved trees including heketara, mahoe, lancewood, tree fuchsia, and tree ferns, where the canopy is broken. The area merges to young secondary manuka dominated scrub around its margins. Old man's beard was recorded. Grazed by domestic stock.
548	Florida Station	X18 103611	340-500	22.1	Secondary kanuka forest-scrub with scattered kohuhu, houhere, putaputaweta, and tree ferns in a south-facing steep sided gully. A few scattered large tawa occur in the gully bottom. The area is grazed by both domestic stock and feral goats leaving the understorey bare.
549	Mt Florida	X18 113603	500-638	31.8	Secondary kanuka scrub-shrubland reverting from pasture, with scattered kohuhu, putaputaweta, and cabbage trees. Grazed and open understorey.
551	Kainui Totara	X18 a) 043592 b) 042589 c) 040587	160-220	 1.3 3.0 2.2	The area includes three discrete patches of forest in the upper catchment of a true left tributary of the Hangaroa River. The northern patch (a) is mainly kahikatea forest with scattered totara and scattered broadleaved trees. The middle patch (b) is a grove of totara forest, and the southern patch (c) is kahikatea-totara-(kanuka) forest treeland. All are grazed and open underneath.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
553	Ruakituri Station	X18 a) 988543 b) 993546	120-400	 10.2 9.3	Two small patches: a) modified primary pukatea/tawa-titoki forest treeland on the lower slopes merging into secondary kanuka forest, and b) modified primary tawa forest surrounded by secondary kanuka/broadleaved forest. Both areas surrounded by newly planted pine plantations. Stock recently excluded.
554	Lake Rotokaha	X18 060597	260	13.2	Most of the native vegetation has been cleared from around the lake margin. Several small patches of rush and sedgeland remain out of stock grazing range, with scattered cabbage tree and manuka also present around the margin. Weeping willows are the dominant vegetation around the margin. Paradise shelducks recorded.
555	Lake Karangata	X18 046601	230-240	11.4	This lake is one of a series in the Tiniroto area. A band of raupo reedland runs almost completely around its margin, with some *Juncus* and *Carex* species also present around the edge. A small area of native vegetation occurs on slopes on the northern side of the lake, with kohuhu, mahoe, five finger and manuka. Exotic trees, planted on the rest of the slopes surrounding the lake, are part of the Hackfalls Arboretum.
556	Lake Kaikiore	X18 045606	260	14.0	This lake has a small marginal fringe of raupo reedland with clumps of *Juncus* spp. and *Carex* spp. amongst it. Most of the taller vegetation around the lake is exotic treeland. The margin of the lake is grazed and trampled to the water's edge.
557	Waihau Lakes and Bush	X18 a) 053620 b) 058620 c) 060623	290-360	 10.9 6.9 1.9	This study site includes two lakes and an area of forest treeland on the hills behind. The smaller lake (a) to the west is quite modified, although it has a small area of advanced secondary kahikatea-kanuka forest treeland along its north-eastern edge, and bands of raupo reedland around its margins. The larger central lake (a) is also very modified with most vegetation around its margin dominated by exotic species (*Salix* sp., Robinia, *Populus* sp.). There is a small area of secondary kanuka treeland at the south-eastern end. Te Kooti's track passes around its edge. On the south-facing hillslope above the larger lake there is a small remnant of tawa-dominated forest-treeland (c). This remnant lies below an old pa site. The margins of both lakes are heavily grazed and trampled by cattle.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
558	Green Lake (a)	X18 043628	270	2.8	This small lake has a narrow discontinuous band of native vegetation around its margin, mainly dominated by raupo with *Carex* sp. and *Juncus* sp. Several patches of manuka treeland exist (the largest at the eastern end) with pasture grasses in the understorey. The lake margin is grazed by domestic stock and feral goats. Bird observed include pukeko, paradise shelducks, mallards, and black swans.
559	Green Lake (b)	X18 042632	270	2.0	This small lake has a two small areas of raupo reedland at the eastern and western ends of the lake with harakeke, *Carex* spp. and *Juncus* sp. Several purei hummocks occur in open water. There is a small area of secondary forest-treeland at the lake's western end, dominated by kanuka with lancewood, kohuhu, mahoe and houhere, and exotic grassland in the understorey. High numbers of waterfowl observed.
564	Awapiko (d)	X18 031671	300-400	10.5	An area of logged primary tawa-pukatea forest which fades to rewarewa/ manuka-kanuka scrub at the margins. Kereru recorded. High numbers of feral goats observed.
565	Awapiko (f)	X18 037658	200-300	18.8	This area is predominantly advanced secondary rewarewa/totara forest on the upper slopes with an open grazed understorey. The lower slopes have advanced secondary totara-kahikatea/kanuka-manuka low forest scrub with scattered tawa and kowhai amongst the canopy. There is also a small area of logged primary kahikatea-(totara) forest with scattered large kahikatea and totara. The entire area is grazed by domestic stock and feral goats. Kereru recorded.
566	Awapiko (c)	X18 034675	380-455	6.8	Logged primary tawa-pukatea forest with scattered rewarewa and pole kahikatea on the upper to mid-slopes and stream sides. Young secondary rewarewa-kahikatea/manuka scrub with kohuhu, houhere and red-fruited karamu surround the core. The understorey is grazed by feral goats and domestic cattle. Tui and kereru recorded.
569	St Leger Lake	X18 053667	300	0.4	This small lake has an almost continuous marginal strip of raupo reedland 2-5 m wide. A small patch of manuka sedgeland, with swamp kiokio, bracken and patches of harakeke occurs at the western end of the lake. The vegetation is grazed and trampled to the lake margin. Paradise shelducks were recorded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
574	Te Arai Ford	X18 265539	200-400	23.3	This remnant is a mosaic of logged primary (pukatea)/tawa forest with totara, nikau, mahoe, and pigeonwood in the subcanopy, and young secondary manuka dominated scrub. Scattered wilding pines. Grazed by feral goats.
575	Waimata Stream (a), (b) & (c)	X18 a) 230650 b) 238645 c) 242639	100-220	 13.7 8.0 7.0	This series of remnants form a semi-continuous chain of indigenous vegetation on alluvial terraces and hillslopes, along a 2.5 km stretch of the Waimata Stream. All 3 areas have a secondary kanuka-totara component with scattered pole matai, kahikatea, titoki, kohuhu, putaputaweta, houhere, and kowhai along the stream sides. Area (a) also has several large ngaio, totara, and pukatea.
576	Mangakiore	X18 258631	60-120	5.3	A small area of advanced secondary totara-kanuka forest on an alluvial terrace and terrace riser of the Waimata Stream. Scattered matai and kahikatea throughout the canopy. Grazed and open.
577	Fairview (a)	X18 241523	440-500	9.4	Predominantly secondary rewarewa/kanuka-broadleaved forest with young rimu, matai, mahoe, kohuhu, and treeferns. Understorey is dense and diverse. The rest of the area is logged primary tawa-(rewarewa-hinau) forest. The area is surrounded by a radiata pine plantation. Understorey not grazed. 700 m west of Waingake Waterworks Bush (PNA 25).
578	Kopuawhara Bush	Y19 305337	30-100	4.5	A small remnant of primary logged tawa-pukatea/kohekohe forest treeland, with patches of secondary kanuka-totara forest on the alluvial terrace. Occasional emergent kahikatea are scattered on the flats. Very high numbers of goats were observed and the understorey was completely bare.
584	Tiromoana	X19 292353	220-260	1.7	A small stream gully with patchy logged primary tawa-rewarewa-karaka forest. Understorey is grazed and open with scattered pines throughout.
590	Mangaotara Stream	X18 045575	80-200	47.3	A long narrow strip of advanced secondary kanuka-totara-(kowhai-kahikatea) forest along the Mangaotara Stream. Dense kahikatea stands occur along the stream. Several areas of young secondary broadleaved scrub (including kohuhu, mahoe, kowhai, wineberry, putaputaweta, and titoki) occur along side SH36. Heavily grazed.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
592	Harewood	X18 072625	380-440	8.8	This area contains logged primary (rimu)/tawa forest, with scattered pukatea, hinau, and rewarewa in the canopy. Only one large emergent rimu remains. Small patches of secondary pole kahikatea forest-treeland lie on the lower hillslopes. The forest fades to secondary broadleaved treeland dominated by putaputaweta, houhere, kohuhu, mahoe, and cabbage tree at its margins. The understorey is grazed by domestic stock. Kereru were recorded.
593	Harewood Lake & Bush	X18 072618	330-380	5.0	The study site includes a lake that is about 75% open water, with raupo reedland and clumps of purei, harakeke, willows, common water milfoil, and various *Juncus* spp.. The north-facing slopes at the southern end of the lake support a remnant of rewarewa/tawa treeland. The lake is good wildlife habitat; pied shags, black swans, and ducks were recorded. Grazed and trampled to margin.
607	Mahanganui (a) & (b)	W19 a) 833435 b) 835435	80-180	 1.7 4.4	Two blocks of advanced secondary titoki-broadleaved forest treeland located in two small stream gullies on moderate slopes above SH38. a) Compact small forest remnant of kowhai, titoki, broadleaved mosaic which fades to treeland. The understorey is open due to grazing by both feral goats, and domestic stock. b) The second area is larger and more open - a mosaic of titoki and other broadleaved species.
623	Linwood	X18 075585	190-436	55.8	This area is dominated by secondary kanuka/broadleaved scrub-shrubland (putaputaweta, heketara, rewarewa, mahoe, tauhinu) with scattered large rimu and pukatea and pole totara, rimu and kahikatea. Young secondary manuka-tauhinu scrub surrounds the margin. Grazed by both feral goats and domestic stock. Kereru recorded.
625	Area 625	X18 088600	440-500	3.1	Logged primary rewarewa-kahikatea/tawa forest with secondary manuka scrub around the margins. Grazed by feral goats and domestic stock.
645	Mangaone Stream	X19 013426	80-140	12.5	A narrow strip of secondary kanuka-(totara-manuka) scrub-treeland along Mangaone Stream (lower Mangapoike tributary). Grazed and open understorey.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
701	Waikare Road	W19 756485	180-380	43.6	A block of secondary kanuka/manuka scrub covering the upper catchment of a small tributary of the Waikaretaheke River. This area is close to the Ruapapa Conservation Covenant and Waihi South Conservation Area (PNAs 54 and 55), which have larger areas of similar vegetation types. High numbers of feral goats observed.
702	Pokopoko Road	W19 746485	100-420	151.9	An area of secondary kanuka low forest and forest covering most of the catchment of a small north-flowing tributary of the Waikaretaheke River, and slopes close to the River. Other species present include cabbage tree, houhere, and putaputaweta. This area is very close to the Ruapapa Conservation Covenant and Waihi South Conservation Area (PNA 54 and 55), which contain larger areas of similar vegetation types. High numbers of feral goats observed.
708	Tawhiti Station	W19 635476	140-400	42.5	A block of primary tawa forest covering two small tributaries of Mangaone Stream, continuous with the Mangaone Stream Conservation Area (PNA 57) on the opposite bank. The main gully contains tawa/broadleaved (e.g. titoki, pukatea and rewarewa) forest with mixed podocarps (e.g. rimu, kahikatea, and totara). The lower half of the gully is dominated by totara. The area is fringed with young kanuka scrub.
710	Pukematai Stream	W19 537461	160-360	47.1	A block of secondary kanuka forest along the Pukematai Stream valley and extending for c. 3 km as a riparian strip along the south bank of the Waiau River. The area is semi-continuous with the Mangaone Conservation Area (PNA 57), which lies on the opposite side of the Waiau River. The kanuka has only a few species amongst it, including manuka, putaputaweta, and cabbage tree. High numbers of feral goats present.
711	Kakanui Gully	W19 643435	80-260	25.2	A long narrow strip of advanced secondary forest which extends from the Waiau River up the gully of a small tributary. The vegetation is a mosaic of kanuka-tawa/broadleaved forest with scattered pole rimu, kahikatea, and totara. The area has pines along the western boundary, with pasture surrounding the rest. Feral goats were recorded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
713	Mangahihi Stream (a) & (b)	W18 a) 798526 b) 800521	200-340	 7.0 6.7	Two blocks of modified primary rewarewa/tawa-(kanuka) forest in stream gullies of two small tributaries of the Mangahohi Stream. Both have tawa-dominated canopies with kanuka dominant on the ridges. Block b) has more kanuka with less primary forest, with several smaller areas of kanuka forest further up stream. Both areas are heavily grazed by feral goats. Kereru were observed.
715	Upper Mangapapa Stream	W18 783527	240-320	34.6	The majority of this area is modified primary tawa forest, with titoki, pukatea, and hinau scattered in the canopy. Small stands of pole kahikatea are locally common especially along the stream sides. High goat numbers have left the understorey very bare.
718	Craighurst	W18 806543	400-460	9.5	Partially logged tawa forest occurs on the hummocky ridge of a south-facing dip-slope. Several large emergent rimu occur in the centre of this remnant, with frequent pole rimu and kahikatea emergent throughout. Other species in the canopy include hinau, and pukatea. The area is not fenced, and is grazed heavily by domestic cattle and feral goats. Kereru were observed.
719	Tank Bush (c)	W18 823523	380-410	1.8	A block of modified primary rewarewa/tawa-pukatea forest treeland in a small gully. Pole kahikatea, rimu, and titoki are common in the canopy. The area is not fenced and has a very open understorey.
726	Tank Bush (d)	W18 704516	160-240	3.0	Modified primary tawa forest treeland with numerous pole rimu and kahikatea emerging through the canopy. Very open understorey due to high grazing pressure from both feral goats and domestic stock. Kereru recorded.
734	Upper Mangaone	W18 565522	360-520	42.6	A block of young manuka-kanuka scrub with broadleaved species regenerating (e.g. heketara, and tawari) through it, and occasional emergent rewarewa and rimu. Adjacent to the Mangaone Conservation Area (PNA 57), it covers a steep north-facing hillslope, extending from the stream up to the vehicle track and ridge. The area is fenced with domestic stock excluded. Deer sign was noted.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
736	Landcorp Scrub	W18 677510	340-509	50.6	An area of young kanuka-tutu-manuka-wineberry scrub situated on the upper slopes of a small tributary of the Waihi stream. Each of the species listed is locally dominant. The area is heavily grazed by domestic stock and feral goats, leaving the understorey bare. A few very small scattered remnants of advanced secondary pole podocarp-beech forest exist in the lower gullies.
737	Point 487	W18 685502	340-420	5.9	This study site contains a small block of partially logged rimu-kahikatea/ tawa forest in a steep stream gully. The area is unfenced and heavily grazed by both feral goats and domestic cattle, that have left the understorey bare. Kereru were recorded.
743	Painga Stream	W18 826584	150-380	59.5	This study site has two distinct vegetation types 1) logged primary tawa forest with occasional pole rimu and kahikatea, and 2) secondary kowhai-kanuka-broadleaved forest-treeland. Grazed by both feral goats and domestic stock.
745	Painga	W18 818590	350-370	3.4	Logged primary rewarewa/pukatea-tawa forest with very occasional pole rimu and kahikatea. Wind damage is quite severe. A diverse range of species is present despite the remnant's small size. Kereru were recorded.
750	Waireka Road	W19 617435	120-220	9.6	This area lies in a steep sided stream gully, and has advanced secondary titoki forest treeland with areas of locally dense kahikatea, totara and rimu. The steepest area at the northern end is almost solely dominated by kahikatea and totara. The understorey is sparse, with exotic grasses dominating. Both domestic stock and feral goats have access.
753	Ruapapa Rd Bridge	W19 668436	80-120	13.1	This block of advanced secondary totara/kanuka-broadleaved forest lies along the lower reaches of the Mangaone Stream only 200 m downstream of RAP TIN 127. Emergent totara is common amongst the mosaic canopy of kanuka and broadleaved species, with kahikatea becoming co-dominant along the stream edge. The area is fenced. The understorey is quite diverse with moderate regeneration.
755	Upper Putere Road	W19 515448	420-460	2.2	An area of logged primary rewarewa/tawa forest, with scattered emergent rimu. The understorey is heavily grazed with limited regeneration. Kereru recorded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
756	Kotare	X19 042478	120-480	128.1	Logged primary rewarewa/tawa forest with, scattered broadleaved species in the subcanopy. Merges into scrub on some margins. Grazed and open understorey. Has had recent logging.
762	Waikatea (b), (e), (f), (g)	X18 b) 937516 e) 905540 f) 914560 g) 913567	 220-414 140-400 240-590 200-480	 84 103 72 70	This study site contains four separate areas: (b) Solid block of almost solely kanuka forest, with scattered broadleaved trees particularly in the gully. Some open grassy patches. (e),Kanuka/manuka scrub, with occasional tauhinu, houhere, and cabbage tree in the canopy. Adjoining area along Wairenga Stream is part of RAP TIN 96. Grazed by both feral goats and domestic stock. (f) Secondary kanuka/manuka scrub, with occasional tauhinu, houhere, and cabbage tree in the canopy. Grazed by both feral goats and domestic stock. (g) Secondary kanuka forest with cabbage tree, houhere, mahoe, treeferns, and kowhai in the canopy. Occasional tawa and titoki occurs in stream gullies. Grazed by both feral goats and domestic stock.
766	Whareti Stream	X18 990635	300-560	187.1	Situated in the upper catchment of the Whareti Stream, this area is composed of kanuka scrub-forest that is regenerating through rough pasture. Other species include cabbage tree, putaputaweta, mahoe, and crown fern. Feral goat numbers are high.
767	Mangapiopio Stream	X18 994674	220-500	130.3	Patchy area of kanuka scrub-forest. All secondary vegetation has established through rough pasture. Most of the remnant lies on lower slopes beside the Mangapiopio Stream. The slopes are dissected quite uniformly by tributaries of the stream.
772	Mangaroa Bush	X18 a) 953630 b) 964631	300-510	 15.0 9.2	Two areas, c. 1 km apart, of secondary kanuka-dominated forest-scrub with emergent rewarewa, pole rimu and kahikatea. Other species include houhere, mahoe, kohuhu, kowhai, mamaku, silverfern and pukatea. Grazed by both feral goats and domestic stock.
783	Mangatahae Stream	X18 924725	580-736	111	Vegetation pattern is similar to that in RAP TIN 106; degraded and intact primary conifer/tawa-beech forest on the lower slopes and upper central slopes, with broadleaved scrub-shrubland-low forest on the upper slopes.
784	Ngapakira	W18 862673	660-884	13.7	Contains two distinct vegetation types 1) Logged primary beech forest and 2) Secondary broadleaved forest, on steep south-facing slopes adjoining RAP TIN 109.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
786	Tomo	X19 033471	120-280	10.4	Small area in the upper-mid catchment of a small true right tributary of the Mangapoike River. Small-leaved scrub-forest on the mid-upper slopes with broadleaved trees in the stream gully.
787	Waiau Station	W19 520444	440-500	3.9	Logged primary tawa-rewarewa forest with occasional hinau, mahoe, titoki and treeferns. Grazed and open understorey.
792	Upper Makaretu Stream	X17 114917	600-680	4.4	The bulk of the study site is modified primary tawa-dominated forest, with broadleaved mosaic in between, and bracken fernland and low scrub on the upper slopes - perhaps burnt quite recently.
793	Kowhai Bush	X17 227888	100-265	6.5	Lower slopes have degraded primary tawa-dominated forest with broad-leaved mosaic on the steeper mid-upper slopes - with lots of kowhai amongst it. Totara or kahikatea in a pocket at the bottom of the slope, with totara scattered along the ridge at the top. One of the few forest areas in the dry northeastern corner of the District.
794	Upper Mangapapa Stream	X19 a) 173340 b) 174343 c) 177341	340-400	 1.7 1.7 7.3	This study site includes three areas in the upper catchment of Mangapapa Stream, upstream of RAP WAH 6. They are modified remnants of the original primary semi-coastal tawa/kohekohe forest, with karaka, nikau and titoki also present. All are grazed.
795	Makaretu Stream/ Hereheretau Rd	X19 a) 034424 b) 044426	 120-200 120-180	 5.1 10.7	a) includes tawa-dominated modified primary forest on lower slopes and an alluvial terrace beside Makaretu Stream, with broadleaved low forest on the upper slopes and ridge. The forest has some scattered conifers e.g. kahikatea. b) is a narrow strip of vegetation between Makaretu Stream and Hereheretau Rd. Predominantly secondary (kanuka-dominated).
799	Mangarewarewa Stream Trib.	W18 854627	380-560	21.8	Beech forest on the ridges and broadleaved forest on the upper-lower slopes - also tawa, and kamahi.
804	Taopo Stream	W18 887675	240-320	10.2	Located in the Ruakituri River valley opposite the Waipaoa 5C reserve (PNA37) and downstream of Taopo Stm. Small area of primary rimu/tawa forest, with large emergent rimu. The canopy is composed of tawa, titoki, rewarewa, and hinau. Domestic stock and feral goat grazing has left the understorey completely bare; no regeneration, with only scattered ferns. Kereru recorded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
815	Fairview gullies	X18 240515	400-500	20	In the upper catchment of the Mangapoike River, close to RAPs TIN 58 and 56 and Waingake Waterworks Bush (PNA25). Native vegetation surviving is mostly small pockets of primary/advanced secondary forest (with tawa, red and black beech and other broadleaved trees) mainly in the stream gullies, after the extensive surrounding manuka scrub was recently cleared for pines.
823	Preston Road	W19 893470	80-200	59.3	An area of secondary (totara)/kanuka forest with scattered broadleaved trees, mainly on lower south-facing slopes of several branches of a tributary of Mangaaruhe River. Grazed by both feral goats and stock.
843	Lake Whakamarino	W18 707576	250-300	15.4	Secondary kanuka scrub-forest with several small areas of older rewarewa-tawa-(titoki) forest, beside Lake Whakamarino opposite Tuai settlement. Tracking and power pylons. On the boundary of the Tiniroto and Waikaremoana Ecological Districts.
847	Mangaone Tributary	W19 662473	140-280	18.1	Steep slopes flanking a southwesterly flowing tributary of Mangaone Stream, continuous with PNA 57 (Mangaone Stream Conservation Area). A continuation of its secondary vegetation pattern, mainly kanuka-dominant scrub-forest with advanced secondary forest patches including broadleaved trees, totara and kahikatea.
851	Upper Mangaone Stream	W19 620500	200-280	4.1	Small area continuous with the north-western end of PNA 57 (Mangaone Stream Conservation Area). It is predominantly kanuka scrub-forest on moderate to steep riparian slopes on the Mangaone Stream.
854	Mohaka Tributary	W19 624343	80-220	25	Continuous with Pihanui Conservation Area (PNA 64) along its southern/ south-eastern boundary. It covers moderate-steep slopes in a T/L tributary of the Mohaka River. The vegetation is a mix of tawa forest on the lower slopes, and kanuka forest with treeferns and broadleaved trees.
858	Whataroa	W18 826570	140-190	10.6	Continuous with Te Raupo Scenic Reserve (PNA 41) along the reserve's upstream/northern boundary, this study site covers mod-steep stream gully and riparian slopes in the lower reaches of Painga Stream a TL tributary of Mangaaruhe River. Vegetation includes broadleaved shrubland-forest with emergent kahikatea and totara.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
859	Te Ra Bush	W18 837558	120-200	20.6	Continuous with southern end of Te Raupo Scenic Reserve (PNA 41), it covers moderate-steep slopes along the Mangaaruhe River with advanced secondary conifer-broadleaved forest.
860	Waihi Rd	W18 708515	240-380	87.4	Continuous with northern end of Waihi South Conservation Area (PNA 54) and RAP TIN 125 to the north, and lying on both sides of Waihi Rd. Vegetation is predominantly kanuka scrub-forest.
861	Tarapatiki Sth	W18 725688	250-420	13.6	Small area continuous with the northern boundary of Waihi South Conservation Area, and complementing it - lies between the cadastral straight-line boundaries of the PNA and the catchment boundaries of the Waihi Stream. Predominantly kanuka scrub-forest with some traces of primary forest in stream gullies.
871	Tirotirowhitu	X19 063394	80-300	177.5	Continuous with eastern end of Anewa Reserve (PNA 30) and the northern end of Kumi Conservation Area (PNA 29). Bulk of the vegetation is kanuka scrub-forest with some more diverse areas with broadleaved trees.
875	Local Purpose Reserve	X18 119595	540-671	10.5	Reserve lies on moderate slopes extending from Parikanapa Road to Ahimanu high point (671 m). The eastern end of the reserve is pine plantation, with modified tawa-broadleaved forest over much of the rest. A band of broadleaved low forest scrub runs along the roadside, which contains a healthy population of *Hebe tairawhiti*.
896	Takararoa (b)	Y19 334368	100-380	38	Covers the upper slopes of a small catchment flowing directly and steeply to the sea. Predominantly secondary vegetation with small ribbons of broad-leaved trees in gullies (e.g. kohekohe, titoki, karaka, ngaio). Scrub is mostly kanuka with tauhinu, hard fern, and red-fruited karamu.
897	Takararoa (a)	Y19 355375	0-320	110	One of a series of small, steep sea-flowing catchments on the eastern coast of the Tiniroto Ecological District. Predominantly secondary vegetation - kanuka-manuka and broadleaved scrub, shrubland and fernland, with pockets of primary and advanced secondary broadleaved trees in the moist stream gullies and on the south-facing slopes. Adjoining upper slopes planted in pines - some wilding pines in study site.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - TINIROTO

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
902	Tikiwhata (b)	Y19 346410	0-400	32.5	Steep-sided basin with steeply incised stream gullies, immediately south of Tikiwhata. Broadleaved trees in lower stream gully slopes, otherwise predominately kanuka-manuka scrub. One of a series of sea-flowing catchments between Mahanga and Whareongaonga.
924	Moumoukai North	X19 232391	520-580	5.1	Small area of advanced secondary broadleaved forest on moderate-steep slopes in the upper catchment of Mangaraukai Stream, on limestone just north of the summit of Moumoukai (612 m).
926	Moutotara Stream	X18 925656	380-516	38.6	An area of partially logged rimu/tawa-(beech) forest with patches of broadleaved scrub and pasture, extending over ridge and valley terrain.
927	Upper Mangatupo	X18 943653	390	2	A small patch of primary kahikatea/tawa forest on alluvial terraces in an unnamed true left tributary of Mangatupo Stream.
938	Mid-Makaretu Stream	X19 086400	170-200	1.9	A small area of modified primary forest which lies on an alluvial terrace and terrace riser on the true left of Makaretu Stream.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
Waihua Ecological District					
179	Waiatai Road (a)	X19 1a) 962338 1b) 964338 2) 966337	10-60	 1.0 1.2 1.5	Three small discrete remnants of modified primary semi-coastal forest in the Waiatai Valley. Remnants 1a and 1b are treeland of scattered karaka, titoki, tawa and pukatea. Remnant 2 is kahikatea-pukatea/totara forest with scattered cabbage trees on the alluvial terrace and lower slopes. Narrow bands of manuka scrub occur around all remnants. All three are grazed by domestic stock.
180	Rotopara Bush	X19 975337	20	1.9	Partially logged primary kahikatea/(pukatea-tawa)/karaka forest treeland on an alluvial terrace. Some large kahikatea still exist, scattered throughout the remnant. Some exotic trees are also present.
181	Waiatai Road (b)	X19 a) 987350 b) 989351	60-140	 2.3 6.1	Two small areas of advanced secondary scrub treeland; a mosaic of kanuka, rewarewa, titoki, mahoe, totara, kowhai, cabbage tree, wineberry, and five-finger. The understoreys of both are grazed and open.
182	Waiatai Road (c)	X19 997353	80-180	7.4	A small area of kanuka-broadleaved forest on a moderate south-westerly facing slope, which extends from streamside to ridge. Broadleaved species present amongst the kanuka include lancewood, mahoe, kohuhu, houhere, rewarewa, kowhai, and ngaio.
183	Waiatai Road Wetland	X19 012355	40	1.3	A small area of advanced secondary kahikatea/giant umbrella sedge-*Juncus* sp. swamp forest on the floor of a small tributary valley, surrounded by kahikatea treeland. It is modified by past logging, drainage, domestic stock grazing, and invasion of exotic weeds.
184	Upper Waiatai Road (a)	X19 017357	80-120	1.4	A small remnant of logged primary (rewarewa)/tawa-titoki/kohekohe forest, with a bare and open understorey. However, it has recently been surrounded in pine plantation, and has had stock excluded, so the understorey will likely recover.
185	Upper Waiatai Road (b)	X19 018361	100-120	0.7	This very small remnant of modified primary titoki/kohekohe treeland is amongst a newly planted pine plantation. Stock have recently been excluded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
186	Point 137	X19 981326	60-120	1.3	A small area of heavily modified primary karaka treeland with scattered titoki, kohekohe, five-finger, nikau, and kohuhu. Very open and grazed. Wind damage was noted on canopy trees - the area is high on a south-facing slope.
187	Area 187	X19 989327	20-60	1.8	Small area of young secondary manuka scrub with scattered emergent broadleaved trees including karaka, and kohuhu. Grazed and open understorey.
188	SH2 Treeland	X19 092299	40-60	1.2	Two small patches of heavily modified treeland dominated by karaka with scattered pukatea, cabbage tree, mahoe, and titoki. Heavily grazed and open understorey.
190	Tahere (a)	X19 059335	20	1.4	A small area of modified primary kahikatea/titoki treeland, with scattered pigeonwood and pukatea on alluvial valley fill. The understorey is open and grazed.
192	Point 223	X19 066352	120-180	3.1	An area of predominantly logged primary rewarewa/tawa-titoki forest, and a small area of secondary rewarewa/kohuhu forest treeland. Grazed and open understorey.
193	Waituku (a)	X19 058321	20-90	2.9	Logged primary rewarewa/tawa-(karaka-kohekohe) forest which merges into kanuka-manuka scrub on the ridges. The understorey is only lightly grazed with good regeneration. Kereru and tui recorded.
195	Tahaenui River (a) & (b)	X19 a) 080350 b) 082350	95-100	 3.0 3.5	Two areas of logged primary rewarewa-pukatea/tawa-titoki forest, with mahoe, nikau, and pigeonwood abundant in the subcanopy, on alluvial valley fill. The remnant to the west (a) is partially fenced with a lightly grazed understorey. The remnant to the east (b) is not fenced with a heavily grazed and open understorey.
197	Tahaenui River (c)	X19 097342	80-100	1.7	A small remnant of mainly modified primary (pukatea-rewarewa)/tawa-titoki forest with karaka and kohekohe common in the subcanopy, on alluvial valley fill. A small stand of pole kahikatea occurs on the toe of the slope. The understorey is open and grazed.
205	Kauhauroa Stream (a)	X19 955395	20-220	34.7	An area of young secondary manuka-kanuka scrub and manuka-tauhinu scrub-shrubland with scattered emergent broadleaved trees. The understorey is grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
206	Kauhauroa Stream (b)	X19 961396	40-140	8.7	A mosaic of advanced secondary rewarewa/kanuka-tawa forest, young secondary kanuka-manuka-broadleaved scrub and manuka-(broadleaved) scrub. The broadleaved species include mahoe, mapou, putaputaweta, and cabbage tree. The understorey is open and grazed.
207	Pines Bush	X19 a) 963409 b) 966409	100-200	 1.3 4.7	Two discrete remnants: (a) secondary broadleaved forest and (b) a small area of modified primary rewarewa/tawa-titoki forest. Both areas are surrounded by pine plantations. High numbers of feral goats were observed.
208	Tank Bush (a)	X19 980406	60-100	1.0	A small remnant of modified primary tawa/titoki forest. The understorey is open with high numbers of feral goats recorded.
209	Maromauku	X19 993387	60-100	2.3	A small remnant with advanced secondary kahikatea-(totara) forest treeland on the lower slopes and stream side, and modified primary tawa-titoki forest on the upper slopes. The understorey is grazed and open.
210	Kauhauroa Stream (c)	X19 982408	50-120	2.2	A small area of scattered primary trees and secondary broadleaved forest treeland. Common species include tawa, titoki, rewarewa, and pukatea. Grazed by both feral goats and domestic stock.
211	Clydebank	X19 987413	60-100	2.4	An area of partially logged primary rewarewa/tawa-titoki forest, with a small area of advanced secondary totara forest with a dense canopy along the back ridge. The understorey is grazed by both feral goats and domestic stock.
212	Kauhauroa Stream (d)	X19 998412	40-60	0.7	A small area of logged primary pukatea-rewarewa-tawa forest treeland with scattered kanuka, titoki and totara. The understorey is bare and open. Grazed by both feral goats and domestic stock.
213	Kauhauroa Stream (e)	X19 009411	50-110	10.9	This is the most diverse of the study sites in the valley of Kahauroa Stream. It has three distinct vegetation types ranging from young secondary kanuka-manuka-(putaputaweta-mahoe) scrub on the steep stream sides, to the main area of advanced secondary totara-titoki-kanuka, with secondary totara-kanuka forest on the upper slopes and ridges. Feral goats and domestic stock graze the open understorey. Kereru observed.
215	Kauhauroa Stream (f)	X19 019413	140-180	1.0	A small remnant of modified logged rewarewa-pukatea/tawa-titoki forest-treeland. The understorey is grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
246	Te Pingao Stream	X19 175325	200-280	7.1	Modified primary semi-coastal forest with tawa and pukatea over a sub-canopy of karaka, kohekohe, and mahoe. The understorey is bare, with grazing by both feral goats and domestic stock. The small stream which runs through the forest originates from a limestone cave system, and is very clean and clear. It supports high numbers of stream invertebrates. There is a high diversity of plant species near the stream e.g. ferns (*Blechnum fluviatile*) and watercress. Mexican daisy carpets areas along stream banks. Kereru were observed.
247	Te Pingao (b)	X19 176317	180-220	1.3	Modified primary rewarewa/tawa-pukatea/kohekohe forest and treeland. The understorey is bare with high numbers of feral goats present.
248	Te Pingao (a)	X19 180323	200-260	7.5	Modified primary tawa-pukatea forest, with karaka and kohekohe in the sub-canopy. The main area is fringed by young secondary manuka-kanuka-tauhinu shrubland. The tawa and pukatea in this area are very large.
249	Te Pingao (c)	X19 176313	150-180	1.0	Degraded primary semi-coastal forest on limestone: karaka treeland with scattered kohekohe, tawa, nikau, and rewarewa. Understorey open and bare. Feral goats recorded.
250	Kokohu Station	X19 150322	100-140	1.4	Small area of semi-coastal treeland in a small stream gully. Karaka is the dominant species, with kohekohe and ngaio. There is no understorey with high feral goat and domestic stock numbers grazing the area. Rocky debris from the bluffs above litter the understorey.
251	Dagger Vee (a)	X19 118328	50-80	3.6	An area of modified primary kahikatea/tawa and titoki forest-treeland, and scattered primary kahikatea and totara on alluvial terrace of Tahaenui River. Feral goats recorded.
252	Dagger Vee (b)	X19 110332	60-120	5.6	Small area of modified primary rewarewa/tawa-pukatea/karaka-kohekohe forest treeland which merges into heavily modified nikau treeland, on slopes beside the Tahaenui River. The understorey is heavily grazed by both feral goats and domestic stock. One large matai and kahikatea occur in the centre of the remnant. High numbers of kereru were observed.
253	Dagger Vee (c)	X19 109333	60-80	1.5	A remnant of logged primary rewarewa/tawa forest-treeland on hillslopes and a terrace beside the Tahaenui River. The understorey is grazed by both domestic stock and feral goats. Kereru recorded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
254	Kokohu Bluff	X19 145321	80-220	6.3	The study sites includes a small area of harakeke-*Hebe* sp. flaxland shrubland on an exposed limestone bluff/cliff face, and an incised stream and waterfall (Pohatunui Stream). Other species present on the bluffs and along the stream include rangiora, hangehange, tutu, wineberry, and *Jovellana sinclairii*. Bluff appears inaccessible to goats.
255	Kokohu Road	X19 165302	20-120	27.3	An area of young kanuka/manuka scrub with broadleaved trees and shrubs scattered throughout, extending over 1 km along slopes above Kokohu Rd. Grazed and open. Some of the site has recently been cleared.
263	Nuhuka River (a)	X19 223355	40-100	3.3	An area of modified primary titoki-pukatea-tawa forest on a terrace riser and hillslope above the Nuhaka River, with young manuka scrub on the alluvial terrace. Grazed by both domestic stock and feral goats.
264	Point 131	X19 219359	90-110	0.3	Small forest remnant on a ridge above the Nuhaka River: modified primary (rewarewa)/titoki-tawa-pukatea forest with kohekohe, nikau, putaputaweta and karaka in the subcanopy. Pines now surround the area. It has been heavily grazed in the past but stock have now been removed.
265	Clark's Bluff	X19 222345	40-100	4.6	A long narrow strip of advanced secondary pukatea-titoki/kohekohe-(kowhai) treeland on very steep hillslopes/bluffs, with Nuhaka River Road running along its eastern boundary. Grazed by feral goats. Kereru observed.
266	Mangaone Valley Road (a)	X19 217323	60-120	5.8	An area of modified primary tawa-(pukatea-rewarewa) forest on north-facing slopes in the Nuhaka valley. Heavily grazed by both feral goats and domestic stock. Kereru recorded.
269	Clonkeen Slope	X19 199352	220-280	4.5	Small hillslope of logged primary tawa-pukatea forest treeland merging into rewarewa treeland along the top ridge. Grazed by feral goats.
272	Omana Rd (a)	X19 202326	60-120	16.2	A sizeable area of modified primary tawa-(pukatea-karaka)/kohekohe forest on easy lower slopes, surrounded on three sides by a pine plantation. Until recently the area was heavily grazed, but stock are now excluded. Kereru and tui recorded.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
273	Omana Rd (b)	X19193313	60-120	1.6	A small site on moderate slopes in a stream gully c. 2 km north of Nuhaka. The vegetation is tawa-karaka forest which merges to kanuka forest on the margins. Other species present in the canopy include ngaio and rewarewa. Grazed with an open understorey.
278	Mangaone Valley Road (b)	X19 213337	60-100	4.7	Three small discrete patches of modified primary lowland forest; two are tawa-titoki treeland with a very open and grazed understorey, the third (and most easterly) is much the same but with a higher proportion of kohekohe in the subcanopy. All areas are grazed by both domestic stock and feral goats.
279	Mangaone Valley Road (c)	X19 204338	160-170	1.1	A small area of logged primary titoki-tawa forest-treeland, with kohekohe, hinau, pukatea and rewarewa. Pines and poplars have been planted around the margin. Grazed by both domestic stock and feral goats.
286	Maungatiaki Road (b)	X19 090315	40-140	9.9	Young secondary manuka-kanuka scrub-shrubInd with infrequent scattered broadleaved species in the canopy. Grazed by both domestic stock and feral goats.
287	308 Gullies	X19 092329	180-260	7.2	Two small patches of tawa/kohekohe forest-treeland with scattered hinau, pukatea, rewarewa, ngaio, and karaka. Heavily grazed by both feral goats and domestic stock.
288	Maungatiaki Road (c)	X19 083324	50-180	4.0	A small strip of modified primary tawa-titoki/kohekohe-karaka forest merging into young kanuka-manuka scrub at the margins. Very open understorey, grazed by both feral goats and domestic stock.
289	Kumi Road (a)	X19 073360	100-245	31.8	A mosaic of manuka scrub and kanuka scrub-forest with scattered broad-leaved trees in the gullies. The understorey is grazed by both feral goats and domestic stock.
290	Kumi Road (b)	X19 066357	100-160	3.5	A small gully remnant of modified primary tawa-titoki forest with scattered large pukatea. A dense stand of willow occurs at the bottom of the gully. The understorey is grazed by both feral goats and domestic stock.
291	Opoho	X19 103330	100-200	15.1	An area of kanuka/manuka scrub. Understorey is grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
293	Kehua Bush	X19 113323	60-100	1.4	A small remnant of tawa/kohekohe-(nikau) forest and treeland merging to secondary kanuka forest along the upper margin. The understorey is completely bare with both feral goats and domestic stock grazing the area.
294	Pryde's Gully	X19 095327	60-220	11.8	An area of secondary kanuka forest in a steep sided gully, with scattered broadleaved trees amongst the even-aged canopy. Understorey is grazed by both feral goats and domestic stock.
301	Hukewaka Station	W19 a) 865389 b) 860390 c) 855388	60-240	 16.0 8.5 18.8	Three discrete areas: (a) secondary kanuka forest with scattered broad-leaved species in the gullies, (b) young secondary kanuka/manuka scrub, and (c) secondary kanuka forest with scattered manuka and putaputaweta at the margins. Red-fruited karamu is the dominant understorey shrub in all areas. All areas grazed by both feral goats and domestic cattle.
302	Waiau Bush	W19 858407	20-140	9.9	A small area of secondary rewarewa-(tawa)/kanuka-broadleaved species and young secondary rewarewa-kanuka/manuka scrub. Grazed by both feral goats and domestic sheep.
303	Jarden Bush	W19 865380	20-220	206	A large area predominantly of pure secondary kanuka forest with minor areas of scattered young broadleaved trees (including putaputaweta, cabbage tree, and mahoe) and young secondary scrub along the lower slopes. Grazed by both feral goats and domestic stock.
305	Mangawhero Lake	W19 816408	100-101	1.3	This small lake has a fringe of raupo reedland with scattered manuka around the outer margin. Grazing by cattle extends c. 3 m into the wetland vegetation. High numbers of water birds.
311	Tutaekuri Stream (a)	W19 809368	80-120	3.1	A small remnant of modified primary kahikatea-rewarewa/tawa-(titoki) forest, on the true left bank of the Tutaekuri River. The understorey is diverse with some regeneration despite feral goat browsing.
312	Tutaekuri Stream (b)	W19 812368	80-120	2.1	A small patch of modified primary tawa forest, on the true left bank of the Tutaekuri River, immediately east of area 311. Scattered kahikatea and rewarewa are emergent over a canopy of tawa and titoki. The understorey is bare with poor regeneration, due in part to the high feral goat numbers.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
313	Tutaekuri Tributary	W19 820362	140-180	1.3	A small remnant of modified primary tawa-broadleaved forest, with titoki, rewarewa, ngaio, and pole kahikatea. The understorey is grazed by both feral goats and domestic stock.
314	Kiakia Tributary	W19 785345	80-220	33.8	An area of kanuka scrub with patches of taller kanuka forest in stream gullies. Grazed by both feral goats and domestic stock.
320	Te Waikopiro	W19 760346	100-220	9.4	This area lies in a long narrow south-facing stream gully, with modified primary tawa forest in the upper catchment and kanuka scrub on the lower slopes. Grazed by both feral goats and domestic stock.
321	Tahekenui Stream	W19 774347	90-130	16.2	This study site includes three areas of kanuka-dominated scrub, on slopes adjacent to the Tahekenui Stream and to the west. All areas are heavily grazed by both feral goats and domestic stock.
323	Kiakia Bush (a)	W19 800350	180-220	4.7	Logged primary tawa-pukatea-(rewarewa-kahikatea) forest with scattered titoki, mahoe, kohekohe, and treeferns in the subcanopy. Despite a long history of grazing the understorey is relatively diverse. Grazed by both feral goats and domestic stock. Kereru recorded.
324	Kiakia Bush (b)	W19 793343	140-220	3.7	Modified primary tawa-pukatea forest with pigeonwood, mahoe and tree-ferns in the subcanopy. Kanuka common around the fringes. Open under-storey grazed by both feral goats and domestic cattle. Kereru recorded.
325	Kiakia Bush (c)	W19 803343	80-160	4.2	Partially logged primary tawa forest with scattered emergent pukatea, rewarewa, and one large matai. Several dense stands of pole kahikatea are located on the streamside. Very exposed to prevailing winds. Understorey open and grazed by both feral goats and domestic stock. Kereru recorded.
326	M^{c}Kay Bush	W19 830324	80-180	13.4	Seven small patches of modified primary forest most of which lies on south-easterly facing slopes above SH2. The patches all have a mixture of species in the canopy including kohekohe, titoki, tawa, rewarewa, kanuka, kahikatea, ngaio, kohuhu, pigeonwood, and karaka. All of the areas are grazed by feral goats and domestic stock. Kereru recorded.
328	Te Kiwi Tributary	W19 784256	20-60	10.0	Small area of manuka scrub, with scattered broadleaved species throughout (including cabbage tree, tauhinu, karamu, and treeferns). Grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
329	Rahui (1)	W19 797300	140-200	3.1	An area of modified primary tawa-(titoki)/kohekohe forest treeland. Very open understorey with both feral goats and domestic stock having grazing access. One large kahikatea occurs in the middle.
330	Rahui (2)	W19 a) 795314 b) 785306	40-160	 36 18.4	This area includes two patches of kanuka/manuka scrub and low forest with scattered broadleaved species (including putaputaweta, cabbage tree, and mahoe), on either side of a valley. A small area of tawa-titoki forest occurs on a ridge in the northern corner of (a). Grazed by both feral goats and domestic stock.
331	Waihua Tributary	W19 782280	10-100	26.6	A long narrow strip of kanuka/manuka scrub along a true right tributary of the Waihua River. Grazed by both feral goats and domestic stock.
332	Raupani	W19 a) 769281 b) 760295	20-234	 100 99	Two large areas of mixed age kanuka scrub with pockets of very tall kanuka forest, lying respectively south and north of the RAP WAH31. Grazed by both feral goats and domestic stock.
334	Waihua Tributary (a)	W19 792293	20-40	3.8	A small remnant of modified primary tawa-titoki/mahoe forest-treeland. Pines have recently been planted around the margin of this area, with the understorey showing signs of recovery with the exclusion of both stock and feral goats.
335	Waihua Tributary (b)	W19 765317	40-100	2.5	A small area of secondary kanuka/broadleaved forest. Grazed by both feral goats and domestic stock. Kereru recorded.
338	Ridge Road	W19 717303	180-260	6.2	An area of modified primary to advanced secondary tawa/broadleaved-kanuka forest. Kereru recorded. Grazed by both feral goat and domestic stock.
340	Mangakino Road	W19 719348	140-220	3.7	A remnant of modified primary rewarewa/tawa forest with scattered titoki, pigeonwood and large numbers of treeferns in the subcanopy. The understorey is lightly grazed withred fruited karamu and ferns (gully fern and nini) common. Kanuka is common around the edges of the remnant. Feral goats are present.
341	Ngamahanga	W19 740326	60-240	31.4	An area of predominantly kanuka/manuka scrub with scattered tawa in gullies. Pines along the south-western boundary. Heavily grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
371	Cricklewood Road - 336	W19 750377	220-280	3.5	A small remnant of modified primary tawa forest located on a south-facing slope. Other species present include titoki, scattered emergent rewarewa, and kahikatea on the fringes. The area is unfenced, with an open and grazed understorey (domestic stock and feral goats). Kereru present.
411	Avalon (b)	X19 928443	20-185	22.1	This area contains kanuka-dominated secondary forest with scattered broadleaved trees, and manuka scrub around the margins. Understorey is bare, with both feral goats and domestic stock grazing.
413	Mangaaruhe Gully (c)	X19 944479	20-160	4.9	An area dominated by logged primary tawa/(titoki) forest with patches of advanced secondary forest - a mosaic of kanuka, putaputaweta, totara and kowhai. Kowhai dominates the steep lower slopes. Grazed by both feral goats and domestic stock. Kereru recorded.
415	Mangaaruhe River (a)	X19 938476	40-45	2.4	A small area of solely secondary kanuka forest on alluvial terrace. Understorey very open with grazing by both feral goats and domestic stock. Some recent clearance in the central area.
417	Woodend Station	X19 003460	40-100	17.6	A long narrow strip of secondary (totara)/kanuka forest on alluvial terraces, riparian slopes and a tributary gully. Scattered wilding pines. Grazed by both feral goats and domestic stock.
421	Kohitane (a)	X19 979354	60-120	1.7	A small remnant in a headwater gully/slope dominated by modified primary pukatea-rewarewa/tawa forest-treeland. Pines recently planted around the margin. The remnant is fenced, with domestic stock and feral goats recently excluded, and a subsequent improvement in regeneration
422	Kohitane (b)	X19 980352	80-120	1.9	Modified primary pukatea/titoki-tawa forest-treeland with scattered large kanuka in the canopy. The understorey is very open, with past heavy grazing. Pines have been planted around the margins. Kereru and red deer noted.
423	Kohitane (c)	X19 978357	80-145	2.5	An area mainly of advanced secondary forest, with emergent rewarewa over a canopy of kanuka, mahoe, putaputaweta, tawa, treeferns, kowhai and pole kahikatea. Grazed by both feral goats and domestic stock.
424	Rotoparu Tributary	X19 958359	60-110	3.3	A small block of solely kanuka forest. Grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
492	Kiwi Station (a)	W19 843297	80-140	1.6	A small remnant of modified primary tawa-titoki/kohekohe-mahoe forest. Heavily grazed by both feral goats and domestic stock.
493	Kiwi Station (b)	W19 850298	80-160	2.4	A small gully of modified primary (rewarewa-titoki)-tawa/kohekohe forest merging into advanced secondary forest-treeland with a mixture of karaka, cabbage tree, ngaio, titoki, and kohekohe in the canopy. Grazed by both feral goats and domestic stock.
494	Kiwi Station (c)	W19 856298	80-140	2.2	An area of modified primary (rewarewa)/tawa-titoki-(karaka) forest and treeland. Heavily grazed by both feral goats and domestic stock.
495	Point 149 Bush	W19 838301	95-120	2.6	A small remnant of modified primary (rewarewa)/tawa-(titoki) forest with kohekohe and mahoe in the subcanopy. Surrounded by newly planted pine plantation. Heavily grazed.
496	Kiwi Station (d)	W19 852316	100-140	0.7	An area of mainly secondary broadleaved forest dominated by a mosaic of species including tawa, ngaio, kohekohe, titoki, and mahoe. Open understorey grazed by both feral goats and domestic stock.
500	Waiotia Stream	W19 a) 684213 b) 685216	80-190	 1.8 1.5	Two small coastal forest remnants in the upper Waiotia stream: (a) kanuka forest merging to karaka-titoki forest on the lower slopes, and (b) advanced secondary titoki-kanuka-karaka treeland. Grazed by both feral goats and domestic stock.
502	Pylon Gully	W19 820293	80-140	2.6	A small area of advanced secondary rewarewa/(kohekohe-karaka) forest, surrounded by newly planted pine plantation. It has been heavily grazed in the past, however stock are now excluded and some goat control is carried out.
503	Waitangi (b)	W19 820298	100-140	1.2	Small gully of modified primary rewarewa/tawa-titoki-karaka forest and treeland with kohekohe abundant in the subcanopy. Surrounded by newly planted pine plantation. Heavily grazed in the past by stock and feral goats, but these have recently been excluded.
505	Te Rapa Stream	W19 723263	40-200	20.5	A long narrow area comprised of a small patch of modified primary tawa-(titoki-karaka-kohekohe) forest surrounded by young secondary kanuka scrub-forest. Grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
508	Ponui Road	W19 653257	120-210	10.5	A long narrow gully dominated by modified primary tawa/(titoki) forest and treeland which merges into advanced secondary low forest on the western side of the stream (a tributary of Waitaha Stream). Heavily grazed by both feral goats and domestic stock.
510	Tank Bush (b)	W19 623270	160-260	13.7	A central core of modified primary (kahikatea)/tawa-(titoki-karaka) forest with pigeonwood and mahoe common in the subcanopy, surrounded by secondary kanuka forest-treeland. Pole kahikatea are scattered throughout the entire area. The understorey is relatively diverse despite grazing by both feral goats and domestic stock.
512	Haliburton Gully	W19 580273	200-260	3.0	Modified primary rewarewa/tawa forest with advanced secondary titoki/ mahoe-pigeonwood-putaputaweta forest on the lower slopes. Grazed by both feral goats and domestic stock.
513	Wedge Southern Gully	W19 565267	80-160	11.0	A steep sided gully of secondary kanuka forest, with scattered broadleaved trees and shrubs. Only the upper, less deeply incised part of this study site is in the Waihua Ecological District - the lower part lies in the Maungaharuru Ecological District. Grazed and open understorey.
515	Waitaha Road (a)	W19 630220	50-70	3.1	Modified mainly primary rewarewa/titoki-(kanuka-karaka-tawa) forest, with a mosaic of secondary forest treeland on the upper slopes. The understorey is grazed by both feral goats and domestic stock.
516	Waitaha Station (a)	W19 621234	95-110	2.5	Primary tawa-titoki forest on the alluvial terrace and terrace riser of a tributary of the Waitaha Stream. Kowhai treeland on the upper slopes. Grazed by both feral goats and domestic stock.
517	Waitaha Station (b)	W19 612243	70-120	5.5	A long narrow strip of secondary rewarewa/kanuka shrubland low forest. Scattered titoki and mahoe in the canopy.
518	Waitaha Road (b)	W19 623215	80-180	3.8	Secondary (rewarewa)/kanuka forest-treeland, with scattered kowhai on the upper slopes and scattered titoki on the lower slopes. Grazed by both feral goats and domestic stock.
519	Waikari Tributary	W19 573227	60-120	11.4	Small area of kanuka forest on steep riparian slopes, with scattered kowhai, cabbage tree, and manuka throughout. Grazed by both feral goats and domestic stock. Some recent clearance.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
543	Pukehau	X19 a) 015487 b) 013486	80-170	 16.3 7.4	Two areas of even-aged kanuka forest in separate steeply incised stream gullies. Grazed by both feral goats and domestic stock.
580	Opoutama Stream	X19 281325	80-280	17.9	This area has two vegetation types; logged primary rewarewa/tawa forest with pukatea, scattered karaka, titoki, ngaio and nikau on the upper slopes, and on the upper slopes young secondary manuka-tauhinu scrub with a very broken canopy.
582	Opoutama Ridge (a)	X19 286318	80-100	2.3	A small remnant of modified primary (rewarewa)/tawa-(pukatea) forest and treeland. The understorey is grazed and open.
583	Opoutama Ridge (b)	X19 275328	280-300	4.8	A small remnant of modified primary (rewarewa)/tawa/kohekohe forest tree-land along the very exposed ridge west of the headwaters of Opoutama Stream. The understorey is very open and grazed, and the canopy has notable wind damage.
586	Bluck's Pit Beach	X19 170284	0-10	108.2	This study site contains a substantial area of dunes and a cluster of small wetlands, extending east from the end of Bluck's Pit Rd. Spinifex dominates most of the vegetation on the foredunes, with exotic marram present in parts. A single population of pingao, a native sandbinder restricted to only a few sites in the ecological region, is present on a small foredune at the western end. Other species present include sand sedge, sand convolvulus, harestail, pohuehue, and lupin. RAP WAH 4 is continuous with the study site to the east.
587	Cableway Forest	X19 941465	60-140	11.8	Two adjoining gullies with a small central core of modified primary tawa forest surrounded by secondary kanuka forest-treeland. The understorey is heavily grazed by feral goats and domestic stock.
595	Black's Gullies	X19 a) 249284 b) 249280	80-180	 10.0 0.9	This study site includes two gully remnants in the upper catchment of the Waikokopu Stream directly inland from Black's Beach. The larger (a) is predominantly modified primary rewarewa/tawa/kohekohe forest-treeland with pockets of titoki common, scattered ngaio, and infrequent hinau and karaka. The other smaller area (b) is similar in composition but has slightly more karaka and titoki in the canopy. Their understoreys are heavily grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
597	Wai (a)	X19 a) 239291 b) 236292	40-100	 1.4 1.6	Two small remnants of semi-coastal forest on north-facing slopes: (a) modified primary tawa-karaka-(titoki) forest and (b) modified primary (rewarewa)-tawa/titoki-karaka forest. Being north-facing they are sheltered from onshore (southerly) winds. Heavily grazed.
598	Wai (b)	X19 233308	40-80	3.0	A small gully of primary tawa/(pukatea)-titoki-karaka forest and treeland, highly modified. Grazed by both feral goat and domestic stock.
599	Whiorau	X19 238330	20-80	3.5	A moderate hillslope dominated by modified primary (pukatea)-tawa-titoki forest. Pines have recently been logged from its southern edge, with eucalypts recently planted along the western boundary. Some small groves of nikau. Grazed in the past, but recently fenced.
603	Little Ohuia Treeland	X19 959305	40-100	3.8	A small area of advanced secondary titoki-kanuka treeland on a hillslope inland of Little Ohuia Lagoon. Open and grazed understorey.
621	Springhill (a)	X19 956428	80-220	10.2	An area of modified primary/advanced secondary (rewarewa)/tawa-(titoki-hinau)-kanuka forest with mahoe, treeferns and pigeonwood common in the subcanopy. Despite grazing the understorey remains diverse especially around stream gullies. Limestone landscape. Kereru recorded.
622	Springhill (b)	X19 954426	60-140	2.1	A narrow stream gully that contains a small remnant of modified primary/ advanced secondary tawa-titoki-kanuka forest. Grazed by both feral goats and domestic stock. Scattered broadleaved species along the stream side.
627	Waipatiki Stream Trib. Gully	W20 525051	30-160	6.5	A small area of advanced secondary kanuka-karaka-titoki forest on the south-facing side of a small stream gully. Newly planted pines around the boundary. Grazed by both feral goats and domestic stock.
633	Rocky Range	W20 508148	380-460	5.4	Small remnant of modified primary (rewarewa)/tawa-titoki forest grading to ngaio treeland. Dense swards of ongaonga present. Grazed by both feral goats and doMestic cattle. Kereru recorded.
634	Moeangiangi Bluffs	W20 567119	290-320	0.9	A very steep section of limestone bluffs c. 2 km inland. Koromiko-rangiora shrubland and whatariki-tuhara flaxland cover most of the bluff with some unstable clear faces. Inaccessible to goats, very limited grazing.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
635	Moeangiangi Tributary (a)	W20 a) 562114 b) 564112 c) 567112	140-300	 3.6 0.7 1.5	Three discrete remnants: a) advanced secondary kahikatea/karaka treeland, b) advanced secondary kahikatea-(tawa-titoki) forest on an alluvial terrace, and c) advanced secondary karaka-titoki-(tawa) forest. All remnants have a history of intense grazing. However, a) and b) are now surrounded by a new pine plantation, with good regeneration potential following stock removal. Feral goats graze all the areas.
637	Moeangiangi Tributary (b)	W20 573125	220-300	5.5	Advanced secondary kahikatea/ngaio-titoki treeland, very open and grazed.
690	Ford Gully	V20 395001	200-320	5.3	A small remnant of secondary broadleaved (cabbage tree, kohuhu, karaka, and five finger) kanuka treeland amongst a young pine plantation. Understorey recovering following recent stock exclusion. Grazed intensively in the past.
691	Ellis-Wallace Gully	V20 396015	170-300	12.0	A remnant of advanced secondary low forest (kanuka, putaputaweta, kowhai, rewarewa and manuka) surrounded by a young pine plantation. Grazed intensively in the past, but recent stock exclusion.
693	Top Run Gully	V20 408012	260-300	2.2	Small gully of modified primary (kahikatea)/kanuka-titoki forest-treeland. Grazed by both feral goats and domestic cattle.
694	Poningo Stream (a)	V20 a) 427062 b) 426066	300-380	 0.9 2.0	Two discrete patches: (a) secondary cabbage tree-broadleaved forest-treeland and (b) secondary (rewarewa)/broadleaved low forest. Grazed and open underneath.
695	Poningo Stream (b)	V20 415067	270-360	9.9	Long narrow area of kahikatea-(rewarewa-ngaio)-broadleaved treeland. Very open canopy with small patches of pole kahikatea scattered throughout. Surrounded by a recently planted pine plantation, with stock now excluded.
699	Pakuratahi Valley	V20 453000	30-70	2.0	Small remnant of karaka-putaputaweta-(titoki) forest with scattered pole kahikatea, on moderate south-facing slope and foot-slope surrounded by mid-rotation pine plantation.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
781	Waiatai Valley	X19 a) 945339 b) 952339 c) 953340 d) 956340	10-120	 10.6 4.8 1.4 1.3	Four small patches spread over 1.4 km on flanking slopes in the lower Waiatai valley. The vegetation in all is dominated by kanuka, with scattered mahoe, titoki, and cabbage tree. (c) also has a stand of young pole kahikatea on the footslope. All of the patches are highly modified, and grazed by both feral goats and domestic cattle.
782	Upper Mangawhero Stream	W19 803394	110-310	60.9	Area of kanuka scrub-forest and treeland, regenerating through rough pasture. Heavily grazed by both feral goats and domestic stock.
796	Waitaki	X19 036338	15	1.4	Contains kahikatea forest on alluvial valley-fill. The northern end is solid even-aged older forest, with sparser and younger kahikatea forest-treeland over the rest of area with cabbage tree amongst it. Some open wetland.
797	Ponui and Opouitu Stream	W19 663224	40-100	33	Various secondary broadleaved shrubland-scrub-forest with scattered podocarps on steep inner-valley slopes, sharply incised into moderate slopes above with kanuka scrub-forest and manuka scrub. Area covers more than 1 km length of valley and riparian slopes, in the semi-coastal zone only 2-3 km inland where little indigenous vegetation remains. Grazed.
798	Tutaenui Stream	W19 601218	20-40	3.8	Degraded primary/advanced secondary forest on alluvial terraces and riparian slopes. Rest of the area is tall kanuka forest and treeland. May also be some totara.
805	Waipatiki Road	W20 519050	20-120	10.7	Kanuka forest with scattered tutu, mahoe and manuka, on a steep slope flanking Waipatiki Road. Grazed and open underneath.
809	Tahere (b)	X19 061336	20-40	2.2	Small remnant of tawa-kohekohe treeland on an alluvial terrace, with high numbers of exotic tree species in the canopy. Grazed and open understorey.
820	Hereheretau Road (b)	X19 066323	40-120	6.1	Modified primary (rewarewa-kahikatea)/tawa/kohekohe forest-treeland. The canopy is intact in parts. Adjacent to RAP WAH 9. Grazed by both feral goats and domestic cattle.
830	Tangoio Beach Bluff	V20 485002	0-60	4.9	Steep unstable bluffs/sea-cliffs immediately east of Tangoio Beach, with patches of whatariki-tuhara flaxland and bare soil/rock. Some grazing by goats. Pasture at the top of the faces. Very unstable with large clumps of vegetation eroding constantly.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - WAIHUA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
831	Kotomangengi Tributary (a)	V20 463027	80-140	3.3	Kanuka scrub with scattered mahoe, cabbage tree, karaka, ngaio and titoki. Grazed and open.
832	Kotomangengi Tributary (b)	V20 474025	40-140	1.4	A small gully of advanced secondary kanuka-karaka-titoki forest treeland, surrounded by newly planted pine plantation. Understorey still very open despite recent domestic stock removal.
833	Kotomangengi Stream (a)	V20 469038	100-200	5.6	Advanced secondary kanuka-titoki-(kahikatea-karaka) forest-treeland, surrounded by newly planted pine plantation. Understorey may recover following domestic stock removal.
834	Kotomangengi Stream (b)	V20 487042	150-170	1.2	Small gully of modified primary titoki-tawa-kanuka forest-treeland. Heavily grazed by both feral goats and domestic stock.
836	Lower Waikari River	W20 631193	0-30	3.9	Kanuka scrub with scattered broadleaved trees and shrubs, on a steep riparian slope above the Waikari River c. 1 km inland. Understorey is dominated by pasture grasses and is heavily grazed.
838	Mohaka Beach and Cliffs	W19 705218	0-80	27.2	Partially vegetated former sea-cliff west of the Mohaka river mouth, together with raised beach at its foot and the accumulated debris of the eroding/ collapsing cliff. On the steepest areas tuhara-whahariki flaxland dominates with extensive areas of recently eroded bare ground. Lower slopes and debris flows are dominated by tauhinu-blackberry shrubland with a mixture of other adventive species including pasture grasses. Most of the vegetation is grazed by both feral goats and domestic stock.
922	Twin Block	W19 (a) 877296 (b) 875294	110-160	2.5	Two small remnants of highly modified primary broadleaved forest c. 2 km inland, patchily dominated by karaka, titoki, kohekohe, mahoe and ngaio. Heavily grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAUNGAHARURU AND MAHIA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
Maungaharuru Ecological District					
389	Kotepapa Stream	W19 567303	280-320	10.3	A small area of modified (rimu-kahikatea)-rewarewa/tawa forest in a tribuary of Kotepapa Stream. Grazed by both feral goats and domestic stock.
514	Wedge Northern Gully	W19 565280	100-300	35.4	A steep gully of modified primary rewarewa/tawa-(titoki) forest treeland with mahoe as the dominant sub-canopy tree, and young secondary kanuka forest scrub around the margins. Grazed and open understorey.
Mahia Ecological District					
428	Kinikini Road (a)	Y19 310221	20-100	10.9	Kanuka forest-treeland with little else in the canopy. Grazed and open understorey. Some recent clearance.
429	Kinikini Road (b)	Y19 315214	60-120	2.6	Small remnant of modified primary tawa-(karaka)/kohekohe forest and treeland, with a thin strip of kanuka-mingimingi scrub surrounding it. The understorey is open and grazed by both feral goats and domestic stock.
432	Kinikini Road (c)	Y19 320209	80-110	1.5	Small area of modified primary rewarewa/tawa/kohekohe forest, and kanuka forest. Grazed by both feral goats and domestic stock.
434	Mouta Hill	Y20 302198	40-204	21.9	This remnant has 1) modified primary karaka-(titoki)/kohekohe forest-treeland and 2) tawa-(karaka)/kohekohe forest-treeland. They are joined by scattered treeland. The understoreys of both units are grazed and open.
436	Ahimanawa (a)	X20 285142	20-160	8.0	Modified primary karaka treeland with scattered kohekohe. Long history of grazing by feral goats and domestic stock.
437	Ahimanawa (b)	Y20 a) 294139 b) 294136	60-200	 9.7 1.6	This study site consists of two remnants in the lower reaches of Huruhurunui Stream. (a) is a long ribbon of tawa-dominated forest-treeland with various mixtures of karaka, titoki, and kohekohe, on mainly riparian and lower slopes, that is grazed. Several scattered young pole podocarps, e.g. matai and rimu are present. (b) is a small remnant on the upper slopes of karaka-(rewarewa)-(tawa)/kohekohe forest-treeland that is very open and grazed.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAHIA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
439	Point 221	Y20 301127	80-200	24.9	An area of kanuka forest on both sides of a Mangatea Stream tributary, with very occasional rewarewa, and scattered broadleaved shrubs. Grazed by both feral goats and domestic stock.
444	Pongaroa Gullies (b) & (c)	Y19 b) 371208 c) 373212	40-140	 3.7 3.9	Two remnants on moderate slopes in the upper catchment of a small true right tributary of Whangawehi Stream: (b) modified primary rewarewa/tawa-titoki/kohekohe forest with fringes of planted exotic trees, (c) modified primary rewarewa/tawa-titoki/kohekohe forest merging into kanuka forest-treeland downstream.
445	Lower Whangawehi Stream	Y19 375219	40-100	2.9	An area of ngaio-(titoki-karaka)/kohekohe forest-treeland on a steep hillslope. Grazed by feral goats. The area is bounded by bluffs in the north.
447	Wainui Stream (c)	Y19 383205	40-100	2.7	Small area of modified primary tawa-titoki-kohekohe forest-treeland. Very open understorey with grazing by both feral goats and domestic stock.
450	Whangawehi Tributary	Y20 318199	80-160	51.7	Area of secondary kanuka/manuka scrub, with pockets of primary tawa, titoki and rewarewa in stream gullies, comprising the full headwater catchment of a tributary of Whangawehi Stream. Grazed by domestic sheep and feral goats. Adjacent to the Mahia Peninsula Scenic Reserve.
452	Oraka Beach Stream	Y19 332248	40-100	5.5	A narrow gully of primary kohekohe-(karaka) forest-treeland in the lower slopes with (rewarewa)-tawa-karaka/kohekohe forest-treeland in the upper gully. Grazed both feral goats and domestic stock. Very open understorey.
453	Waitupatu Tributary	Y19 a) 342224 b) 341226	80-160	 1.3 3.5	Two small remnants of modified primary forest: (a) (rewarewa)-tawa/kohekohe forest and (b) (rewarewa)-tawa/karaka-kohekohe forest, on upper slopes behind Mahia township. Both areas are grazed by feral goats and domestic stock. Some canopy damage from wind.
454	Lower Wainuiorangi Stream	Y20 362160	20-40	2.0	Small area of scattered primary karaka-titoki-(tawa)/kohekohe forest-treeland. Very open canopy with both feral goats and domestic stock grazing. Wind damage severe.
456	Taiporutu	Y20 a) 366169 b) 368171	60-100	 2.2 2.1	Two small patches of coastal forest: (a) primary (karaka-rewarewa)/kohekohe forest-treeland, and (b) primary (rewarewa)/tawa-karaka/kohekohe forest-treeland. Grazed by both feral goats and domestic stock. Ngaio treeland is scattered around the edges of both remnants.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAHIA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
457	Wainuiorangi Stream	Y20 a) 353160 b) 354156 c) 351153 d) 357153	20-160	 4.1 7.1 2.6 3.6	This study site contains four discrete remnants, in the catchments of the Wainuiarangi (a), Waipia (b), and Waingaroa (c&d) Streams. All contain degraded coastal-semi-coastal primary forest-treeland with various mixes of emergent rewarewa, and tawa, karaka, kohekohe, titoki, pukatea, nikau, treeferns and ngaio in the canopy. Grazed by both feral goats and domestic stock. Tauhinu-dominated scrub occurs around the margins, and in the surrounding pasture.
459	Upper Wainuiorangi Stream	Y20 341156	200-260	1.3	Small area of tawa-(titoki-rewarewa) forest-treeland. Grazed by both feral goats and domestic stock. Understorey completely bare.
460	Ahimanawa Back Blocks	Y20 a) 325148 b) 324146 c) 322146	260-400	 2.7 3.1 9.6	Three areas of modified primary/advanced secondary (rewarewa)/tawa/ kohekohe forest. Other species present include pukatea (in b and c), nikau, karaka, titoki, lancewood, and treeferns. Grazed by both feral goats and domestic stock. Understoreys are all very open
461	Upper Urumatui Stream (a)	Y20 323152	180-260	4.5	Small area of partially modified primary tawa forest. Grazed by both feral goats and domestic stock.
462	Waianiwaniwa Tributary	Y20 341134	220-280	2.6	Small narrow strip of modified primary rewarewa/tawa-pukatea/kohekohe forest-treeland with mahoe common in the subcanopy. Open understorey, grazed by both feral goats and domestic stock.
465	Waiopine Tributary	Y20 313079	140-200	3.8	Narrow gully with degraded primary karaka-kohekohe-ngaio-rewarewa treeland. Understorey open, grazed by both feral goats and domestic stock. Wind damage noted in the canopy.
466	Upper Otunua Stream	Y20 328112	240-320	3.9 1.3	Two small remnants of primary rewarewa/tawa-(pukatea)/kohekohe forest. Kohekohe is the dominant tree. Understorey open, grazed by both feral goats and domestic stock.
468	Otunua Stream	Y20 320118	100-240	4.5	Remnant of modified primary rewarewa-tawa-(titoki)/kohekohe-(karaka) forest. Understorey open, grazed by both feral goats and domestic stock.
470	Upper Mangatea Stream (a)	Y20 325136	140-320	18.0	Modified primary titoki-tawa/kohekohe forest-treeland extending c. 1 km along shady slopes towards the head of the Mangatea Stream, close to RAP MAH 15. Understorey open, grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAHIA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
472	Upper Mangatea Stream (b)	Y20 324132	240-300	2.4	An area of modified primary tawa-titoki/kohekohe/mahoe forest-treeland, on north-facing slopes high above Mangatea Stream. Understorey open, grazed by both feral goats and domestic stock.
473	Taiporutu Stream	Y20 357173	100-120	4.7	Small area of modified primary tawa-titoki/kohekohe forest-treeland merging into kanuka/manuka scrub at the margins. Understorey open, grazed by both feral goats and domestic stock.
474	Whangawehi Coronation Reserve	Y19 381226	0-10	2.5	A small reserve that lies 3 km south-east of Mahia township. It covers rocky bluffs and a grassy picnic area just east of Whangawehi estuary. Gifted to the crown to commemorate the coronation of Queen Elizabeth II, the reserve was the site where Rev. William Williams first baptised Hawke's Bay Maori in 1842. Bluffs near the mouth of the estuary support a range of coastal tree, shrub, herb and fern species.
476	Homestead Bush	Y19 342215	70-100	3.5	A remnant of modified primary tawa-titoki-(karaka) forest-treeland. Understorey open, grazed by both feral goats and domestic stock.
477	Waitupatu Stream (b)	Y19 346231	30-60	7.7	This study site covers gentle to moderate gully slopes in a small tributary of Waitupatu Stream, behind Mahia township. Kanuka scrub-forest dominates the upper slopes of the gully, with broadleaved trees in the lower slopes. The vegetation at the downstream end of the gully is dominated by exotic conifers and eucalypts.
482	Lake Rotopounamu	Y19 334326	30	3.3	Lake Rotopounamu, a water-filled hollow in the debris of a large ancient landslide, is highly modified with very little native vegetation remaining around its margin. Small patches of raupo reedland occur along the road side, with scattered patches of willow and poplars. A small area of karaka-dominated treeland at the northern end reaches the lake edge. The lake is eutrophic probably due to the input of nutrients from fertiliser runoff. Grazed to the lake edge.
520	Onenui Treeland	X20 299070	60-140	6.2	Modified primary karaka-(titoki-tawa)/kohekohe treeland, on marine terrace surface and small incised valleys. Understorey open, and grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAHIA

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
521	Waiopine Gully	Y20 311072	80-160	2.3	An area of modified primary (rewarewa)/titoki-karaka/kohekohe forest in a steep southeast-facing gully. Very open understorey, grazed by both feral goats and domestic stock. Wind damage evident in the canopy.
522	Airstrip Gully	Y20 314076	100-180	3.0	A small area of advanced secondary rewarewa/kohekohe-cabbage tree tree-land. Very open understorey, grazed by both feral goats and domestic stock.
523	Point 255	Y20 302090	140-250	3.3	Small remnant of karaka-(titoki)/kohekohe forest-treeland. Grazed by both feral goats and domestic stock.
525	Rahuimokairoa (b)	Y20 322125	160-320	9.2	Small remnant of modified primary (tawa)/kohekohe forest with mahoe common in the subcanopy. Grazed by feral goats only. Surrounded by new pine plantation.
526	Rahuimokairoa (a)	Y20 318123	140-300	6.9	A remnant of modified primary tawa-titoki forest-treeland. Surrounded by a new pine plantation. Grazed by feral goats only. Understorey bare.
527	Waipapa Stream (b)	Y20 a) 329105 b) 324106	 240-320 190-240	 4.6 3.7	Two remnants of modified primary tawa/kohekohe forest treeland with scattered nikau, karaka and titoki, in the upper Waipapa Stream catchment. Understorey open, grazed by both feral goats and domestic stock. Wind damage evident in the canopy.
528	Waipapa Stream (a)	Y20 324109	260-320	5.4	A remnant of modified primary rewarewa-(tawa) forest-treeland with ngaio and mahoe common in the understorey. Large hinau scattered along the ridge. Merges into young secondary tauhinu-manuka scrub around the margins. Understorey open, grazed by both feral goats and domestic stock.
610	Mangatupae Stream	Y20 362193	80-160	3.9	A remnant of modified primary tawa-(pukatea)/kohekohe forest-treeland on gentle-moderate slopes. Understorey open, grazed by both feral goats and domestic stock.
613	Waterfall Cliff	Y19 390225	20-50	1.2	Small area of coastal cliff vegetation dominated by whatariki-*Hebe* sp. flaxland- shrubland, that surrounds a small waterfall on the eastern side of Auroa Pt. Most of the area is too steep for feral goats to graze.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAHIA

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
617	Taupiri Gully	X20 285164	80-240	7.5	A narrow north-facing gully with karaka-titoki/(kohekohe) forest-treeland with secondary kanuka scrub around the margin. The remnant is divided by Kinikini Road. Grazed by both feral goats and domestic stock. Several prominent limestone outcrops.
618	Moemoto Bay (b)	X20 285170	40-140	4.7	An area of advanced secondary karaka-kanuka-titoki/kohekohe forest in the mid-reaches of a small stream flowing to Moemoto Bay. Exposed to prevailing westerly winds, with some wind damage in the canopy. Grazed by both feral goats and domestic stock.
619	Moemoto Bay (a)	X20 283173	30-50	2.9	Small remnant of secondary kohekohe-karaka-titoki forest-treeland with occasional kanuka, on the terrace and incised streams by Moemoto Bay. Most of the understorey is grazed and open.
620	Kinikini Gully	X20 281152	140-200	3.3	Small area of karaka treeland with scattered cabbage tree, rewarewa and titoki. The understorey is dominated by pasture grasses. Grazed by both feral goats and domestic stock. Wind damage to the canopy.
661	Lower Otunua Stream	X20 295112	40-220	39.9	An area of tauhinu-manuka scrub and kanuka forest with scattered broad-leaved trees. Grazed by both feral goats and domestic stock.
662	Upper Urumatui Stream (c)	Y20 314157	160-320	4.9	A small remnant of modified primary tawa-(pukatea-titoki) forest with scattered nikau and cabbage tree in the canopy. Grazed by both feral goats and domestic stock.
663	Upper Urumatui Stream (d)	Y20 a) 312161 b) 314164 c) 319165	260-340	 5.3 2.2 2.1	Three small remnants of modified primary tawa forest-treeland with scattered karaka, nikau and pukatea amongst the canopy. Grazed by both feral goats and domestic stock.
664	Upper Te Muka	X20 297156	180-300	27.6	An area of kanuka scrub with scattered patches of broadleaved trees in the gullies, in the stream valley above Te Muka Falls. Grazed by both feral goats and domestic stock.
665	Kopuni Stream (a)	X20 293159	180-260	7.7	Young kanuka scrub with scattered broadleaved trees. Grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAHIA

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
666	Kopuni Stream (b)	Y20 303161	240-320	12.5	Kanuka scrub-forest with scattered broadleaved trees. Grazed by both feral goats and domestic stock.
667	Kopuni Stream (c)	Y20 301167	200-320	17.8	An area of modified primary tawa-(karaka-titoki) forest, and kanuka-tauhinu scrub. Grazed by both feral goats and domestic stock.
668	Kinkini Road (d)	X20 298180	80-180	17.7	An area of kanuka forest and kanuka-(tauhinu-manuka) scrub. Grazed by both feral goats and domestic stock.
669	Onenui Gullies	Y20 302078	80-240	15.9	A series of deeply incised gullies with a mosaic of advanced secondary and modified primary forest dominated by a mosaic of titoki, tawa, kohekohe, karaka, kanuka and rewarewa. Grazed by both feral goats and domestic stock.
670	Kinikini Road (e)	Y20 300187	180-260	10.0	An area of modified primary tawa-titoki/kohekohe forest close to the Mahia Peninsula Scenic Reserve. Some kanuka-(tauhinu-manuka) scrub-shrubland around the margins. Grazed by both feral goats and domestic stock.
671	Ruatahuna Stream	Y20 309176	240-340	15.2	An area of advanced secondary/degraded primary vegetation in the upper catchment of the Ruatahuna Stream, close to the southern margin of the Mahia Peninsula Scenic Reserve. Grazed by both feral goats and domestic stock.
800	Pukenui Beach Wetlands	Y19 a) 327296 b) 325299	 0 0	 1.6 1.3	Two small wetland-lakes on the eastern side of the Mahia Peninsula isthmus. Both have raupo reedland around much of their margins along with other sedge and rush species. Pine plantations almost surround both areas, which are part of the same wetland system in an intra-dune hollow.
908	Ormond Drive Wetland	Y19 316251	0-10	2.9	A small brackish wetland that lies in a dune hollow beside Ormond Drive just north of Mahia Beach settlement. The wetland vegetation includes sea rush, jointed wire-rush, jointed twig-rush, giant umbrella sedge, harakeke, and cabbage tree. Weeds present include willow, blackberry, and poplar. Appears to be grazed with no fencing.
931	Upper Urumatui Stream (b)	Y20 323156	230-310	3.6	Small remnant of modified primary tawa/kohekohe forest. Grazed by both feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MAHIA AND MATAWAI

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
932	Maungawhio Tributary	Y19 326250	30-80	2.1	Small remnant of degraded primary treeland, surrounded by young secondary tauhinu-dominated scrub, in a small gully flowing north to Maungawhio Lagoon. Grazed by feral goats.
933	Mahia Beach Duneland	Y19 312258	0-10	28.5	An area of ephemeral wetlands among dunes between Mahia golf course and Mahia Beach. Grazed by domestic stock and feral goats. Dominated by exotic species including; blackberry, marram, and giant umbrella sedge, *Juncus* sp., *Isolepis nodosa*, and small areas of raupo reedland.
Matawai Ecological District					
4	Trig L Bush	X16 070115	560-869	120	Large area with logged primary kamahi-tawari-beech forest grading to treeland along the lower slopes, with several large northern rata, and broadleaved species in the understorey. Large areas of broadleaved scrub scattered throughout. Domestic stock graze throughout. Kereru and tomtit present.
5	Alcuin Alluvial	X16 050128	500-510	1.0	Modified primary kahikatea forest-treeland (two remnants) on an alluvial river terrace system in the Motu River valley. The understorey is dominated by exotic grassland and bare soil, with domestic stock grazing.
7	Burnage Station Bush (a)	X17 (a) 050895 (b) 049892	500-640	8.9	Modified primary tawa/tawari forest-treeland covers most of this area on moderate upper slopes with some emergent pole rimu. High feral goats numbers have left the understorey bare with only scattered ferns and shrubs.
8	Burnage Station (b)	X17 (a) 041917 (b) 044916 (c) 035917	700-880	46.3	Three areas in south-facing catchment headwaters - dominated by modified primary tawa forest and tawari forest. Broadleaved species are abundant in the understorey with beech present along the stream sides. The understorey is modified by domestic stock grazing. Shining cuckoo and kereru were recorded.
9	Hikutai Station	X17 053945	640-680	10.9	A remnant of logged primary tawa forest-treeland surrounded by low broadleaved forest with treefern and tree fuchsia, on a notably gentle northwest-facing slope. Limited regeneration with feral goats and domestic stock grazing the understorey. Tui and kereru were recorded.
12	Awanui (a)	X17 976998	700-870	8.1	Secondary broadleaved forest covering a wide open gully basin. Sheltered by steep ridges on three sides. Grazed by feral goats and domestic stock.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MATAWAI

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
13	Awanui (b)	X17 982003	660-780	4.7	Secondary broadleaved forest dominated by tree fuchsia and akepiro with small areas of manuka scrub. Several large beech trees are present on the ridges.
14	Mahunga Station	X17 (a) 010995 (b) 007990 (c) 012991 (d) 017992	600-853	122	Main area (a) includes small areas of logged primary tawa forest and logged primary beech forest, more extensive advanced secondary beech-dominated forest-treeland and, especially on upper slopes, broadleaved scrub - all on steep south-facing slopes from ridge to stream-side 400-1200 m north of Matawai Conservation Area. The understorey is dense with strong regeneration, and only light grazing throughout. Also three areas of modified primary and advanced secondary beech forest on terraces and gently undulating land between the above and Matawai Conservation Area. Kereru recorded.
16	Point 724	X17 002036	600-724	8.9	An area dominated by young secondary broadleaved scrub, with a small patch of logged primary beech forest in the centre. Open grassy areas and blackened tree spars indicate past burning.
17	Quarry Hill	X17 008035	560-690	12.0	Several small patches of primary beech forest amongst secondary broad-leaved forest. A quarry abuts on the eastern side. Grazed by domestic stock.
19	Rakauroa Station (b)	X17 073010	540-580	3.8	A remnant of heavily modified primary tawa forest-treeland on rolling hillslopes. Low diversity in the understorey, with very little regeneration. Grazed by domestic stock.
20	Rakauroa Station (a)	X17 082020	490-520	12.5	Primary rimu/tawa forest with a broadleaved-treefern subcanopy, on rolling terrain. Despite light grazing, regeneration is strong in the understorey.
21	Kiriroa (a)	X17 035091	560-719	43.6	An area predominantly of secondary broadleaved scrub situated on an asymmetrical ridge, with small pockets of older tawa-totara-beech forest. Domestic stock have access.
24	Kiriroa (b)	X17 055090	560-590	1.3	Logged primary tawa forest-treeland. No seedlings or ferns present in the understorey which is open to 6 m with only occasional divaricating shrubs. Long term modification by grazing.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MATAWAI

STUDY SITE NO.	NAME	GRID REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
25	Mt Matawai	X17 090070	750-960	105.1	This area is dominated by advanced secondary montane scrub with mountain horopito, broadleaf and *Coprosma* sp.(t). Scattered remnants of red beech-silver beech forest occur throughout. Abundant pole podocarps are in scattered patches, with kahikatea and matai the most numerous. Domestic stock grazing. Red deer recorded.
31	Kahika (a)	X17 960872	660	3.4	A remnant of advanced secondary kamahi forest covering the top of a small hill. The stand is even-aged with no understorey due to long-term grazing.
32	Kahika (b)	X17 962866	500	3.4	This remnant of modified primary kahikatea/kamahi forest is located in a flat valley bottom. Problem weed species are limited to small areas around the margins (e.g. ivy and cotoneaster). The area is grazed by domestic stock. Kereru were recorded.
33	Highlands Station	X17 920880	740-900	178.1	This site covers a broad ridge and upper slopes, close to the large Waikareiti North Conservation Area. It is dominated by advanced secondary beech forest with broadleaved species (e.g., pokaka, kamahi and broadleaf) a component of the canopy. Shining cuckoo and kereru were recorded. Domestic cattle grazing.
34	Whaiere (a)	X17 955904	720-840	63.7	This remnant is dominated by secondary broadleaved forest on upper slopes grading to treeland on lower slopes. Several large matai, kahikatea and totara occur along the stream side. There is a small wetland with willow dominating its margins. Domestic stock periodically graze the area.
35	Whaiere (b)	X17 968899	610-650	6.9	An area of partially logged primary rimu/tawa forest with scattered emergent pole kahikatea. The understorey is open with scattered ferns and exotic weed species. Exotic tree species are planted around the margin. Domestic stock graze the remnant.
36	Ramoe (a)	X17 991832	510-590	7.7	This small remnant is dominated by partially logged primary tawa forest with scattered emergent rimu and matai on the upper slopes and logged primary tawa forest on the lower slopes. The area has recently been fenced and regeneration is strong.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MATAWAI

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
37	Ramoe (b)	X17 988831	500-560	2.3	A remnant of partially logged primary tawa forest with occasional emergent matai and kahikatea, broadleaved species dominate the sparse grazed understorey. Kereru were recorded.
38	Ramoe (d)	X17 991823	500	2.5	Predominantly advanced secondary kahikatea forest with scattered large primary kahikatea and rimu, on an alluvial terrace. The understorey is open, but the forest has recently been fenced with some regeneration noted. Kereru recorded.
42	Waikohu River	X17 095999	450-460	7.0	An area of secondary scrub-forest that is a mosaic of kowhai, kanuka, totara, toetoe and mahoe. Large open grassy areas on the flats, with scattered vegetation on the steep cliff/bluff system flanking the Waikohu River. The understorey is dense in areas where feral goat access is restricted, and around the stream margins.
55	Makaretu Rd.	X17 110922	750-860	10.3	An area of secondary Hall's totara/heketara-mahoe-broadleaf forest-scrub on moderate-steep south-facing slopes of Wharekopae. Other species present include putaputaweta, houhere, kamahi, and tree fuchsia. Grazed by both feral goats and domestic stock.
56	Wharekopae North	X17 100934	600-920	67.2	An area on the steep north-facing slopes of (Mt) Wharekopae, dominated by a mosaic of advanced secondary broadleaved forest and broadleaved scrub-shrubland with scattered tawa treeland patches on lower slopes.
58	Wharekopae South	X17 102928	800-900	11.1	An area on the moderate south-facing slope of (Mt) Wharekopae. The lower slope has Hall's totara/houhere-tree fuchsia-mountain horopito-tawari forest, with Hall's totara-tawari/horopito scrub forest on the upper slope. The area is grazed, and open in places.
68	Pukehau	X17 055963	560-590	6.6	Footslopes beside the Waikohu River, predominantly logged primary tawa forest with scattered pole rimu and matai; tawari and mahoe are dominant in the subcanopy. The understorey is dense with the exclusion of domestic stock; numbers and diversity of seedlings is high.
69	Whaiere (c)	X17 965895	520-600	11.1	A small remnant of logged primary red beech forest with broadleaved species e.g. broadleaf and mahoe, in the understorey. One large northern rata noted. The area has been fenced recently with some understorey recovery noted.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MATAWAI

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
158	Marewa (a)	X17 001846	550-600	6.2	An area of logged primary tawa forest with a mosaic of broadleaved shrubs in the subcanopy. The understorey is open with domestic stock grazing.
159	Tapere (a)	X17 980864	560-620	10.3	Partially logged primary tawa forest with scattered emergent rimu, merging into advanced secondary broadleaved forest around the margins. The understorey is lightly grazed.
160	Tapere (b)	X17 978857	480-520	11.3	A largely advanced secondary broadleaved forest-treeland with emergent pole podocarps (dominated by rimu and kahikatea) over a broadleaved mosaic, on alluvial terraces and footslopes beside the eastern branch of Mutuera Stream. Poplars have been planted along the roadside.
161	Wharekopae School Bush	X17 010860	540-580	8.1	An area of primary tawa forest with large scattered emergent kahikatea and rimu, on the alluvial terraces and lower hillslopes of small stream. The area has been selectively logged, and is grazed by domestic stock.
164	Mutuera Stream (f)	X17 960845	500-600	9.8	Seven patches of tawa-broadleaved mosaic forest-treeland with emergent kahikatea and miro, on gently sloping east-facing hillslopes above Mutuera Stream. The remnants have been logged and are grazed by both cattle and sheep.
165	Mutuera Stream (e)	X17 966838	440-500	5.7	Advanced secondary kahikatea forest on an alluvial terrace, with advanced secondary kowhai-(kohuhu-tawari) low forest on foot-slopes, and logged primary tawa/tawari with occasional emergent matai on hillslopes. In more open areas high numbers of *Pittosporum ralphii* occur. There is a small oxbow wetland on the alluvial terrace, modified by intense cattle grazing and dominated by weed species.
166	Mutuera Stream (d)	X17 965835	440-500	5.1	Logged primary tawa forest on the hillslopes merging into a mosaic of secondary broadleaved forest and scrub (including mahoe, houhere, and cabbage tree) on foot-slopes. An alluvial terrace is dominated by advanced secondary kahikatea forest. The area is grazed by domestic cattle and sheep.
167	Mutuera Stream (c)	X17 962831	430-440	3.6	An area of advanced secondary kowhai-totara treeland on an alluvial terrace, with scattered emergent kahikatea. The area is grazed by domestic cattle and sheep, with the understorey consequently dominated by pasture grasses.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MATAWAI

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
779	Moanui Road (a)	X17 954991	700-1018	139	Large area of logged and partially burnt vegetation with a central core of partially modified rimu/beech forest, surrounded by secondary mountain horopito-manuka scrub. Strong regeneration is occurring in both areas.
780	Moanui Road (b)	X17 927992	600-943	465	This large remnant is a mosaic of partially logged/modified rimu/beech forest and mountain horopito-manuka scrub on a range of steepland hill country landforms.
790	Marewa (b)	X17 979838	520-570	11.6	Logged/modified primary tawa-dominated forest with advanced secondary broadleaved forest amongst it. Scattered emergent and pole kahikatea, and a grove at the western end.
791	Marewa (c)	X17 000837	560-650	18.5	Mainly logged/modified primary tawa-dominated forest (more intact at the eastern end) with broadleaved low forest in between and enclosing primary forest patches.
899	Rata Hills (b)	X17 126006	240-300	0.4	A remnant of modified primary matai/titoki-rewarewa-totara-tawa forest on steep riparian slopes flanking the Waikohu River adjoining RAP MAT 24 and Whakarau Scenic Reserve. Some silver poplar patches. Grazed understorey.
914	Kotaka	X17 026068	550-590	5.9	A small remnant of logged primary beech forest-treeland on terraces and moderate terrace risers, with scattered pole matai and rimu, and tawa and other broadleaved trees amongst the canopy. The majority of the understorey is dominated by pasture grasses. Grazed.
916	Matawai North Block	X17 040992	700-822	62.0	A mosaic of logged primary beech forest patches with secondary scrub dominated by mountain horopito, *Coprosma* sp. (t), kamahi and broadleaf, and advanced secondary beech/broadleaved scrub-forest. This area is continuous with the northern straight-line boundary of Matawai Conservation Area.
917	Moanui Wetland	X17 905978	455	14.0	Highly modified wetland with several small patches of advanced secondary kahikatea treeland, scattered purei, and scattered *Coprosma propinqua-Pseudopanax anomalus*-kaikomako-mingimingi shrubland with the rest of the wetland dominated by pasture grasses and weeds. Heavily grazed.

APPENDIX 1: (CONTINUED) NON - RAP STUDY SITES - MATAWAI

STUDY SITE NO.	NAME	GRID. REF.	ALTITUDE RANGE (M)	TOTAL AREA (HA)	ECOLOGICAL DESCRIPTION
918	Point 888m	X17 933851	780-888	34.2	An area of logged primary beech/broadleaved forest with tawari, kamahi, pole miro and rimu in the canopy, and mountain horopito, broadleaf and pate common in the understorey. The areas of secondary scrub are dominated by mountain horopito, ***Pittosporum ralphii***, tree ferns, kamahi, and broadleaf. The main feature of this area is a steep bluff in the centre. Grazed.

Appendix 2

RECOMMENDED AREAS FOR PROTECTION - MATAWAI ECOLOGICAL DISTRICT

Below are the descriptions for those RAPs that lie within the newly defined Matawai Ecological District, but which were surveyed and provisionally included within the Waiapu PNAP survey (Leathwick *et al.* 1995). Although the RAP descriptions are taken directly from that report, they have been renumbered here to conform to their redefined context in the Matawai Ecological District (the old numbering is retained in brackets to allow reference back to the Waiapu survey report). Sub-districts, of similar climate, geology and landform, were defined and used as a framework/context during the Waiapu survey. There are several references to these in the descriptions that follow. For full sub-district definitions and boundaries refer to Leathwick *et al.* (1995).

RAP MAT 1 KERERUHUAHUA BUSH (EX- WAI 138)

Priority:	1
Grid Ref.:	NZMS 260 Y16 386265
Area:	37 ha
Percent primary:	100%
Altitudinal range:	620-960 m
Bioclimatic zone:	lowland-montane

This RAP is located on a steep, upper hillslope on the southwestern side of Kereruhuahua, a high point at the northern end of Mangatu Forest. It contains a remnant of little modified primary forest now almost surrounded by plantation forest. Silver beech, tawari and kamahi are dominant in the canopy along with Hall's totara, red beech, tree fuchsia, broadleaf, *Dracophyllum traversii* and mountain cabbage tree. This and RAP 98 are the two substantial remnants of primary red/silver beech-dominant forest most distant from the main tract on the Raukumara Range to the west. The area may be subject to some ongoing modification by domestic stock and probably also goats.

RAP MAT 2 TARNDALE SECONDARY BEECH FOREST (EX- WAI 139)

Priority:	3
Grid Ref.:	NZMS 260 Y16 307227
Area:	240 ha
Percent primary:	nil
Altitudinal range:	560-920 m
Bioclimatic zone:	lowland-montane

This RAP is located on an area of moderately steep upper slopes and steep lower slopes of southerly to easterly aspect below Tarndale Rd, on the northwest margins of Mangatu Forest. It consists of a piece of secondary forest in which it appears that the original cover of red and silver beech was felled, but because of its southeasterly aspect was not successfully burnt. It has now regenerated predominantly in silver beech, forming an almost complete forest cover over most of the area except around the lower margins, where a woodland with lower densities of trees has resulted. Other species present include red beech and rimu at lower altitudes and broadleaf, tawheowheo and kamahi at higher altitudes.

This RAP remains significant despite its degree of modification, because of the extent to which the sub-district has been so thoroughly cleared. It has an SSWI ranking of 'moderate', with a range of common bush birds recorded, including rifleman.

RAP MAT 3 TUANUIOTEKAHAKAHA (1) (EX-WAI 140)

Priority:	1
Grid Ref.:	NZMS 260 X16 275260
Area:	1561 ha
Percent primary:	100%
Altitudinal range:	520-1139 m
Bioclimatic zone:	lowland to montane

This and the next RAP, which are contiguous, together contain the most extensive block of unlogged native forest left in freehold ownership in the study area, totalling over 7000 ha. This RAP encompasses the catchment of the main western tributary of the Mangaotane River. Although the lower slopes are generally steep, the upper faces and ridge crests are much more gentle and rounded. The block covers a wide altitudinal gradient, along which there is a gradual transition from forest dominated by rimu and tawa at low altitudes, through mixed rimu-red beech-silver beech-tawari forest with occasional hard beech and toatoa at mid-altitudes, to red beech-silver beech-tawari forest with scattered Hall's totara at high altitudes. Mountain toatoa and kaikawaka occur locally on poorly drained areas on the main ridge crests. Some partial logging has been carried out on an area of more gentle slope below 900 m in the south of the block.

This, the more highly ranked of these two RAPs, contains a catchment representative of the wider area which, because of its wide altitudinal range, good representation of forest sequences and clearly defined catchment boundaries, is recommended at the highest priority for protection. Together with MAT 4 (ex-WAI 141) it has an SSWI ranking of 'moderate-high', with a range of common bush birds recorded, including kereru, pied tit, rifleman, and weka, and reports of kaka and falcon.

RAP MAT 4 TUANUIOTEKAHAKAHA (2) (EX-WAI 141)

Priority:	3
Grid Ref.:	NZMS 260 X16 250250
Area:	5406 ha
Percent primary:	96%
Altitudinal range:	400-1140 m
Bioclimatic zone:	lowland-montane

This RAP is very similar in ecological character to No. 140, with which it is contiguous (see details above). It contains an extensive area of predominantly primary forest over a wide altitudinal range, most of which falls within the catchments of the Whakamaria Stream draining west into the Motu River and a north-flowing, lower tributary of the Mangaotane Stream. Small cleared or cutover areas occur in the west, with access from Kirk's clearing on the Motu River, and in the southeast in the headwaters of the Whakamaria Stream. Although noteworthy for the extent and relatively unmodified nature of the forest it contains, it has been ranked lower than MAT 3 (ex- WAI 140), reflecting the greater degree of modification around its margins and its less clearly defined catchment boundaries.

RAP MAT 5 MANGATAHU STATION BUSH (EX- WAI 111)

Priority:	1
Grid Ref.:	NZMS 260 X16 284113
Area:	40 ha
Percent primary:	100%
Altitudinal range:	170-300 m
Bioclimatic zone:	lowland

This RAP, located in the northwest of the Waipaoa sub-district, contains two areas of very gentle lower hill-slopes, with locally steeper sites, at the junction of Te Hua Stream and the Mangatu River. The more westerly piece, situated on the western bank of the Mangatu River, is of easterly aspect, but that on the eastern banks and which extends around into the lower parts of the Te Hua Stream is of southerly aspect. Both pieces contain fine examples of mixed broadleaved forest dominated by titoki, tawa and pukatea, with kahikatea, rewarewa and mahoe also common.

The RAP well represents the primary forest which once occurred on the gentle lower hill-slopes in this catchment (cf. the steep lower hillslopes of RAP 109; Leathwick *et al* 1995). Although the understorey is heavily modified as a consequence of grazing by both domestic stock and goats, the canopy is still in relatively good condition. Fencing should be considered a priority, given the lack of any topographic barriers to stock access.

RAP MAT 6 MANGATAHU STREAM BUSH (EX- WAI 142)

Priority:	1
Grid Ref:	NZMS 260 X16 265140
Area:	72 ha
Percent primary:	20%
Altitudinal range:	220-440 m
Bioclimatic zone:	lowland

This RAP is located along the lower reaches of the Mangatahu Stream, where the stream cuts through a northwest to southeast-trending limestone ridge. In the upstream half of the area steep lower hill-slopes of southwesterly aspect lie to the north of the stream, but moderate slopes of northeasterly aspect lie to the south. Further downstream a gorge is sharply incised into the underlying limestone, and slopes on both sides of the stream are steep to very steep. The area contains a diverse mixture of both primary forest and secondary forest and scrub, with the latter mostly located in the downstream part. Tawa, pukatea and rewarewa are dominant in the primary forest, with young totara, kahikatea and kowhai around the margins. Younger secondary communities are dominated by manuka with scattered totara and kohuhu on moderately sloping sites, and by *Pittosporum ralphii*, kohuhu and whareriki on steeper sites and cliffs.

Although somewhat modified, this RAP is significant for its combination of primary and secondary communities on limestone. The dominance of manuka in younger secondary stands but with invading totara, elsewhere found mostly on fertile soils formed on younger mudstones (e.g. RAP 40, Pakarae sub-district [Leathwick *et al.* 1995]), is unusual in the context of the [Waiapu] Ecological District. Although the RAP is surrounded by plantation forest, it is subject to modification by stock.

RAP MAT 7 TE APITI STATION BUSH (EX- WAI 143)

Priority:	3
Grid Ref.:	NZMS 260 X16 230140
Area:	36 ha
Percent primary:	50%
Altitudinal range:	460-630 m
Bioclimatic zone:	lowland

This RAP is located in one of the upper catchments of the Mangatahu Stream, approximately 3 km west of No. 143. It consists of a moderate-sized remnant of modified primary hill-slope forest dominated by scattered tawa, but with gaps - perhaps a consequence of old disturbances - occupied by mahoe, supplejack and wheki. Podocarps such as rimu and totara were presumably once also present, but have probably been selectively removed for timber.

The RAP is broadly representative of the lower-altitude forest once extensive in the Maungahaumi sub-district. It is unfenced and grazed by domestic stock.

RAP MAT 8 MAKURIWAO STREAM (EX- WAI 144)

Priority:	1
Grid Ref.:	NZMS 260 X17 275098
Area:	69 ha
Percent primary:	58%
Altitudinal range:	180-660 m
Bioclimatic zone:	lowland

This RAP is located on steep faces at the southern end of a sharply defined limestone ridge adjacent to the Mangatu River, and is bounded along the southern margins by the Makuriwao Stream. Slopes of predominantly southeasterly to southwesterly aspect are steep at higher altitudes, but gentler toe-slopes and small areas of alluvial terrace occur at lower altitude in the east. The primary hill-slope forest, which is dominant over most of the area, has been locally modified by burning, grazing and selective removal of podocarps. On the steeper slopes it consists of a mosaic of taller forest patches dominated by pukatea, tawa, rewarewa and titoki interspersed with areas of lower canopy dominated by mahoe, with kohuhu, lancewood, mapou, ngaio, putaputaweta and kawakawa. Smaller areas of forest on an alluvial terrace are dominated by titoki along with tawa, tarata, kowhai, pukatea, akeake, rewarewa, lancewood and kohuhu. An area of shrubland growing on steep cliffs is dominated by *Hebe* spp., *Pittosporum ralphii*, ngaio, kohuhu and whahariki.

The RAP, although modified, contains one of the most extensive forest remnants left at lower altitudes in this part of the study area. It has an SSWI ranking of 'moderate', with a range of common bush birds recorded, including kereru. The area is unfenced and subject to ongoing modification by domestic stock, and probably also goats; severe damage by possums was noted.

RAP MAT 9 KNOB NO.2 (EX- WAI 145)

Priority:	1
Grid Ref.:	NZMS 260 X17 223096
Area:	26 ha
Percent primary:	nil
Altitudinal range:	640-770 m
Bioclimatic zone:	lowland-montane

This RAP is centred on a limestone outcrop and cliff-face running along a high ridge aligned northwest to southeast above the Maungahaumi Rd. It supports mainly scrub and shrubland, but with pockets of secondary broadleaved forest at the base of the cliffs. Vegetation of the cliffs is variously dominated by *Chionochloa flavicans*, *Hebe* sp. unnamed (*Hebe* sp. (n) of Eagle 1982), *Hebe* sp. (b) (*Veronica arborea*) and whahariki, with prickly mingimingi, *Pittosporum ralphii*, *Craspedia viscosa* and *Pimelea longifolia* also present. Some indication of the original forest cover can be gained from the presence of one black beech tree and scattered matai logs.

This RAP has very high significance given its combination of limestone substrate and an assemblage of mainly cliff-dwelling plant species of restricted

distribution. It has been severely damaged by sheep and feral goats wherever they have had access, but the vegetation on steeper sites remains more intact.

RAP MAT 10 KOMIHANA BUSH (EX- WAI 146)

Priority:	2
Grid Ref.:	NZMS 260 X17 213082, 205078
Area:	38 ha
Percent primary:	100%
Altitudinal range:	340-460 m
Bioclimatic zone:	lowland

This RAP consists of two blocks located approximately 1 km apart on areas of gentle lower hill-slopes of southerly aspect below the southern end of the Maungahaumi massif. Both contain small remnants of primary forest in which tawa is strongly dominant, but with occasional pukatea, rewarewa and/or hinau; mahoe and mamaku occur in areas with a more open canopy. Podocarps have probably been selectively removed for their timber.

This RAP is strongly complementary to the adjacent Maungahaumi RAP MAT 13 (ex-WAI 151), which although large is predominantly above c. 700 m in altitude, and contains only small areas of lower-altitude forest such as occurs here. Both blocks are unfenced and subject to heavy modification by both domestic stock and feral goats.

RAP MAT 11 MANGATAWA SCRUB AND SHRUBLANDS (EX- WAI 148)

Priority:	2
Grid Ref.:	NZMS 260 X17 180040
Area:	324 ha
Percent primary:	nil
Altitudinal range:	240-700 m
Bioclimatic zone:	lowland

This large RAP encompasses an area of steep hill-slopes centred along a mudstone ridge approximately 2 km southeast of the high point Maunganui, and extending over a wide altitudinal range. The central ridge separates one catchment system of predominantly southwesterly aspect from a smaller northeast-facing catchment. Secondary hillslope communities predominate, and cover a range of successional stages from fernland and young manuka-kanuka scrub developing over pasture, through manuka-mingimingi-kanuka scrub, to tall kanuka-dominant scrub in which species such as kohuhu, putaputaweta, mamaku and mahoe are becoming abundant.

The significance of the RAP stems from the diversity of its secondary communities, which are unusual in the context of the [Waiapu] Ecological District for the dominance in early stages of succession by species other than kanuka, such as bracken and manuka. The area is unfenced and subject to grazing and browsing.

RAP MAT 12 MANGATAWA BUSH (EX- WAI 149)

Priority:	3
Grid Ref.:	NZMS 260 X17 160040
Area:	73 ha
Percent primary:	10%
Altitudinal range:	380-620 m
Bioclimatic zone:	lowland

This RAP is located approximately 1 km to the west of RAP MAT 11 (ex-WAI 148) to which it is broadly similar in ecological character. Most of the area consists of moderate to steep slopes of predominantly southwesterly aspect, but it also extends over the main ridge to include small areas of northeasterly aspect. Secondary vegetation is dominant over most of the area, but one remnant of primary forest has survived in a small basin in the west. Younger secondary communities are dominated by kanuka with scattered rewarewa, but rewarewa and kamahi are dominant in older stands over an understorey of silver fern, wheki, putaputaweta, kohuhu and mingimingi. The small area of primary forest consists of tawa and mahoe, with scattered pukatea and hinau. Although the most significant feature of the RAP is its advanced secondary forest with rewarewa and kamahi, the small primary remnant is also valuable, given the general clearance of primary forest at lower altitudes in this sub-district. The area is subject to modification by goats.

RAP MAT 13 MAUNGAHAUMI (EX- WAI 151)

Priority:	1
Grid Ref.:	NZMS 260 X16 179121
Area:	7452 ha
Percent primary:	96%
Altitudinal range:	500-1213m
Bioclimatic zone:	lowland-subalpine

The diverse landforms contained in this RAP are dominated in the north by two bold ridges, one the steeply upthrust spine running north and south from the high point Maungahaumi at an altitude of 1213 m, and the second a parallel ridge to the northwest which reaches nearly 1000 m in altitude. Slopes in the extensive basin between these two ridges and in the far northwest are generally gentle to moderate. To the south of these, and in the Maungahaumi sub-district, a series of bold limestone and sandstone ridges at lower altitude trend northwest to southeast, separating perched open valleys with steep-sided gorges where streams cut through the ridges.

Although extensive removal of timber trees has occurred throughout the area at lower altitudes and where the terrain has allowed access, the selective nature of these operations has left relatively intact forest over most of the area below treeline. At lower altitudes, before logging the forest was generally dominated by scattered rimu emergent over tawa and/or red beech, but with increasing altitude a transition occurred, first to red beech-silver beech-tawari forest, then to silver beech-red beech forest, and finally to silver beech-tawari forest. Hard

beech and toatoa occur locally at lower altitudes, particularly on more sharply defined ridges. Virgin stands still remain in parts of the upper Waireporepo Stream, including kahikatea-dominant stands on areas of flat terrace-like topography and in some valleys in the south. Not all the forest at high altitude is dominated by beech species. South of the summit of Maungahaumi the montane forest consists of kaikawaka and pink pine emergent over both divaricate and broadleaved shrubs and small trees. Small areas of tree fuchsia-dominant forest occur at high altitudes on limestone substrates. Subalpine scrub dominated by tupare occurs in small pockets on and immediately north of the summit.

It would be difficult to overstate the significance of this RAP, which is the largest and perhaps the most diverse in the entire [Waiapu+Matawai] Ecological District. It must also be considered significant in a national context for its high-altitude forest and subalpine scrub communities on Tertiary substrates. It has an SSWI ranking of 'outstanding', with a range of common bush birds recorded, including kereru, whitehead, rifleman and weka, and with reports of kaka and falcon.

RAP MAT 14 REG'S BUSH (EX- WAI 152)

Priority:	2
Grid Ref.:	NZMS 260 X17 080085
Area:	73 ha
Percent primary:	100%
Altitudinal range:	600-770 m
Bioclimatic zone:	lowland-montane

This RAP, which lies 3 km north of Matawai on the western fringes of the area surveyed, contains an area of moderate to steep hill-slopes on both sides of the main ridge between the Motu River and the Whakarau Rd. The vegetation consists of a moderate-sized block of primary forest in excellent condition and dominated by silver beech, tawari and tawa, with scattered emergent rimu. Although a full range of other forest species is present, some modification has occurred around the margins through both past logging and ongoing grazing, particularly by cattle.

Although reasonably close to the extensive and very highly rated Maungahaumi RAP (MAT 13 ex-WAI 151), this is one of few larger forest remnants left at lower altitude in an area now largely cleared for agriculture.

Appendix 3

CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS

The following list of 491 taxa was compiled from the present survey and surveys by Clarkson & Clarkson (1991a;1991b), Clarkson & Druce (1991), Druce (1985, 1987, 1988a-d), Leathwick *et al.* (1995), and Beadel (1989b), and recent taxonomic updates by Heenan (1996), and Petterson (1997). Searches were also made of the records of the FRI (NZFRI), Landcare Research (NZCHR), and Auckland Museum (AK) herbaria. Historical records of plants in the Waihua Ecological District come from Guthrie-Smith (1953).

Abbreviations used are as follows:

aff.	affinities with
agg.	aggregate, comprising more than one species
cf.	compare with
inclu.	including
(h)	historical record, may now be extinct in district
(p)	planted
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
s.l.	sensu lato, in a wide sense
s.s.	sensu stricto, in the narrow sense
X	hybrid
var.	variety

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
Acaena anserinifolia	hutiwai	X			X
A. novae-zelandiae	red bidibid	X			
Adiantum cunninghamii	common maidenhair	X	X	X	X
Alectryon excelsus var. *excelsus*	titoki	X	X	X	X
Alseuosmia pusilla	karapapa	X			X
Anaphalioides bellidioides		X			
Anaphalis subrigida		X	X		
A. trinervis	puatea	X	X		X
A. trinervis X *A. subrigida*		X			
Anarthropteris lanceolata	lance fern	X			
Apium prostratum	native celery, tutae-koau		X	X	

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
Aristotelia serrata	wineberry	X	X	X	X
Arthropodium candidum	forest floor lily	X			
Arthropteris tenella	jointed fern	X			
Asplenium bulbiferum agg.	hen and chicken fern	X	X	X	X
A. flabellifolium	necklace fern	X			
A. flaccidum	hanging spleenwort	X	X	X	X
A. gracillimum		X	X		X
A. hookerianum	perching spleenwort	X	X	X	X
A. oblongifolium	shining spleenwort	X	X	X	X
A. polyodon	sickle spleenwort	X	X	X	X
A. gracillimum X *A. hookerianum*		X			
Astelia fragrans	kahaka, fragrant astelia	X			X
A. solandri	kowharawhara, perching lily	X			X
Australina pusilla		X			
Austrofestuca littoralis	sand tussock			X	
Azolla filiculoides	kareiarera, Pacific azolla	X	X	X	
Baumea articulata	jointed twig-rush			X	
B. juncea				X	
B. rubiginosa		X			X
Beilschmiedia tawa	tawa	X	X	X	X
Blechnum chambersii	nini	X	X	X	X
B. colensoi		X			X
B. discolor	crown fern, piupiu	X	X		X
B. filiforme	thread fern	X	X	X	X
B. fluviatile agg.	kiwakiwa	X	X		X
B. membranaceum		X	X		
B. nigrum					X
B. penna-marina	little hard fern	X	X		X
B. procerum	small kiokio	X			X
B. novaezelandiae	kiokio	X	X		X
B. novaezelandiae (swamp form)	swamp kiokio	X	X		X
B. triangularifolium	greenbay kiokio	X	X	X	X
B. vulcanicum	triangular kiokio	X			
Bolboschoenus fluviatilis	marsh clubrush	X	X		X
B. medianus			X		
Botrychium biforme	fine leaved parsley fern	X			
Brachyglottis repanda s.s.	rangiora	X	X	X	X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
Cakile sp.	sea rocket			X	
Caladenia catenata	pink orchid	X			
Callitriche petriei ssp. *petriei*	starwort	X			
Calystegia soldanella	sand convolvulus		X	X	
C. tuguriorum	NZ convolvulus, powhiwhi	X	X	X	X
Cardamine sp. (*C. debilis* agg. 'narrow petal')	bittercress, panapana	X	X		X
C. sp. (b) (cf. *C. corymbosa*)		X			
C. sp unnamed (*C.* 'water')					X
Carex breviculmis	grassland sedge	X			
C. coriacea	cutty grass				X
C. dipsacea var. *dipsacea*			X		X
C. dissita s.s.		X	X		X
C. fasciularis		X			X
C. flagellifera	Glen Murray tussock	X			
C. forsteri		X			X
C. geminata s.l.		X	X		X
C. inversa	knob sedge	X			
C. lambertiana		X			
C. maorica		X			X
C. pumila	sand sedge		X	X	
C. secta s.s.	purei, makura	X	X	X	X
C. sinclairii		X			
C. solandri		X			X
C. spinirostris		X			
C. virgata	swamp sedge	X	X		X
C. sp. (*C. geminata* agg; 'large')		X			X
Carmichaelia australis	New Zealand broom	X	X	X	
Carpodetus serratus	putaputaweta	X	X	X	X
Cassinia leptophylla	tauhinu	X	X	X	X
Cheilanthes humilis	rock fern		X		
Chiloglottis cornuta	green bird orchid	X			
Chionochloa flavicans		X	X		X
Clematis cunninghamii		X	X		
C. foetida	scented clematis	X			X
C. forsteri	puataua, small white clematis	X	X		X
C. paniculata	bush clematis	X	X	X	X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
Clianthus puniceus	kakabeak, kowhai ngutu-kaka	X	X (h)		
Collospermum hastatum	perching lily, kahakaha	X	X	X	
C. microspermum		X			X
Coprosma acerosa	sand coprosma		X		
C. areolata		X	X		X
C. brunnea		X			
C. colensoi					X
C. crassifolia		X			
C. foetidissima	hupiro, stinkwood	X			X
C. grandifolia	kanono, raurekau	X	X		X
C. lucida	karamu	X	X		X
C. microcarpa	large seeded coprosma	X			
C. pedicellata		X			
C. propinqua ssp. *propinqua*	mingimingi	X	X		X
C. propinqua X *C. robusta*		X	X		X
C. repens	taupata	X	X	X	
C. rhamnoides ssp. *rhamnoides*	red-fruited karamu	X	X	X	X
C. rigida		X	X		
C. robusta	karamu	X	X		X
C. rotundifolia		X	X		X
C. rubra		X			
*C.*sp. unnamed (*C.* sp. (t) of Eagle 1986)		X			X
C. tenuicaulis	swamp coprosma	X	X		
C. tenuifolia	kohuhu	X	X		X
C. virescens		X			
Cordyline australis	ti, cabbage tree	X	X	X	X
C. banksii	ti ngahere	X	X		X
C. indivisa	mountain cabbage tree, toi	X			X
Coriaria arborea var. *arborea*	tutu	X	X	X	X
C. kingiana	small-leaved tutu	X	X		
C. arborea X *C. kingiana*		X			
C. pottsiana					X
Corokia cotoneaster var. *cotoneaster*	kōrokio	X			
Cortaderia fulvida	toetoe	X	X		X
Corybas acuminatus	spider orchid	X			X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
C. macranthus	red spider orchid	X	X	X	
C. trilobus s.s.		X	X		X
Corynocarpus laevigatus	karaka	X	X	X	
Cotula coronopifolia	batchelors button		X	X	
Craspedia viscosa		X			X
Ctenopteris heterophylla	comb fern	X			X
Cyathea cunninghamii	gully treefern	X	X		
C. dealbata	ponga, silverfern	X	X	X	X
C. medullaris	mamaku, black treefern	X	X	X	X
C. smithii	katote, soft treefern	X	X		X
Cyathodes juniperina	prickly mingimingi	X			X
Cyperus ustulatus	giant umbrella sedge	X	X	X	X
Dacrycarpus dacrydioides	kahikatea	X	X	X	X
Dacrydium cupressinum	rimu	X	X	X	X
Dactylanthus taylorii	woodrose	X	X		X
Desmoschoenus spiralis	pingao		X	X	
Deyeuxia avenoides (incl. *Deyeuxia avenoides* var. *brachyantha*)	mountain oat grass	X			
D. billardieri	sand wind grass	X			
Dianella nigra	turutu	X	X	X	X
Dichondra repens	dichondra	X			
Dicksonia fibrosa	wheki-ponga	X	X	X	X
D. lanata s.s.	stumpy tree fern	X			X
D. squarrosa	wheki	X	X	X	X
Diplazium australe		X			
Dodonaea viscosa	akeake	X	X	X	
Doodia media ssp. *australis*	rasp fern, pukupuku	X	X		
Dracophyllum latifolium	neinei				X
D. longifolium	inanga	X			X
D. traversii	large grass tree	X			X
Drosera binata	forked sundew	X	X		X
D. peltata subsp. *auriculata*	spoon-leaved sundew	X	X		
Drymoanthus adversus		X			
Dysoxsylum spectabile	kohekohe	X	X	X	
Earina autumnalis	ruapeka, easter orchid	X	X	X	X
E. mucronata	hanging tree orchid	X	X	X	X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
Echinopogon ovatus	hedgehog grass	X	X		
Elaeocarpus dentatus (inclu. *E. d.* var. *obovatus*)	hinau	X	X	X	X
E. hookerianus	pokaka	X	X		X
Eleocharis acuta	sharp spiked-sedge	X	X	X	X
E. gracilenta		X			
E. pusilla		X			
E. sphacelata	bamboo spiked-sedge	X	X	X	
Elymus multiflorus	blue grass	X			
Entelea arborescens	whau		X	X	
Epilobium alsinoides s.s.		X			X
E. brunnescens s.s.	creeping willowherb	X			
E. chionanthum		X			
E. cinereum		X			
E. insulare		X			
E. nerteroides	common willow herb	X			
E. nummulariifolium	creeping willowherb	X	X		
E. pedunculare s.s.	long-stalked willowherb	X			
E. pubens		X			
E. rotundifolium	round-leaved willowherb	X			X
E. sp. unnamed (*E. 'minutiflorum'*)					X
Euphrasia cuneata	N.Z. eyebright	X	X		
Freycinetia baueriana ssp. *banksii*	kiekie	X	X	X	
Fuchsia excorticata	kotukutuku, tree fuchsia	X	X	X	X
F. excorticata X *F. perscandens*		X	X		
F. perscandens		X	X		
Gahnia pauciflora	cutting sedge	X	X	X	X
G. procera	giant sedge				X
G. setifolia		X			
Galium propinqum		X			X
G. trilobium		X	X		
Gastrodia cunninghamii	black orchid	X			
Gaultheria antipoda	bush snowberry	X	X		X
G. oppositifolia	snowberry	X			
Geniostoma rupestre var. *ligustrifolium*	hangehange	X	X	X	X
Gentiana grisebachii	marsh gentian				X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN TINIROTO	WAIHUA	MAHIA	MATAWAI
Geranium microphyllum	namunamu	X			
G. potentilloides subsp. *potentilloides*		X			
G. sessiliflorum var. *novae-zelandiae*	short-flowered cranesbill	X			
G. solandri	turnip-rooted geranium	X			
Gleichenia dicarpa	tangle fern				X
Gnaphalium audax		X			X
G. delicatum	creeping cudweed				X
G. gymnocephalum	creeping cudweed	X			
Grammitis billardieri		X			X
G. ciliata		X			
G. magellanica					X
Gratiola sexdentata			X		
Griselinia littoralis	broadleaf	X			X
G. lucida	puka	X	X	X	
Gunnera monoica	solitary gunnera	X	X		X
Haloragis erecta ssp. *erecta*	toatoa	X	X	X	X
Halocarpus biformis	pink pine				X
Hebe parviflora	koromiko taranga	X	X		
H. stricta var. *macroura*			X		
H. stricta var. *stricta*	koromiko	X	X	X	X
H. tairawhiti		X	X	X	
H. sp. (*Veronica arborea*)			X		X
H. sp. (*Veronica squalida*)					X
H. sp. (*Veronica salicifolia* var. *angustissima*)					X
Hedycarya arborea	pigeonwood	X	X	X	X
Helichrysum aggregatum var. *aggregatum*		X	X	X	X
H. filicaule	creeping everlasting daisy	X			
Histiopteris incisa	water fern, mata	X			X
Hoberia angustifolia	narrow-leaved lacebark	X	X		
H. populnea var. *lanceolata* (inclu. *H. sexstylosa*)	houhere, lacebark	X	X	X	X
Hydrocotyle dissecta					X
H. elongata		X	X		
H. heteromeria	waxweed	X			
H. hydrophila		X			
H. microphylla		X			X
H. moschata	hairy pennywort	X			

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
H. novae-zeelandiae		X			X
H. pterocarpa			X		
H. sp. *sibthorpioides?*		X			
H. sulcata		X			
Hymenophyllum bivalve		X			
H. demissum	irirangi	X	X	X	X
H. flabellatum	fan-like filmy fern	X			
H. ferrugineum		X			
H. multifidum		X			
H. rarum		X			X
H. revolutum		X			
H. sanguinolentum agg.	piripiri	X			
H. scabrum		X			
Hypericum japonicum	swamp hypericum	X			
Hypolepis ambigua		X	X		
H. lactea		X			
H. rufobarbata	sticky pig fern	X			X
Ileostylus micranthus		X			X
Isolepis cernua	slender clubrush		X	X	
I. distigmatosa					X
I. habra					X
I. nodosa	knobby clubrush		X	X	
I. pottsii		X			
I. prolifer	three-square	X	X	X	
I. reticularis		X	X		
Ixerba brexioides	tawari	X			X
Jovellana sinclairii		X	X	X	X
Juncus australis	leafless rush	X	X	X	X
J. distegus		X			
J. gregiflorus	leafless rush	X	X	X	X
J. krausii var. *australiensis*	sea rush		X	X	X
J. novae-zelandiae	dwarf rush	X			X
J. pallidus			X	X	
J. planifolius	flat-leaved rush	X	X		X
J. procerus	giant rush	X		X	
J. sarophorus		X			
Knightia excelsa	rewarewa	X	X	X	X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN TINIROTO	WAIHUA	MAHIA	MATAWAI
Korthalsella lindsayi s.s.	dwarf mistletoe	X	X		
Kunzea ericoides var. *ericoides*	kanuka	X	X	X	X
Lachnagrostis sp. (unnamed) (inclu. in *L. filiformis* as var. *semi-glabra*, by Zotov, 1965)	wind grass	X			X
Lagenifera pumila	parataniwhaniwha	X	X		X
Lastreopsis glabella	smooth shield fern	X	X		
L. hispida	hairy fern	X			
L. microsora ssp. *pentagularis*		X			
Laurelia novae-zelandiae	pukatea	X	X	X	X
Lemna sp. (*L.* 'minor NZ')	karearea, duckweed	X	X		X
Lepilaena bilocularis		X			
Leptinella squalida s.s.		X	X		
Leptocarpus similis	oioi, jointed wire rush		X	X	
Leptolepia novae-zelandiae		X			
Leptopteris hymenophylloides	heruheru	X	X		X
L. superba	Prince of Wales' feathers	X			X
Leptospermum scoparium	manuka	X	X	X	X
Leucopogon fasiculatus	mingimingi	X	X	X	X
L. fraseri s.s	dwarf mingimingi	X			X
Libertia grandiflora	star herb		X	X	
L. ixioides		X			
L. pulchella					X
Libocedrus bidwilli	kaikawaka	X			X
Lilaeopsis novae-zelandiae			X	X	
Linum monogynum	rauhuia, NZ true flax	X	X		
Lobelia anceps	shore lobelia	X	X	X	
Lophomyrtus bullata	ramarama	X	X	X	X
L. obcordata	rohutu	X	X		X
Luzula picta s.s.		X			
L. sp. unnamed (*L. picta* var. *limosa*)					X
Luzuriaga parviflora	lantern berry				X
Lycopodium fastigiatum	mountain clubmoss	X			X
L. scariosum	creeping clubmoss	X			X
L. varium	tassel fern	X			X
L. volubile	waewaekoukou	X	X		X
Machaerina sinclairii	tuhara	X	X	X	X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
Macropiper excelsum var. *excelsum*	kawakawa	X	X	X	X
Mazus novae-zeelandiae		X	X		
Melicope simplex	poataniwha	X	X		X
M. ternata	wharangi		X		
Melicytus lanceolatus (inclu. *M. l.* var. *latior*)	mahoe wao	X			X
M. micranthus	shrubby mahoe, manakura	X	X		
M. ramiflorus ssp. *ramiflorus*	mahoe, whitey wood	X	X	X	X
Mentha cunninghamii	native mint	X	X		
Metrosideros colensoi	climbing rata	X	X	X	X
M. diffusa	white climbing rata	X	X	X	X
M. excelsa	pohutukawa		X (p)	X (p)	
M. perforata	aka	X	X	X	X
M. robusta	northern rata	X	X	X	X
Microlaena avenacea	forest oat grass	X	X	X	X
M. polynoda		X			
M. stipoides	meadow rice grass	X	X		X
Microtis unifolia	maikaika	X	X		X
Mida salicifolia	willow-leaved maire	X	X ?		X
Mimulus repens	Maori musk		X		
Muehlenbeckia australis	pohuehue	X	X	X	X
M. complexa	pohuehue	X	X	X	X
M. australis X *M. complexa*		X	X		
Myoporum laetum var. *laetum*	ngaio	X	X	X	
Myosotis spathulata		X			
M. sp. (*M. forsteri* agg.)		X			X
Myriophyllum propinquum	common water milfoil	X	X		
M. triphyllum	water milfoil				X
Myrsine australis	mapou	X	X	X	X
M. divaricata	weeping mapou	X	X		X
M. salicina	toro	X			X
Neomyrtus pedunculata	rohutu	X	X		X
Nertera ciliata					X
N. depressa (inclu. *N. cunninghamii*)		X	X	X	X
N. dichondrifolia		X			X
Nestegis cunninghamii	maire, black maire	X	X		X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
N. lanceolata	white maire	X	X	X	X
N. montana	oro-oro	X			X
Nothofagus fusca	red beech	X			X
N. menziesii	silver beech	X			X
N. solandri var. *solandri*	black beech	X	X		X
N. truncata	hard beech				X
Olearia arborescens	common tree daisy				X
O. colensoi	tupare				X
O. furfuracea s.s. (inclu. *O. f.* var. *augustata*)	akepiro	X	X		X
O. rani	heketara	X	X	X	X
Oplismenus imbecillus	panic grass	X	X	X	X
Oreomyrrhis ramosa					X
Orthoceras strictum agg.		X			
Ourisia lactea ssp. *drucei*					X
O. macrophylla ssp. *robusta*	mountain foxglove	X			
Oxalis exilis	yellow oxalis	X	X		
O. lactea	native oxalis		X		
O. magellanica					X
Paesia scaberula	hard fern	X	X	X	X
Parahebe catarractae ssp. *diffusa*	streamside hebe	X			
Parietaria debilis		X			
Parsonsia capsularis	ake kiori, native jasmine	X	X	X	X
P. heterophylla	kaiwhiria, native jasmine	X	X	X	X
Passiflora tetrandra	kohia	X	X	X	X
Pelargonium inodorum	kopata	X			
Pellaea rotundifolia	tarawera	X	X	X	X
Pennantia corymbosa	kaikomako	X	X	X	X
Phormium cookianum	whaririki, mountain flax	X	X	X	X
P. tenax	harakeke, NZ flax	X	X	X	X
Phyllocladus alpinus	mountain toatoa	X			X
P. glaucus	toatoa	X			X
P. trichomanoides	tanekaha	X			X
Phymatosorus pustulatus	hound's tongue	X	X	X	X
P. novae-zelandiae		X			X
P. scandens	fragrant fern	X	X		
Pimelea arenaria	sand pimelea		X	X	

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
P. longifolia var. *longifolia*	taranga	X			X
P. prostrata s.s.	Strathmore weed	X	X	X	X
P. tomentosa			X		
Pittosporum crassifolium	karo		X	X	
P. eugenioides	lemonwood, tarata	X	X	X	X
P. obcordatum	heart-leaved kohuhu	X	X		
P. ralphii	Ralph's kohuhu	X	X	X	X
P. tenuifolium ssp. *tenuifolium*	kohuhu	X	X	X	X
Plagianthus divaricatus	saltmarsh ribbonwood		X	X	
P. regius var. *regius*	lowland ribbonwood	X	X		X
Plantago raoulii		X			
Pneumatopteris pennigera	gully fern	X	X	X	X
Poa anceps ssp. *anceps*	broad-leaved poa	X	X	X	X
P. cita	silver tussock	X			
P. imbecilla	weak poa	X			
P. pusilla		X			
Podocarpus halliі	Hall's totara	X			X
P. totara	totara	X	X	X	X
Polystichum richardii (common form)	common shieldfern, pikopiko	X	X	X	X
P. silvaticum		X	X		
P. vestitum	prickly shield fern	X	X		X
P. sp. unnamed (*P. richardii* complex, 'deep purple' form)		X			
Pomaderris phylicifolia var. *ericifolia*	dwarf pomaderris	X	X (h)		
Potamogeton cheesemanii	red pondweed	X			
P. pectinatus	fennel-leaved pondweed		X		
P. suboblongus	mud pondweed	X	X		X
Potentilla anserinoides	silverweed	X			
Pratia angulata	panakenake	X	X	X	X
P. perpusilla		X			X
Prumnopitys ferruginea	miro	X	X		X
P. taxifolia	matai	X	X	X	X
Pseudognaphalium sp. (*P. luteo-album* agg.)		X	X		
Pseudopanax anomalus		X	X		X
P. arboreus var. *arboreus*	five finger, whauwhaupaku	X	X	X	X
P. colensoi s.s.	orihou	X			X

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
P. crassifolius	lancewood, horoeka	X	X	X	X
P. edgerleyii	raukawa	X			X
P. simplex (inclu. *P.s.* var. *sinclairii*)	haumakaroa	X			X
Pseudowintera axillaris	pepper tree, lowland horopito	X			X
P. colorata	mountain horopito, pepper tree	X			X
Pteridium esculentum	bracken, rahurahu	X	X	X	X
Pteris macilenta	sweet fern	X			
P. pendula		X			
P. tremula	shaking brake, turawera	X	X		X
Pterostylis banksii	tutukiwi	X	X		X
P. cardiostigma		X			
P. foliata			X		
P. patens		X			
P. sp. undetermined		X			
Pyrrosia elaeagnifolia	leather-leaf fern	X	X	X	X
Quintinia serrata (inclu. *Q. acutifolia* and *Q. elliptica*)	tawheowheo	X			X
Ranunculus acaulis	sand buttercup			X	
R. amphitrichus	waoriki	X			
R. glabrifolius					X
R. macropus	swamp buttercup	X			
R. reflexus	hairy buttercup	X			X
Raoulia australis	coastal scabweed		X		
R. glabra		X			X
R. tenuicaulis		X			X
Rhopalostylis sapida	nikau	X	X	X	
Ripogonum scandens	supplejack	X	X	X	X
Rorippa palustris	marsh yellow cress	X			
Rubus australis	bush lawyer	X			
R. cissoides var. *cissoides*	bush lawyer	X	X	X	X
R. schmidelioides var. *schmidelioides*		X	X	X	X
Rumohra adiantiformis	leathery shield fern	X			X
Rytidosperma clavatum		X			
R. gracile		X			
R. racemosum			X		
Samolus repens	sea primrose		X	X	
Sarcocornia quinqueflora	glasswort		X	X	

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN TINIROTO	WAIHUA	MAHIA	MATAWAI
Scandia sp. (*S. rosifolia* agg.)		X			
Schefflera digitata	pate	X	X	X	X
Schizeilema trifoliolatum		X	X (h)		
Schoenoplectus pungens	three-square		X	X	
S. validus	lake clubrush	X		X	
Schoenus pauciflorus s.s.	bog-rush	X			
Scirpus medianus			X		
Selliera radicans	selliera, remuremu		X	X	
Senecio banksii			X	X	
S. bipinnatisectus			X		
S. colensoi var. (*S. banksii*)		X			
S. minimus	fireweed	X			X
S. rufiglandulosus var. *rufiglandulosus*		X	X		X
Sophora microphylla	small-leaved kowhai	X	X		
S. tetraptera	kowhai	X	X	X	X
S. microphylla X *S. tetraptera*	kowhai	X	X		
Sparganium subglobosum	burr-reed		X		
Spergularia media	sea spurrey		X		
Spiranthes sinensis subsp. *australis*			X (h)		
Stellaria decipiens (inclu. *S. minuta* and *S. parviflora*)		X			X
Streblus heterophyllus	small-leaved milktree, turepo	X	X	X	X
Teucridium parvifolium (inclu. *T. p.* var. *luxurians*)		X			
Thelymitra carnea		X			
T. longifolia	white sun orchid	X	X		X
Tmesipteris elongata	fork fern	X	X		X
Trichomanes reniforme	kidney fern, raurenga	X			X
T. venosum	veined bristle fern	X			X
Triglochin striata	arrow-grass		X		
Trisetum sp. (unnamed; aff. *T. antarcticum*)		X			
T. sp. unnamed 'slender'		X			
Typha orientalis	raupo	X	X	X	X
Uncinia banksii		X	X	X	
U. clavata		X			
U. ferruginea		X			X
U. gracilenta					X
U. laxiflora		X			

APPENDIX 3 : CHECKLIST OF NATIVE VASCULAR PLANTS IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONTINUED)

BOTANICAL NAME	COMMON NAME(S)	ECOLOGICAL DISTRICT PRESENT IN			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
U. scabra		X			
U. uncinata	hook sedge	X	X		X
U. zotovii		X			X
U. sp.		X			
Urtica ferox	ongaonga	X	X	X	X
U. incisa	scrub nettle	X	X		X
Viola cunninghamii	mountain violet	X	X		X
V. filicaulis	forest violet	X			X
V. lyallii	NZ violet	X			
Vitex lucens	puriri			X	
Vittadinia australis	white fuzzweed	X			X
Wahlenbergia ramosa		X	X	X	
W. violacea		X	X	X	X
Weinmannia racemosa	kamahi	X	X		X
Winika cunninghamii		X	X	X	X
Zoysia minima	zoysia		X	X	

Appendix 4

COMMON PLANT NAMES USED IN THE TEXT

The following list gives the corresponding botanical names for common names used in the text.

* Adventive species

Common name	Botanical name
aka	*Metrosideros perforata*
akeake	*Dodonaea viscosa*
akepiro	*Olearia furfuracea*
arrow-grass	*Triglochin striata*
bachelors button	*Cotula coronopifolia*
bamboo spiked-sedge	*Eleocharis sphacelata*
*barberry	*Berberis darwinii*
black beech	*Nothofagus solandri*
black maire	*Nestegis cunninghamii*
*blackberry	*Rubus fruticosus* agg.
bog rush	*Schoenus pauciflorus*
boxthorn	*Lycium ferocissimum*
bracken	*Pteridium esculentum*
broadleaf	*Griselinia littoralis*
*buck's horn plantain	*Plantago coronopus*
*buddleia	*Buddleja davidii*
*buffalo grass	*Stenotaphrum secundatum*
burr-reed	*Sparganium subglobosum*
bush lawyer	*Rubus cissoides*
cabbage tree	*Cordyline australis*
*catsear	*Hypochaeris radicata*
*Chinese privet	*Ligustrum sinense*
coastal scabweed	*Raoulia australis*
common maidenhair	*Adiantum cunninghamii*
common shieldfern	*Polystichum richardii*
common water milfoil	*Myriophyllum propinquum*
common willowherb	*Epilobium nerteroides*

Common name	Botanical name
cotoneaster	*Cotoneaster* sp.
*crab apple	*Malus floribunda*
*crack willow	*Salix fragilis*
crown fern	*Blechnum discolor*
duckweed	*Lemna minor*
dwarf pomaderris	*Pomaderris phylicifolia*
easter orchid	*Earina autumnalis*
five finger	*Pseudopanax arboreus*
*flowering cherry	*Prunus* sp.
forest oat grass	*Microlaena avenacea*
forked sundew	*Drosera binata*
giant umbrella sedge	*Cyperus ustulatus*
glasswort	*Sarcocornia quinqueflora*
*gorse	*Ulex europaeus*
*grey willow	*Salix cinerea*
gully fern	*Pneumatopteris pennigera*
gully tree fern	*Cyathea cunninghamii*
Hall's totara	*Podocarpus hallii*
hangehange	*Geniostoma rupestre*
hanging tree orchid	*Winika cunninghamii*
harakeke	*Phormium tenax*
hard beech	*Nothofagus truncata*
hard fern	*Paesia scaberula*
*harestail	*Lagurus ovatus*
haumakaroa	*Pseudopanax simplex*
*hawthorn	*Crataegus monogyna*
heart-leaved kohuhu	*Pittosporum obcordatum*
heketara	*Olearia rani*
hen and chicken fern	*Asplenium bulbiferum*
heruheru	*Leptopteris hymenophylloides*
hinau	*Elaeocarpus dentatus*
hook sedge	*Uncinia uncinata*
houhere	*Hoheria populnea*
hound's tongue	*Phymatosorus pustulatus*
hupiro	*Coprosma foetidissima*

Common name	Botanical name
*Indian doab	*Cynodon dactylon*
*Indian dogwood	*Cornus* sp.
irirangi	*Hymenophyllum demissum*
*ivy	*Hedera helix*
*Japanese wineberry	*Rubus phoenicolasius*
*Japanese honeysuckle	*Lonicera japonica*
*Jerusalem cherry	*Solanum pseudocapsicum*
jointed fern	*Arthropteris tenella*
*jointed rush	*Juncus articulatus*
jointed twig-rush	*Baumea articulata*
jointed wire-rush	*Leptocarpus similis*
kahaka	*Astelia fragrans*
kahikatea	*Dacrycarpus dacrydioides*
kaikawaka	*Libocedrus bidwillii*
kaikomako	*Pennantia corymbosa*
kakabeak	*Clianthus puniceus*
kamahi	*Weinmannia racemosa*
kanono	*Coprosma grandifolia*
kanuka	*Kunzea ericoides* var. *ericoides*
karaka	*Corynocarpus laevigatus*
karamu	*Coprosma robusta*
karo	*Pittosporum crassifolium*
kawakawa	*Macropiper excelsum*
kiekie	*Freycinetia baueriana* ssp. *banksii*
*kikuyu grass	*Pennisetum clandestinum*
kiokio	*Blechnum novaezelandiae*
kiwakiwa	*Blechnum fluviatile*
knobby clubrush	*Isolepis nodosa*
kohekohe	*Dysoxylum spectabile*
kohia	*Passiflora tetrandra*
kohuhu	*Pittosporum tenuifolium*
koromiko	*Hebe stricta*
koromiko taranga	*Hebe parviflora*
kowhai	*Sophora tetraptera*
lake clubrush	*Schoenoplectus validus*

Common name	Botanical name
lancewood	*Pseudopanax crassifolius*
*larch	*Larix decidua*
lemonwood	*Pittosporum eugenioides*
*liquidambar	*Liquidambar styraciflua*
little hard fern	*Blechnum penna-marina*
*London plane	*Platanus* x *hispanica*
*lotus	*Lotus pedunculatus*
lowland horopito	*Pseudowintera axillaris*
lowland ribbonwood	*Plagianthus regius* var. *regius*
*lupin (tree lupin)	*Lupinus arboreus*
*macrocarpa	*Cupressus macrocarpa*
mahoe	*Melicytus ramiflorus*
mahoe wao	*Melicytus lanceolatus*
mamaku	*Cyathea medullaris*
manuka	*Leptospermum scoparium*
mapou	*Myrsine australis*
*marram	*Ammophila arenaria*
marsh clubrush	*Bolboschoenus fluviatilis*
matai	*Prumnopitys taxifolia*
*Mercer grass	*Paspalum distichum*
*Mexican daisy	*Erigeron karvinskianus*
mingimingi	*Leucopogon fasciculatus*
miro	*Prumnopitys furruginea*
*montbretia	*Crocosmia* x *crocosmiflora*
mountain cabbage tree	*Cordyline indivisa*
mountain horopito	*Pseudowintera colorata*
mountain toatoa	*Phyllocladus alpinus*
mud pondweed	*Potamogeton suboblongus*
*musky storksbill	*Erodium moschatum*
narrow-leaved lacebark	*Hoheria angustifolia*
native celery	*Apium australe*
native jasmine	*Parsonsia capsularis*, *P. heterophylla*
native oxalis	*Oxalis lactea*
neinei	*Dracophyllum latifolium*
NZ broom	*Carmichaelia australis*

Common name	Botanical name
NZ convolvulus	*Calystegia tuguriorum*
NZ eyebright	*Euphrasia cuneata*
NZ jasmine	*Parsonsia* spp.
ngaio	*Myoporum laetum*
nini	*Blechnum chambersii*
nikau	*Rhopalostylis sapida*
northern rata	*Metrosideros robusta*
*old man's beard	*Clematis vitalba*
ongaonga	*Urtica ferox*
*pampas grass	*Cortaderia selloana*
panakenake	*Pratia angulata*
parataniwhaniwha	*Lagenifera pumila*
pate	*Schefflera digitata*
perching spleenwort	*Asplenium bookerianum*
*perennial ryegrass	*Lolium perenne*
pigeonwood	*Hedycarya arborea*
pingao	*Desmoschoenus spiralis*
pink pine	*Halocarpus biformis*
poataniwha	*Melicope simplex*
pohuehue	*Muehlenbeckia australis, M. complexa*
pokaka	*Elaeocarpus hookerianus*
*poplar	*Populus* spp.
prickly mingimingi	*Cyathodes juniperina*
Prince of Wales' feathers	*Leptopteris superba*
puatea	*Anaphalioides trinervis*
puka	*Griselinia lucida*
pukatea	*Laurelia novae-zealandiae*
purei	*Carex secta*
puriri	*Vitex lucens*
putaputaweta	*Carpodetus serratus*
*radiata pine/wilding pines	*Pinus radiata*
*ragwort	*Senecio jacobea*
rangiora	*Brachyglottis repanda*
rasp fern	*Doodia media*
raukawa	*Pseudopanax edgerleyi*

Common name	Botanical name
raupo	*Typha orientalis*
red beech	*Nothofagus fusca*
red-fruited karamu	*Coprosma rhamnoides*
*reed-grass	*Glyceria maxima*
rewarewa	*Knightia excelsa*
rimu	*Dacrydium cupressinum*
*robinia	*Robinia pseudoacacia*
rohutu	*Lophomyrtus obcordata*
saltmarsh ribbonwood	*Plagianthus divaricatus*
sand buttercup	*Ranunculus acaulis*
sand convolvulus	*Calystegia soldanella*
sand coprosma	*Coprosma acerosa*
sand pimelea	*Pimelea arenaria*
sand sedge	*Carex pumila*
sand tussock	*Austrofestuca littoralis*
scrub nettle	*Urtica incisa*
*sea aster	*Aster subulatus*
sea primrose	*Samolus repens*
sea rocket	*Cakile* spp.
sea rush	*Juncus maritimus* var. *australiensis*
selliera	*Selliera radicans*
shaking brake	*Pteris tremula*
sharp spiked-sedge	*Eleocharis acuta*
shore lobelia	*Lobelia anceps*
shrubby mahoe	*Melicytus micranthus*
sickle spleenwort	*Asplenium polyodon*
silver beech	*Nothofagus menziesii*
silver fern	*Cyathea dealbata*
*silver poplar	*Populus alba*
small-leaved kowhai	*Sophora microphylla*
*small-leaved (Chinese) privet	*Ligustrum sinense*
snowberry	*Gaultheria antipoda*
*soft rush	*Juncus effusus*
sphagnum	*Sphagnum cristatum*
spinifex	*Spinifex sericeus*

Common name	Botanical name
spoon-leaved sundew	*Drosera peltata* subsp. *auriculata*
*stinking iris	*Iris foetidissima*
Strathmore weed	*Pimelea prostrata*
supplejack	*Ripogonum scandens*
swamp coprosma	*Coprosma tenuicaulis*
swamp kiokio	*Blechnum minus*
sweet fern	*Pteris macilenta*
*sycamore	*Acer pseudoplatanus*
tanekaha	*Phyllocladus trichomanoides*
tangle fern	*Gleichenia dicarpa*
tarata	*Pittosporum eugenioides*
tarawera	*Pellaea rotundifolia*
tauhinu	*Cassinia leptophylla*
taupata	*Coprosma repens*
tawa	*Beilschmiedia tawa*
tawari	*Ixerba brexioides*
tawheowheo	*Quintinia serrata*
thread fern	*Blechnum filiforme*
three-square	*Schoenoplectus pungens*
titoki	*Alectryon excelsus* var. *excelsus*
toatoa	*Phyllocladus glaucus*
toetoe	*Cortaderia fulvida*
toro	*Myrsine salicina*
totara	*Podocarpus totara*
tree fuchsia	*Fuchsia excorticata*
*tree privet	*Ligustrum lucidum*
*tree lucerne	*Chamaecytisus palmensis*
tuhara	*Machaerina sinclairii*
tupare	*Olearia colensoi*
turepo	*Streblus heterophyllus*
turutu	*Dianella nigra*
tutu	*Coriaria arborea*
*umbrella sedge	*Cyperus eragrostis*
*Virginia creeper	*Parthenocissus inserta*
waewaekoukou	*Lycopodium volubile*

Common name	Botanical name
*wandering willie	*Tradescantia fluminensis*
*water forget-me-not	*Myosotis laxa* subsp. *caespitosa*
*water pepper	*Polygonum hydropiper*
weeping mapou	*Myrsine divaricata*
wharangi	*Melicope ternata*
whararikí	*Phormium cookianum*
whau	*Entelea arborescens*
wheki	*Dicksonia squarrosa*
wheki-ponga	*Dicksonia fibrosa*
white maire	*Nestegis lanceolata*
*wild strawberry	*Fragaria vesca*
willow-leaved maire	*Mida salicifolia*
*willow weed	*Polygonum persicaria*
wineberry	*Aristotelia serrata*
zoysia	*Zoysia minima*

Appendix 5

BIRD SPECIES RECORDED IN TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS

The following bird species, listed in checklist order (Ornithological Society of New Zealand 1990), have been recorded as currently occurring in the study area either during this survey, or by Rasch (1989), Bull *et al.* (1985), and Heather & Robertson (1996).

Three different publications are used in determining species conservation status:

Bell (1986) defines the conservation status of New Zealand wildlife in a national rather than international setting, with 'wildlife' being defined by the Wildlife Act 1953 and subsequent amendments. Tisdall (1994) is more explicitly an assessment of priority for conservation action by the Department of Conservation; it is also more recent than Bell, uses a broader range of input factors, and is semi-quantitative. Both give considerable regard to conservation threat categories established and updated by the I.U.C.N. New Zealand birds are most recently rated in this international setting by Collar *et al.* (1994).

Species of special status are identified by letters as follows:

From Bell (1986):

e Endangered
t Threatened
c Regionally threatened
r Rare

From Tisdall (1994):

A Highest priority threatened species
B Second priority threatened species
C Third priority threatened species
O Species which are threatened in NZ,but which are known to be secure in other parts of their range outside NZ.

From Collar *et al.* (1994):

E Endangered
V Vulnerable
N Near threatened

* Introduced species

APPENDIX 5 : BIRD SPECIES RECORDED IN TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	TINIROTO	WAIHUA	MAHIA	MATAWAI
North Island brown kiwi	*Apteryx australis mantelli*	I,A,V	X			X
NZ dabchick	*Podiceps rufopectus*	I,C,E	X	X		
white-faced storm petrel	*Pelagodroma marina*				X	
black-winged petrel	*Pterodroma nigripennis*				X	
grey-faced petrel	*Pterodroma macroptera*		X			
blue penguin	*Eudyptula minor*			X	X	
Australasian gannet	*Sula bassana serrator*			X	X	
black shag	*Phalacrocorax carbo*		X	X	X	
pied shag	*P. varius*			X	X	
little black shag	*P. sulcirostris*		X	X		
little shag	*P. melanoleucos*		X	X	X	
white-faced heron	*Ardea novaehollandiae*		X	X	X	X
white heron	*Egretta alba*	C,O		X		
reef heron	*E. sacra*			X	X	
Australasian bittern	*Botaurus stellaris poiciloptilus*	I,O,E	X	X	X	
royal spoonbill	*Platalea regia*	I,O		X	X	
* black swan	*Cygnus atratus*		X	X	X	X
* Canada goose	*Branta canadensis*		X	X	X	X
* paradise shelduck	*Tadorna variegata*		X	X	X	X
whio, blue duck	*Hymenolaimus malacorhyncos*	I,B,V	X			
* mallard	*Anas platyrhynchos*		X	X	X	X
grey duck	*A. superciliosa*		X	X		X
grey teal	*A. gibberifrons*			X	X	
Australasian shoveler	*A. rhynchotis*		X	X	X	
NZ scaup	*Aythya novaeseelandiae*		X	X		
Australasian harrier	*Circus approximans*		X	X	X	X
NZ falcon	*Falco novaeseelandiae*	I,B,N	X			X
* Californian quail	*Lophortyx californica*		X	X	X	
* brown quail	*Synoicus ypsilophorus*		X	X		
* pheasant	*Phasianus colchicus*		X	X	X	X
* peafowl, peacock	*Pavo cristatus*			X	X	
* wild turkey	*Meleagris galloparo*		X	X	X	X
banded rail	*Rallus philippensis*				X	
weka	*Gallirallus australis*	B	X			X
spotless crake	*Porzana tabuensis*		X	X	X	
pukeko	*Porphyrio porphyrio melanotus*		X	X	X	X
Australian coot	*Fulica atra*			X		
pied oystercatcher	*Haematopus ostralegus*			X	X	

APPENDIX 5 : BIRD SPECIES RECORDED IN TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	TINIROTO	WAIHUA	MAHIA	MATAWAI
variable oystercatcher	*H. unicolor*		X		X	
pied stilt	*Himantopus himantopus*		X	X	X	
shore plover	*Thinornis novaeseelandiae*	e, E			X	
NZ dotterel	*Charadrius obscurus*	t,B,E		X	X	
banded dotterel	*C. bicinctus*			X	X	
black-fronted dotterel	*C. melanops*			X		
wrybill	*Anarhynchus frontalis*	t		X		
Pacific golden plover	*Pluvialis fulva*	r		X	X	
spur-winged plover	*Vanellus miles novaehollandiae*		X	X	X	X
turnstone	*Arenaria interpres*				X	
lesser knot	*Calidris canutus*			X		
bar-tailed godwit	*Limosa lapponica*		X	X	X	
black-backed gull	*Larus dominicanus*		X	X	X	
red-billed gull	*L. novaehollandiae*		X	X	X	
black-billed gull	*L. bulleri*		X	X	X	
black-fronted tern	*Sterna albostriata*	t,B,V		X		
Caspian tern	*S. caspia*	t,O		X	X	
white-fronted tern	*S. striata*	c		X	X	
kereru, NZ pigeon	*Hemiphaga novaeseelandiae*	B	X	X	X	X
* rock pigeon	*Columba livia*		X	X	X	
kaka	*Nestor meridionalis*	t,B,V	X			X
red-crowned parakeet	*Cyanoramphus novaezelandiae*	c	X			X
kakariki, yellow-crowned parakeet	*C. auriceps*	N	X			X
shining cuckoo	*Chrysococcyx lucidus*		X	X	X	X
long-tailed cuckoo	*Eudynamys taitensis*	r	X	X		X
morepork	*Ninox novaeseelandiae*		X	X	X	X
NZ kingfisher	*Halcyon sancta*		X	X	X	X
rifleman	*Acanthisitta chloris*		X			X
* skylark	*Alauda arvensis*		X	X	X	
welcome swallow	*Hirundo tahitica*		X	X	X	X
NZ pipit	*Anthus novaeseelandiae*		X	X		X
* blackbird	*Turdus merula*		X	X	X	X
* song thrush	*T. philomelos*		X	X	X	X
fernbird	*Bowdleria punctata*	c	X	X	X	X
whitehead	*Mohoua albicilla*		X	X		X
grey warbler	*Gerygone igata*		X	X	X	X
fantail	*Rhipidura fuliginosa*		X	X	X	X

APPENDIX 5 : BIRD SPECIES RECORDED IN TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	TINIROTO	WAIHUA	MAHIA	MATAWAI
tomtit, pied tit	*Petroica macrocephala*	?	X	?		X
NZ robin	*P. australis*	c	X			X
silvereye	*Zosterops lateralis*		X	X	X	X
bellbird	*Anthornis melanura*		X	X	X	X
tui	*Prosthemadera novaeseelandiae*		X	X	X	X
* yellow hammer	*Emberiza citrinella*		X	X	X	
* chaffinch	*Fringilla coelebs*		X	X	X	X
* greenfinch	*Carduelis chloris*		X	X	X	
* goldfinch	*C. carduelis*		X	X	X	
* redpoll	*C. flammea*		X	X		
* house sparrow	*Passer domesticus*		X	X	X	X
* starling	*Sturnus vulgaris*		X	X	X	X
* myna	*Acridotheres tristis*		X	X	X	X
* Australian magpie	*Gymnorhina tibicen*		X	X	X	X
* rook	*Corvus frugilegus*			X		

Appendix 6

MAMMALS, AMPHIBIA, FISH AND MOLLUSCS RECORDED IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS

Indigenous and naturalized introduced species recorded in the Tiniroto, Waihua, Mahia and Matawai Ecological Districts. Distribution records for mammals are largely taken from King (1990), fish from McDowall (1990), amphibia and lizards from Pickard & Towns (1988) and molluscs from Parrish (1984).

COMMON NAME	SCIENTIFIC NAME	ECOLOGICAL DISTRICT			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
MAMMALS					
Native					
Vespertilionidae					
long-tailed bat	*Chalinolobus tuberculatus*	X	X		
Introduced					
Phalangeridae					
brush-tailed possum	*Trichosurus vulpecula*	X	X	X	X
Erinaceidae					
hedgehog	*Erinaceus europaeus*	X	X	X	X
Leporidae					
rabbit	*Oryctolagus cuniculus*	X	X	X	X
hare	*Lepus europaeus*	X	X	X	X
Muridae					
Norway rat	*Rattus norvegicus*	X	X	X	X
ship rat	*R. rattus*	X	X	X	X
house mouse	*Mus musculus*	X	X	X	X
Mustelidae					
stoat	*Mustela erminea*	X	X	X	X
weasel	*M. nivalis vulgaris*	X	X	X	X
ferret	*Mustela furo*	X	X	X	X
Felidae					
feral cat	*Felis catus*	X	X	X	X
Suidae					
pig (feral)	*Sus scrofa*	X	X	X	X
Bovidae					
feral goat	*Capra hircus*	X	X	X	X
Cervidae					
red deer	*Cervus elaphus*	X	X	X	X

APPENDIX 6 : MAMMALS, AMPHIBIA, FISH AND MOLLUSCS RECORDED IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONT.)

COMMON NAME	SCIENTIFIC NAME	ECOLOGICAL DISTRICT			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
sika deer	*C. nippon*				X
AMPHIBIA					
golden bell frog	*Litoria aurea*	X	X	X	X
REPTILES					
common green gecko	*Naultinus elegans punctatus*	X	X	X	
forest gecko	*Hoplodactylus granulatus*		X		
common gecko	*H. maculatus*			X	
Pacific gecko	*H. pacificus*			X	
common skink	*Leiolopisma nigriplantare*			X	
FISH					
Geotriidae					
lamprey	*Geotria australis*		X		
Anguillidae					
long-finned eel	*Anguilla dieffenbachii*	X	X	X	X
shortfinned eel	*A. australis*	X	X	X	
Retropinnidae					
common smelt	*Retropinna retropinna*	X	X		
Galaxidae					
koaro	*Galaxis brevipinnis*	X	X	X	X
banded kokopu	*G. fasciatus*	X	X		
inanga	*G. maculatus*	X	X	X	
Salmonidae					
brown trout	*Salmo trutta*	X	X		X
rainbow trout	*Oncorhynchus mykiss*	X	X		
quinnat salmon	*O. tshawytscha*	X	X		
Mugilidae					
yellow-eyed mullet	*Aldrichetta forsteri*		X	X	
grey mullet	*Mugil cephalus*		X		
Mugiloididae					
torrentfish	*Cheimarrichthys fosteri*	X	X		
Tripterygiidae					
cockabully	*Triperygion nigripenne*		X	X	
Eleotridae					
red-finned bully	*Gobiomorphus huttoni*	X	X		
common bully	*G. cotidianus*	X	X		
Cran's bully	*G. basalis*	X	X		
bluegilled bully	*G. hubbsi*	X	X		
giant bully	*G. gobioides*		X		

APPENDIX 6 : MAMMALS, AMPHIBIA, FISH AND MOLLUSCS RECORDED IN THE TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS (CONT.)

COMMON NAME	SCIENTIFIC NAME	ECOLOGICAL DISTRICT			
		TINIROTO	WAIHUA	MAHIA	MATAWAI
Pleuronectidae					
yellow flounder	*Rhomboslea leporina*		X	X	
black flounder	*R. retiaria*		X		
MOLLUSCS					
Family Endodontidae					
Subfamily Endodontinae					
	Charopa bianca			X	
	C. coma			X	
	C. montivaga			X	
	C. accelerata			X	
	Huonodon hectori			X	
	H. pseudoleiodon			X	
	Cavellia buccinella			X	
	C. anguicula			X	
	Mocella eta			X	
	M. n. sp. 'northern maculata'			X	
	Phenacharopa novoseelandica			X	
	Therasiella neozelanica				
Subfamily Flammulininae					
	Flammulina perdita			X	
	Therasia traversi			X	
	T. zelandiae			X	
	Phenacohelix giveni			X	
	Serpho kivi			X	
Subfamily Punctinae					
	Laoma ciliata			X	
	L. ariel			X	
	L. glabriuscula			X	
	Paralaoma lateumbilicata			X	
	P. raricostata			X	
Superfamily Streptaxacea					
Family Paryphantidae					
	Delos coresia			X	

Appendix 7

SURVEY METHODS

Collection of field data

Most Protected Natural Areas Programme surveys carried out in New Zealand have followed a standard plot-based method for description of vegetation (Myers *et al.* 1987). However, the magnitude and time frame of this study made the use of this approach in its entirety impractical. Instead the methodology developed by Leathwick *et al.* (1995) was employed which identified ecological units within each study site, but which described the units qualitatively rather than using the semi-quantitative plots as in the standard method.

For each study site we recorded:

- physical location, using NZMS 260 grid references;
- ownership;
- bioclimatic zone;
- land unit;
- physiographic features, e.g. altitude, slope, aspect;
- canopy height;
- ecological pattern;
- nature of the surrounding landscape and the degree to which it buffered the ecological values of the study site;
- other conservation values, e.g. rare plant species, birds, pa sites etc.;
- threats to and modification of the site.

For each ecological unit we recorded:

- a floristic and structural description of the canopy;
- the landform(s) on which it occurred;
- a list of other major species present within it.

The vegetation was categorised as Primary, Advanced secondary, or Secondary, using the definitions listed in the glossary (Appendix 9). The vegetation at each site was also assigned a 'Vegetation Class' code, as described in Appendix 10.

GIS Analysis of field data

Study site and ecological unit boundaries, delineated on 1:50 000 maps during field survey, were digitised using Terrasoft (Digital Resource Systems 1992), a proprietary Geographic Information System (GIS). Field data and any additional information (e.g. SSWI rankings) for each study site was concurrently entered into a database linked to the GIS.

The spatial information and linked database files were exported into ArcView where all subsequent analysis was carried out. Other layers of information were also incorporated into the project, including data on climate, bioclimatic zones and the ecological district boundaries. The study sites and RAPs from the Waiapu PNAP survey (Leathwick *et al.* 1995) that fell into the newly created Matawai Ecological District also formed another layer.

Appendix 8

SELECTION OF RECOMMENDED AREAS FOR PROTECTION

Selection of RAPs was carried out using a two-stage process. In the first stage an approximate initial ranking of conservation values was made using a mathematical index calculated using study site attributes. Attributes contributing to this index were as follows.

1. **Area** - the total area of the study site. Raw values ranged from 0.3 ha (a small area of degraded semi-coastal forest) to c. 3800 ha (a large tract of forest in the west of the study area). Because of this wide variation, values were log-transformed so that, for example, an increase from 10 to 20 ha is given more significance than an increase from 1010 to 1020 ha. Log-transformed values ranged from -0.52 to 3.58.

2. **Primary** - the percentage of primary forest in the study site. Values ranged from nil to 100%.

3. **Diversity** - vegetation community diversity was calculated using the index $e^{H'}$ (Peet 1974), which takes account of both the number of different vegetation types and the evenness with which they occupied the total study site area. For example, three vegetation communities each occupying a study site in the ratio of 033 : 0.33 : 0.33 would give a higher score (3.0) than three communities occurring in the ratio of 0.90 : 0.05 : 0.05 (score = 1.48), but five evenly distributed communities would give an even higher score (5.0). Actual values ranged from 1.0 to 6.30.

4. **Perimeter** - this was calculated by comparing the actual perimeter of each study site with its minimum potential perimeter, i.e. that needed to contain a circular patch of equivalent area. Values close to 1 indicate study sites of compact shape with minimal edge effects, requiring minimum fencing. High values generally indicate either elongated or fragmented study sites, prone to weed invasion and more expensive to fence. Raw values ranged from 1.03 to 6.75, but because low values are more desirable than high, values were reversed by subtraction from the maximum raw value.

5. **Patches** - number of fragments making up the study site. Raw values ranged from 1 to 8, but because study sites consisting of a single fragment are generally a better prospect for conservation than separate fragments, values were reversed by subtraction from the maximum raw value, i.e. 8.

The total score for each study site was then calculated by standardising each of these factors into the range from 0 to 1 and summing them with weights reflecting a subjective ranking of their relative importance, as follows:

Score = (1.0 * **Area**) + (1.0 * **Primary**) + (1.0 * **Diversity**) + (0.25 * **Perimeter**) + (0.20 * **Patches**)

In theory final scores could range from 0 to 3.45 (the maximum for each component times the sum of the weights), but in practice they ranged from 0.39

to 2.88, with the highest scores gained by study sites containing a high proportion of primary forest with a high diversity of different forest types and consisting of one block roughly circular in shape. Lowest scores were generally gained by small, fragmented areas of secondary vegetation with elongated or convoluted margins.

Once this initial ranking had been carried out, Recommended Areas for Protection (RAPs) were selected using these scores in conjunction with information on other factors not easily amenable to numerical analysis, e.g. the significance of the various vegetation types contained in each study site as representative of the district and special features such as the presence of rare species or communities. Criteria used in this process were those outlined by Myers *et al.* (1987), as follows.

representativeness	The extent to which an area represents or exemplifies the components of the natural diversity of a larger reference area, e.g. representation in reserves of the current natural diversity of an ecological district, or representation of the original natural landscape. The identification and evaluation of the key representative natural areas in all Ecological Districts is the principal objective of PNA Programme surveys.
natural diversity	The range of the natural physical and biotic components in the landscape, including species, plant and animal communities, ecosystems, landforms, soil sequences and dynamic systems and processes.
pattern	An ecological term describing the arrangement of species, communities and habitats according to spatial and environmental gradients.
rarity	A measure of the paucity of numbers or occurrences of elements of natural diversity (e.g. species, communities).
naturalness	Involves assessment of the degree to which an area (e.g. vegetation, ecosystem) has been free from the effects of human disturbance and intervention. It is also an assessment of the indigenous content of the area.
viability	The ability of an area's plant communities (or in some instances a particular species) to maintain themselves in the long term, in the absence of any special effort to perpetuate them. Regeneration and vigour of a particular species and the size and stability of communities are important factors for evaluation.
buffering	Protection of an area (or a particular community) from outside modifying influences, given by natural features (catchment boundaries, rock barriers, surrounding vegetation) or, in some instances, by fences or other artificial structures.

surrounding landscape	The land which surrounds and influences a particular natural area and is influenced by the same set of physical parameters as the natural area.

The eligibility of study sites for RAP status was assessed by comparing study sites firstly in the context of the Ecological District, then on a more localised basis particularly in the large complex districts (Tiniroto, Waihua). That is, selection took into account not only the quality and character of each individual study site, but also those of adjacent study sites, while attempting to encompass most of the range of vegetation, landform and climatic diversity occurring in each district, with emphasis on features not already well represented in existing protected natural areas.

RAPs were each ranked in three categories of priority, 1 (the highest), 2 and 3, according to an overall assessment of their conservation value within that ecological district (and more local) context. Oblique aerial photographs were then taken of most areas provisionally selected as RAPs and a number of other study sites. These provided an up-to-date overview of the study sites or significant parts of them, complementing the ground-based field survey data and were used to check and refine RAP boundaries, ranking and selection.

Appendix 9

GLOSSARY OF TERMS USED IN THE TEXT

ADVANCED SECONDARY — Vegetation that has undergone (near-)complete modification in the past, but in which there has been significant recovery by species typical of original vegetation (e.g., tawa).

ADVENTIVE — Arriving from outside New Zealand cf. native.

a.s.l. — Above sea level

BIOCLIMATIC ZONES — One of the categories used in classifying natural ecosystems in the PNA Programme. It refers to the broad distribution of vegetation zones along both altitudinal and coastal to inland gradients where a particular coastal regime dictates the character of the natural ecosystem (Leathwick *et al.* 1995). Bioclimatic zones used in this survey were as follows.

coastal — A narrow zone extending up to 1 km inland from the coast, where the vegetation is often exposed to salt-laden winds, and frosts are mostly absent. It is characterised by estuarine, sand dune, or sea-cliff species, or on forested sites often by karaka (although karaka does extend further inland) (Leathwick *et al.* 1995).

semi-coastal — This zone extends approx. 10 km inland from the coast, and generally to an altitude of 200 m (Leathwick *et al.* 1995). Abundant kohekohe in the canopy is an indicator of the inland limit of this zone (as in the Turanga Ecological District; Clarkson & Clarkson 1991c).

lowland — Inland from the semi-coastal zone, this zone extends to around 700-750 m a.s.l., and is typified by the dominance of tawa, often with emergent podocarps on hillslopes, and by kahikatea, matai and/or totara on alluvial terraces (Leathwick *et al.* 1995).

montane — This zone extends from around 700-750 m up to the treeline at around 1200 m. It is typified by the dominance of beech species, with red beech more abundant at lower altitudes, and silver beech dominant at higher altitudes.

CANOPY — The layer or layers formed by the uppermost crown or their parts. The concept is applicable to any kind of vegetation. In forests it includes lianes and epiphytes.

COMMUNITY	A collection of populations of animals and plants that occur naturally together in a common environment of any size.
dbh	Diameter at breast height (1.4 m from ground)
ECOLOGICAL DISTRICT	A local part of New Zealand where geological, topographical, climatic and biological features and processes, including the broad cultural pattern, interrelate to produce a characteristic landscape and range of biological communities. 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 instances, a single very distinctive ecological district.
ECOLOGICAL UNIT	Any combination of vegetation types (or suite of interrelated types)plus the landform it occurs on, e.g. kahikatea forest on alluvial river terrace. Other important attributes of the unit such as the bioclimatic zone (e.g. montane, coastal) may be added to the name.
EXOTIC	Introduced from abroad. Often referred to in relation to pasture grassland and plantation forestry, e.g. exotic grassland, exotic forest.
FERNLAND	Vegetation in which the cover of ferns in the canopy is 20-100% and in which the fern cover exceeds that of any other growth from or bare ground, e.g. bracken fernland. Treeferns with stems >10 cm diameter are excluded as trees (cf. forest).
FOREST	Woody vegetation in which the cover of trees and shrubs in the canopy is >80% and in which the tree cover exceeds that of shrubs.
HABITAT	The part of the environment in which a plant or animal lives. A organism usually has adaptions which allow it to live in that particular environment and it may be more or less restricted to that habitat.
HERBFIELD	Vegetation in which the cover of herbs in the canopy is 20-100% and in which the herb cover exceeds that of any other growth form or bare ground. Herbs include all herbaceous and low-growing semi-woody plants that are not separated as shrubs, ferns, tussocks, grasses, sedges, rushes, reeds, cushion plants, mosses or lichens.
INDIGENOUS	Native to, and occurring naturally in New Zealand. All those features which in the aggregate originally gave New Zealand its own distinctive character. Important at the regional, district and species level.

KARST	Type of landscape which is formed by dissolving of limestone rocks by water, and includes but is not limited to the classic characteristics of a hummocky, bumpy appearance caused by surface hollows, depressions and fissures, collapse structures such as natural arches, caves, disappearing and reappearing rivers and streams and strangely shaped rocky outcrops.
KAWENATA	Covenant giving legal protection to Maori land under the Nga Whenua Rahui provisions of the Reserves or Conservation Acts.
LANDFORM	A recognisable, naturally formed physical feature of the land having a characteristic shape, e.g. hill, alluvial terrace. In the PAN programme, classification of a landform emphasises its ecological significance rather than its geomorphological or geological significance.
alluvial terrace	Flat to gently sloping area of alluvium of variable height above river level. May be periodically flooded.
cliff	Very steep sloping to vertical rock face.
foredune	Coastal dune parallel to the shoreline at the landward margin of the beach.
hillslope	Slope unit on which drainage lines are predominantly parallel.
NATIVE	Not known to have been introduced by human agency.
NATURAL AREA	A place largely characterised by indigenous species or ecosystems. This includes some areas that have suffered significant modification in the past, with most natural areas surveyed likely to have had some form of modification (e.g. logging, human-induced burning, grazing or browsing by introduced mammals etc.).
OSC	Open Space Covenant - Queen Elizabeth II National Trust
PODOCARPS	A predominantly Southern Hemisphere family of coniferous plants which include kahikatea, totara, Hall's totara, matai, miro, rimu, tanekaha, kaikawaka and toatoa.
PRIMARY	Vegetation which is essentially original in composition and structure, i.e. which has escaped major human modification.
PROTECTED NATURAL AREA (PNA)	A legally protected area, characterised by indigenous species or ecosystems, in which the principal purpose of management is the retention of the indigenous state.

RECOMMENDED AREA FOR PROTECTION (RAP)

An area identified as having priority for protection because it contains good representative examples of its type or class of natural ecosystem and/or landscape in an ecological district. An 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, making it more fully representative of New Zealand's ecological diversity.

REEDLAND

Vegetation in which the cover of reeds in the canopy is 20-100% and in which the reed cover exceeds that of any other growth form. Reeds are herbaceous plants growing in standing or slowly running water that have tall, slender, erect, unbranched leaves or culms that are either hollow or have a very strong pith. e.g. raupo reedland.

RUSHLAND

Vegetation in which the cover of rushes in the canopy is 20-100% and in which the rush cover exceeds that of any other growth form of bare ground. Included in the rush growth form are some species of *Juncus* and all species of *Sporodanthus*, *Leptocarpus* and *Empodisma*.

SCRUB

Woody vegetation in which the cover of shrubs and trees in the canopy is >80% and in which shrub cover exceeds that of trees (cf. forest). Shrubs are woody plants <10 cm dbh.

SECONDARY

Vegetation that has established after destruction or disturbance of the previous cover and which is essentially different from the original vegetation, e.g. kanuka scrub and forest (cf. advanced secondary).

SEDGELAND

Vegetation in which the cover of sedges in the canopy is 20-100% and in which the sedge cover exceeds that of any other growth form or bare ground. Included in the sedge growth form are many species of *Carex*, *Uncinia* and *Scirpus*.

SHRUBLAND

cf. SCRUB but has 20-80% cover of shrubs.

SSWI

Site of Special Wildlife Interest. Identified by the former Wildlife Service between 1983-1985 and later published. The focus was mainly on birds and their habitats.

STUDY SITE

A tract of land with indigenous vegetation delineated as suitable for study by rapid field inventory in order to identify the ecological patterns and natural diversity of an Ecological District. An arbitrary unit, empirically defined - perhaps by the boundary of a remnant forest stand, a catchment, a legal title.

SUCCESSION	The process of change in appearance, composition and structure of a community, usually over a number of years. Change may be due to biotic (intrinsic) factors, or state (extrinsic) factors, or both.
TOMBOLO	An accumulation of mainly beach and dune sands that connects a former island to the mainland.

Appendix 10

TINIROTO, WAIHUA, MAHIA AND MATAWAI ECOLOGICAL DISTRICTS - VEGETATION CLASSES

The vegetation of the Tiniroto, Waihua, Mahia and Matawai Ecological Districts was divided into broad vegetation classes. These descriptions are based on the survey data and those made by Nicholls (1976).

FOREST

Primary, logged primary or advanced secondary

Beech forest Bch

This forest class includes black beech, red beech and silver beech forest, growing either singly or in various mixtures. Red and silver beech dominate at higher altitudes, with black beech extending down to lower altitudes. Black beech is the only beech present in the Waihua Ecological District. This class also includes younger advanced secondary beech forest that has regenerated following clearance or burning.

Conifer/beech forest CBch

Rimu/beech at higher altitudes, with Hall's totara, miro, matai, totara and kahikatea and a mix of broadleaved trees (tawari, tree fuchsia and kamahi). On alluvial terraces in the Matawai Ecological District kahikatea is dominant with red beech, matai and rimu over a mixed canopy of tawa, white maire and tawari.

Conifer/broadleaved-beech forest CGBch

Beech is abundant with occasional to frequent emergent conifers; usually rimu, with miro and Hall's totara. Amongst the mainly beech canopy are kamahi and tawari. This forest class is restricted to above the altitudinal limit of tawa (c. 800 m a.s.l.).

Broadleaved-beech forest GBch

The steeper upper slopes, of Te Ihuorurumaioterangi (PNA 59), for example, support broadleaved-beech forest with tawa, kamahi and tawari in the canopy and pockets of pure beech on the ridges. Most mature podocarps have been logged from this primary forest class.

Conifer/tawa-beech forest CTBch

Primary forest where the dominant conifers include rimu, matai, kahikatea, totara and Hall's totara (higher altitudes). The canopy is dominated by tawa and

beech (predominantly red and silver), with northern rata, hinau, rewarewa and kamahi.

Conifer/broadleaved forest CH

Primary forest with emergent rimu, miro, matai, kahikatea and local totara; rimu and matai are the most common emergents. Combinations of tawa, hinau, rewarewa, black maire and kamahi are abundant in the canopy.

Tawa-beech forest TBch

This forest class is chiefly composed of former rimu/tawa-beech forest where the conifers have been largely felled or destroyed by fire (Nicholls 1976). Generally a large proportion of the original tawa-beech canopy remains intact. In the southern half of the Matawai Ecological District the class has red beech with a small amount of silver beech, while in the Tiniroto Ecological District it has primarily black beech with some red beech. The canopy also contains variable mixtures of rewarewa, kamahi, tawari, mountain horopito and treeferns.

Broadleaved-beech forest BLBch

This forest class is composed mainly of former conifer/broadleaved-beech forest where the conifers have been largely logged. Rewarewa, kamahi, red and silver beech and tawari are also present in varying concentrations.

Conifer/tawa forest CT

This forest class is widespread throughout the districts. It consists of conifers (e.g. rimu the most abundant, kahikatea, matai, totara, miro) and northern rata over a canopy dominated by tawa. Hinau, pukatea and rewarewa are common amongst the tawa at lower altitudes (>400 m a.s.l.), with kamahi, tree fuchsia, kamahi and tawari at higher altitudes. It includes primary forests and those that have been partially logged. Conifers range from very occasional to abundant and vary in their species composition.

Conifer/tawa-kohekohe forest CTk

Primary forest that lies within the coastal/semi-coastal bioclimatic zone. Titoki, karaka, puka, nikau and ngaio are all common amongst the tawa-dominated canopy. Kohekohe dominates the understorey. Rimu, kahikatea and matai are the most abundant podocarps, although few areas of this forest class remain unlogged in the survey area.

Tawa forest T

Generally conifer/tawa forest that has been selectively logged of conifers leaving a largely tawa-dominant residue. Pukatea, hinau, kamahi and tawari are all common associates of this class.

Tawa/kohekohe forest Tk

Generally coastal/semi-coastal conifer/tawa forest that has been selectively logged of conifers leaving a largely tawa-dominant residue, with kohekohe, karaka, ngaio, puka and nikau.

Tawa-titoki forest TT

This forest class occurs primarily in the lowland and semi-coastal bioclimatic zones of the Waihua and Mahia Ecological Districts, with a small amount in the warmer lowlands of Tiniroto. Much of it lies on gentle hillslopes and alluvial terraces. Species commonly occurring include kahikatea, matai, rimu, rewarewa, nikau, kohekohe, pukatea, karaka, mahoe and kowhai.

Tawa-titoki-kohekohe forest Ttk

This forest class occurs within the semi-coastal bioclimatic zone, mostly within the Waihua and Mahia Ecological Districts. The species associated with it are similar to those described above for tawa-titoki forest, but with greater concentrations of kohekohe in the canopy/sub-canopy.

Conifer/tawa-titoki forest CTT

This class is similar to tawa-titoki forest, but has greater numbers of large conifers. All of it identified lies in the lowland Tiniroto and Waihua Ecological Districts. Kahikatea is the most abundant conifer, with occasional totara and matai. Other species present include mahoe, pokaka, kohuhu, kowhai and karaka (closer to the coast).

Conifer forest C

Often referred to as dense podocarp forest. Largely kahikatea dominated on alluvial sites, with totara, matai and rimu associated with it. Also on moderate well-drained slopes of high natural fertility, where matai and totara are generally dominant. Most of this forest class has largely gone from lower altitudes, with only small pockets of secondary and advanced secondary pole stands that have established since initial clearance. Some of the river valleys within the Tiniroto Ecological District still retain tracts of the original forest - in particular the Waikura and Hangaroa River valleys.

Conifer/broadleaved forest CBL

This forest class is advanced secondary vegetation, with mainly pole conifers emergent over a mixed broadleaved canopy. Conifers include rimu, kahikatea, matai and totara. The broadleaved canopy (which may include everything but tawa) may have occasional kanuka amongst it, with tawari and kamahi in wetter areas and at higher altitudes.

Conifer/kanuka forest CK

This low forest class is secondary, with kanuka the main canopy species. The dominant conifers are usually pole kahikatea and totara, with occasional rimu. This forest has established following clearance and/or burning of the original vegetation in most cases for agriculture.

Conifer/kanuka-broadleaved forest CBS

Advanced secondary vegetation with abundant kanuka in the canopy, with young podocarps amongst it and emergent (predominantly totara, with some kahikatea, rimu and matai). Broadleaved trees present in the canopy include mahoe, pigeonwood, ngaio, mapou and houhere.

Conifer/kanuka-kohekohe forest CKk

As above but closer to the coast. Kohekohe is a component of the canopy (some of which are primary trees), along with karaka, nikau, titoki, kowhai, and scattered tawa and pukatea.

Broadleaved forest BL

Advanced secondary forest, that has either been logged, or had some other major disturbance. Tawa is absent, or only a minor component, with variable mixtures of broadleaved trees and shrubs dominating the canopy (e.g. coastal/semi-coastal - karaka, titoki, kohekohe, ngaio, nikau; lowland and higher altitudes - kamahi, tawari, tree fuchsia).

Kanuka-broadleaved forest BS

Advanced secondary or secondary vegetation with kanuka a major component of the canopy. Other species present include kanono, kowhai, mahoe, heketara, putaputaweta, young podocarps (kahikatea, totara, matai and rimu), lancewood, pate, cabbage tree, nikau (close to the coast), kamahi and tree fuchsia (wetter areas and at higher altitudes). Often has scattered primary trees, particularly in the gullies that the forest has grown up around, e.g. tawa, titoki, karaka (coastal).

Secondary Scrub/Shrubland/Low forest

Kanuka forest K

This secondary forest generally establishes on agricultural land, or through other successional vegetation following fire. In most areas kanuka forms a pure canopy, with only scattered broadleaved trees and treeferns amongst it and in the stream gullies. Emergent rewarewa is often associated with this forest class, particularly when the area has suffered past burning. The understoreys are generally sparse, with red-fruited karamu often the dominant shrub.

Conifer/small-leaved scrub Csl

This secondary vegetation, most of which lies in the lowland bioclimatic zones of the Waihua and Tiniroto Ecological Districts, has totara and/or kahikatea over an either kanuka-, manuka-, or mixed kanuka-manuka-dominated low canopy. Other species present include rewarewa, red-fruited karamu, mingimingi, kohuhu, cabbage tree and lancewood.

Kanuka scrub k

This young secondary class occurs on the more fertile, less stressed sites cf. manuka scrub below. More common in semi-coastal and drier lowland sites in the Tiniroto, Waihua and Mahia Ecological Districts. Other species present amongst the kanuka include young totara, and kahikatea, cabbage tree, kohuhu, kowhai and treeferns.

Manuka scrub m

This secondary vegetation occurs on the more stressed, colder or dry sites (ridges and spurs) and moist/water logged sites (high rainfall and wetland and lake margins) throughout. Often associated with the margins of freshwater and saline wetlands. Mingimingi and red-fruited karamu are most frequently associated with manuka scrub at lower altitudes. It may also contain pockets of broadleaved trees in pockets in gullies remnants of the original vegetation, or moist pockets where regeneration has been more rapid.

Tauhinu scrub-shrubland ts

This young secondary vegetation is largely restricted to dry hillslopes in the coastal and semi-coastal bioclimatic zones. Most abundant in the Waihua and Mahia Ecological Districts.

Manuka-kanuka scrub sl

Young secondary vegetation with various mixtures of manuka or kanuka in the low canopy. Present throughout semi-coastal and lowland Waihua, Tiniroto and Mahia Ecological Districts.

Broadleaved/small-leaved scrub bs

Secondary vegetation with a mixture of small-leaved shrubs (e.g. manuka, kanuka, tauhinu, mingimingi) and broadleaved shrubs/trees (e.g. cabbage tree, houhere, koromiko) in the low canopy.

Broadleaved scrub-shrubland bl

Secondary vegetation where the mix of species at any one site varies depending on climate and site history. In the semi-coastal-lowland bioclimatic zone karo, ngaio, mahoe, rangiora, tutu, wineberry, five finger, koromiko, *Hebe tairawhiti*

and kaikomako occur. With increasing distance inland and altitude mountain horopito becomes the main broadleaved scrub species along with heketara, *Coprosma* sp. unnamed (*C.* (t) of Eagle 1986), broadleaf, young Hall's totara, young rimu and hupiro. It often has scattered young red or silver beech amongst it. This inland variant is most abundant in the Matawai Ecological District.

Cliff

Cliff vegetation cliff

This vegetation class includes both coastal and inland steep slope/cliff/bluff vegetation. Its composition depends largely on the site's stability and substrate, aspect and the extent of browsing. Tauhinu is often the commonest shrub on coastal and drier lowland sites (particularly in Waihua and Mahia Ecological Districts), along with manuka and kanuka, whaririki, *Hebe* spp. tutu, karamu, taupata and shore lobelia. Moist seepage areas along coastal cliffs also support herbaceous species like *Senecio banksii*, sea primrose, *Nertera depressa* and *Senecio rufiglandulosus*. Inland sites often support *Pittosporum ralphii*, *Hebe* spp., koromiko, kowhai, tutu, rangiora, manuka, kanuka, *Gahnia* sp., tuhara, whaririki flaxland, herbaceous species like *Craspedia* spp., *Anaphalioides bellidioides*, *Euphrasia* spp. and *Parahebe* spp. Kakabeak occurs on cliffs and bluffs, near the edges of Te Urewera National Park and in RAP TIN 60.

Wetlands

Freshwater wetlands FW

Includes all seasonal, ephemeral and permanent wetlands and freshwater lakes. The vegetation patterns at each site reflect the local topography and hence drainage characteristics, differences in substrates, fertility and the history of disturbances e.g. fire, artificial drainage and trampling and grazing by stock (Johnson & Brooke 1989). Around the margins of the wetlands/lakes there are distinctive bands of vegetation, dominated by various herbaceous, rush, sedge and reed species. The most typical species of lowland wetlands/swamps are raupo, *Carex* spp., *Juncus* spp. and harakeke. Other species often present within/around the margins of the wetlands/lakes of the study area include giant umbrella sedge, bamboo and sharp spiked-sedge, purei, *Carex virgata*, *C. maorica*, *Baumea* spp., *Isolepis* spp., lake clubrush, sphagnum moss and burr-reed (only in RAP WAH 26).

Manuka scrub is also often present around the wetland/lake margins and on hummock/islands throughout. A number of the wetlands/lakes within the study area have also been invaded by crack and/or grey willow.

Saltwater wetlands SW

Saline wetlands occur only in the Waihua and Mahia Ecological Districts. The plant communities indicative of them include sea rush rushland, turffields and saltmarshes of glasswort, selliera, sea primrose, bachelors button, *Lilaeopsis novae-zelandiae*, and *Mazus novae-zeelandiae*, raupo reedland and

Bolboschoenus medianus sedgeland. Other species present include saltmarsh ribbonwood, sharp spiked-sedge, bamboo spiked-sedge, jointed wire rush, and knobby clubrush. Many of the wetlands along the Waihua coastline have varying salinities. Many are fed by freshwater, with salt water reaching them through seepage, salt spray and when beach barriers are breached (naturally or through human intervention).

Dunelands

Dunelands D

Occur in the Waihua and Mahia Ecological Districts. Foredune species include the sandbinders spinifex, marram (which has invaded most of the dunes within the districts), pingao (restricted to only a few sites) and sand tussock (only present in the Mahia Ecological District). Species on the more stable back dunes include harestail, sand sedge, sand convolvulus, sand pimelea, jointed wire rush, pohuehue, sand coprosma, zoysia and *Raoulia australis*.

Appendix 11

COMPARISONS OF AMOUNTS OF INDIGENOUS VEGETATION SURVEYED, CURRENTLY PROTECTED AND RECOMMENDED FOR PROTECTION

During this survey study sites where identified and mapped in the field and later checked against aerial photographs. Vegetation types/ecological units were defined and mapped using these study site boundaries. When the RAPs were selected, however, their boundaries did not in all cases coincide with the study area boundaries, meaning discrepancies arose between these two layers on the GIS. This was only a problem where the RAP was larger than the study site and therefore did not have unit information associated with its whole area. These discrepancies mean that direct comparisons between the amount of indigenous vegetation represented within the RAPs and those within the PNAs and other study sites can not be fully and reliably quantitative. With this proviso, tables of the amounts (ha) of indigenous vegetation types/landforms classes within the study sites that are contained within the RAPs and PNA in each district are provided below in order to provide useful indicative information.

TABLE 1 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN ALL STUDY SITES, IN PROTECTED NATURAL AREAS AND IN RECOMMENDED AREAS FOR PROTECTION IN THE TINIROTO ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	PNAS (HA)	PNAS (%)	RAPS (HA)	RAPS (%)
Primary/modified primary					
beech forest	1939	6.9	0.4	1799	93
conifer/beech forest	816	592	73	189	23
conifer/broadleaved-beech forest	162	133	82	27	17
broadleaved-beech forest	36	36	100	0	0
conifer/tawa-beech forest	3714	2523	68	971	26
conifer/broadleaved forest	264	38	14	0	0
tawa-beech forest	156	15	9.6	108	69
conifer/tawa forest	3289	1570	48	1372	42
conifer/tawa-titoki forest	30	01	0	4	13
conifer/tawa-kohekohe forest	54	0	0	53	98
tawa forest	4072	990	24	2286	56
tawa/kohekohe forest	237	14	6	168	71
tawa-titoki/kohekohe forest	0.8	0	0	0	0
tawa-titoki forest	159	6.7	4.2	32	20
conifer forest	497	101	20	264	53

TABLE 1 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN ALL STUDY SITES, IN PROTECTED NATURAL AREAS AND IN RECOMMENDED AREAS FOR PROTECTION IN THE TINIROTO ECOLOGICAL DISTRICT. (CONT.)

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	PNAS (HA)	PNAS (%)	RAPS (HA)	RAPS (%)
Advanced secondary					
conifer/broadleaved forest	69	38	55	26	38
conifer/kanuka-broadleaved forest	243	0	0	43	18
conifer/kanuka forest	886	0	0	548	62
broadleaved forest	1081	38	3.5	1043	96
kanuka-broadleaved forest	1514	735	49	274	18
Secondary forest/scrub/shrubland					
kanuka forest	9571	2929	31	4637	48
conifer/small-leaved scrub	15	0	0	6	40
kanuka scrub	2273	425	19	1089	48
manuka scrub	2090	0	0	1283	61
manuka-kanuka scrub	6898	1559	23	2854	41
tauhinu scrub-shrubland	83	0	0	0	0
broadleaved/small-leaved scrub	3182	769	24	2118	67
broadleaved scrub-shrubland	646	22	3.4	335	52
Cliff vegetation	54	0	0	35	65
Freshwater wetlands and lakes	222	26	11.7	98	44
TOTAL	44253	12567	28.4	21662	49

TABLE 2 : AREAS AND PERCENTAGES OF MAJOR VEGETATION CLASSES IN ALL STUDY SITES, IN PROTECTED NATURAL AREAS AND RECOMMENDED AREAS FOR PROTECTION IN THE WAIHUA ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	PNAS (HA)	PNAS (%)	RAPS (HA)	RAPS (%)
Primary/modified primary					
beech forest	13.5	13.5	100	0	0
conifer/tawa forest	129	64	49.6	47	36
conifer/tawa-titoki forest	6	2	33	0	0
conifer/tawa-kohekohe forest	289	226	78	1	17
tawa forest	735	264	36	294	40
tawa/kohekohe forest	222	15	7.0	115	52
tawa-titoki forest	124	4.8	3.9	56	45
tawa-titoki/kohekohe forest	63	4.9	7.8	44	70
conifer forest	26	7.7	30	3	12
Advanced secondary					
conifer/broadleaved forest	84	57	68	10	12
conifer/kanuka forest	32	1.5	4.7	24	75
conifer/kanuka-kohekohe forest	4	0	0	4	100
broadleaved forest	377	48	12.7	266	71
kanuka-broadleaved forest	209	55	26	41	20
Secondary forest/scrub/shrubland					
kanuka forest	1436	499	34.7	679	47
conifer/small-leaved scrub	25	0	0	20	80
kanuka scrub	854	41	4.8	199	23
manuka scrub	276	16	5.8	80	29
manuka-kanuka scrub	2013	57	2.8	1073	53
tauhinu scrub-shrubland	160	121	76	33	21
broadleaved/small-leaved scrub	43	0	0	28	65
broadleaved scrub-shrubland	24	0	0	24	100
Cliff vegetation	231	103	45	56	24
Freshwater wetlands and lakes	237	219	92	15	6
Saltwater wetlands/lagoons	909	220	24	677	74
Duneland	324	28	8.6	175	54
TOTAL	8845	2067	23	3964	45

TABLE 3 : AREAS (HA) AND PERCENTAGES OF MAJOR VEGETATION/LANDFORM IN ALL STUDY SITES, IN PROTECTED NATURAL AREAS (PNAS) AND RECOMMENDED AREAS FOR PROTECTION (RAPS) IN THE MAHIA ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	PNAS (HA)	PNAS (%)	RAPS (HA)	RAPS (%)
Primary/modified primary					
conifer/tawa-kohekohe forest	400	345	86	54	14
tawa forest	37	0	0	4	11
tawa/kohekohe forest	512	42	8.2	310	61
tawa-titoki forest	12	0	0	0	0
tawa-titoki/kohekohe forest	62	0	0	25	40
Advanced secondary					
conifer/broadleaved forest	1.8	1.8	100	0	0
broadleaved forest	65	3.5	5.4	13	20
kanuka-broadleaved forest	21	0	0	12	57
Secondary forest/scrub/shrubland					
kanuka forest	198	25.0	13	138	70
kanuka scrub	253	0	0	153	60
manuka scrub	2.8	0	0	3	100
tauhinu scrub-shrubland	37	0	0	1	3
manuka-kanuka scrub	139	0	0	73	53
broadleaved/small-leaved scrub	15.8	0	0	3	14
broadleaved scrub-shrubland	19	0	0	0	0
Cliff vegetation	7.8	6.2	79	0	0
Freshwater wetlands and lakes	57	8.6	15	37	65
Saltwater wetlands/lagoons	159	0	0	122	77
Duneland	446	0	0	213	48
TOTAL	2445	432	17.7	1161	47.5

TABLE 4 : AREAS AND PERCENTAGES OF MAJOR VEGETATION/LANDFORM CLASSES IN ALL STUDY SITES, IN PROTECTED NATURAL AREAS (PNAS) AND IN RECOMMENDED AREAS FOR PROTECTION (RAPS) IN THE SOUTHERN HALF OF THE MATAWAI ECOLOGICAL DISTRICT.

VEGETATION/LANDFORM CLASS	TOTAL AREA (HA)	PNAS (HA)	PNAS (%)	RAPS (HA)	RAPS (%)
Primary/modified primary					
beech forest	1466	1063	73	109	7
conifer/beech forest	2001	1556	78	84	4
conifer/broadleaved-beech forest	789	747	95	44	5.6
conifer/tawa-beech forest	995	931	94	0	0
tawa-beech forest	77	0	0	29	38
conifer/tawa forest	379	13.6	3.6	284	75
tawa forest	1404	654	47	510	36
conifer forest	89	18.2	20	45	51
Advanced secondary					
conifer/broadleaved forest	162	0	0	115	71
broadleaved forest	541	276	51	47	8.7
Secondary scrub/shrubland					
manuka scrub	416	0	0	35	8.4
broadleaved/small-leaved scrub	494	118	24	117	24
broadleaved scrub-shrubland	173	113	65	46	27
Freshwater wetland	16	0.7	4.4	0[1]	0
TOTAL	9002	5490	61	1465	16

[1] Several wetlands do lie within the RAPs in the Matawai Ecological District, but because the vegetation in and around them was either conifer forest (C) or manuka scrub (m) they fall under those codes e.g. RAPs MAT 15 and 17.