



Otanewainuku Ecological District

Survey report for the
Protected Natural Areas Programme

NEW ZEALAND PROTECTED NATURAL AREAS PROGRAMME NO. 37



Department of Conservation
Te Papa Atawhai

Otanewainuku Ecological District

Survey Report for the Protected Natural Areas Programme

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Foreword

This report forms part of the Protected Natural Areas (PNA) Programme series of reports. These reports describe Recommended Areas for Protection (RAPs) within ecological regions and districts throughout New Zealand.

Otanewainuku Ecological District extends across the Kaimai Range and the northern Mamaku Plateau to the coast at Otamarakau. The district was once entirely forested, however it now comprises a mixture of indigenous vegetation, plantation forestry, agriculture and horticulture. A range of forest types occur across the district from the tawari dominated submontane forest and rimu-northern rata/tawa-kamahi-rewarewa forest in the lowland zone, through to the pohutukawa dominated coastal zone and sand dune communities. Some of the remaining forest has been logged for podocarps and broad-leaved species. Whilst the present day indigenous vegetation is still largely forest, there are a few scattered wetlands and low sand-dune vegetation along the 16 km of coast. Twenty-five threatened plant species have been found in the district with seven other species attaining distributional limits, including kauri.

This report contains a large amount of information on the ecological values of the Otanewainuku Ecological District. It is a significant reference work but also gives guidance as to conservation priorities. It will be a useful document for landholders, conservation managers from the Department of Conservation and other related organisations, iwi, conservation groups, scientists and the general public.

The identification of RAPs is the starting point for the implementation phase of the PNA programme. This could involve discussions and consultation with landowners, aimed at securing some form of protection of the natural values associated with the RAPs if the landowner so desires.

Effective conservation involves partnerships between local and central government, landowners and local communities. To achieve protection the Department of Conservation promotes a wide range of mechanisms including covenants, management agreements, protected private land agreements, reserves and District Scheme provisions.

The Otanewainuku Ecological District PNAP report has been prepared by Wildland Consultants Ltd under contract to the Department of Conservation.



Henry Weston
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Abstract

Otanewainuku Ecological District was surveyed during the period January to May 1994 for the New Zealand Protected Natural Areas Programme in order to identify priority representative natural areas for protection. The district covers approximately 188,700 ha. The main characteristics of the ecological district are the dissected ignimbrite plateaus with their incised gorges. The few physiographic variations are primarily due to differing age of ignimbrites, local andesite outcrops and minor rhyolitic domes.

The soils of the district are mainly moderately to strongly leached volcanic ash soils. The former primary podocarp/tawa forests with local beech, which covered much of the district in 1840, have been widely logged and cleared for farming and exotic forestry.

The ecological district was subdivided into eight land systems and four bioclimatic zones (coastal, semi-coastal, lowland, and sub-montane). The land systems reflect the geological and landform variation, while bioclimatic zones were distinguished on the basis of the distributions of selected indicator plant species.

Protected natural areas are relatively extensive and include reserves administered by the Department of Conservation (c. 40,000 ha), QEII Covenants (c. 1,170 ha), water reserves (c. 2,700 ha), and Whakatane District Council Coastal Reserves (c. 174 ha). In total these reserves comprise 45,078 ha or 24% of the ecological district. However, a relatively large proportion of the protected areas are in the lowland bioclimatic zone, with c. 46% of the lowland bioclimatic zone in reserves. By comparison the semi-coastal bioclimatic zone is under-represented in the existing reserve system with only 10.5% protected overall. Five of the seven land systems represented in the semi-coastal bioclimatic zone can be regarded as being under-represented in the protected area network.

Sixty-two recommended areas for protection (RAPs) are identified, totalling 19,922 ha or 10.6% of the ecological district. These were selected to complement existing protected natural areas, to represent more fully the natural diversity of the Otanewainuku Ecological District. In addition, some recommendations are made for improved management of existing protected areas, some of which should have an upgraded classification in order to reflect their importance for nature conservation.

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1. Introduction

The main objective of the protected natural areas programme (PNAP) is to identify and establish a network of reserves representing the full range of New Zealand's natural diversity, as outlined in Section 3(1)(b) of the Reserves Act 1977.

“The preservation of representative samples of all classes of natural ecosystems and landscapes which in their aggregate originally gave New Zealand its own recognisable character.”

Otanewainuku Ecological District was identified as a “first priority” for survey by the Biological Resources Centre (Myers 1984) for several reasons. Firstly, the existing reserves system is not representative, semi-coastal vegetation in particular being under-represented. Secondly, technical information about the district is inadequate for wise land-use planning. Thirdly, land clearance is continuing. In addition, there is ongoing inappropriate management of some lands which are currently “protected”. These issues are addressed in this report.

Otanewainuku Ecological District is administered by six different territorial local authorities (Matamata-Piako, South Waikato, Tauranga, Western Bay of Plenty, Whakatane, and Rotorua District Councils), and two regional councils (Waikato and Bay of Plenty).

Fieldwork was carried out in February and March 1994. Existing information was used where available. Survey methods used were abbreviated from those outlined in the guidebook for the rapid ecological survey of natural areas (Myers *et al.* 1987).

The ecological character of the district is described in Section 2 and survey methodology is outlined in Section 3. The results section (4) includes descriptions of the vegetation, flora and wildlife, and Section 5 identifies recommended areas for protection (RAPs). Appendices contain vegetation type descriptions, an ecological unit checklist, species lists, description of the land systems, a list of already protected areas in Otanewainuku Ecological District, and glossaries.

The report was completed in October 1994, however it was not published at that time. Following the Department of Conservation's intention to publish the report in 2006, selected parts of the report were updated, e.g. threat categories of flora and fauna have been updated. In addition, several areas that were listed in the 1994 report as protected based on information provided at that time by land managers, but which were subsequently found to be unprotected, have been identified as RAPs where they meet the criteria.

2. Ecological character of Otanewainuku Ecological District

LOCATION AND SETTING

Otanewainuku Ecological District covers approximately 188,700 ha of the Northern Volcanic Plateau Ecological Region and is roughly rectangular in shape (see Figure 1). The name is taken from Mt Otanewainuku, a prominent central landmark. At the eastern end, the Otamarakau-Matata coastline and the edge of the Rangitaiki Plains provide natural boundaries. The Rotorua Lakes catchments are excluded by the southern boundary. The district extends west across the Kaimai Range, incorporating the northern Mamaku Plateau (North of SH5), Whakamarama Plateau, the Papamoa Hills, and thence east across to the coast at Otamarakau.

Otanewainuku Ecological District is one of five ecological districts comprising the Northern Volcanic Plateau Ecological Region. All contain landforms derived from volcanic activity, but each has its own very distinctive character.

Otanewainuku Ecological District was distinguished on the basis of two criteria: geology and physiography (McEwen 1987). The main characteristics are the dissected ignimbrite plateaus approximately 300–600 m a.s.l., sloping mainly north. The few physiographic variations are primarily due to differing ages of the ignimbrites, local andesite outcrops and minor rhyolitic domes. Its climate is mild and humid. The soils of the district are mainly moderately to strongly leached volcanic ash soils. The former primary podocarp/tawa forests with local beech and very local kauri, which covered most of the district in 1840, have been widely logged and cleared for farming and exotic forestry.

The main features of the Tauranga Ecological District, to the north, are coastal sand dunes and estuaries, and alluvial plains, terraces, and downlands derived over geological time from erosion in the volcanic hinterland. In the south, Rotorua Lakes Ecological District contains the Rotorua caldera (source of the Mamaku Ignimbrite), numerous large volcanic domes (including Mt Tarawera), many lakes, and several very active geothermal fields. Motiti and White Island Ecological Districts comprise islands off the Bay of Plenty Coast. The former ecological district comprises one plateau-like main island and several stacks, whilst the latter comprises an active volcano, an extinct volcano and several small island and stacks.

PHYSIOGRAPHY

Land systems

The Otanewainuku Ecological District was divided into eight land systems with uniform attributes of landforms, geology, soils, altitude, and climate, defined in Table 1 and mapped in Figure 2. The land system framework along with bioclimatic zones divides the ecological district into more manageable units to help identify representative examples of remaining ecological units. Areas of indigenous vegetation in Recommended Areas for Protection (RAPs) and reserves in each land system and bioclimatic zone were calculated and used to assist in assessing the relative significance of each RAP (see Section 5).

TABLE 1. LAND SYSTEMS OF THE OTANEWAINUKU ECOLOGICAL DISTRICT

SYSTEM	LANDFORMS	ALTITUDE	GEOLOGY	SOILS	PRE-HUMAN VEGETATION	CLIMATE
1. Whakamarama Plateau	Rhyolite plateau surface is undulating to hilly, dissected by streams. Bounded on the east by the high andesitic escarpment (Kaimai Range) overlooking the Matamata Plains. The Wairere and Waiteriki Falls are the result of vertical movements along the Okauia Fault, where the ignimbrite sheet and underlying andesitic strata have been disrupted.	20–765m asl (Semi-coastal, lowland, sub-montane)	Waiteriki ignimbrite (light to dark grey dacite or andesitic ignimbrite with pronounced streaky lenticular texture, usually highly welded (Pliocene). Beeson's Island volcanics form lower scrap face along the western margin (hornblende and pyroxene andesites; Miocene).	Waitekauri and Whakamarama yellow-brown loams.	Mostly lowland forest, main species rimu-miro-northern rata/tawa-hinau-rewarewa-kamahitawari. Under 450 m asl in the north and extreme west, similar forest with additional semi-coastal species, e.g. mangao, pukatea, kohekohe, puriri, also local gorge forest with little tawa. Rare pockets of sub-montane forest on exceptionally high points, For example: Te Weraiti.	Mean annual rainfall is between 3152mm and 3940mm. The high rainfall is due to the uplifting of very moist air during the passing of frontal depressions or, in summer, the fringes of tropical cyclones. Prevailing wind is westerly; the steep western face of the plateau intensifies the force and turbulence of the northeasterly gales that often accompany the heavy rains. Light snow falls on land above about 470m once or twice a year.
2. Northern Mamaku Plateau (Refers to the northern portion only of the "Mamaku Plateau". The plateau straddles three ecological districts.)	Mamaku rhyolite plateau surface is undulating to hummocky, cut into long segments by the gorges followed by virtually all the streams. These flow shallow and rapid over rock pavements; waterfalls are fairly common. The eastern side is characterised by rolling to hilly terrain between gorges; the rhyolite rock being deeply covered by moderately eroded volcanic breccia and pumiceous ash erupted from sources a few miles southward in the late Pleistocene.	The margins of the plateau are about 60–100m, the crest of the plateau at the heads of the Mangapapa and Mangorewa Rivers reaches almost 580m; a few rhyolite dome ridges are a little higher (for example: Puwhenua 620m, Hiwiroa 696m). (Semi-coastal, lowland)	Mamaku ignimbrite, pale pink to grey ignimbrite containing plagioclase and minor quartz, poorly welded. Rotoiti breccia, poorly compacted white pumice breccias (Pleistocene), veneers the plateau about its eastern margins.	Oropi-Kaharoa, Kaharoa-Mamaku, Mamaku and Waiteti yellow-brown pumice soils.	A more varied pattern than on other systems. Lowland rimu-northern rata/tawa forest predominant above 450–500m, with the semi-coastal variant in the eastern quarter and toward the northern margin. A type characterised by near absence of tawa and common tanekaha and Hall's totara along upper reaches of the many incised streams; hard beech dominant in gorges of lower reaches. A hard-red-silver beech type about headwaters of Mangapapa and Mangorewa Rivers. Rare kauri near northern and western margins.	Mean annual rainfall is between 3152 mm and 3940 mm and can be as high as 4728 mm. Mean annual temperature over most of the forested land is probably close to 10oC and the mean annual number of ground frosts between 50 and 100. Light snow falls on land above about 470 m once or twice a year.

SYSTEM	LANDFORMS	ALTITUDE	GEOLOGY	SOILS	PRE-HUMAN VEGETATION	CLIMATE
3. Papamoa Hills	Ridges of rhyolites, andesites and volcanic breccias running north from the headwaters of the Whataroa Stream. Comprise the Papamoa Range with Mt Misery, Pukunui and Kupukairua domes to the west.	20–564m asl. (Semi-coastal, lowland)	Papamoa ignimbrite, dark grey highly welded dacite or andesitic ignimbrite lenticular texture. Upper less welded portion has flattened pumice lenticles (Pliocene). Te Puke breccias; white to pale brown pumice breccias and tuffs, with interbedded freshwater siltstones and sandstones (Pliocene). Beeson's Island volcanics; hornblende and pyroxene andesites (Miocene?). Omahia andesite; flows and dikes of platey andesite (Pliocene).	Oropi-Kaharoa and Kaharoa-Mamaku yellow-brown pumice soils.	Almost entirely semi-coastal podocarp-hardwood forest. Rare kauri. Lowland forest only above 500m asl at points along Otawa-Otanewainuku divide.	
4. Rotoiti Breccia Ignimbrite Fan	Eastern quarter of the district comprising ignimbrite overlain by beds of late Pleistocene pumiceous volcanic breccias up to 160m thick. It is tilted northwest, sloping gradually from heights of 420m, along to southeastern boundaries of 60–100m along an embayed margin overlooking the Maketu basin, Otamarakau coast. The breccia veneer has been eroded to the extent that most of the plateau surface is rolling to hilly. Numerous gullies and long narrow valleys have flat floors and no streams because of the porous breccia and subsequent accumulation of later volcanic ash. The plateau or fan is drained almost entirely by a series of northerly flowing streams that rise on the high ground in the south and southeast.	0–420m asl. (Semi-coastal)	Rotoiti breccia (poorly compacted white pumice breccias) and basal Matahina ignimbrite. In stream valleys: peat and undifferentiated alluvium (Holocene) undifferentiated terrace and fan deposits; Fluvial terrace deposits (Pleistocene) on northwestern periphery.	Paengaroa Ohinepanea, Oropi-Kaharoa yellow-brown pumice soils; central recent soils from Tarawera volcanic ash; recent soils for peat and alluvium.	Semi-coastal forest predominant, with common occurrence of mangao, pukatea, kohekohe, puriri, karaka, and nikau, mamaku, and kawakawa in understories. Kahikatea-pukatea dominant stands on valley floors in the low-lying northwest quarter.	Mean annual rainfall is approximately 970mm along the flanks of the plateau, increasing to 1654mm at Rotoehu Forest over the higher ground. The mean annual temperature at Rotoehu Forest is 8-18oC and the mean annual number of ground frosts is 70.

SYSTEM	LANDFORMS	ALTITUDE	GEOLOGY	SOILS	PRE-HUMAN VEGETATION	CLIMATE
5. Otamarakau Hills	Greywacke hills rising above the Kaharoa Plateau.	20–230m asl. (Semi-coastal)	Urewera greywacke comprising banded argillite, alternating siltstone and sandstones, conglomerates (Mesozoic).	Primary podzolic soils from volcanic ash.	Semi-coastal forest.	Greywacke mean annual rainfall of about 1400mm. Less than 50 ground frosts per year.
6. Sand dunes	Fore dunes and rear dunes; separated by dune hollow wetlands.	Approx 0–5m asl. (Coastal)	Holocene fixed foredunes.	Secondary podzolic soils from aeolian sand.	Dune vegetation.	Mean annual rainfall of about 1400mm. Very few frosts.
7. Matata Hills	Very steep hill country; along the eastern margin is a broken scarp 150 to 370m high overlooking the Rangitaiki Plain, coastal cliffs up to 230m high form the northern margin.	0–370m asl (Coastal and semi-coastal)	Matahina ignimbrite (pale pink to grey ignimbrite containing abundant plagioclase and minor quartz. Upper part poorly compacted and pumice recrystallised; lower part fine grained welded (entaculite)). Marine sandstones with fossils, conglomerates and interbedded pumiceous tuffs in upper part form scarp and narrow bands along north and east margin.	Recent soils from Tarawera volcanic ash; Paengaroa Ohinepanea yellow-brown pumice soils.	All semi-coastal forest, including a unique pohutukawa-hard beech type on the most broken terrain, just inland of Matata.	Mean annual rainfall of 1400–1600mm. Up to about 50 ground frosts every year - decreasing in frequency towards the coast.
8. Otuhepo Hills	Andesitic hills.	140–510m asl. (Semi-coastal)	Beeson's Island volcanics (hornblende and pyroxene) (Miocene).	Recent soils from Tarawera volcanic ash.	Semi-coastal forest.	Mean annual rainfalls of between 1600 and 2000mm. About 50 ground frosts every year.

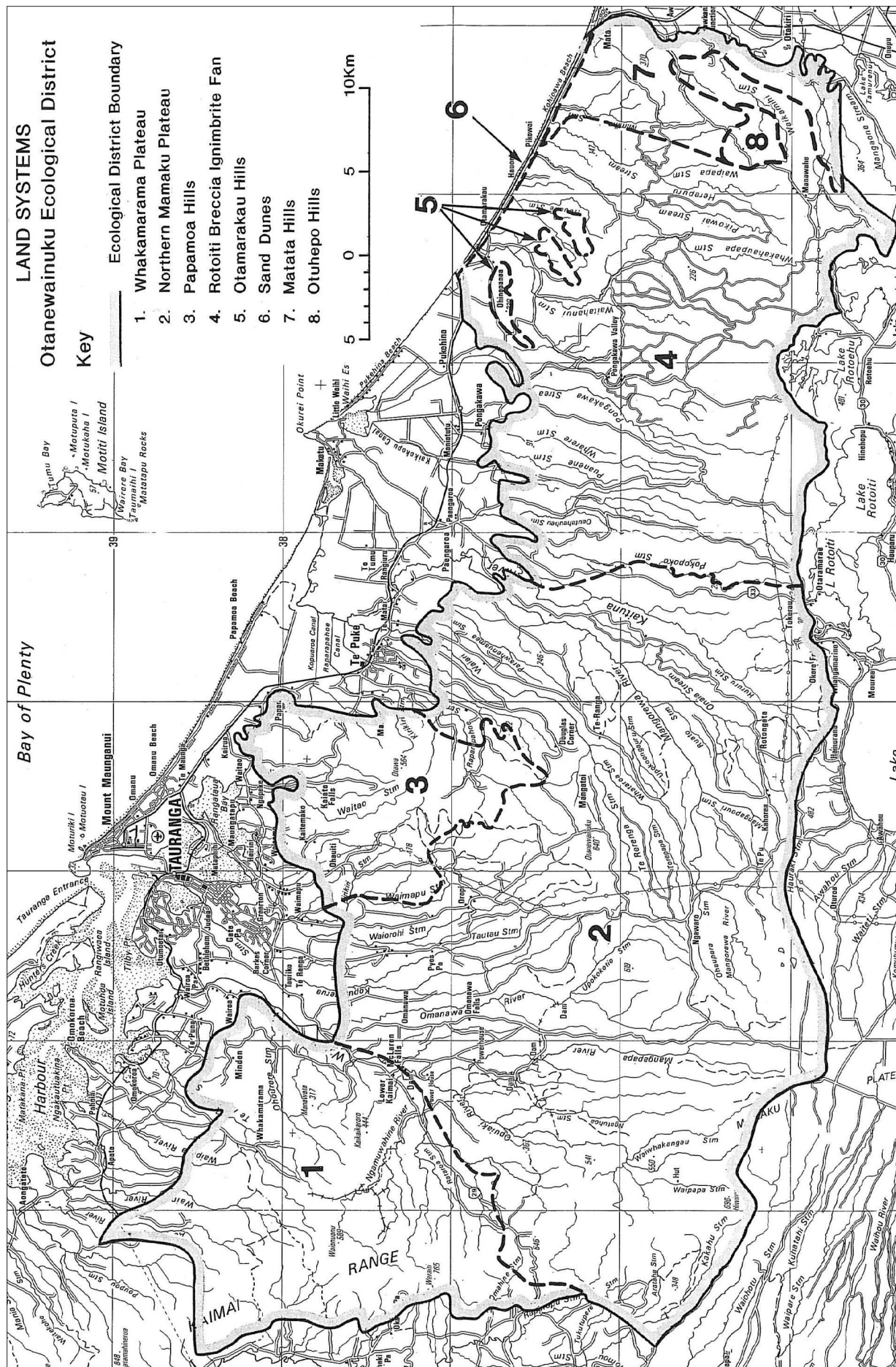


Figure 2. Land systems, Otanewainuku Ecological District.

Whakamarama Plateau

The Whakamarama rhyolite plateau is one of the oldest in the central North Island volcanic region. The plateau surface is undulating to hilly, with a main gradual fall east and north. It is bounded on the west by a high escarpment exposing andesite on the lower face and overlooking the Matamata Plain. The crest of this major fault scarp (Okauia Fault) is the Kaimai Range. In the east and south, a number of ancient rhyolite domes surmount the typical plateau surface.

A minor portion of the plateau is drained by streams crossing the scarp (Wairere and Te Arika Falls) but otherwise streams flow northeast to eastward to the Tauranga Basin, becoming deeply entrenched along their lower reaches.

Northern Mamaku Plateau

The very gradual northern fall of the Mamaku plateau, the largest land system of the district, formed c.140,000 years ago. The surface is undulating to hummocky, and divided into long segments by the gorges containing virtually all the streams. These flow shallow and rapid over rock pavements; waterfalls are fairly common. The eastern side is characterised by rolling to hilly terrain between gorges; the ignimbrite being more deeply covered by moderately eroded pumiceous ash erupted from sources a few miles southward from the late Pleistocene to recent times.

Papamoa Hills

The Papamoa hills comprise ridges of rhyolites, andesites and volcanic breccias generally aligned northward from the headwaters of the Whataroa Stream. A main divide known as the Papamoa Range runs along the eastern side reaching 564 m a.s.l. (Otago). Volcanic domes on the western side include Mt Misery, Pukunui and Kupukairua.

Rotoiti Breccia Fan

The immense Rotoiti breccia (unwelded ignimbrite) fan was erupted from sources just east of Rotorua c.50,000 years ago. An overall gradual fall from an altitude of 420 m or so along the south eastern boundaries ends at 60–100 m along an embayed margin overlooking the Maketu basin and Otamarakau coast. The breccia has been eroded to the extent that most of the plateau surface is rolling to hilly. Numerous consequent gullies and long narrow valleys have flat floors and few streams because of the very porous nature of the breccia and later ash deposits. Underlying Matahina Ignimbrite is exposed in a few very deep valleys.

Matata Hills

The Matata hills on the eastern side of the district are mainly very steep and rugged, rising to 370 m. The country rock is Matahina ignimbrite (which westward is overlain by the breccia fan). This land system is bounded on the north by Upper Pleistocene marine sandstone coastal cliffs up to 200 m high, and on the east by a high broken scarp (150–370 m) overlooking the Rangitaiki Plains.

Sand dunes

An originally narrow band of sand dunes lining the coast beneath the steep sandstone and ignimbrite cliffs has been further reduced by construction of a railway line and state highway running below the cliffs. The dune field is broken by several small streams and dune hollow wetlands occur in several places (generally associated with the streams).

Otuhupo Hills

Two small land systems are the outcropping Otuhupo andesitic hills in the south-eastern corner of the district and greywacke hills near Otamarakau.

Special geological features

Kenny and Hayward (1996) identified four special geological features in the ecological district (see Table 2). The Matata Pleistocene marine sequence and fauna is of national importance and is the best exposed sequence of marine Pleistocene in northern North Island, one of several highly diverse Molluscan faunas of Pleistocene age in the Bay of Plenty. The Braemar Road Tephra Section, on the north-eastern margin of the district, is of national importance as the type locality for Hauparu, Te Mahoe and Maketu Tephra.

Two sites are of regional importance. Taheke geothermal field has surface hydrothermal activity, which is of typical acid-sulphide, steam-heated type. Hydrothermal features consist of fumaroles, soft sinter pans, deposits of sulphur, and many small springs, seepages, and pools emitting gas. Discharges occur on the floors and lower slopes of valleys. Okere Falls hydro-electricity station and gorge is an excellent example of a deeply incised river gorge and falls. It is the site of an early hydro-electric power station, and Okere Falls was the fourth community in New Zealand to receive electric power.

SOILS

Soils of the district are mainly moderately to strongly leached, developed from airfall volcanic ash, and can be classified in three main groups (DSIR 1964) as follows:

Recent soils from volcanic ash: these are the soils in the Manawahe locality, in the south-eastern corner of the ecological district. Grouped under "Tarawera soils", they are gravelly sands and gravels up to 25 cm thick derived from basaltic ash and lapilli erupted from Mt Tarawera in June 1886. Drainage and decomposition of organic matter are rapid.

TABLE 2. IMPORTANT GEOLOGICAL SITES AND LANDFORMS IN THE OTANEWAINUKU ECOLOGICAL DISTRICT (FROM KENNY AND HAYWARD 1996)

IMPORTANCE & VULNERABILITY*	NAME	GRID REF.	RAP OR PNA
B3	Pleistocene marine sequence and faunas	V15 375627	Ohinekoao (RAP 27)
B3	Braemar Road Tephra Section	V15 396548	
C2	Taheke Geothermal Field	U15 048497	Taheke Geothermal (RAP 15)
C3	Okere Falls hydro-electricity station	U15 039486	Okere Falls Scenic Reserve

* Importance rankings (Kenny and Hayward 1996) are:

- A International scientific importance
- B National scientific, educational or aesthetic importance
- C Regional scientific, educational or aesthetic importance

Vulnerability rankings (Kenny and Hayward 1996) are:

- 1 Highly vulnerable to complete destruction or major modification by humans
- 2 Moderately vulnerable to modification by humans
- 3 Unlikely to be damaged by humans
- 4 Could be improved by human activity
- 5 Site already destroyed (not necessarily by human activity)

Yellow-brown pumice soils: this group covers virtually the entire ecological district except for the Whakamarama Plateau and the minor Manawahe sector. They are derived from rhyolitic ash and lapilli widespread during eruptions in the Okataina (east of Rotorua) and Taupo Volcanic Centres, converted by the action of climate and organisms into a suite of sandy to gravelly soils with varying degrees of weathering and fertility.

Central yellow-brown loams: these soils, derived from older pumiceous ash beds, occur on the Whakamarama Plateau. In general, topsoils are brownish black and about 20 cm deep; and subsoils yellowish brown friable sandy loams, with a moderately developed nutty structure. They are relatively strongly leached.

Six sites in Otanewainuku Ecological District have been recorded as being of regional significance for their soils (Arand *et al.* 1993). These sites contain good quality examples of several soil types (for example: Mangawhea, Manawahe, Tarawera, Pukemaku, Kaharoa, Oropi, Otanewainuku and Whakamarama soils) of the ecological district. Good quality examples of these soils are uncommon.

TABLE 3. IMPORTANT SOIL SITES IN THE OTANEWAINUKU ECOLOGICAL DISTRICT (FROM ARAND *ET AL.* 1993)

I ¹	S ²	V ³	NAME	GRID REF.	RAP OR PNA
3	• Only example of Mangawhea soils in this inventory.	3	Carrie Gibbons Scenic Reserve	V15 176537	Carrie Gibbons Scenic Reserve
3	• Good examples of Kaharoa and Oropi soils are uncommon.	3	Mangapouri Scenic Reserve	U15 911510	Mangapouri Scenic Reserve
3	• Good example of recent and older soils formed from volcanic ash under native vegetation. • Good examples of Pukeamaru and Manawahe soils are uncommon. • Most Manawahe soils have been developed for sheep and dairy farming.	3	Mangaone Scenic Reserve	V15 305477	Mangaone Scenic Reserve
3	• Good examples of Whakamarama soils are uncommon.	3	Otawa Scenic Reserve	U14 965767	Otawa Scenic Reserve
3	• Good examples of Kaharoa soils are uncommon.	3	Penny Road Scenic Reserve	W15 599483	Penny Road Scenic Reserve
3	• Good examples of Whakamarama soils are uncommon.	3	Puketoki Scenic Reserve	U14 731813	Puketoki Scenic Reserve

1 1 = International

- contains the best example of a soil (generally a soil group) or soil-vegetation or soil-landform association that is unique to New Zealand (or these latitudes).
- contains a soil that is naturally uncommon or greatly reduced in extent in other parts of the world.
- contains a wide range of extensive soils with a relatively unmodified vegetation cover.
- has been studied in detail and is known internationally.

2 = National

- contains the best or a “classic” example of a soil (either a soil group or a mapping unit) or a soil-vegetation or soil-landform association in New Zealand.
- contains a soil or soil-vegetation or soil-landform association that is nationally uncommon or reduced in extent.
- contains a moderate range of extensive soils with a relatively unmodified vegetation cover.
- has been studied in detail and is known nationally.

3 = Regional

- contains the best regional examples of a soil (generally a mapping unit) or a soil-vegetation or soil-landform association.
- contains a limited range of soils under vegetation that is relatively unmodified.

2 Significance

- This is an explanation of the features of the site that make it worthy of inclusion in the inventory.
- Where possible, each mapping unit is represented by three sites to try to cover the variability of the mapping unit.

3 Vulnerability

- 1 = site has no formal protection of soil, vegetation or other scientific or scenic values; soil and/or vegetation threatened by modification.
- 2 = formal protection of the site has been proposed or is being negotiated; soil and/or vegetation threatened by modification; most parts formally protected.
- 3 = site is formally protected; no foreseeable threat to soil and/or vegetation.

In general, sites with legal protection (for example: national park, scenic reserve, covenanted) and Department of Conservation stewardship land are rated “3”; areas that have been formally recommended for protection are rated “2”; and most other sites are rated “1”.

CLIMATE

The following description of the climate of Otanewainuku Ecological District was compiled from Quayle (1984) and Ministry of Works (1962).

The Otanewainuku Ecological District is rather sheltered by inland ranges from the prevailing westerly winds. Contrasts occur between both coastal and inland situations, and between high and low country, with respect to both diurnal and annual variation. Average daily maximum temperatures over 20°C are recorded in most areas between December and March but rarely exceed 30°C.

While upland areas may receive rain with airstream from any direction, most of the district receives a large part of its annual rainfall during periods of onshore winds from the north to north-east. Rainfall varies from 1400 mm near the coast to up to 3000 mm over the Whakamarama and Mamaku Plateaus.

Winds come predominantly from the westerly quarter, with occasional north-east gales on the Kaimai Range. Spring is the windiest season. The high country to the west and south shelters the lowlands, which receive less wind than many other parts of the country. In summer, occasional foehn wind conditions of high temperatures and low humidities coincide with a prolonged dry spell, and cause rapid drying out of vegetation. The occurrence of frost and fog varies considerably. Cloud is frequent over the Kaimai Range. The average annual frequency of frosts varies from about five per year near the coast to over 50 per year for inland areas. Light snow falls on land above about 470 m about once every three years.

BIOCLIMATIC ZONES

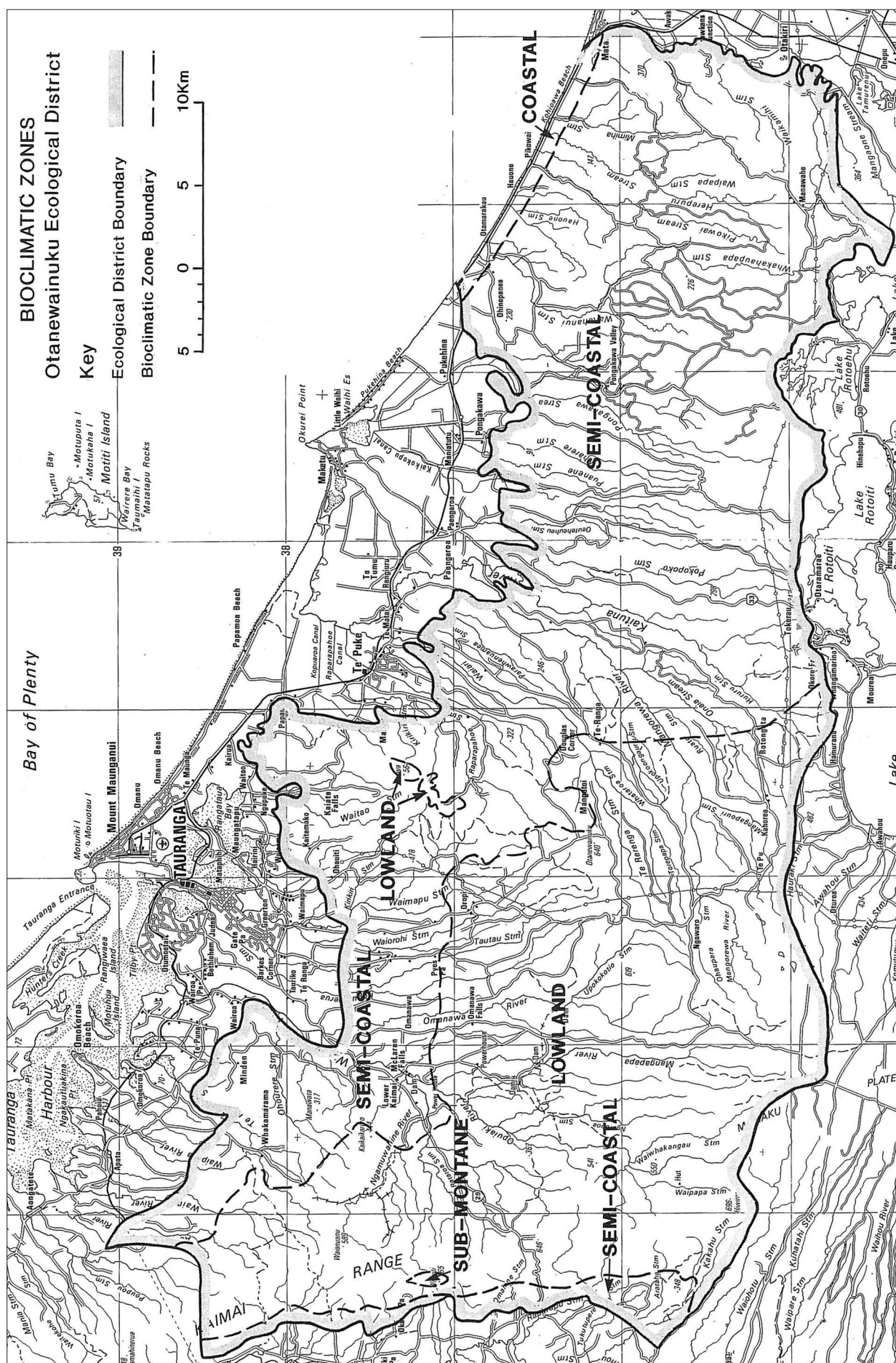
Four bioclimatic zones have been recognised; coastal, semi-coastal, lowland and sub-montane, determined mainly by indicator plant species (see Figure 3). They are:

Coastal: The coastal zone extends from the coast to the inland limit of pohutukawa as a dominant canopy species. This zone extends approximately 1 km inland from the coast and the vegetation is often exposed to salt-laden winds. Characterised by a range of different species dependent on the site, for example: sand dune species, salt marsh species, pohutukawa, taupata, houpara, ngaio, and karo.

Semi-coastal: Extends from the coastal zone to the inland limit of kohekohe. This may be up to about 30 km from the open coastline, depending on landform and substrate.

Lowland: Extends from the semi-coastal zone inland to the upper limit of tawa.

Sub-montane: Occurs above the lowland zone. Only applies to Te Weraiti, on the Kaimai Range.



VEGETATION HISTORY

The following description of the vegetation history of Otanewainuku Ecological District was compiled largely from Nicholls (1965b).

There is good stratigraphic evidence in the Central North Island and Bay of Plenty indicating that from about 30,000 years ago there was deterioration in climate, leading to a widespread erosional hiatus at about 20,000 years ago. Stability was not re-established in many places, particularly those above 300 m, until about 14,000 years ago.

For the following several thousand years prior to Polynesian settlement the ecological district would have been almost entirely forested (c.f. Vucetich and Pullar 1963 & 1964) with few exceptions, for example: foredunes, some wetlands, landslide scars and clearings created by natural fires caused by lightning strikes. The forests would have been similar to today's unlogged forests, i.e. predominantly rimu/tawa forest. There is no evidence to suggest that any forest outside the Okataina Volcanic Centre¹ was destroyed through volcanic action during the Holocene period (last 10,000 years).

Following Polynesian settlement of the Bay of Plenty Region large areas of forest were destroyed by fires, as the land was cleared for occupation, fortification, cultivation, forage and travel. Low fernlands and scrub with rare pockets of tall forest replaced extensive forest tracts. This clearance was most drastic on the coastal lowlands but also extended to about 200 m altitude on the plateaus and the Rotoiti breccia fan. When burning of the fire-induced shrub and fernlands waned in the 19th century, secondary forest developed widely on the high forest margins.

European settlement on a significant scale began on the Tauranga and Te Puke lowlands in the 1870s and soon extended over open country further inland. The major clearings of forest in the Whakamarama, Kaimai and Oropi areas and south-west of Te Puke had been made by 1900. Between 1900 and 1920 many blocks were opened and farmed about Ngawaro and Kaharoa. Although many ventures were initially unsuccessful, many abandoned farms were re-occupied in the 1950s and 1960s. Much secondary forest was cleared alongside State Highway 33 in the 1960s for farming.

Virtually all unprotected forests and some recently protected forests have been logged for podocarps and broad-leaved species. Before 1945 only softwoods were felled, but since then some of the more numerous hardwoods have also been extracted. Logging started about Whakamarama in the early 1900s, and continued until about 1970, leaving untouched only the forest above 500 m in the western quarter. Apart from very minor light operations, logging did not begin on the northern Mamaku Plateau before 1920 where until 1945 logging was confined largely to forest on the plateau segments within reach of tramways and steam-driven log haulers. This included felling of red beech for fencing and mining timbers. Over the ensuing 30 years, most of the previously logged

1. In the Rotorua Lakes Ecological District.

forest was roaded and re-logged, as were many once inaccessible areas, including broken country in the north-west quarter of the Mamaku Plateau and the west side of the Papamoa Range.

Much of the forest, about and north of Manawahe was logged and then cleared in small operations between 1900 and the early 1920s. Rotoehu forests east of that area were logged between 1934 and 1958.

Some features of the forest pattern appear anomalous and can be elucidated, rather tentatively, by recourse to knowledge of a past different environment.

The limitation of red and silver beech to relatively small areas in the upper Mangapapa and Mangorewa catchments (on the northern Mamaku Plateau) and total absence on the southern half, seems most probably related to fortuitous spot survivals during several thousand years of very cold and windy climate. During this cold period (20–15,000 years ago) erosion of earlier soil cover and deposition of sterile loess (wind-blown sands) to considerable depth occurred, resulting in a generally depauperate, treeless, vegetation over at least the higher, most exposed parts of the plateau (Kennedy 1994). Podocarp/tawa forest reappeared by c.13,500 years ago, with climate amelioration and vastly improved soils brought about by deposition of volcanic ash at intervals up until 1850 years BP. The reasons remain obscure as to why red beech and silver beech became together confined to their present localities; how they continue to thrive there; and why there are no signs of any expansion into rimu/tawa forest.

Hard beech, on the other hand, not only occurs within the red beech-silver beech stands, but also wherever to be expected, lining gorges and on sharp spurs where soils are generally very shallow and comparatively stony and dry.

From the distribution pattern of the rare small stands and lone trees of kauri, all close to the present forest fringes of the Whakamarama and Mamaku Plateaus and the Papamoa Range, it appears that these represent the uppermost altitudinal limit of a former fairly common occurrence at low altitudes, in the Tauranga Ecological District.

Northern rata has quite rapidly become an historic relic in the forests of the Otanewainuku Ecological District. Large to very large trees of epiphytic origin (mainly on rimu but occasionally on other trees) previously occurred frequently, almost throughout. Dieback was first recorded in the 1930s, and mortality increased thereafter until few northern rata survive today. As research has failed to discover any pathogens, it may be surmised that the trees succumbed to heavy possum browsing.

Before disturbance by Polynesians or Europeans along the Otamarakau-Matata coastline, spinifex and pingao would have dominated foredunes with local hinarepe (*Austrofestuca littoralis*). This would have graded back to *Ficinia nodosa*/*Muehlenbeckia complexa* vineland and then into forest dominated by pohutukawa and houpapa. Primary podocarp/broadleaved forest would have extended down on to the dunes.

WILDLIFE HISTORY

The native wildlife of the district has been severely reduced in numbers, distribution and diversity through habitat destruction, introduction of mammalian predators and browsers, and direct exploitation by humans (*vide* Innes and Hay 1991). Many native species are now nationally extinct, including the huia, bush wren, and piopio (native thrush). Other birds have disappeared from the Otanewainuku Ecological District, but still occur at a few sites elsewhere in the country, for example kakapo, saddleback and stitchbird (Williams and Given 1981).

A number of species are now rare in the district (including North Island brown kiwi, North Island kokako, bats, and Hochstetter's frog) and these are discussed in more detail in Section 4.5.

Moa remains have not been directly recorded from within the Otanewainuku Ecological District but they are known from surrounding districts. Moa-hunter sites were excavated at Tokoroa (Law 1973) and at Whakamoenga Cave, Lake Taupo (Leahy 1976), so there is evidence available that the moa inhabited the podocarp forests of the central Volcanic Plateau, which had re-established themselves after the Taupo eruption. Moa bones have recently been found in Ohiwa Harbour (K. Tatton pers. comm.). The absence across the Volcanic Plateau of further material and sites which contain moa bone is probably a reflection of the lack of site survey and the general difficulty in finding these sites under heavy vegetation cover (R. McGovern-Wilson pers. comm.).

Very little is known of the precise wildlife history of the ecological district, however, the following extracts from Atkinson and Millener (1991) apply to mainland New Zealand in general.

"Evidence from cave deposits and rat-free islands indicates that skinks and geckos were originally very abundant in lowland and coastal forests (Whitaker 1973, Daugherty *et al.* 1990). Nocturnal and diurnal skinks were largely restricted to the ground but some geckos foraged arboreally. Tuatara (*Sphenodon* spp.) were also widespread on the mainland and may have been eaten by some bird predators. Subfossil evidence and island distribution of living species of leiopelmatid frogs suggest that these also were a potential food, particularly since they lack a free-living tadpole stage. Three species of small nocturnal bats were originally widespread in lowland forests and roosted in caves or hollow trees. Birds themselves provided prey for raptors.

"The invertebrate life of lowland forest was once characterised by an abundance and variety of large (>20 mm) flightless insects occupying habitats from the forest floor up into the canopy. These included wetas (giant wetas, tree wetas, ground wetas, and cave wetas). More than half of the known insect fauna of New Zealand are beetles, and this group was also very common in forest, particularly the flightless ground beetles and large flightless weevils. Other formerly abundant invertebrates include veined slugs of the family *Arthorocophoridae*, amphipods, litter-feeding caterpillars of moths, and large (up to 20 mm width) pill millipedes (Watt 1975). Perched leaf litters among epiphytes and in tree cavities provide

important habitat for caterpillars, ants and amphipods. The numbers and variety of all these groups of animals have been greatly reduced since the advent of mammalian predators in New Zealand, particularly rats and mice.” (Atkinson and Millener 1991)

INTRODUCED ANIMALS

Introduced animals comprise a sizeable element of the fauna of the district (listed in Appendix 5). Native wildlife and vegetation evolved largely in the absence of mammalian species. Those introduced have irreversibly affected the composition of the forests, and other vegetation types, and thus reduced food and shelter available for native wildlife. Kioie have been present for at least several hundred years and Europeans accidentally introduced three more rodents – the Norway rat, ship rat and house mouse. Dogs, domestic and feral cats, ferrets, stoats, weasels and possums also kill native wildlife. The lakes, rivers and streams have not been exempt from modification by introduced invaders. Five species of introduced fish established in the Bay of Plenty have had a significant impact on the native fish they prey upon and compete with.

The deliberate releases of larger animals (goats, pigs, two species of deer, rabbits, hares, possum and wallabies) by Europeans have had detrimental impacts on the forests. Pigs were probably the first introduced, and by the early 1800s were common in open country near the coast. Numbers fluctuate considerably, even where they are rarely hunted. Feral cattle probably inhabited large areas of forests for about 140 years preceding 1955, particularly on the eastern side of the Whakamarama Plateau and the north-western section of the Mamaku Plateau.

Pockets of feral goats occur throughout the district and there is ongoing re-invasion of indigenous vegetation from farmed stock. Red deer were released in the Bay of Plenty in 1907 and 1922 (Nicholls 1965f). However, whilst moderate numbers occur in forests on the eastern side of the district, numbers are low on the western side. Fallow deer were released on the Papamoa Hills in 1880 (Nicholls 1965f). They are now locally common there, but increasingly rare to the south where they extend to the Mangorewa Stream.

Dama wallabies were released near Lake Okareka, just south of Rotorua, in 1912 (Wodzicki 1950). They have spread through the south-east side of the Otanewainuku Ecological District, including Pokopoko Scenic Reserve and the Rotoehu Conservation Area.

Possums were released at Oropi in 1893 and probably at several other locations about the same time and for several years after (Pracy 1962). By 1947, although widely dispersed, they were not common except in the Kaharoa locality on the Mamaku Plateau where they were reported to be abundant (Wodzicki 1950). However, in subsequent years possum numbers have increased markedly and during the present survey possum sign was common throughout.

LANDSCAPE

Three separate landscape evaluations have been undertaken for the coastal margin of the Bay of Plenty Region, Western Bay of Plenty District, and Whakatane District by Boffa Miskell (1993a, b, and c respectively). That part of Otanewainuku Ecological District administered by Rotorua District Council has also been evaluated in a similar study by District Council staff. These studies identified landscape units, significant segments of these units, and proposed policies for landscape protection.

3. Methodology

FIELD SURVEY

The methodology used in the survey was based on Myers *et al.* 1987. Existing ecological information was compiled from published and unpublished sources (see Bibliography). Aerial photographs were obtained. Recent (1992 and 1993) 1:25,000 colour aerial photographs (stereo pairs) were available for most of the district. Black and white (1992; 1:42,000) photos were used for the south-west corner of the ecological district.

The boundary of the ecological district was delineated on NZMS 260 topographic maps. Eight land systems were identified, and four bioclimatic zones. Boundaries of these were refined during field survey. Protected natural areas were delineated onto topographic maps. Using existing information, the land system, bioclimatic zone, hydrologic class and vegetation structural class, were combined to give a set of ecological classes which describe the broad ecological patterns of the district. The adequacy of protection of these classes was then assessed to indicate priorities for survey.

Aerial photographs and topographic maps were studied to identify areas of unprotected natural vegetation. Schedules of sites of significant conservation values on unprotected lands of the Western Bay of Plenty and Rotorua Districts were checked. The minimum size of remnants surveyed was generally about 20 ha, but in land systems where little native vegetation remained (for example Otamarakau hills) smaller areas were surveyed. The survey was not designed to be an inventory of all natural areas and only unprotected natural areas that were potential RAPs were field surveyed. Ninety-five study areas were identified and then delineated on transparencies over aerial photographs (adjacent or nearby protected natural areas were also delineated). Existing ecological information was written on survey cards.

Study areas were surveyed using a modified form of the survey card in Myers *et al.* (1987) (see Appendix 11). Vegetation types were identified and mapped on transparencies on aerial photographs. Representativeness, diversity and pattern, rarity and special features, naturalness, long-term ecological viability, size and shape, buffering and surrounding landscape were assessed. Wildlife information was from Rasch (1989), Fauna Survey Unit unpublished data (1982), Department of Conservation (1993a-f), Beadel (1994b), and observations during the present survey. Assessments were made of threats and management requirements (for example: grazing, weeds, wild animals, drainage, erosion, fire, clearance, topdressing, fencing, protection). Details of fauna were noted for each study area. Plant species lists for the ecological district were compiled from previous vegetation surveys by the author; the present survey; and other existing species lists (refer to Appendices 3 and 4).

The field survey was carried out in February and March 1994, with a

further four days in May 1994. Two field teams were used during the middle part of the field survey. Each field team generally comprised two people, with field assistance provided by staff from Department of Conservation field centres and Rotorua Conservancy office. Landowners were visited or contacted to obtain permission for access onto their properties as the survey progressed.

An aerial reconnaissance of the district was conducted during the fieldwork to obtain a wider perspective and to check some sites for particular community types difficult to identify from aerial photographs (for example: small stands of maire tawake or kahikatea).

VEGETATION TYPES

Field survey data and existing information were sorted manually into vegetation types (Appendix 2) and these were then combined with the land systems to give ecological units (Appendix 1).

EVALUATION

Recommended areas for protection (RAPs) were selected on the basis of seven criteria:

- a) Representativeness—the primary criterion
- b) Diversity and pattern
- c) Rarity and special features
- d) Naturalness
- e) Long term viability
- f) Size and shape
- g) Buffering and surrounding landscape

Ecological units provided the framework for selecting natural areas to recommend for protection. Where an ecological unit was not adequately represented in existing protected natural areas, one or more of the best examples of this unit have been recommended for protection, generally in conjunction with adjoining ecological units in order to identify a viable area with natural boundaries, adequate size and compact shape (c.f. O'Connor *et al.* 1990; Myers *et al.* 1987; Diamond 1975; Young and Mitchell 1994).

The rapid nature of the survey meant that it was not possible to find every locality of rare and endangered species, such as *Pimelea tomentosa* or bats, and it is likely that some small but important natural areas have been overlooked. Any future discoveries should be assessed for ecological values and management requirements.

It must be emphasised that although some natural areas have not been ranked highly, it does not imply they are not of significant conservation value. Only the most significant sites have been selected. Criteria used

here to select priority areas are pertinent to biological or landform values only. Criteria relating to landscape, recreational, cultural or historical, and soil and water conservation values may identify sites significant in one or more of those respects.

MAPS

The topographic maps of the RAPs presented in the report are based on 2003 digital aerial photographs held by the Bay of Plenty Regional Council and provide relatively accurate representation of the RAP boundaries. The sketch maps were prepared in 1994 and have been retained in this report to show the location and extent of vegetation types, but the maps were not drawn to scale. Where the boundaries on the two maps differ, the topographic map overrides the sketch map RAP boundaries. Some of the sketch maps in this report were updated in 2006 immediately prior to publication and thus have a slightly different appearance from the maps prepared in 1994.

4. Results

SURVEY DATA

Field survey data cards are held at the Bay of Plenty Conservancy Office, Department of Conservation, Rotorua.

VEGETATION PATTERN

Indigenous vegetation

Present day indigenous vegetation is predominantly forest with a few scattered wetlands. Sand-dune vegetation is present along the 16 km coastal strip. Most remaining forest has been logged. Detailed vegetation types are identified for each RAP. These accurately portray the vegetation types present in each RAP. They particularly reflect the considerable variation in secondary vegetation types, which are present. From these, sixty broad vegetation types and habitats were identified for the ecological district. These are listed in Table 4 and described in Appendix 2. These are generalisations of the types present and do not correspond exactly with the vegetation type names used in the RAP descriptions. The RAPs that each broad vegetation type occurs in are identified in Appendix 2.

TABLE 4. VEGETATION AND HABITAT TYPES

Forest
* Hard beech forest
* Hard beech-pohutukawa forest
* Hard beech-tanekaha-tawa forest
* Kahikatea-maire tawake forest
* Kamahi forest
* Kanuka forest
* (Kauri)/podocarps-broad leaved species
* Kauri (rickers)/tanekaha-tawari forest
* Kauri rickers/tawari forest
* Mangeao forest
* (Miro)/tawa-kamahi-tawari forest
* (Northern rata)-(rimu)/tawa-kohekohe forest
* (Northern rata)/tawa-kohekohe forest
* Pohutukawa forest and treeland
* Pohutukawa-kanuka forest
* Pole podocarp forest
* Rewarewa/broadleaved species-treefern forest

- * Rewarewa / kamahi forest
- * Rewarewa / kamahi-kohekohe-mangeao forest
- * Rewarewa / kanuka forest
- * (Rimu)-(miro)-tawa-kamahi-tawari forest
- * (Rimu)-(miro)-(tanekaha) / tawa-hinau-rewarewa-kamahi-tawari- tawheowheo forest
- * (Rimu)-(northern rata) / tawa-kamahi-rewarewa-mangeao forest
- * Rimu-red beech / tawa-kamahi-tawari-hard beech-silver beech forest
- * Rimu / tawari-kamahi / *Gabnia xanthocarpa* forest
- * (Rimu) / tawari-wheki-maire tawake forest
- * Tanekaha forest
- * Tawa forest
- * Tawa-kamahi-tawari-hard beech-silver beech forest
- * Tawa-rewarewa forest
- * Tawa-rewarewa-pukatea-kohekohe forest
- * Tawari forest
- * Tawari-tawheowheo forest
- * Heavily logged rimu/tawa forest

Secondary scrub, shrubland and fernland

- * Mamaku treefernland
- * Secondary scrub, shrubland and fernland

Sand dune vegetation

- * Dune hollow wetlands
- * *Spinifex* sandfield and grassland
- * *Ficinia nodosa* / *Muehlenbeckia complexa* vineland and sedgeland

Wetland vegetation

- * *Myriophyllum pedunculatum* subsp. *novae-zelandiae* herbfield
- * Raupo reedland
- * *Baumea teretifolia* sedgeland
- * Sedge-grass-reed wetland associations
- * (Manuka)-(grey willow)-(Coprosma tenuicaulis) / raupo-Gleichenia microphylla-Baumea teretifolia / Sphagnum shrub-sedge-fern-reedland
- * Manuka-harakeke-toetoe-raupo/Baumea tenax-B. teretifolia-B. arthrophylla-swamp kiokio sedge-shrubland
- * Manuka-monoao / Gabnia-Astelia grandis-Gleichenia dicarpa / Sphagnum shrubland and scrub
- * Manuka-Coprosma tenuicaulis scrub and shrubland
- * Tanekaha / manuka scrub and shrubland
- * Grey willow forest
- * Manuka scrub and shrubland.

Geothermal

- * Pohutukawa × northern rata dominant forest
- * Prostrate kanuka-manuka-mingimingi scrub
- * Mingimingi-prostrate kanuka-manuka scrub ⇔ Histiopteris incisa fernland ⇔ Hypolepis distans fernland

- * Manuka-prostrate kanuka-*Lycopodiella cernua* shrubland
- * *Histiopteris incisa*-mingimangi fernland
- * *Lycopodiella cernua* fernland
- * (Dead pohutukawa × northern rata)/wheki-kamahi-*Gabnia setifolia* treefernland
- * Nonvegetated raw-soilfield

Others

- * Lake
 - * Bluffs
 - * Landslide scars
-

Forests

The main forest type is rimu/tawa forest. Its composition varies according to changes in three main factors—distance from coast, altitude, and topography. A few tree species disappear with increasing distance from coast and altitude (for example: pohutukawa, puriri, and kohekohe) or tend to decrease in abundance. Others become more abundant with increasing altitude or distance from the coast, or are common only on certain sites (for example: pukatea, maire tawake).

Coastal

Pohutukawa is dominant on coastal cliffs, with scattered houpara and mahoe. On coastal hillslopes there are mixtures of pohutukawa, kanuka and rewarewa with kohekohe, puriri, tawa, mamaku, pukatea and whau in gullies. This forest cover has been induced through burning. Low scrub or shrubland of manuka, mingimangi and hukihuki occurs locally.

Semi-Coastal

The semi-coastal bioclimatic zone extends from 100–200 m asl up to about 500 m, inclusive of all the Rotoiti Breccia formation and the Papamoa Range, but continuing further west only as a comparatively narrow band across the lower fringes of the Mamaku and Whakamarama Plateaus. There is also a narrow strip along the lower face of the Okauia fault scarp and the south-western extremity of the Mamaku Plateau.

At the time of human occupation, the zone was entirely forested, but after centuries of Polynesians followed by Europeans, that cover has become extremely fragmented. The only sizeable remnants occur on the Papamoa Range, the Matata Hills, and the mid-southern section of the Rotoiti Breccia Fan. Because of logging, damage by fire, and grazing and browsing by introduced animals, nearly all remnants, large or small, have been modified to some degree.

The main forest type on the typical easy rolling to moderately hilly terrain, was dominated by scattered emergent rimu, miro, and northern rata, over frequent tawa, hinau, rewarewa, mangeao, pukatea, and kohekohe. Puriri and karaka, and even pohutukawa (in the Kaituna River catchment) occurred locally. Understorey species confined to this zone are nikau, mamaku and gully tree ferns, and the shrub kawakawa. Former forest on valley flats nearing the northern margins was distinguished by a predominance of kahikatea and pukatea, and presence of some

matai, totara, maire tawake, and probably, though unconfirmed, lowland ribbonwood.

A unique association of pohutukawa and hard beech still occurs on the most rugged portion of the Matata Hills. Kauri, whatever its past distribution, is still represented by one stand of stunted trees on an infertile site at the northern end of the Papamoa Range and a few rickers on the eastern flank, south-west of Te Puke. A few decades ago, kauri occurred near McLaren Falls near State Highway 29, but have been destroyed in a river flood.

Lowland

An also once complete forest cover was little disturbed in Polynesian times, but the greater part was exhaustively logged during the present century, up until about 1980. During this period, substantial areas were increasingly cleared for farming or exotic forestry, mainly in the eastern half of the Mamaku Plateau. The only substantial unaffected forest tracts are on the higher half of the Whakamarama Plateau (Kaimai Range) and the upper Opuiki catchment of the Mamaku Plateau.

Again, the bulk of the forest consisted of one broad type. The common trees were rimu, northern rata, miro, with local Hall's totara and kahikatea, emergent over tawa, hinau and rewarewa, and kamahi and tawari, these last two most indicative of cooler climate and higher rainfall. Wheki was (and still is) the common tree fern and is generally abundant.

Rugged terrain is far more common on the plateaus than in the semi-coastal bioclimatic zone. As streams become deeply entrenched, Hall's totara, tanekaha, toatoa, kamahi, and tawari prevail, and toru and neinei occur in an understorey with few tree ferns but abundant sedges. Almost pure hard beech forest still occurs on all the very steep gorge sides in the lower reaches of the streams. An association of hard beech, red beech and silver beech about the upper reaches of the Mangorewa River incorporates all the elements of the above podocarp-broad-leaved type on similar terrain.

The originally quite extensive mixed beech-podocarp-hardwood type on apparently infertile flat to hummocky ground about the sources of the Mangapapa and Mangorewa Rivers was logged, with much subsequent clearance. However, an unmodified remnant fortuitously remains.

A few kauri occur not far within the confines of this zone: they are spaced along gorge or deep valley margins of the Omanawa and Mangapapa Rivers and the Rapurapu and Kakahu Streams. In the Mangapapa and Rapurapu localities, fire-induced scrub and secondary forest contains many kauri rickers and seedlings.

Stunted forest, with Hall's totara, kamahi, and broadleaf, caps the atypical prominences of Otanewainuku and Hiwiroa on the Mamaku Plateau.

Sub-Montane

"Goblin" forest on the Te Weraiti summit is dominated by tawari with common associates tawheowheo, orihou and *Dracophyllum traversii*. There is scattered puka, kaikawaka and kanono. (This is the only

occurrence of kaikawaka in the district, although it occurs commonly on sub-montane forest on the adjacent Te Aroha Ecological District to the north.)

Sand dunes

The original sand dune vegetation has been altered substantially in recent times. A railway line and state highway has been constructed at the base of the sandstone and breccia cliffs between Otamarakau and Matata. The vegetation between these and the sea is highly modified, with introduced grasses, herbs and shrubs including marram, catsear, haretail, pampas, *Eucalyptus botryoides* and African boxthorn growing in association with native species. Spinifex, marram and *Muehlenbeckia complexa* are common on the foredunes, with scattered pingao. *Ficinia nodosa* and *Muehlenbeckia complexa* are common on the rear dunes.

At the north-western end of the sand dunes a commercial mining operation extracts sand from the foreshore and dunes.

Wetlands

Very few wetlands remain in the district. Local dune hollow wetlands, generally small, occur along the coast. Common species include raupo, *Bolboschoenus fluviatilis*, pampas and harakeke. Several small wetlands occur in small gully flushes or associated with small streams on the eastern side of the district. The largest of these is the Tuhua wetland. Common species include raupo, waewae kaka, *Baumea* and *Coprosma tenuicaulis*. Wetlands have also been invaded by rapidly spreading adventive species, including grey willow, water purslane and mercer grass. Inland, on the Mamaku Plateau a little distance north of State Highway 5, is a series of natural wetlands and pakihi induced by logging. Common species include manuka, monoao, *Gleichenia dicarpa*, *Baumea teretifolia*, *Astelia grandis* and *Sphagnum*.

Forest modification and health

Whilst there are several relatively large good quality examples of unlogged forest in the district, all forest has been modified to varying degrees by the activities of browsing animals or the presence of introduced plants. Several of the larger unlogged forest tracts in protected natural areas are in relatively good condition. However, the majority of the extant forest tracts or remnants have been logged (see Vegetation History) or crown fires have passed through them. The intensity of logging varies. Some forests have been merely selectively logged for large podocarps, but many blocks have been logged more intensively (often two or three times) for tawa, hinau, rewarewa, kohekohe, mangeao, pukatea, red beech, puriri and all podocarps.

There are major tracts of logged podocarp-hardwood forest on the eastward fall of the Whakamarama Plateau. Podocarps have been eliminated and hardwood canopies disrupted by partial burning or incomplete clearing of podocarp-hardwood forest in places along the present western forest margin (as foothills were cleared many years ago for farming). A sizeable area of tawa-kamahi-tawari forest occurs between 550–650 m a.s.l. The

south-west quarter of the Whakamarama Plateau has not been logged but appears to be naturally almost devoid of emergent podocarps.

Many unprotected natural areas are grazed by domestic stock and smaller examples appear to have doubtful long-term viability if grazing continues at present levels. Adventive trees and shrubs are often locally abundant in these remnants, reflecting repeated disturbance (burning and clearing). Prominent species are radiata pine, patula pine, pinaster pine, gorse, and willow-leaved hakea.

There are several landslide scars below Te Weraiti, on the Kaimai Range. Jane & Green (1983a) proposed that natural vegetation mortality adjacent to this type of site is the most important factor predisposing the area to erosion. In their study no evidence was found to suggest that the mortality was due to browsing animals, but rather was linked to a severe drought in 1946. Prevalent fog, by maintaining high soil moisture content, may enhance vegetation susceptibility to drought and increase the landslide risk in the fog zone. From their work further north along the range, Jane and Green (1983a) found that severe storms in 1954, 1960, 1966 and 1972 followed a period of below-average storm intensity and triggered the current erosion episode. An earthquake in 1972 post-dated the main erosion episode and intensified erosion activity.

VEGETATION TYPES

Brief descriptions of the broad vegetation types identified during the survey are provided in Appendix 2.

FLORA

General

Around 500 indigenous species have been recorded in the ecological district over the last decade. A list has been compiled on the present survey, combined with other species lists compiled in the district (for example: McLaren Falls (Beadel 1994b), Lake Hiwiroa (Rotorua Botanical Society 1985a,b&c), Otawa-Otanewainuku (Beadel 1985a), Matata Scenic Reserve (Beadel 1991), see Bibliography for a full listing). A comprehensive list is provided in Appendix 3: this is not complete because of the rapid survey techniques used and the limited time available. Further survey will result in additional taxa being found, particularly in specialised habitats, such as wetlands and bluffs. Several species which were thought to be no longer present in the ecological district have been recently rediscovered in the ecological district (for example: *Peraxilla tetrapetala*, which was recorded more than 25 years ago). One hundred and ninety-nine adventive vascular species are listed in Appendix 4. However, these are only the prominent or common weeds, and the total adventive flora could be considerably greater.

Threatened and uncommon plants

Twenty-five species listed in the 2004 national checklist of threatened and uncommon plants (de Lange *et al.* 2004) have been recorded in the ecological district (Appendix 6), 22 of which have been seen in recent years (P. Cashmore pers. comm.).

- a) *Sicyos australis* (mawhai, native cucumber) is classed as Acutely Threatened, Nationally Critical. This species occurs in pine forest near Otamarakau.
- b) *Olearia pachyphylla* is classed as Acutely Threatened, Nationally Endangered¹.
- c) *Rorippa divaricata* (matangoa, NZ cress) (classed as Acutely Threatened, Nationally Endangered) was recorded from the Wairere Falls track up the Whakamarama escarpment in 1975, and the species has recently been found in Ottawa Scenic Reserve and Kaharoa Conservation Area.
- d) *Dactylanthus taylorii* (pua o te reinga) is classed as Chronically Threatened, Serious Decline, and occurs in two protected natural areas in the Oropi-Ngawaro area. There is another unconfirmed record from RAP 42.
- e) *Marattia salicina* (para, king fern) is classed as Chronically Threatened, Serious Decline. It is found at several sites in the ecological district; examples include Otanewainuku Conservation Area, Upper Kaituna Scenic Reserve, RAP 8 and 38, and a Water Works Reserve contiguous with Ottawa Scenic Reserve (see Beadel 1992b). It is known from at least six other sites.
- f) *Pimelea tomentosa* (a shrub) is classed as Chronically Threatened, Serious Decline. It is known from the Matata Hills and may also occur in the north-western corner of the district (it is known from inland of Katikati). Matata Scenic Reserve contains one of the largest known populations in the country.
- g) *Pterostylis paludosa* (Chronically Threatened, Serious Decline) was recorded from RAP 26 (Capella Road Wetland) in 1985 (NZFRI 15753).
- h) *Brachyglottis kirkii* var. *kirkii* (Kirks daisy, kohurangi; Chronically Threatened, Serious Decline) has been recorded from several sites in the ecological district, e.g. Te Matai Road-Otanewainuku area.
- i) *Pittosporum kirkii* (thick leaved kohuhu), classed as Chronically Threatened, Serious Decline, is known from several sites in the ecological district, including Opuiaki and Mangorewa Ecological Areas.
- j) *Austrofestuca littoralis* (hinarepe, sand tussock) is classed as Chronically Threatened, Gradual Decline. A small population of about five plants, occurring near Otamarakau, is threatened by vehicles, trampling, and rabbits. This population has recently disappeared.
- k) *Desmoschoenus spiralis* (pingao) is classed as Chronically Threatened, Gradual Decline. A few plants are scattered along the coast.
- l) *Mida salicifolia* (mida) is classed as Chronically Threatened, Gradual Decline. This species has been recorded from several sites

1. Doubtful record. There are old records of *O. pachyphylla* from the ecological district (P. de Lange pers. comm.).

in the ecological district, e.g. Matata Scenic Reserve, Otanewainuku Conservation Area.

- m) *Olearia cheesemanii* is classed as Chronically Threatened, Gradual Decline. It is known from the vicinity of the McLarens Falls area.
- n) *Peraxilla tetrapetala* (a red flowering mistletoe), is classed as Chronically Threatened, Gradual Decline. It was recorded from Kauri Knob on the Papamoa Range in 1967 (Ogle 1967). Despite searching, this species has not been relocated at this site, and as most of the tawheowheo and kamahi, thought to be the host species (C. Ogle pers. comm.), have died it is unlikely that *P. tetrapetala* still occurs there. However, it is present in Opuiki Ecological Area in the Kaimai-Mamaku Forest Park.
- o) *Raukaua edgerleyi* (raukawa) is classed as Chronically Threatened, Gradual Decline. It has been recorded from a range of sites in the ecological district (including RAP 58).
- p) *Tupeia antarctica* (pirita, green mistletoe) (classed as Chronically Threatened, Gradual Decline) is known from two sites in the ecological district. A large population is present in Taumata Scenic Reserve and a small population of approximately seven plants has also been found on the edge of the Raparapahoe Stream (RAP 40).
- q) *Peperomia tetraphylla* (classed as At Risk, Sparse) occurs on the edge of the Raparapahoe Stream (RAP 40) and headwaters of the Parawhenuamea Stream (Hobbs 2001) and in Ottawa Scenic Reserve.
- r) *Corunastylis pumila* and *Corunastylis nuda* (leek orchids) are classed as At Risk, Sparse, and have both been recorded in the ecological district, including RAP 7.
- s) *Hymenophyllum* aff. *flexuosum* (filmy fern) (AK177370: Mt Burnett) is classed as At Risk, Sparse. It has been recorded at Wairere Falls (P. de Lange pers. comm.).
- t) *Hymenophyllum atrovirens* (filmy fern, mauku) (At Risk, Sparse) has been recorded from some stream margins in the ecological district, including a range of sites in the Kaimai-Mamaku Forest Park, such as Rapurapu and Wairere Falls, the Onaia Stream, and Mangorewa River.
- u) *Lindsaea viridis* (fern) is classed as At Risk, Sparse, and is known from a range of stream margins in the Otanewainuku Ecological District. Populations are present in the Kaimai-Mamaku Forest Park (several populations), Onaia Stream, Mangorewa River, and Otanewainuku Mountain.
- v) *Microsorium novae-zelandiae* (fragrant fern) is classed as At Risk, Sparse. It is known from Otanewainuku Mountain.
- w) *Schizaea dichotoma* is classed as At Risk, Sparse. It has been recorded from Kaharoa Conservation Area (Shaw 1991).
- x) *Tetragonia tetragonioides* is classed as At Risk, Sparse. It has been recorded from one site along the coast.
- y) *Kunzea ericoides* var. *microflora* (prostrate kanuka) is classed as At Risk, Range Restricted. This species occurs in the Taheke geothermal area (most of which is within RAP 15).

Distribution limits

Seven species reach limits of distribution in the district;

- a) *Agathis australis* (kauri) occurs at a few sites. It reaches its southern distribution limit on the eastern side of the North Island near the Kakahu Stream (approx. 37° 59' S). Kauri does extend a little further south on the western side of North Island (38° 07' S) (Ecroyd 1982). On the Papamoa Hills a few rickers mark its eastern limit (approx. 176° 13' E).
- b) *Leionema nudum* (mairehau) reaches its known southern limit on the eastern side of the North Island in RAP 7 at latitude 37° 51' S. It extends further south on the western side of the island (Gudex 1963).
- c) *Lepidosperma laterale* reaches its known southern limit on the eastern side of the North Island in RAP 1 at latitude 37° 42' S. It extends further south on the western side of the island (Moore and Edgar 1970).
- d) *Gabnia rigida*. Whilst relatively common in the South Island, *Gabnia rigida* is known from only three locations in the North Island. One of these is Mamaku Lagoons wetland on the Mamaku Plateau (RAP 62) where it attains its northern limit (Wallace 1986).
- e) *Coprosma arborea* (mamangi) reaches its known southern limit on the eastern side of the North Island in RAP 1 at latitude 37° 42' S. It extends further south on the western side of the island.
- f) *Thelymitra aemula*. There is one unconfirmed record of this orchid. This would be a southern limit for this species.
- g) *Peperomia tetraphylla* (At Risk, Sparse) reaches its northern and western limit of distribution in Otawa Scenic Reserve (Beadel 1985).

WILDLIFE

Bats

The long-tailed bat is classed as an Acutely Threatened, nationally vulnerable species, and the central short-tailed bat is classed as At Risk, Range Restricted (Hitchmough 2002). Both species have been reported from the margins of the larger indigenous forest tracts throughout the district. Most of these sightings are likely to be of long-tailed bats but short-tailed bats have been recorded in the Mangorewa River area (Kiwi Stream) south-east of Otanewainuku and more recently in the Pongakawa Ecological Area of Rotoehu Forest. An unidentified bat, probably long-tailed bat, was recently detected in the Papamoa Hills.

Neither species is easy to detect due to their near-exclusive nocturnal behaviour and it is likely they are more widely distributed within the larger and more intact forest habitats in the region than the records to date suggest. This does not mean, however, that their conservation status is secure as it is also likely that continued loss/fragmentation/degradation of their habitat and introduced mammalian predators threaten their survival.

(Source: A. Garrick pers. comm. 1994)

Avifauna

Seventy-two bird species (49 native and 23 introduced) have been recorded or are likely to be present in the district (Appendix 5). These include 18 threatened species (Hitchmough 2002; refer to Appendix 6). Acutely threatened species are North Island kokako (Nationally Endangered), whio (blue duck) (Nationally Endangered), Australasian bittern (Nationally Endangered), North Island kaka (Nationally Endangered), New Zealand falcon (nationally vulnerable), and Caspian tern (nationally vulnerable). Kereru (New Zealand pigeon) is listed as a Chronically Threatened, Gradual Decline species because of the ongoing decline of its habitat, its low breeding output due to both predation and intrinsic factors, and continued illegal harvesting. Other Chronically Threatened species are North Island brown kiwi (Serious Decline), long-tailed cuckoo (Gradual Decline), banded dotterel (Gradual Decline), and yellow-crowned kakariki (Gradual Decline). At Risk species are New Zealand dabchick (Sparse), fernbird (Sparse), northern New Zealand dotterel (Sparse), banded rail (Sparse), marsh crake (Sparse), spotless crake (Sparse), and little black shag (Sparse).

Kokako, falcon, kiwi, kaka, robin, and yellow-crowned parakeet are forest-dwelling birds. The blue duck lives in fast flowing streams/rivers surrounded by forest. The New Zealand dotterel, banded dotterel, variable osytercatcher and Caspian tern primarily inhabit sandy beaches and dunelands, and the North Island fernbird dwells in shrublands often associated with wetlands. Shallow lowland wetlands are the habitat of dabchick and bittern.

The North Island rifleman or titipounamu has been recorded in “Rotoehu Road Bush” on the Rotoiti breccia fan (Owen 1994). This sub-species is generally confined to the larger upland forest tracts of the North Island south of Mount Te Aroha¹, where modification is slight and the quality of habitat high.

(Source: A. Garrick pers. comm. 1994)

Reptiles (lizards)

Relatively few records of reptiles have been made in the district, however this is probably a reflection of their inconspicuous appearance and cryptic behaviour rather than an indication they are rarely present.

The striped skink (*Oligosoma striatum*) (classed as data deficient in Hitchmough 2002) has been recorded from two locations and there is an unconfirmed report of its presence at one other. The copper skink (*Cyclodina aenea*) has been recorded in the Kaharoa area and this species plus the common green gecko (*Naultinus elegans elegans*), common gecko (*Hoplodactylus maculatus* or *H. pacificus*) and forest gecko (*Hoplodactylus granulatus*) are likely to occur throughout the district in areas of suitable habitat. *H. granulatus* has been recorded at a number of sites in the northern Mamaku Plateau, in the Opuia

1. Found in Warawara Forest in Northland, the first record north of Mount Te Aroha for decades (A. Garrick pers. comm.).

Ecological Area (Whitaker 2000). An introduced species, the rainbow skink (*Lampropholis delicata*) has been recorded from the Mangatōi Road area of the Mamaku Plateau. A large unidentified gecko was reported several years ago from the Mount Otanewainuku area but a field survey did not confirm its presence.

(Source: A. Garrick and Keith Owen pers. comm.)

Amphibians (frogs)

The native Hochstetter's frog (*Leiopelma hochstetteri*), an At Risk, Sparse species (Hitchmough 2002), is found in low numbers from the Raparapahoe Stream catchment within the Ottawa Forest. More intensive searching may reveal it's more widespread occurrence in unmodified catchments in the southern Kaimai range. Surveys on the main part of northern Mamaku Plateau have failed to find it there (Whitaker 2000).

The introduced green and golden bell frog (*Litoria aurea*) and the southern bell frog (*Litoria raniformis*) have been recorded in the district, and are believed to be widespread. Both species are under threat in their native Australia.

(Source: A. Garrick and Keith Owen pers. comm.)

Freshwater fish

The Otanewainuku Ecological District contains a diverse range of fish species. A major contributing factor is its proximity to the coast. Most of New Zealand's indigenous freshwater fish require access to the sea to complete their life cycle and usually a wide range of species can be found in streams and rivers close to the coast without artificial or natural barriers. Some notably diverse rivers and streams include the Wairoa, Kaituna, Waitahanui, Pikowai, Mimiha, and others, all supporting a wide range of indigenous fish species. Some of the smaller catchments, particularly those between Otamarakau and Matata are very significant and deserve protection against threats to water quality and quantity.

The typical range of species found in a generalised river or stream of the district could include the following species. Near the river mouth a number of estuarine species including yellow-eyed mullet (*Aldrichetta forsteri*), grey mullet (*Mugil cephalus*) and flounder (*Rhombosolea* sp.) may be found. Some of these may also persist above the salt influence where more "typically freshwater" fish exist, such as giant bullies (*Gobiomorphus gobioides*), common smelt (*Retropinna retropinna*) and inanga (*Galaxias maculatus*). A little further upstream and in addition to smelt and inanga, common bullies (*Gobiomorphus cotidianus*) are often abundant along with shortfinned eels (*Anguilla australis*) and long-finned eels (*A. dieffenbachii*), while giant kokopu (*Galaxias argenteus*) may also be present. Further upstream still, long-finned eels persist along with redfinned bullies (*Gobiomorphus buttoni*) and banded kokopu (*Galaxias fasciatus*). Indigenous species present in the steep upper catchments will usually only include those with climbing ability: longfinned eels, banded kokopu and to a lesser degree bullies. Another accomplished climber, the koaro (*Galaxias brevipinnis*), is not well represented in rivers of this district.

Obstructions have a direct influence on the distribution of fish species, as can be seen in the Wairoa catchment which has been developed for hydro-electric power production impeding passage, and also contains McLaren Falls which is likely to have been an impassable natural barrier to many species. Upstream of McLaren Falls, diversity is generally limited to remnant eels (pre-dating hydro construction) and self-sustaining trout populations. A very significant exception to this is the presence of shortjaw kokopu (*Galaxias postvectis*) immediately above McLaren Falls (presence confirmed during a survey in March 1994).

Introduced fish species of the district include brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). They are present throughout a number of catchments and provide some significant trout fishing waters, for example: the Wairoa and Kaituna Rivers. Other introduced species include goldfish (*Carassius auratus*) and mosquitofish (*Gambusia affinis*) both of which are widespread. Other significant introduced species are tench (*Tinca tinca*) and rudd (*Scardinius erythrophthalmus*) which have been illegally released into Lake McLaren. Tench have been observed spawning in the lake margin in March 1994, and rudd are regularly observed during the summer months also in the lake margins. The potential impacts of tench and rudd on the ecology of Lake McLaren and the lower Wairoa River is unknown.

In summary, the Otanewainuku Ecological District contains a wide range of indigenous freshwater fish in addition to a number of introduced species. Significant indigenous fish species present include shortjaw kokopu (Chronically Threatened, Gradual Decline), giant kokopu (Chronically Threatened, Gradual Decline), and lamprey (At Risk, Sparse) (Hitchmough 2002). Notable introduced fish include trout, which provide a local fishery, and tench and rudd which were illegally introduced and whose potential ecological impacts are unknown.

(Source: Gavin Williamson and Kim Young pers. comm.)

Invertebrates

Invertebrates were not included in this survey, but the invertebrate fauna is likely to be diverse and to contain local or biogeographically significant species. Some general points have been outlined below.

Insects

“Recent collecting of Heteroptera and carabid beetles, especially the genus *Mecodema*, suggests the occurrence of a Kaimai movement ‘corridor’ linking the insect fauna of Coromandel Range and eastern Bay of Plenty. It is likely that the recently described endemic Cydnidae (Heteroptera), *Chilocoris neozealandicus* Larivière & Froeschner, found on the east coast of the Coromandel region also occurs in coastal areas in this district. If the corridor does exist, it is important that its fauna should be surveyed more thoroughly. Movement corridors often are required to maintain diversity (richness) or to conserve genetic uniqueness” (M. Larivière pers. comm.)

This district contains a transition zone between two subspecies of cicadas,

Kikibia cutora cutora (Walker) and *Kikibia cutora cumberi* (Fleming). This would reflect an area of genetic change between north and south populations (John Dugdale pers. comm.).

Snails

The diverse range of forest types present is reflected in the snail populations: ninety-eight indigenous snail species having been recorded so far from the district (Mayhill 1994, listed in Appendix 5). Several of these species have very restricted ranges: e.g. *Chaureopa depressa*, found only in the Bay of Plenty, and *Liarea egea*, which reaches its southern limit in the district.

As well, there are several introduced species found in the district, including the large native kauri snail *Paryphanta busbyi busbyi* introduced to Kaukaumoutiti Stream, (RAP 21) from a Northland kauri forest. Another of the introduced species, *Cionella lubrica*, is omnivorous and often invades forests following logging. This species may be reducing native snail populations at some sites.

(Source: P. Mayhill pers. comm. 1994)

5. Opportunities for protection

EXISTING PROTECTED NATURAL AREAS

Representativeness

There are approximately 45,000 ha of indigenous vegetation in the protected natural area network: scenic reserves, conservation areas, forest parks, ecological areas, open space covenants, water reserves, local purpose reserves and recreation reserves. This represents about 24% of the ecological district (approx. 188,680 ha). The existing networks of protected areas do not adequately protect freshwater wetlands throughout the ecological district and semi-coastal vegetation (all classes), with only 10.5% of the semi-coastal zone protected. However, 46% of the lowland bioclimatic zone, 32% of the coastal bioclimatic zone, and 24% of the small sub-montane bioclimatic zone is formally protected (see Tables 5, 6, and 7).

TABLE 5. INDIGENOUS VEGETATION IN PROTECTED AREAS IN EACH LAND SYSTEM AND BIOCLIMATIC ZONE (AREAS AND PERCENTAGES)

LAND SYSTEM	BIOCLIMATIC ZONE	TOTAL AREA	RESERVES ADMINISTERED BY DEPARTMENT OF CONSERVATION		QEII COVENANTS		WATER RESERVES		WHAKATANE DISTRICT COUNCIL COASTAL RESERVES		OTHER PROTECTED NATURAL AREAS		TOTAL PNA AREA	
			ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Whakamarama Plateau	Semi-coastal	13,583.3	972.6	7.2	64.8	0.5		0.0		0.0		0.0	1,057.4	7.6
	Lowland	14,527.7	10,266.4	70.7	7.1	0.0		0.0		0.0		0.0	10,273.5	70.7
	Sub-montane	96.4	23.4	24.3		0.0		0.0		0.0		0.0	23.4	24.3
Northern Mamaku Plateau	Semi-coastal	34,416.2	3,943.1	11.5	446.4	1.3	274.9	0.8		0.0	2.4	0.0	4,666.8	13.6
	Lowland	52,260.1	18,241.9	34.9	45.8	0.1	2,277.0	4.4		0.0	651.3	1.2	21,216.0	40.6
Papamoa Hills	Coastal	2.7		0.0		0.0		0.0		0.0		0.0	0.0	0.0
	Semi-coastal	12,320.4	868.0	7.0	12.6	0.1	75.3	0.6		0.6	13.6	0.1	969.5	7.9
Rotoriti Breccia Ignimbrite Fan	Lowland	1,485.3	547.3	36.8		0.0	16.2	1.1		1.1	0.2	0.0	563.7	38.0
	Coastal	1,011.8		0.0		0.0		0.0		0.0		0.0	0.0	0.0
	Semi-coastal	49,063.8	4,112.5	8.4	298.4	0.6	1.0	0.0		0.0	293.9	0.6	4,705.8	9.6
	Lowland	795.0		0.0		0.0		0.0		0.0		0.0	0.0	0.0
Otamarakau Hills	Semi-coastal	701.3		0.0		0.0		0.0		0.0		0.0	0.0	0.0
	Coastal	30.2		0.0		0.0		0.0		0.0		0.0	0.0	0.0
Sand Dunes	Coastal	342.3	2.0	0.6	2.0	0.6		0.0	138.3	40.4		0.0	142.3	41.6
	Coastal	832.9	452.4	54.3	87.1	10.5		0.0	35.7	4.3		0.0	575.2	69.1
Oruhepo Hills	Semi-coastal	6,278.2	650.5	10.4	89.1	1.4	50.7	0.8		0.0		0.0	790.3	12.6
	Semi-coastal	934.1	0.5	0.1	114.0	12.2		0.0		0.0		0.0	114.5	12.3
Total		188,681.7	40,080.6	21.2	1,167.3	0.6	2,695.1	1.4	174.0	0.1	961.4	0.5	45,078.4	23.9

TABLE 6. INDIGENOUS VEGETATION IN RESERVES AND RECOMMENDED AREAS FOR PROTECTION IN EACH LAND SYSTEM AND BIOCLIMATIC ZONE (AREAS AND PERCENTAGES)

LAND SYSTEM	BIOCLIMATIC ZONE	TOTAL AREA	RAPs		Category 1		Category 2		Category 3		Total		PNA TOTAL ¹		RAP & PNA TOTAL	
			ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Whakamarama Plateau	Semi Coastal	13,583.3	1,007.0	7.4	379.6	2.8	201.3	1.5	1,587.9	11.7	1,037.4	7.6	2,625.3	19.3		
	Lowland	14,527.7	1,520.7	10.5	254.8	1.8	110.3	0.8	1,885.8	13.0	10,273.5	70.7	12,159.3	83.7		
	Sub-montane	96.4	38.8	40.2		0.0		0.0	38.8	40.2	23.4	24.3	62.2	64.5		
Northern Mamaku Plateau	Semi Coastal	34,416.2	2,087.1	6.1	1,821.5	5.3	837.5	2.4	4,746.1	13.8	4,666.8	13.6	9,412.9	27.4		
	Lowland	52,260.1	2,515.8	4.6	1,726.0	3.5	1,344.3	2.6	5,586.1	10.7	21,216.0	40.6	26,802.1	51.3		
Papamoa Hills	Coastal	2.7		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Semi-coastal	12,320.4	1,211.7	9.8	303.3	2.5	50.2	0.4	1,565.2	12.7	969.5	7.9	2,534.7	20.6		
Rotoriti Breccia Ignimbrite Fan	Lowland	1,485.3	514.4	34.6	11.5	0.8		0.0	525.9	35.4	563.7	38.0	1,089.6	73.4		
	Coastal	1,011.8		0.0	3.9	0.4		0.0	3.9	0.4	0.0	0.0	3.9	0.4		
	Semi-coastal	49,063.8	51.7	0.1	1,606.4	3.3	433.3	0.9	2,091.4	4.3	4,705.8	9.6	6,797.2	13.9		
Otamarakau Hills	Lowland	795.0		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Semi-coastal	701.3		0.0		0.0	17.1	2.4	17.1	2.4	0.0	0.0	17.1	2.4		
	Coastal	30.2		0.0		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Sand Dunes	Coastal	342.3		0.0	21.0	6.1		0.0	21.0	6.1	142.3	41.6	163.3	47.7		
	Coastal	832.9	0.4	0.0	320.4	38.5		0.0	320.8	38.5	575.2	69.1	896.0	107.6		
Marata Hills	Coastal			0.0												
	Semi-coastal	6,278.2	950.4	15.1	335.5	5.3	201.1	3.2	1,487.0	23.7	790.3	12.6	2,277.3	36.3		
Otuhepo Hills	Semi-coastal	934.1		0.0	44.4	4.8	0.7	0.1	45.1	4.8	114.5	12.3	159.6	17.1		
Total		188,681.7	9,898.0	5.2	6,828.3	3.7	3,195.8	1.7	19,922.1	10.6	45,078.4	23.9	65,000.5	34.4		

1. From Table 5

TABLE 7. INDIGENOUS VEGETATION IN RESERVES AND RECOMMENDED AREAS FOR PROTECTION IN EACH BIOCLIMATIC ZONE (AREAS AND PERCENTAGES)

BIOCLIMATIC ZONE	TOTAL AREA	RAP		PNA		TOTAL (RAP & PNA)	
		ha	%	ha	%	ha	%
Sub-montane	96.4	38.8	40.2	23.4	24.3	62.2	64.5
Lowland	69,068.1	7,997.8	11.6	32,053.1	46.4	40,050.9	58.0
Semi-coastal	117,297.3	11,539.8	9.8	12,284.4	10.5	23,824.2	20.3
Coastal	2,219.9	345.7	15.6	717.5	32.3	1,063.2	47.9
Total	188,681.7	19,922.1	10.6	45,078.4	23.9	65,000.5	34.4

The RAP selection process emphasises selection of ecological units (for example: indigenous vegetation within a particular bioclimatic zone in a particular land system) which are inadequately represented, particularly where the extent of loss of these ecological units has been great. However, some disparity could not be properly addressed as insufficient, or nil, areas of some ecological units have survived to the present day (for example: the coastal bioclimatic zone within the Otamarakau Hills and the Rotoiti Breccia Ignimbrite Fan land systems).

Security and management

Vegetation with significant conservation values is present in some reserves with insufficient security of protection. The management of some of these reserves is inappropriate (for example: grazing of domestic stock, problem weed control) and at least one has a quarry. Coastal recreation reserves and waterworks reserves fall into these categories. Part or all of these reserves should have an upgraded classification to reflect their importance for nature conservation (refer to Beadel 1994a for coastal reserves and Beadel 1985a for waterworks reserves in the Otawa-Otanewainuku forest tract).

Information and ranking

Information on some protected areas can be found in a botanical inventory of lands administered by Department of Conservation (Beadel 1995) and the Rotorua District Council natural heritage inventory (Beadel *et al.* 1998). Botanical inventories and conservation rankings of lands administered by Department of Conservation, and natural areas in the coastal zone are presented in Beadel (1995 & 1994 respectively).

RECOMMENDED AREAS FOR PROTECTION

Evaluation and ranking

Ninety-six ecological units were identified in the district (see Appendix 1). Of these, 54 are unrepresented or poorly represented in existing protected areas. Ecological units in the semi-coastal bioclimatic zone and wetlands in general are the most poorly represented.

The 62 recommended areas for protection (RAPs) in the Otanewainuku Ecological District are listed in Table 8 and their location shown in Figure 4. Category 1 RAPs comprise the highest ranked RAPs and these are the highest priority for protection. Category 1 RAPs (17) include some of the largest areas of unprotected indigenous vegetation in the district (for example: 1,891 ha of forest contiguous to Ottawa Scenic Reserve and Oropi Forest; Whakamarama forest (1,506 ha) contiguous with Kaimai-Mamaku Forest Park north of State Highway 29 and an area containing hard beech forest in the Opuiaki River Catchment (2,480 ha). However there are several relatively small Category 1 RAPs, for example: the best known stand of maire tawake in the ecological district forms the basis for one RAP (c.53 ha) (near Oropi). RAPs in Category 2 (23) are also of high priority and complement the vegetation types and landforms of Category 1 RAPs and existing protected areas, (for example: Ottawa West RAP and Pukunui-Otawa RAP which are contiguous with the Ottawa-Otanewainuku Forests RAP and existing protected areas; Mangaone Extension RAP (contiguous with Mangaone Scenic Reserve); and Waipapa RAP (contiguous with Kaimai-Mamaku Forest Park). Category 3 comprises RAPs which tend to be smaller in size, often in poorer condition, yet containing significant features; or of a vegetation type better represented in other RAPs (Pongakawa Stream RAP and Tautau Stream-Kopurererua Stream RAP). Category 3 RAPs (22) are valuable in ensuring representation of all features of the ecological district, (for example: Hauone Stream Wetland, 2.8 ha); and Matamanu RAP on the hills inland from Otamarakau which comprises several very small remnants of indigenous vegetation which, although small, are the best remaining examples in these parts of the district. However active low-level management of these sites is required (for example: fencing).

It must be stressed that natural areas within each category are of more or less equal importance. If the RAPs proposed cannot be securely protected as part of the protected natural area network (for example: using protection covenants) then it may be appropriate to select alternative RAPs using evaluation methods outlined in Section 3.3.

Postscript

This PNAP survey placed RAPs in 3 categories. However the approach used in the PNA Programme has been evolving relatively rapidly. The currently accepted approach is to survey, document and map all significant natural areas remaining in each ecological district. Subsequent PNAP surveys in the Bay of Plenty (for example: Rotorua Lakes Ecological District - Beadel *et al.* 1998; Taneatua Ecological District - Beadel *et al.* 1999) have used this approach.

Two other inventories should be referred to for information on natural areas in Otanewainuku Ecological District that have not been classed as RAPs in this report. These are; the Western Bay of Plenty District Council natural heritage schedule (1997/98) and the Rotorua District Council natural heritage inventory (Shaw & Beadel 1998).

COMMUNITY AND LANDOWNER ROLES

The ecological landscapes of Otanewainuku Ecological District are special to that place. The district has a character that is very attractive to the people who live there, and to many others who aspire to live in the Western Bay of Plenty, which has one of the fastest growing human populations in New Zealand. This rapid growth has created a huge demand for land, and has increased pressure to clear indigenous vegetation and drain wetlands.

Coincidentally, this has coincided with the enactment and implementation of the Resource Management Act (1991) and the need to safeguard the life-supporting capacity of air, water and terrestrial ecosystems, and the protection of significant indigenous vegetation and habitats of indigenous fauna. The major challenge for the community will be to reach agreement on what needs to be done to achieve protection, and how to fund it. This will require commitment by both individual landowners and the wider community to develop ways of paying for protection works (such as fencing), and for compensating landowners for protecting features and values also of interest to others. The protection of features on Maori-owned land will need to be achieved in a way that recognises their *mana whenua* and special relationships to land. There are also requirements for a high level of inter-agency co-operation between local and central Government.

If the community meets these challenges then the future will provide opportunities to enhance the place of nature in Otanewainuku Ecological District, in contrast to the indifferent exploitation, which has largely prevailed since the arrival of humankind.

TABLE 8. PROTECTED NATURAL AREAS AND RECOMMENDED AREAS FOR PROTECTION - OTANEWAINUKU ECOLOGICAL DISTRICT (KEY FOR FIGURE 4)

SITE NO.	NAME
Lands administered by Department of Conservation	
1	Kaimai-Mamaku Forest Park (part)
2	Wairere Falls Scenic Reserve
3	Gordon Park Scenic Reserve
4	Land Exchange to Kaimai-Mamaku Forest Park
5	Land Exchange to Kaimai-Mamaku Forest Park
6	Land Exchange to Kaimai-Mamaku Forest Park
7	Waiteariki Ecological Area
8	Opuia Ecological Area
9	Rapurapu Ecological Area
10	Wainui Stewardship Area
11	Whakamarama Stewardship Area
12	Land Exchange to Kaimai-Mamaku Forest Park
13	Ongaonga Scenic Reserve
14	Hidden Gorge Scenic Reserve
15	Omanawa Stewardship Area
16	'Tautau' Scenic Reserve
18	Otawa Stewardship Area
19	Otawa Stewardship Area
20	Otawa Scenic Reserve
21	Wairoa River Marginal Strip
22	Kopurererua River Marginal Strip
23	Tautau Stream Marginal Strip
24	Kopurererua River Marginal Strip
25	Waimapu Stream Marginal Strip
26	Raparapahoe Stream Marginal Strip
27	Waipapa River Marginal Strip
28	'Omanawa' Stewardship Area
29	Mangorewa Forest
30	Puwhenua Forest
31	Taumata Scenic Reserve
32	Mangorewa Scenic Reserve
33	'Whataroa' Stewardship Area
34	Mangapouri Scenic Reserve
35	Otawa Stewardship Area
36	Oropi Forest
37	OtaneWainuku Forest
38	Te Matai Stewardship Area
39	Mangapouri Stewardship Area

SITE NO.	NAME
40	Maungaruahine Pa Historic Reserve
41	'Waiairi Gorge' Stewardship Area
42	Penny Road Scenic Reserve
43	Kaharoa Forest
44	Okere Falls Scenic Reserve
45	Upper Kaituna Scenic Reserve
47	Pokopoko Stream Scenic Reserve
48	Roydon Downs Scenic Reserve
49	Government Purpose (Afforestation) Reserve
50	Onaia Ecological Area
51	Mangapapa Ecological Area
52	Mangorewa Ecological Area
53	Gammons Block
54	Te Matai Forest
55	Kaharoa Stewardship Area
56	Closed Road
57	Puwhenua Stewardship Area
58	Rataroa Stream Marginal Strip
59	Tuakopae Stream Marginal Strip
60	Omanawa River Marginal Strip
61	Rerenga Stream Marginal Strip
62	Whataroa Stream Marginal Strip
63	Rararapahoe Stream Marginal Strip
64	Rararapahoe Stream Marginal Strip
65	Mangorewa River Marginal Strip
66	Mangorewa River Marginal Strip
67	Mangorewa River Marginal Strip
68	Pokopoko Stream Marginal Strip
69	Mangapouri Stream Marginal Strip
70	Carrie Gibbons Scenic Reserve
71	Ohinekoao Recreation Reserve
72	Ohinekoao Scenic Reserve
73	Matata Scenic Reserve
74	Matata Stewardship Area
76	Rotoehu Forest
83	Pongokawa Ecological Area
84	Pongokawa Marginal Strip
85	Waitahanui Stream Marginal Strip
86	Waitahanui Stream Marginal Strip
87	Waitahanui Stream Marginal Strip
88	Whakahaupapa Stream Marginal Strip

SITE NO.	NAME
89	Otamarakau Marginal Strip
90	Pikowai Stream Marginal Strip
91	Herepuru Stream Marginal Strip
92	Waipapa Stream Marginal Strip
93	Te Puna Stream Marginal Strip
94	Waimapu Stream Marginal Strip
111	Maurihero Scenic Reserve (part)
115	Wainui River Marginal Strip (part)
116	Kaituna River Marginal Strip (part)
117	Rotoehu Conservation Area
118	Omanawa Scenic Reserve
122	Unnamed Crown Land
123	Unnamed Crown Land
124	Unnamed Crown Land

QEII National Trust covenants¹

1	NZ Native Forest Restoration Trust
2	Collings
3	Mackersey
4	Oteora Trust
5	Coster
6	Burke
7	Harrison
10	Carpenter
11	Anstis
12	Short
15	Wallingford
16	Dawson
17	Pattie
18	Wood
19	Merriman
21	Pendergrast
22	Queen Elizabeth II National Trust
23	Kranenbarg
24	Verwey
25	Mark
27	Lempriere
28	Linton
31	M. Burt
32	P. Burt
34	O'Hagan
36	Gray

1. As per information provided by QEII Trust in 1994.

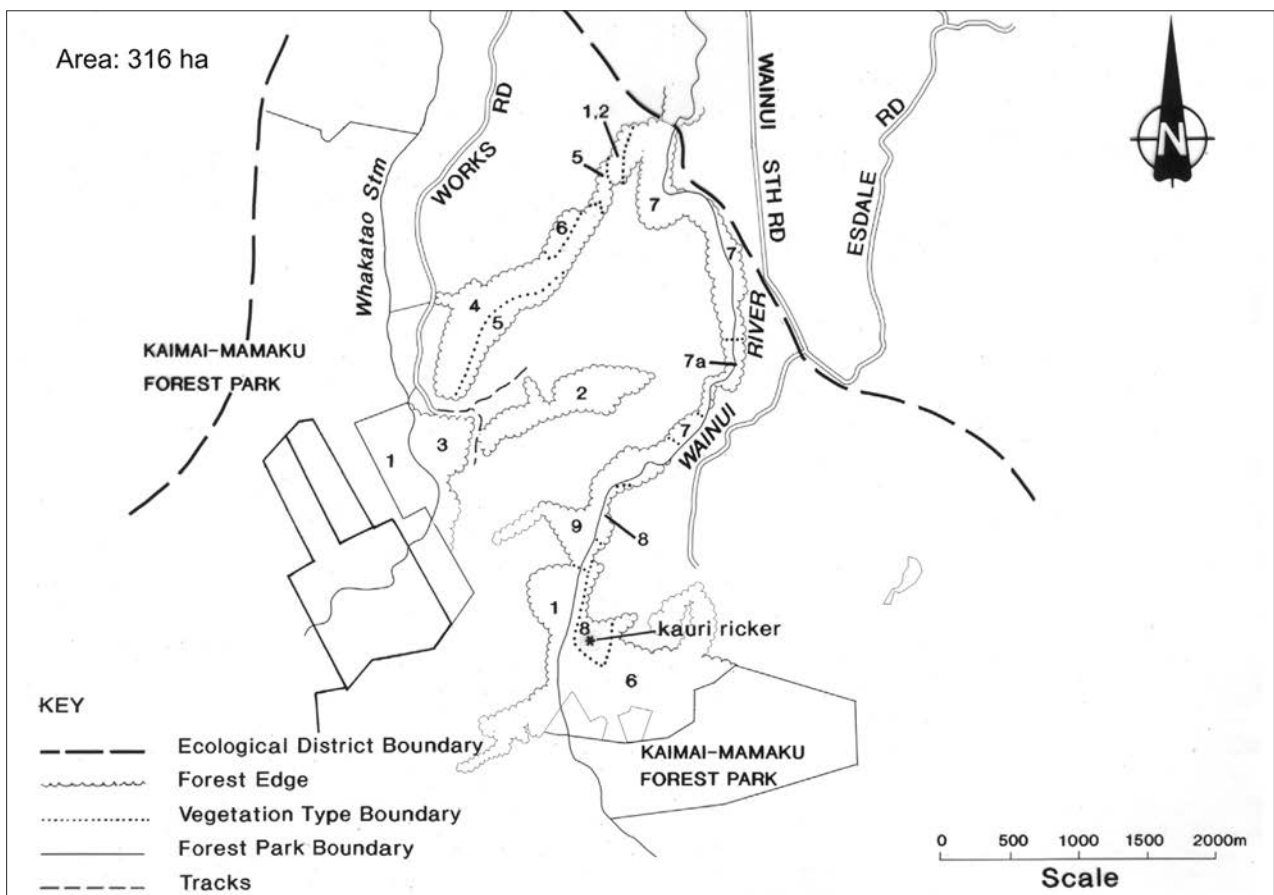
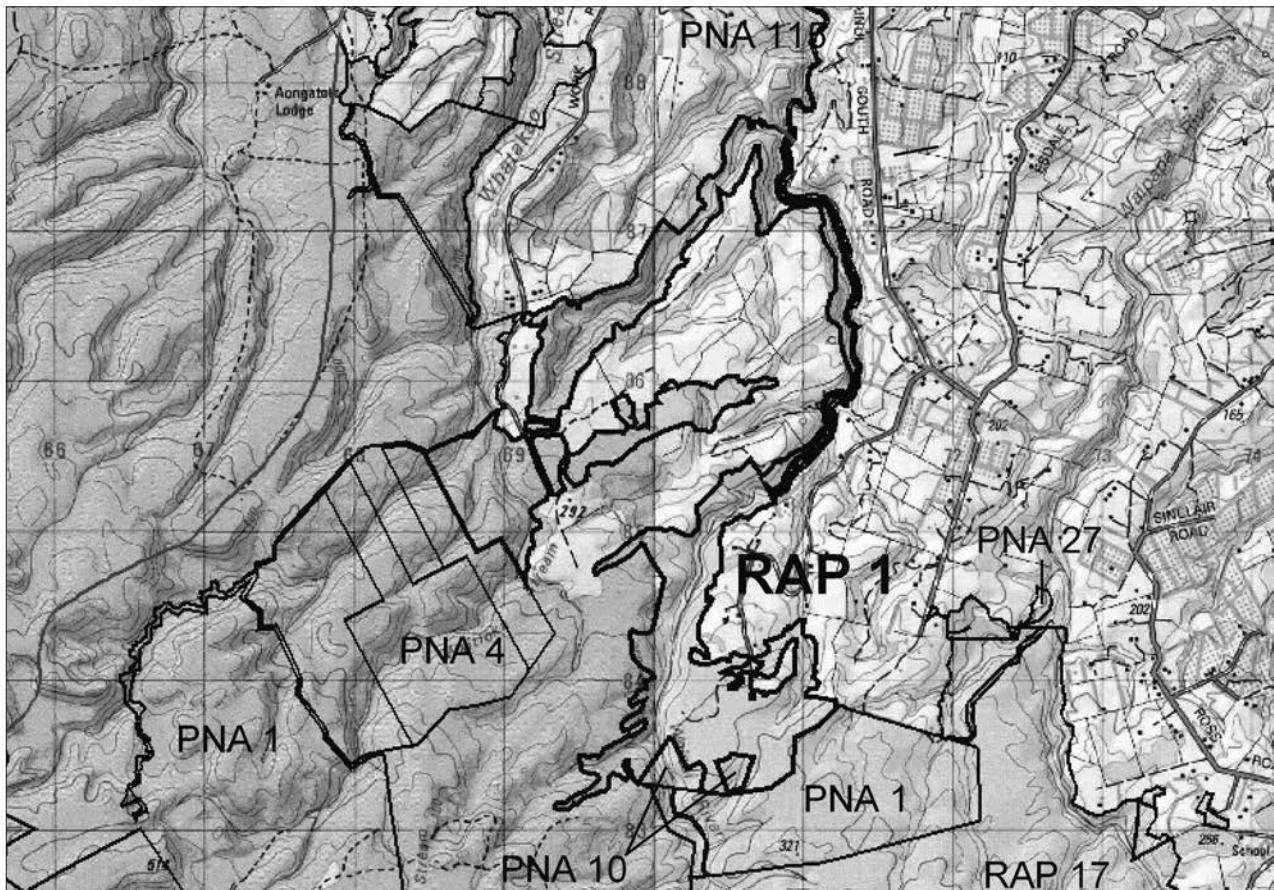
SITE NO.	NAME
37	Pickford
38	Mackintosh
53	Fleming
54	Davie
55	Wallace
56	McAlister
District Council reserve	
57	Whakatane District Council Coastal Recreation Reserves
Waterworks reserves	
39	Water Supply Reserve (Waiorahi Stream)
40	Water Supply Reserve (Waiorahi Stream)
41	Water Supply Reserve (Waiorahi Stream)
42	Water Conservation Reserve (Otawa)
43	Waterworks Reserve (Pyes Pa Road)
44	Waterworks Reserve (East Taumata Road)
45	Mt Maunganui Waterworks Reserve (Mountain Road)
46	Waterworks Reserve (Mountain Road)
47	Waterworks Reserve (Oropi Forest)
48	Waterworks Reserve (Seale Road)
49	Water Supply Catchment and Conservation (North West Otanewainuku Forest)
50	Waiorahi Stream
51	Karaponga Stream Reservoir Reserve
Other protected natural areas	
17	Ohauti Conservation Covenant
46	Okere Falls Recreation Reserve
75	Whakahaupapa Stream Covenant
77	Eiwa Covenant
78	Whakahaupapa Stream Covenant
79	Pikowai Stream Protective Covenant (East Block Covenant)
80	Pikowai Stream Covenant
81	Falls Road Covenant
82	Pongakawa Stream Valley Covenant
114	Brungger Conservation Covenant
119	Kirikiri Stream Conservation Covenant
120	Omanawa Conservation Covenant
121	Te Matai Covenant
Recommended Areas for Protection	
<i>Category 1</i>	
R1	Wainui River
R2	Putangi Stream
R3	Te Weraiti

SITE NO.	NAME
R4	Whakamarama
R5	Omahine Stream A
R6	Whaiti Kuranui
R7	Opuiaki River
R8	Otawa-Otanewainuku
R9	McIvor Road
R10	McPhail Road
R11	Mangatoi Stream
R12	Mid Mangorewa Gorge
R13	Lower Mangorewa Gorge
R14	Awakaponga
R15	Taheke Geothermal
R26	Capella Road Wetland
R62	Mamaku Lagoon
<i>Category 2</i>	
R16	Graveson Rd
R17	Waipapa
R18	Otawa West
R19	Pukunui
R20	Omahine Stream B
R21	Kaukaumoutiti Stream
R22	Otamarakau
R23	Ohineangaanga Stream
R24	Waiari Stream
R25	Omanawa East Extension
R27	Ohinekoao
R28	Whataroa Gorge
R29	Tuhua Wetland
R30	Pokopoko
R31	Te Iringa
R32	Waipapa Stream
R33	Tokerau
R34	Otuhepo
R35	Mangaone Extension
R44	Kaituna River
R54	Lagoon Road
R58	Gammons
R60	Taumata-Te Matai
<i>Category 3</i>	
R36	Whatakao Stream
R37	Mangakurukuru Stream

SITE NO.	NAME
R38	Rataroa Stream-Te Ahuru
R39	Waiorahi Stream
R40	Raparapahoe Stream
R41	Henderson Western Tram
R42	Tautau Stream-Kopurererua Stream
R43	Oropi Forest
R45	Otawa-Otanewainuku Extension
R46	Te Pareoterawahirua
R47	Hauone Stream Wetland
R48	Matamanu
R49	Kakahu Road
R50	Waiwhakarewarewa Stream
R51	Pongakawa Stream
R52	Manawahe Scarp
R53	Mangorewa Extension
R55	Upper Kaituna
R56	Rotoehu Extension
R57	Ohinetewai
R59	Te Matai
R61	Upper Mangorewa River

Category 1 RAPs

RAP 1 WAINUI RIVER



RAP 1 WAINUI RIVER

Area:	316.1 ha
Altitudinal range:	40–340 m
Grid reference:	NZMS 260 U14 704850
Land system:	Whakamarama Plateau
Study area no.:	59, 63, 64, 67
Status:	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. (Rimu)-(northern rata)/tawa-rewarewa-pukatea-kamahi forest	Hillslope
Semi-coastal	2. (Northern rata)/tawa-kohekohe-puriri forest	Plateau
Semi-coastal	3. Tawa-miro-rimu-hinau forest	Hillslope
Semi-coastal	4. Tawa-rewarewa-kohekohe forest	Hillslope
Semi-coastal	5. Kamahi forest	Gully and hillslope
Semi-coastal	6. Tawa-puriri-kohekohe-rewarewa-pukatea forest	Hillslope
Semi-coastal	7. Rewarewa-kamahi-radiata pine-maritime pine-(tanekaha)-(kanuka)-(mamaku) forest 7a Heavily modified; tracks traverse this portion.	Hillslope and gully
Semi-coastal	8. Tanekaha forest	Ridge
Semi-coastal	9. Tawa-kamahi-mamaku forest	Hillslope

Landform

This RAP encompasses the steep faces and gorges along the Wainui River and one of its tributaries. These flow over flat rock platforms with several waterfalls. Much of the flat land between the two waterways has been cleared, however one area of indigenous vegetation remains which is included in this RAP.

Vegetation

The vegetation is diverse and although heavily modified in parts, it is relatively intact in others.

Flora

Lepidosperma laterale and *Coprosma arborea* occur in this RAP. This is the only known location in the ecological district for both species and the southern limit on the eastern side of the North Island for both species.

Fauna

Forest bird species present include kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) and tui.

Threat / modification

Farm tracks traverse this RAP. Domestic stock graze throughout much of the RAP. Domestic grazing should be excluded.

In the past the RAP has been lightly logged for rimu and possibly locally for puriri. There is ongoing logging and clearing, and protection of this RAP is a high priority.

Evaluation

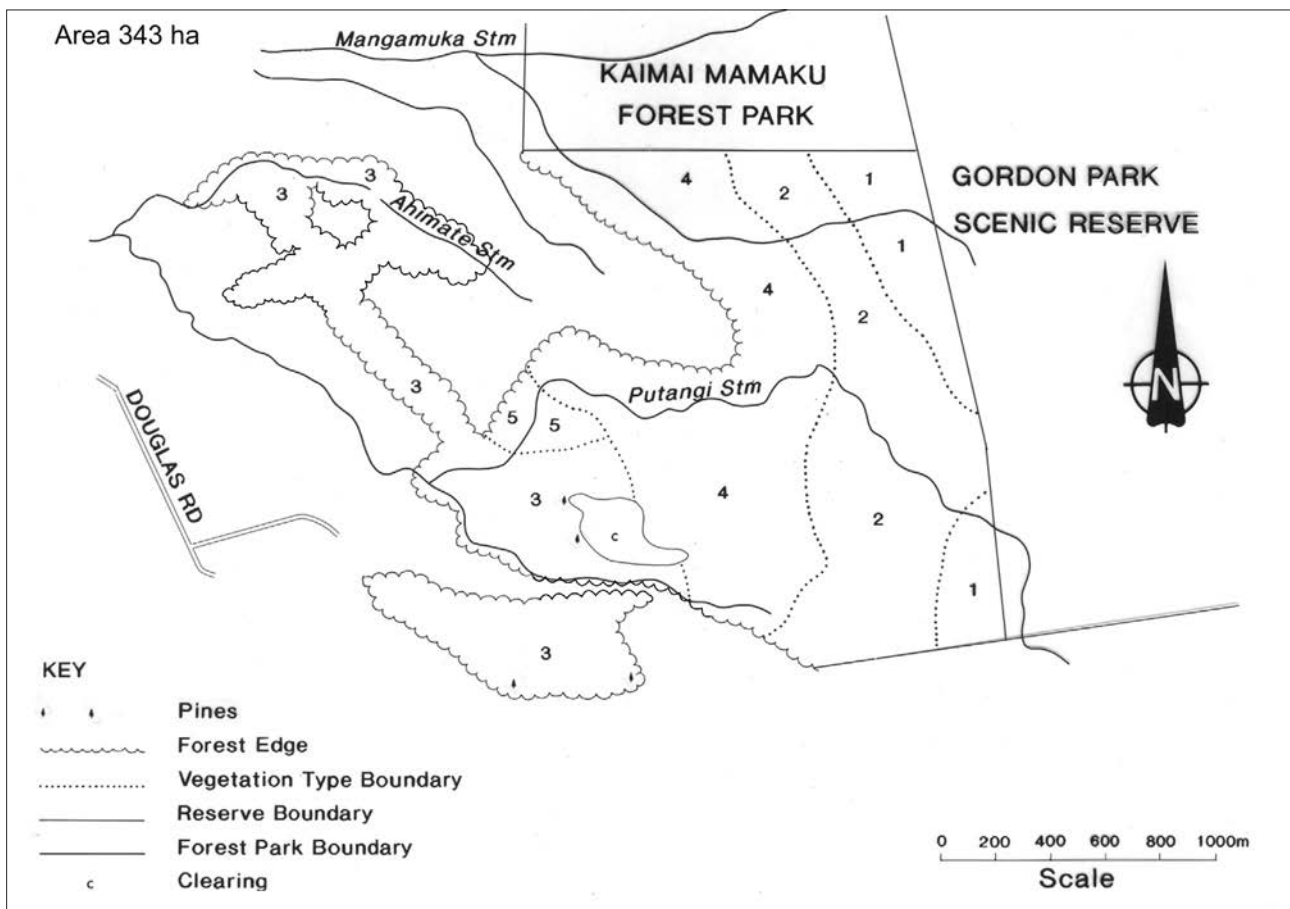
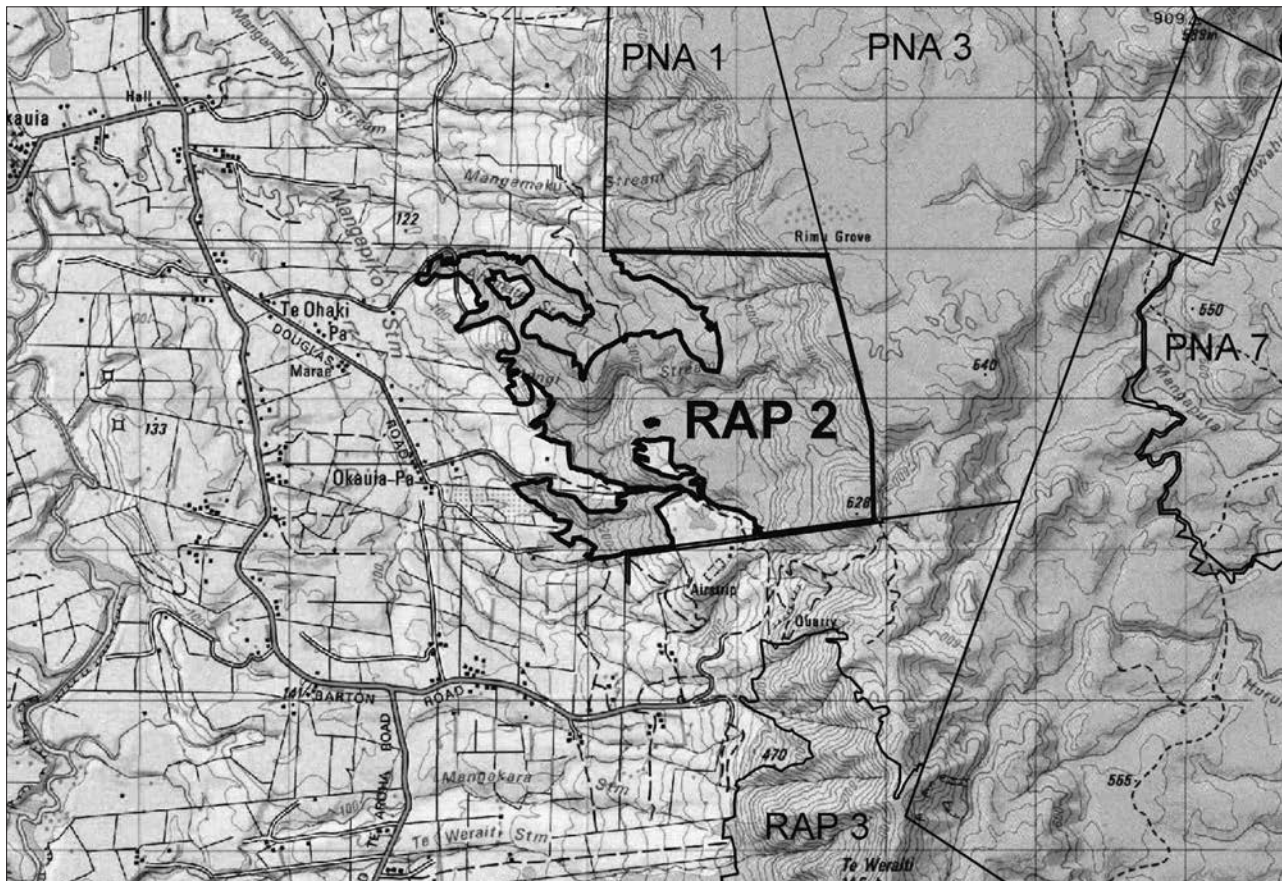
Representativeness	H	Viability	M
Diversity	H	Buffering	L
Naturalness	M	Size & Shape	L
Special Features	H	Threats	H

Discussion

This RAP is contiguous with the Kaimai-Mamaku Forest Park and extends through the semi-coastal bioclimatic zone of the Otanewainuku ecological district to the Tauranga ecological district, providing a continuous, although narrow and modified, altitudinal vegetation sequence. Very little indigenous forest remains in the Tauranga ecological district which highlights the value of remaining areas, particularly those contiguous with large areas, albeit in adjoining ecological districts. In turn, the value of contiguous vegetation in adjoining ecological districts (i.e. this RAP) is enhanced.

Semi-coastal vegetation is under-represented in the existing reserve system in the Otanewainuku ecological district.

RAP 2 PUTANGI STREAM



RAP 2 PUTANGI STREAM¹

Area:	342.7 ha
Altitudinal range:	100–600 m
Grid reference:	NZMS 260 T14 636733
Land system:	Whakamarama Plateau
Study area no.:	82
Status:	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Sub-montane	1. Tawari-tawheowheo forest	Hillslope
Lowland	2. (Miro)/kamahi-tawari-tawa forest	Hillslope
Semi-coastal	3. (Northern rata)-(rimu)/tawa-rewarewa-pukatea-mangeao-kamahi forest	Hillslope
Semi-coastal	4. (Northern rata)/tawa-pukatea-kohekohe-rewarewa forest	Hillslope
Semi-coastal	5. (Northern rata)-(rimu)/tawa-pukatea-rewarewa forest	Hillslope

Landform

Comprises part of the steep andesite escarpment above the Matamata Plains forming the western edge of the Whakamarama rhyolite plateau and a down-faulted section of the rhyolite below it. The RAP is bounded on the western side by a parallel steep escarpment above the Mangapiko Stream. The small gently sloping plateau segment in the centre of this site is farmed and is excluded from the RAP.

Vegetation

The lower slopes and the margins have been lightly logged and locally affected by crown fires.

Flora

Karaka was recorded in this RAP during the survey. Inland occurrences of karaka, whilst not uncommon, are noteworthy.

Fauna

Forest birds present include kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002).

Threat / modification

Clearance of these forests for conversion to pasture has been ongoing in recent years and conversion to exotic forestry is a future possibility. Domestic stock graze some of the lower slopes and should be excluded.

1. A very small part of this RAP lies in the Hinuera Ecological District.

The top ridge was used for Army training during World War II.

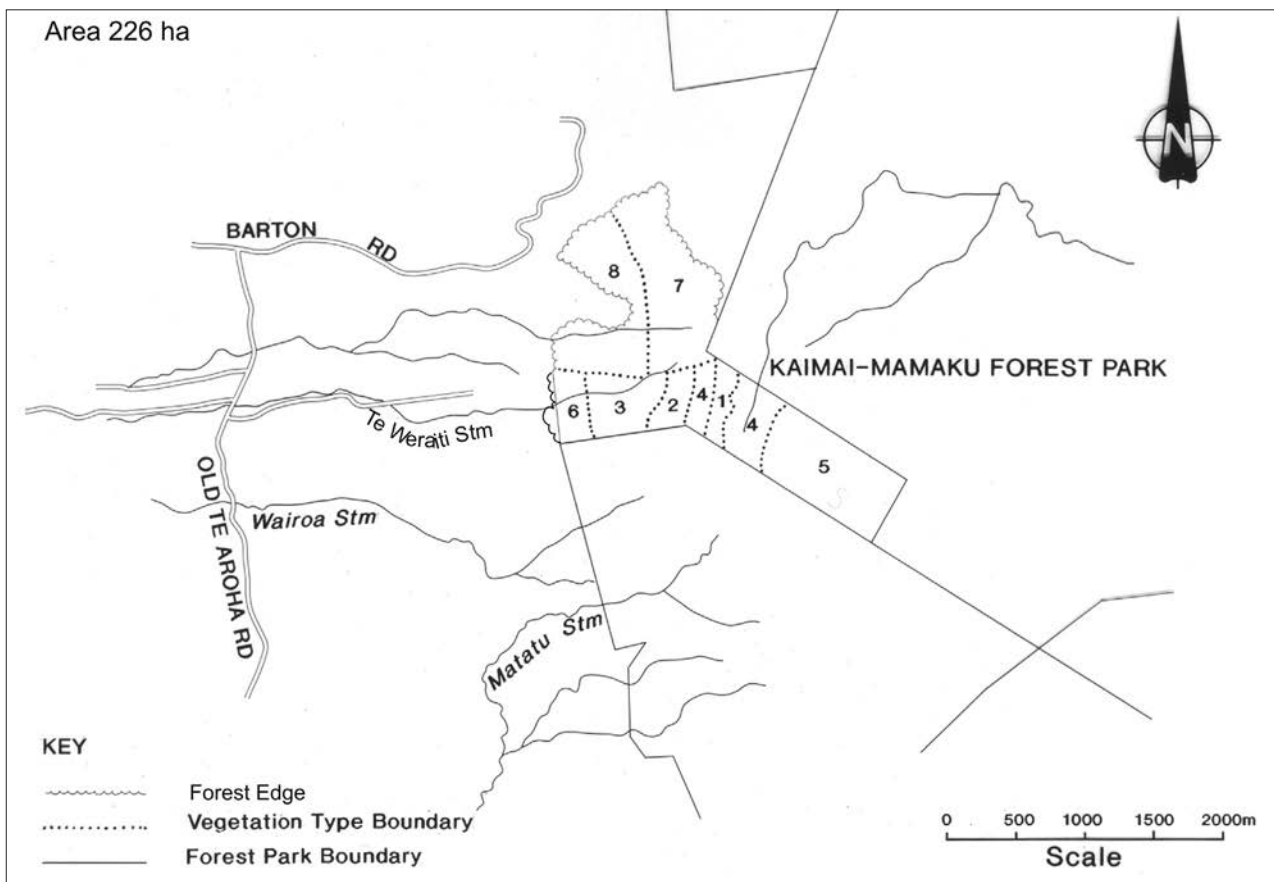
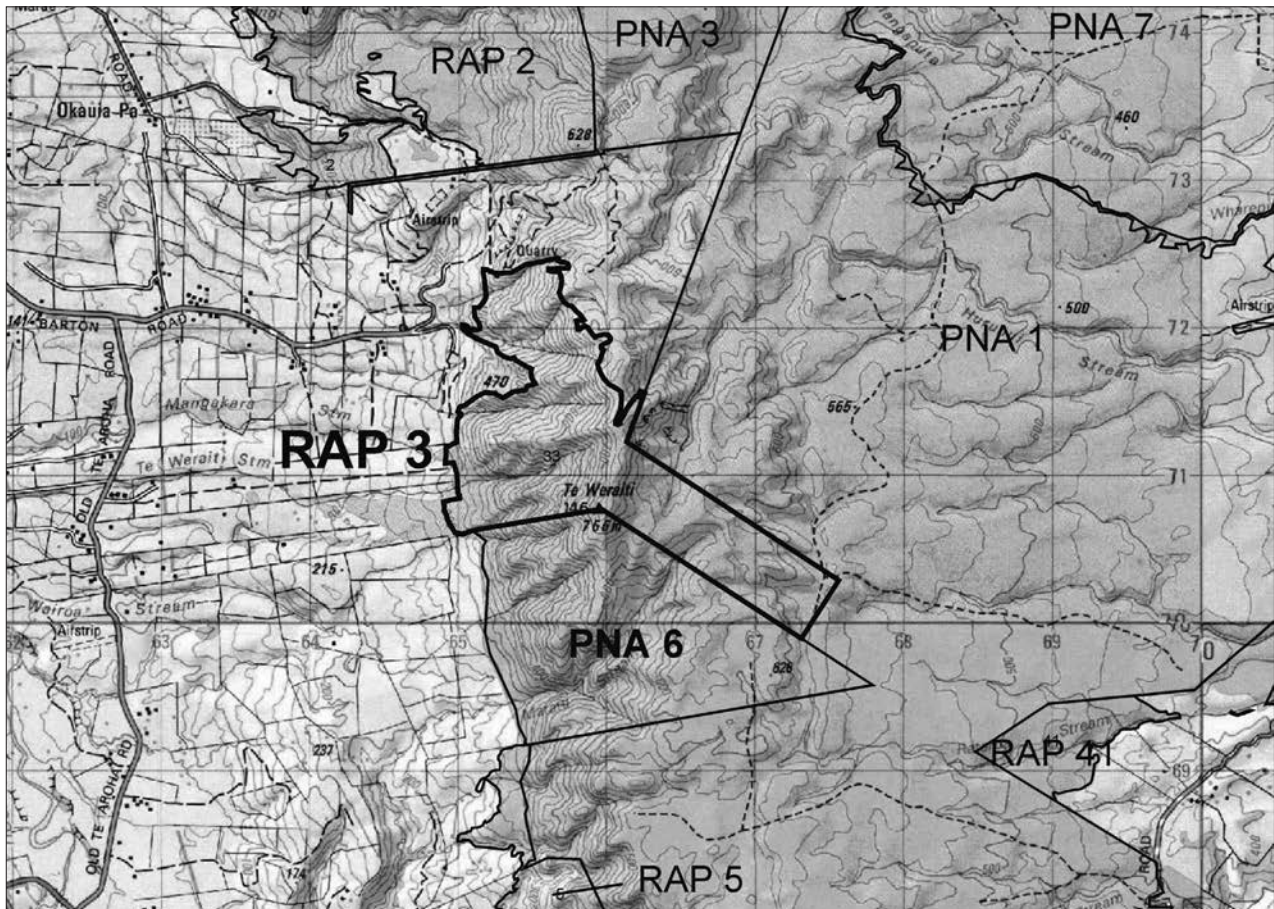
Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	H
Naturalness	M	Size & Shape	H
Special Features	M	Threats	M

Discussion

This RAP comprises a relatively large example of indigenous vegetation forming part of a continuous altitudinal sequence from semi-coastal to sub-montane vegetation. It is part of an extensive forest tract and is prominent as seen from the Matamata Plain. It contains semi-coastal forest which is under-represented in the ecological district, particularly on the western side of the Kaimai Range.

RAP 3 TE WERAITI



RAP 3 TE WERAITI

Area	226.2 ha
Altitudinal Range	220–765 m
Grid Reference	NZMS 260 T14 660720
Land System	Whakamarama Plateau
Study Area No.	84
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Sub-montane	1. Tawari-tawheowheo-orihou- <i>Dracophyllum traversii</i> forest	Ridge crest
Sub-montane	2. Miro/tawa-kamahi-tawari forest	Hillslope
Lowland	3. (Northern rata)/tawa-rewarewa-pukatea forest	Hillslope
Lowland and sub-montane	4. Tawari-tawheowheo forest	Hillslope
Lowland	5. Tawari-tawheowheo-(tawa)-(rimu)-(miro) forest	Hillslope
Semi-coastal	6. Tawa-rewarewa-pukatea-kohekohe forest	Hillslope
Sub-montane and lowland	7. <i>Raukaua anomalus</i> -mingimingi-kiokio shrubland and scrub; ⇔ tawari-tawheowheo scrub	Hillslope
Lowland and semi-coastal	8. (Rewarewa)/mamaku-mahoe-mangeao forest; ⇔ bracken-kiokio fernland	Hillslope

Landform

This section of the Whakamarama rhyolite plateau is notable for Te Weraiti peak, the highest point on the plateau and in the ecological district. The plateau has a steep escarpment along its western edge, rising up from the Matamata Plain.

Vegetation and flora

The vegetation is diverse comprising sequences of both forest and scrub, each extending from the semi-coastal bioclimatic zone up through the lowland zone to the sub-montane zone. Species present in the sub-montane zone include *Libocedrus bidwillii*, *Dracophyllum traversii*, *Pseudopanax colensoi*, *Raukaua anomalus*, *Blechnum procerum*, and *Libertia micrantha*, all of which are uncommon in the ecological district.

Libocedrus bidwillii is a notable feature. The nearest occurrences are on the range above Gordon to the north and to the south in the central Te Urewera Ranges.

Fauna

Common forest bird species occur in this RAP.

Threat / modification

The northern portion has been cleared and burnt, and in the past has been farmed. Parts are still grazed by domestic stock and this should cease. Exotic pine plantations are being established in adjoining areas and this site may be threatened by development.

Spanish heath is locally common in the secondary shrubland and there are scattered radiata pine (*Pinus radiata*). The pines should be removed or killed *in situ*.

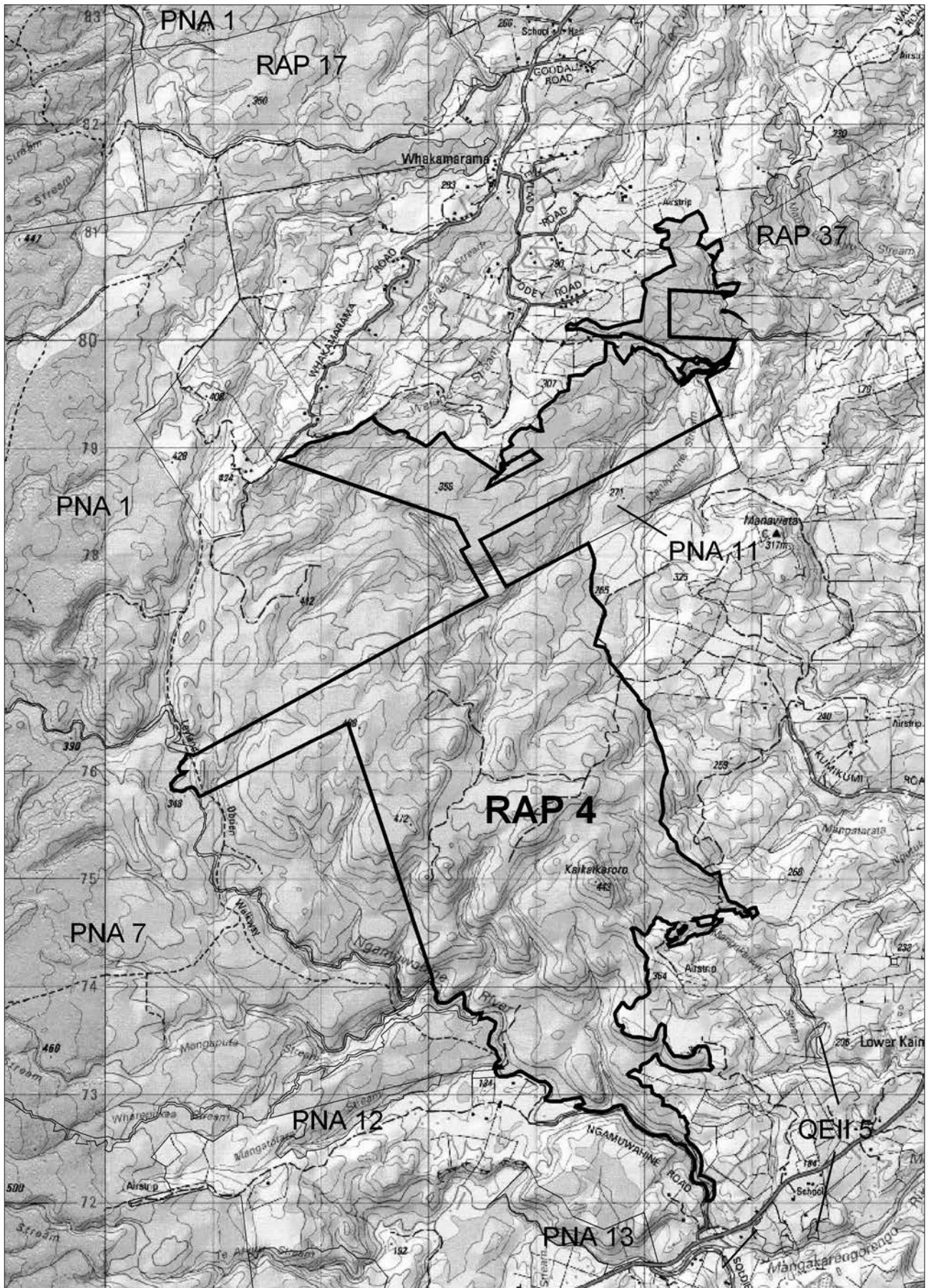
Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	H
Naturalness	H	Size & Shape	H
Special Features	H	Threats	H

Discussion

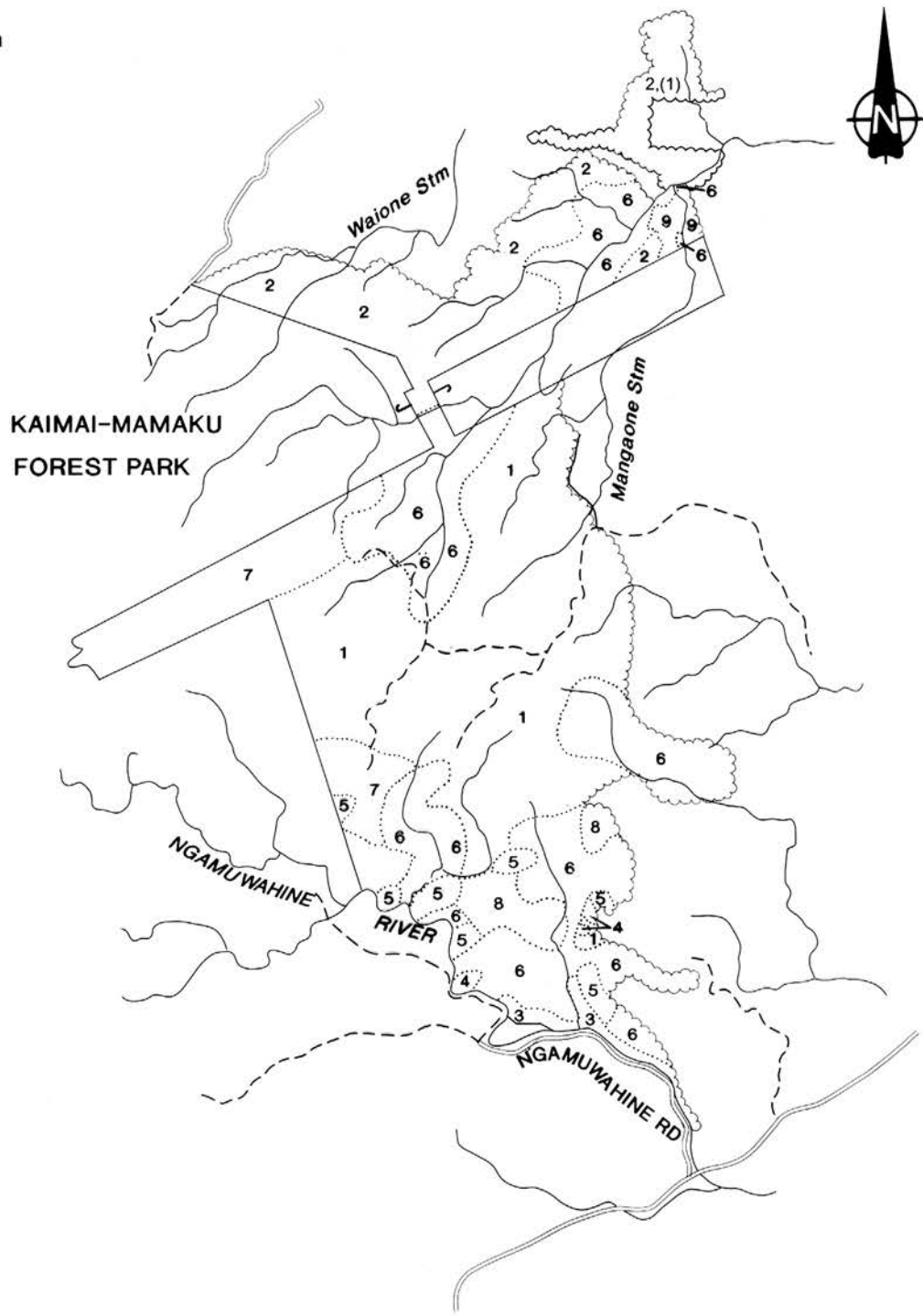
This RAP contains representative altitudinal vegetation sequences of both scrub and forest from the semi-coastal bioclimatic zone to the montane bioclimatic zone and includes the highest point in the ecological district. This RAP is a prominent part of the Kaimai Range and highly visible from the Matamata Plains.

RAP 4 WHAKAMARAMA

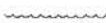


RAP 4 WHAKAMARAMA

Area: 1506 ha



KEY

-  Forest Edge
-  Vegetation Type Boundary
-  Forest Park Boundary

0 500 1000 1500 2000m
Scale

RAP 4 WHAKAMARAMA

Area	1,506.3 ha
Altitudinal Range	180–488 m
Grid Reference	NZMS 260 U14 738762
Land System	Whakamarama Plateau
Study Area No.	55
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland and semi-coastal	1. (Pukatea)/tawa-rewarewa-mahoe-mamaku forest	Hillslope, plateau
Semi-coastal	2. (Northern rata)-(rimu)/tawa-pukatea-hinau forest	Hillslope
Lowland	3. Rimu/totara/tanekaha forest	Hillslope
Lowland	4. Bracken fernland and mamaku scrub and shrubland	Hillslope
Semi-coastal	5. Rewarewa-kamahi forest	Hillslope
Semi-coastal and lowland	6. (Rimu)-(miro)/tawa-kamahi-tawari forest	Hillslope
Lowland	7. (Northern rata)/tawa-rewarewa-mangeao-kamahi forest	Hillslope
Semi-coastal	8. (Rimu)-(northern rata)/tawa-kohekohe-kamahi forest	Hillslope
Semi-coastal	9. Secondary scrub and shrublands	Hillslope
Lowland and semi-coastal	10. Wheki-mamaku treefernland (not mapped)	Skid site

Landform

Comprises part of the Whakamarama rhyolite plateau. The southern side of the RAP drains into the Mangaone Stream, a tributary of the Wairoa River, whilst the northern side comprises the headwaters of the Te Puna Stream. These streams are shallow and swampy on the eastern side, whilst along the western boundary they are boulder-filled.

Vegetation

Large areas in this RAP have been heavily logged for podocarps, leaving a discontinuous canopy of scattered pukatea, tawa and rewarewa over a mixture of shrubs and treeferns, including mahoe, mamaku, kanono, pate, wheki and hangehange. The north-eastern extension is generally less modified than other parts.

There are small examples of (rimu)-(miro)/tawa-kamahi-tawari forest along river margins. Elsewhere, on less accessible sites, are small examples of unlogged or lightly logged tawa and rewarewa-kamahi forest occurs locally on old burn sites.

Flora

Pterostylis “aff. *montana*” occurs in this RAP. This is the only record of this species from the ecological district.

Fauna

Forest bird species present include kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), North Island robin, whitehead, tui, kingfisher and bellbird (Fauna Survey Unit, unpublished 1982).

Threat / modification

Much of this RAP was heavily logged prior to the 1960s. Tasmanian blackwoods are a problem plant and proposals to plant along old logging roads should not proceed. Clearance for conversion to exotic forestry is proposed for a portion on the eastern side of the RAP, however protection of Whakamarama RAP is of high priority.

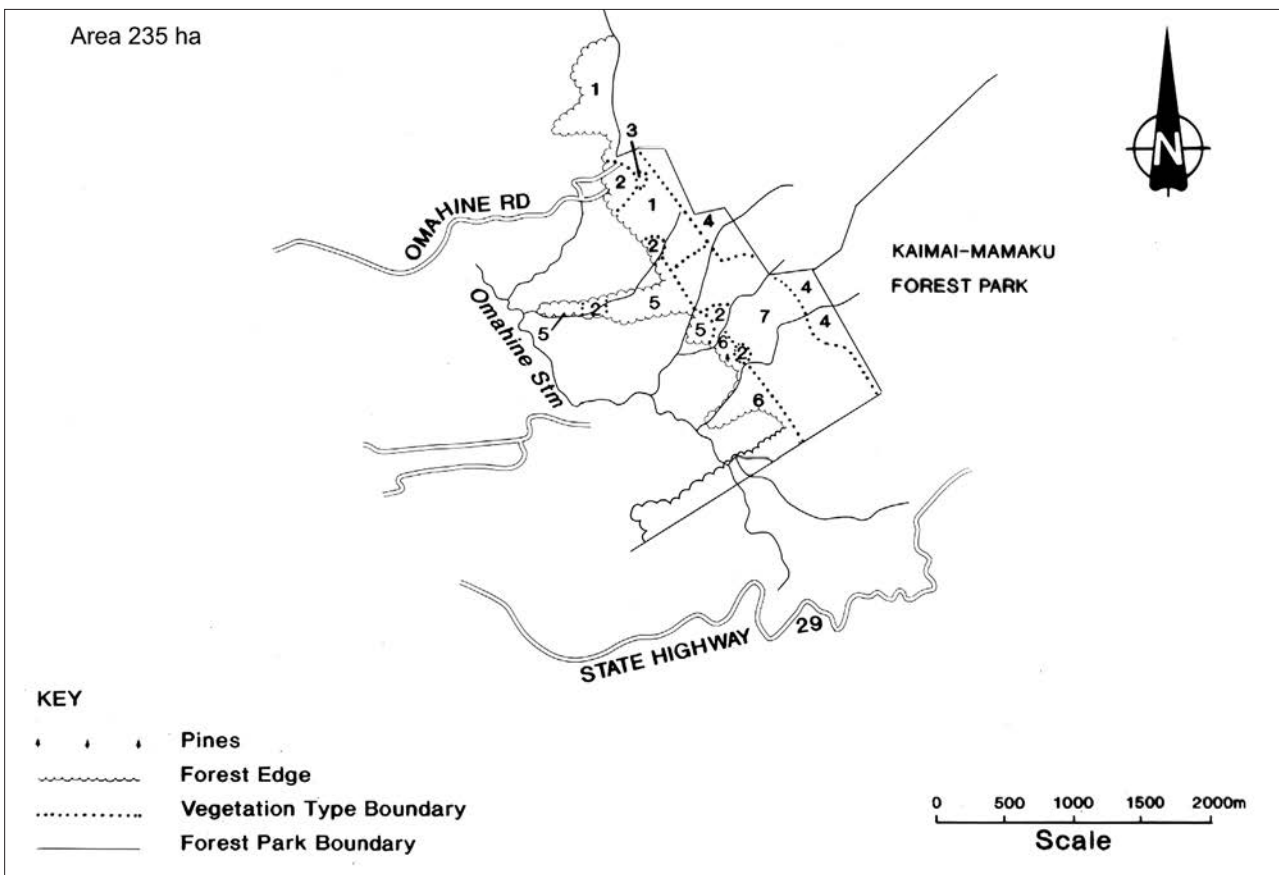
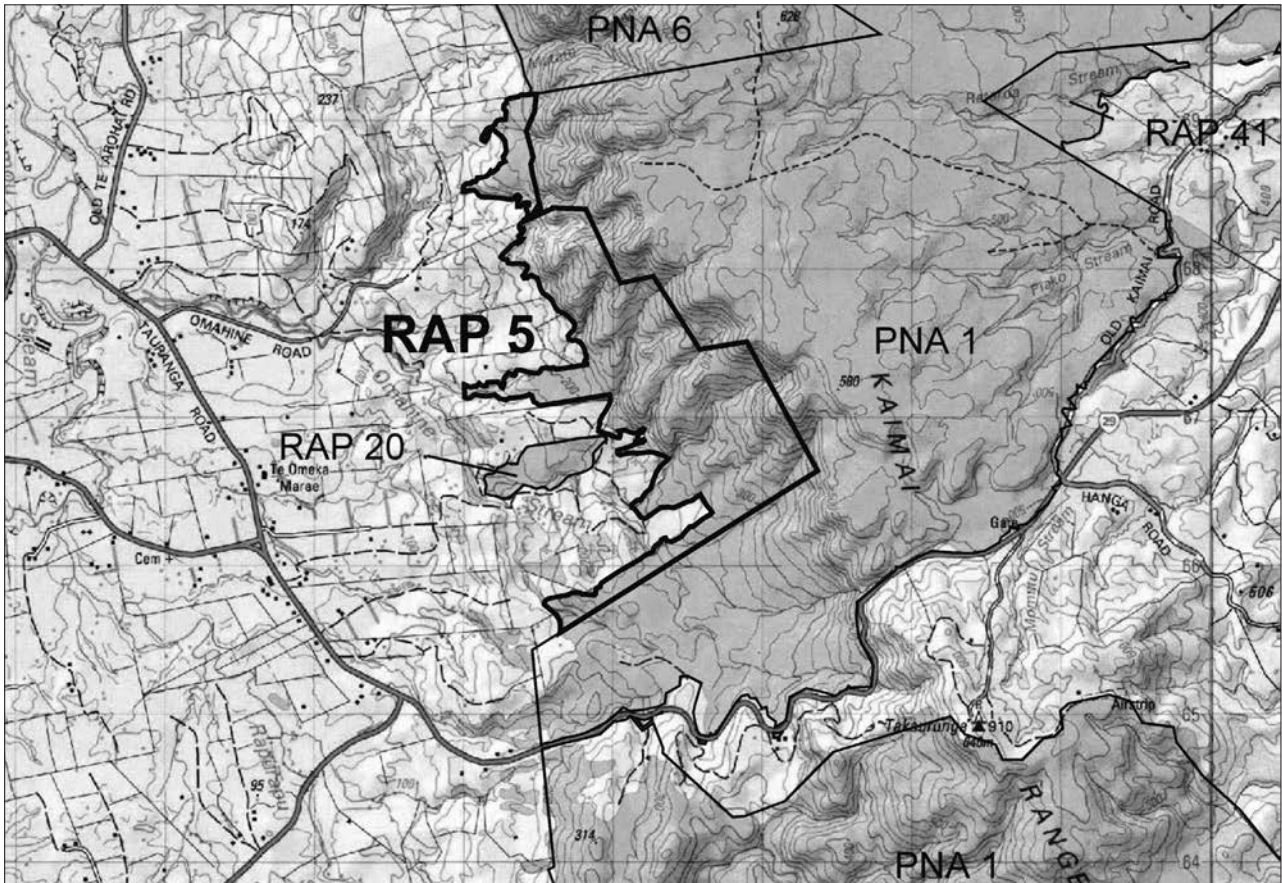
Evaluation

Representativeness	M	Viability	H
Diversity	L	Buffering	H
Naturalness	M	Size & Shape	H
Special Features	M	Threats	M

Discussion

This RAP is relatively large and is part of an extensive forest tract (Kaimai-Mamaku Forest Park). It entirely encompasses a Park outlier and would join it to the Park. It contains examples of semi-coastal vegetation and is part of a representative culturally interrupted altitudinal vegetation sequence extending from the top of the Kaimai Range towards the coast.

RAP 5 OMAHINE STREAM A



RAP 5 OMAHINE STREAM A

Area	235.0 ha
Altitudinal Range	280–520 m
Grid Reference	NZMS 260 T15 663670
Land System	Whakamarama Plateau
Study Area No.	86
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland and semi-coastal	1. Tawa-rewarewa-pukatea forest	Hillslope
Lowland and semi-coastal	2. Rewarewa/mamaku-mahoe forest	Hillslope
Lowland	3. Gorse shrubland	Hillslope (old quarry workings)
Lowland	4. Tawari-tawa-kamahi forest	Hillslope
Semi-coastal	5. Tawa-pukatea-rewarewa-kohekohe forest	Hillslope
Semi-coastal	6. Tawa-rewarewa-kohekohe forest	Hillslope
Lowland	7. (Rimu)-(northern rata)/tawa-rewarewa forest	Hillslope

Landform

A section of the high western escarpment of the Whakamarama rhyolite plateau rising above the Matamata Plain. Extends in several places below onto the gently sloping volcanic alluvium terraces flanking the Omahine Stream and its tributaries.

Vegetation

The vegetation on the lower slopes has been lightly logged, burned or at one site removed to establish a rock quarry. Tawa, rewarewa and pukatea are common with local emergent rimu and northern rata on the lower slopes at the southern end. Tawari, tawa and kamahi are dominant on the steep escarpment.

Small examples of secondary rewarewa/mamaku-mahoe forest occur along the margins in association with *Coprosma robusta*, makomako, bracken, tutu and *Cordyline banksii*.

Flora and fauna

No significant species were recorded during this survey.

Threat / modification

The majority of this RAP is no longer grazed by domestic stock. However, in the past it has been grazed, and some fencing to exclude stock is

required. The forests on the lower slopes extending into the farmland are vulnerable to clearance for conversion to farmland or exotic forest plantations.

Evaluation

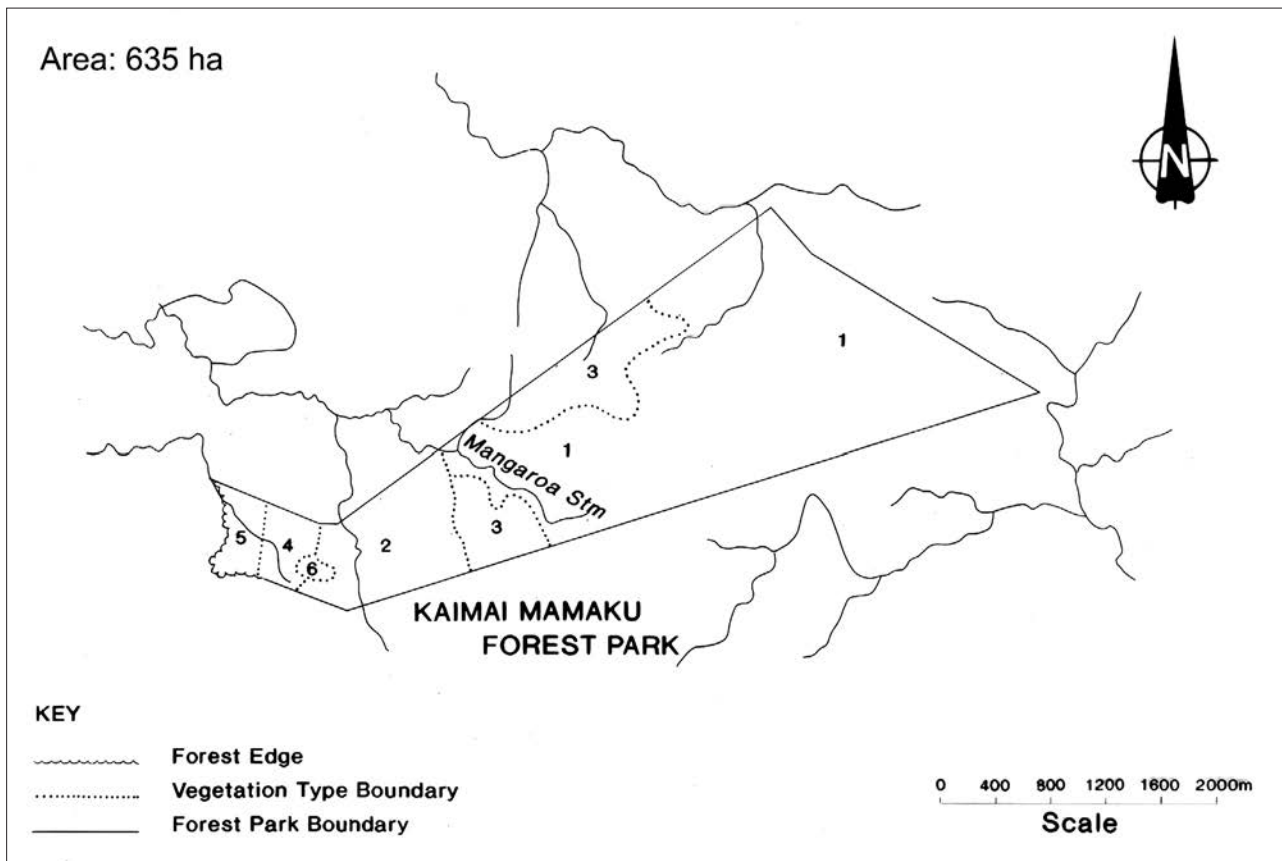
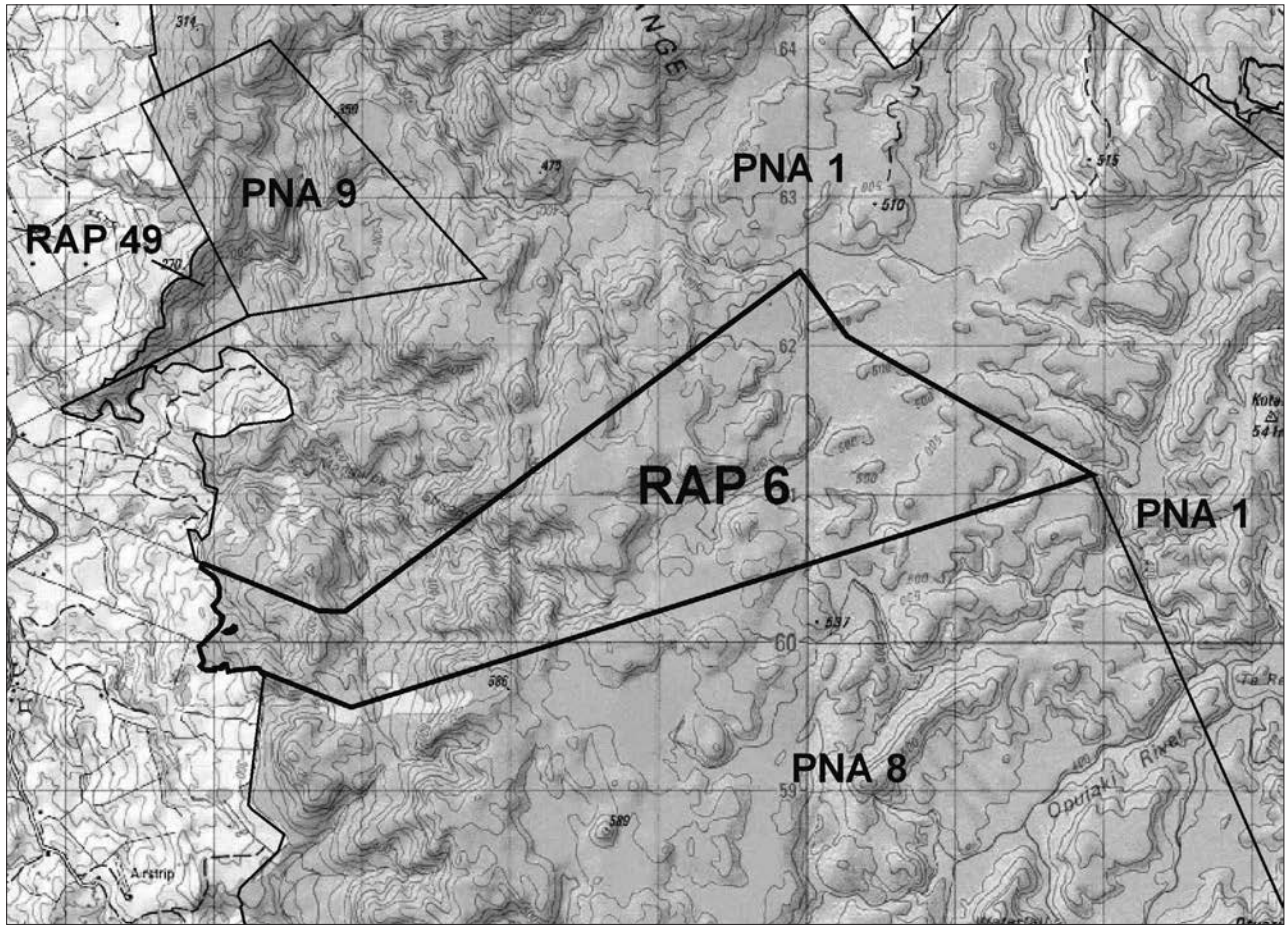
Representativeness	M	Viability	H
Diversity	M	Buffering	H
Naturalness	M	Size & Shape	M
Special Features	L	Threats	M

Discussion

This RAP is relatively large and comprises part of a large tract of indigenous vegetation which extends across several ecological districts (i.e. Kaimai-Mamaku Forest Park). It extends up the western side of the Kaimai Range and is highly visible from the Matamata Plain.

On the lower slopes it contains relatively good quality examples of semi-coastal vegetation, which is under-represented in the existing reserve system in the district.

RAP 6 WHAITI KURANUI



RAP 6 WHAITI KURANUI

Area	635.4 ha
Altitudinal Range	260–580 m
Grid Reference	NZMS 260 T15 688608
Land System	Whakamarama Plateau
Study Area No.	87
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE ¹	LANDFORM
Lowland	1. (Rimu)-(northern rata)/tawa-kamahi forest	Hillslope
Lowland	2. (Rimu)-(northern rata)/tawa-rewarewa-mangeao-kamahi forest	Hillslope
Lowland	3. (Miro)/tawa-kamahi-tawari forest	Exposed ridges
Lowland	4. (Northern rata)/tawa-rewarewa-mangeao-kamahi forest	Hillslope
Semi-coastal	5. (Northern rata)/tawa-kohekohe-kamahi forest	Hillslope
Lowland	6. Secondary scrub	Hillslope

1. From Nicholls 1965a & b.

Landform

A large triangular section across the southern end of Whakamarama rhyolite plateau, containing parts of the headwaters of the Rapurapu and Mangaroa Streams and part of the high escarpment along the western edge of the plateau.

Vegetation and flora

A short narrow strip of modified semi-coastal tawa-kohekohe forest occurs along the western side of the RAP. Miro/tawa-kamahi-tawari forest occurs along the escarpment. Elsewhere, tawa combines with kamahi, rewarewa, mangeao, hinau and tawari in varying proportions to form the canopy in association with local emergent rimu and northern rata. This block was assessed for timber in 1972/73 and was found to have good “stocking” of old podocarps; however, by the mid 1980s podocarp numbers had decreased significantly (A. Jones pers. comm.). This was probably the result of complex causes which include changes in soil water table, increased exposure of residual trees, low nutrient status of the soils, and attacks by pathogens. Drought may be associated with the primary causes of mortality (Jane & Green 1983c).

Fauna

Common forest bird species occur at this site.

Threat / modification

Clearance of this property for exotic pine plantation has been considered by the owners and formal protection is of high priority. Local wilding *Pinus pinaster* occur on the western side and these should be removed or killed in situ.

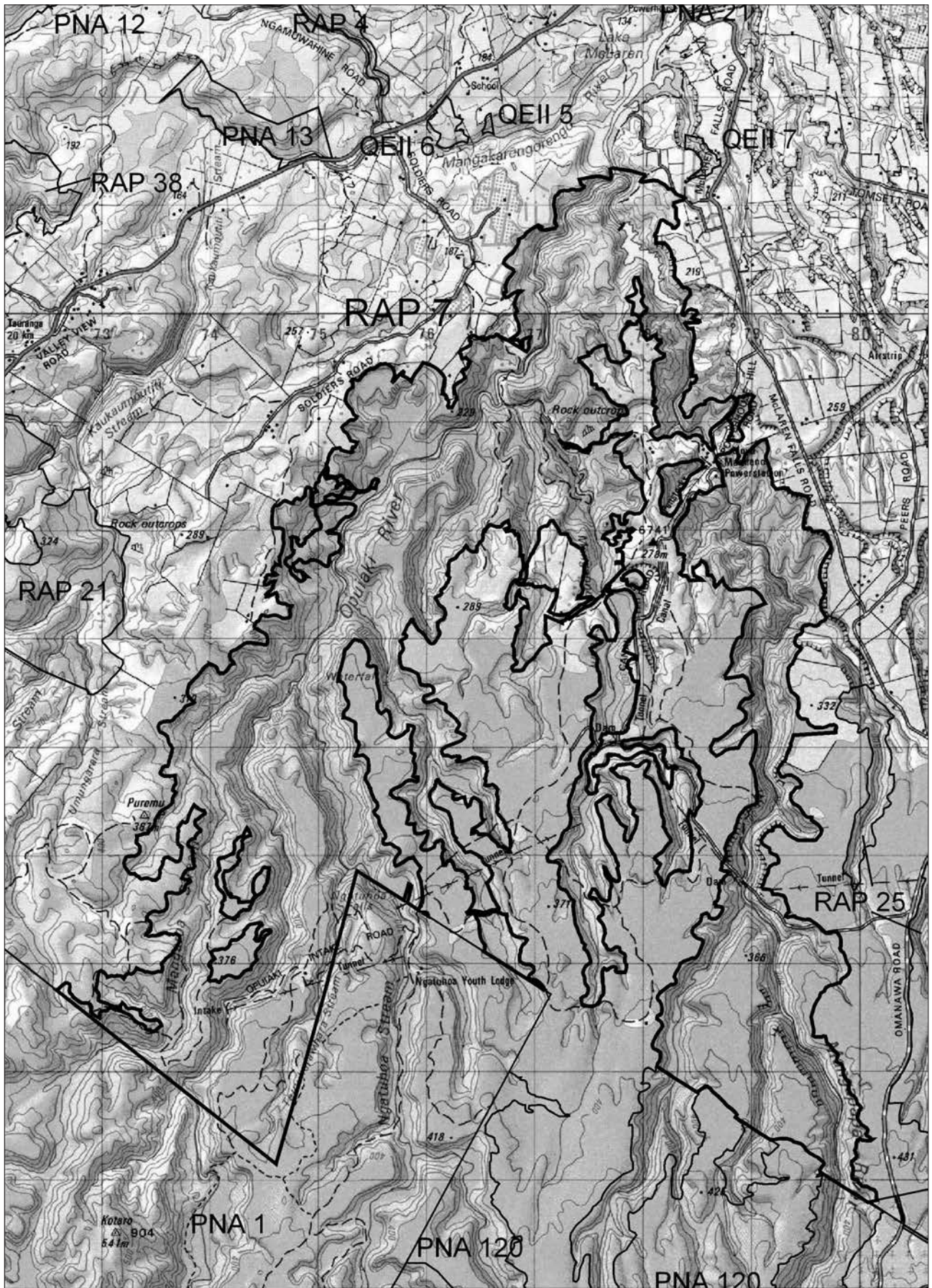
Evaluation

Representativeness	H	Viability	H
Diversity	M	Buffering	H
Naturalness	H	Size & Shape	H
Special Features	M	Threats	M

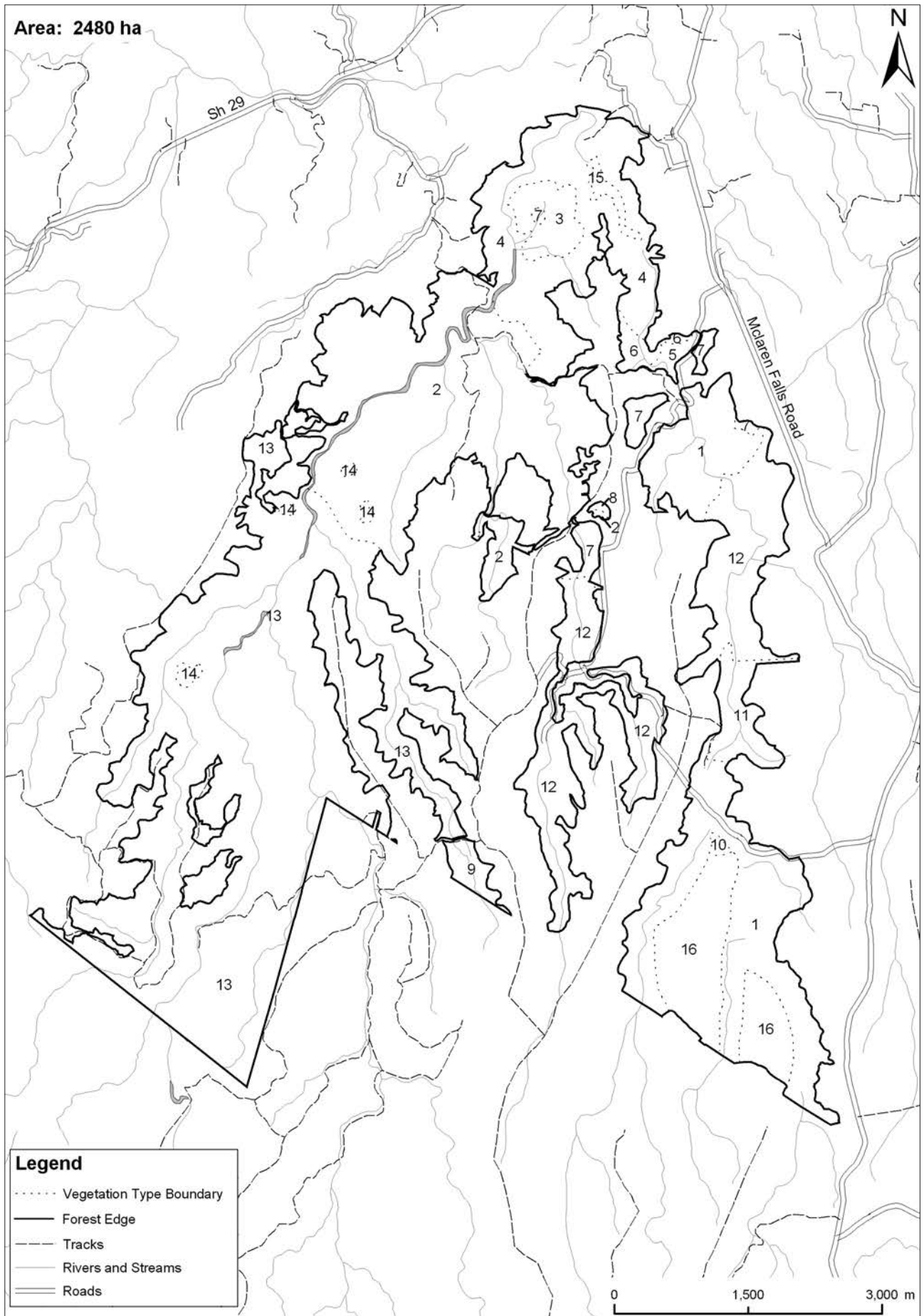
Discussion

An extensive area of largely unmodified indigenous vegetation which virtually bisects the Kaimai-Mamaku Forest Park. Protection of this RAP would enhance the long term integrity of the Forest Park. Clearance of this site would be detrimental to the significant conservation values of the surrounding indigenous vegetation; Opuiaki Ecological Area adjoins the southern boundary of this RAP.

RAP 7 OPUIAKI RIVER



RAP 7 OPUIAKI RIVER



RAP 7 OPUIAKI RIVER

Area	2,480.1 ha
Altitudinal Range	100–280 m
Grid Reference	NZMS 260 U15 763685
Land System	Northern Mamaku Plateau
Study Area No.	44
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Hard beech forest	Hillslope, ridge
Lowland	2. Mosaic of : • Hard beech-tanekaha forest • Tanekaha/manuka scrub and shrubland • (Tanekaha)/manuka scrub and shrubland • Tawa-rewarewa-pukatea-mahoe-mangeao forest • Manuka scrub and shrubland	Steep ridge, spur, hillslope Steep ridge, spur, hillslope Alluvial flat (stream margins) Gully, face, hillslope Gorge, steep hillslope
Lowland	3. Rewarewa/kamahi forest	Plateau
Lowland	4. Tanekaha forest Tawa-pukatea-rewarewa-mamaku forest	Steep hillslope Steep hillslope
Lowland	5. Toro-rewarewa/bracken shrubland and forest	Hillslope
Lowland	6. Mahoe-wheki/bracken fernland	Hillslope
Lowland	7. Tawa-pukatea-rewarewa-mamaku forest	Gully, hillslope
Lowland	8. Manuka-harakeke-toetoe-raupo/ <i>Baumea tenax</i> - <i>Baumea teretifolia</i> - <i>Baumea arthrophylla</i> -swamp kiokio sedge-shrubland	Alluvial flat (wetland)
Lowland	9. (Rimu)-(miro)/tawa-rewarewa forest (with local hard beech)	Hillslope
Lowland	10. Tanekaha-rewarewa-kamahi-pole rimu forest	Hillslope
Lowland	11. (Rimu)-(tanekaha)/tawa-kamahi-tawari forest	Hillslope
Lowland	12. (Tanekaha)-(rimu)/tawa-kamahi-tawari-hard beech forest	Hillslope
Lowland	13. Rimu/tawa-rewarewa-kamahi forest ⇔ hard beech forest	Hillslope
Lowland	14. Kamahi-rewarewa/tawheowheo forest	Hillslope
Lowland	15. Lake	Lake
Lowland	16. (Pukatea)-(rimu)/tawa-mamaku-rewarewa forest	Plateau

Landform

This RAP incorporates some of the steep gorges of the Mangaonui Stream and the Opuiaki River which cut through the Mamaku rhyolite plateau. Also included is a small example of a relatively flat part of Mamaku Plateau between Mangapapa River and tributaries.

Vegetation

The vegetation is diverse. Good quality examples of hard beech forest occur in the Mangaonui Stream catchment. Elsewhere hard beech-tanekaha forest and tanekaha forest occur along the steep gorge sides whilst in the gullies is tawa-rewarewa-pukatea-mahoe-mangeao forest. Narrow wetlands comprising (tanekaha)/manuka scrub and shrubland occur alongside the Mangapouri Stream. Some parts of the RAP have been burnt and there is now a mixture of secondary vegetation, including mihimihi-rewarewa/bracken shrubland and fernland, mahoe-wheki/bracken fernland and (tanekaha)/manuka scrub and shrubland on a flat plateau. In the north-west corner there is a small example of rewarewa/kamahi forest.

In the southern part of the RAP there are large examples of tawa-kamahi dominant forests with local rimu, rewarewa, tawari, tanekaha, northern rata, and local hard beech forest and kamahi-rewarewa forest.

Flora

Mairehau (*Leionema nudum*) reaches its southern limit of distribution on the eastern side of the North Island in this RAP. *Olearia cheesemanii* (classed as Chronically Threatened, Gradual Decline in de Lange *et al.* 2004) is present. RAP 7 is the only known location for these two species in the Otanewainuku Ecological District.

Other species of interest which occur at this site include *Corunastylis pumila* (At Risk, Sparse), *Lycopodiella cernua*, *Schizaea bifida*, and *Corokia buddleioides*. These species are known from very few sites in the ecological district.

There are two large kauri trees and several rickers in this RAP. This population is near the southern limit of this species on the eastern side of the North Island.

Matai, which is relatively uncommon in the ecological district, is also present.

Fauna

Forest birds present include pied tit and North Island robin. In the adjacent McLaren Falls Park there are whitehead and reported records of North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) (Beadel 1994b).

Threat / modification

The lower portion and margins of this RAP have a long history of clearing and burning and more recently logging. Low level logging operations

were still being undertaken in the early 2000's. A small part of this RAP adjacent to the Mangapapa River has been heavily logged. An adjoining area has recently been cleared and planted in exotic pine plantation and the RAP may be threatened by clearance for pine plantation or logging of wilding *Pinus pinaster*. Domestic stock are grazed in a few small portions of the RAP, and should be excluded.

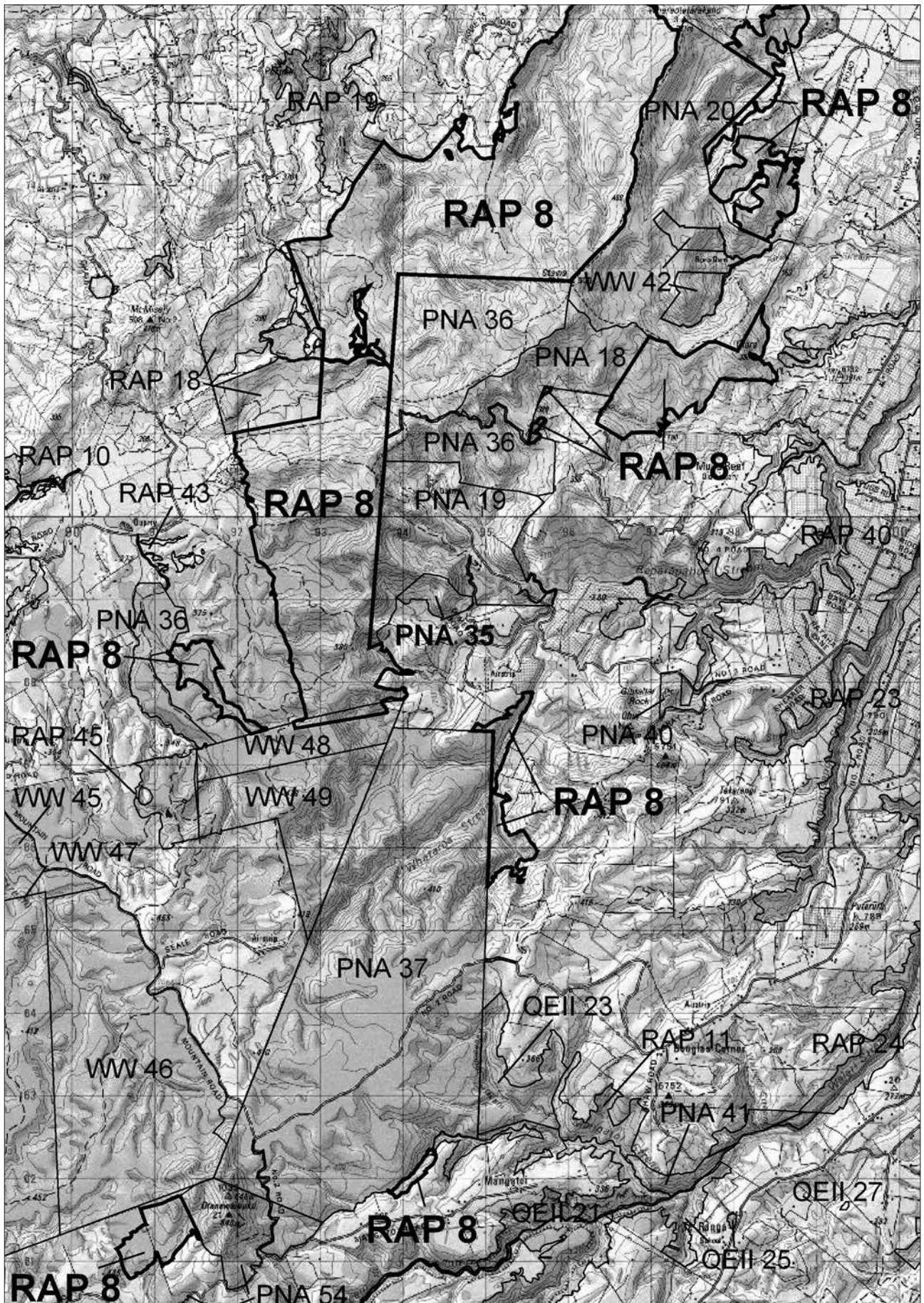
Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	M
Naturalness	M	Size & Shape	M
Special Features	H	Threats	H

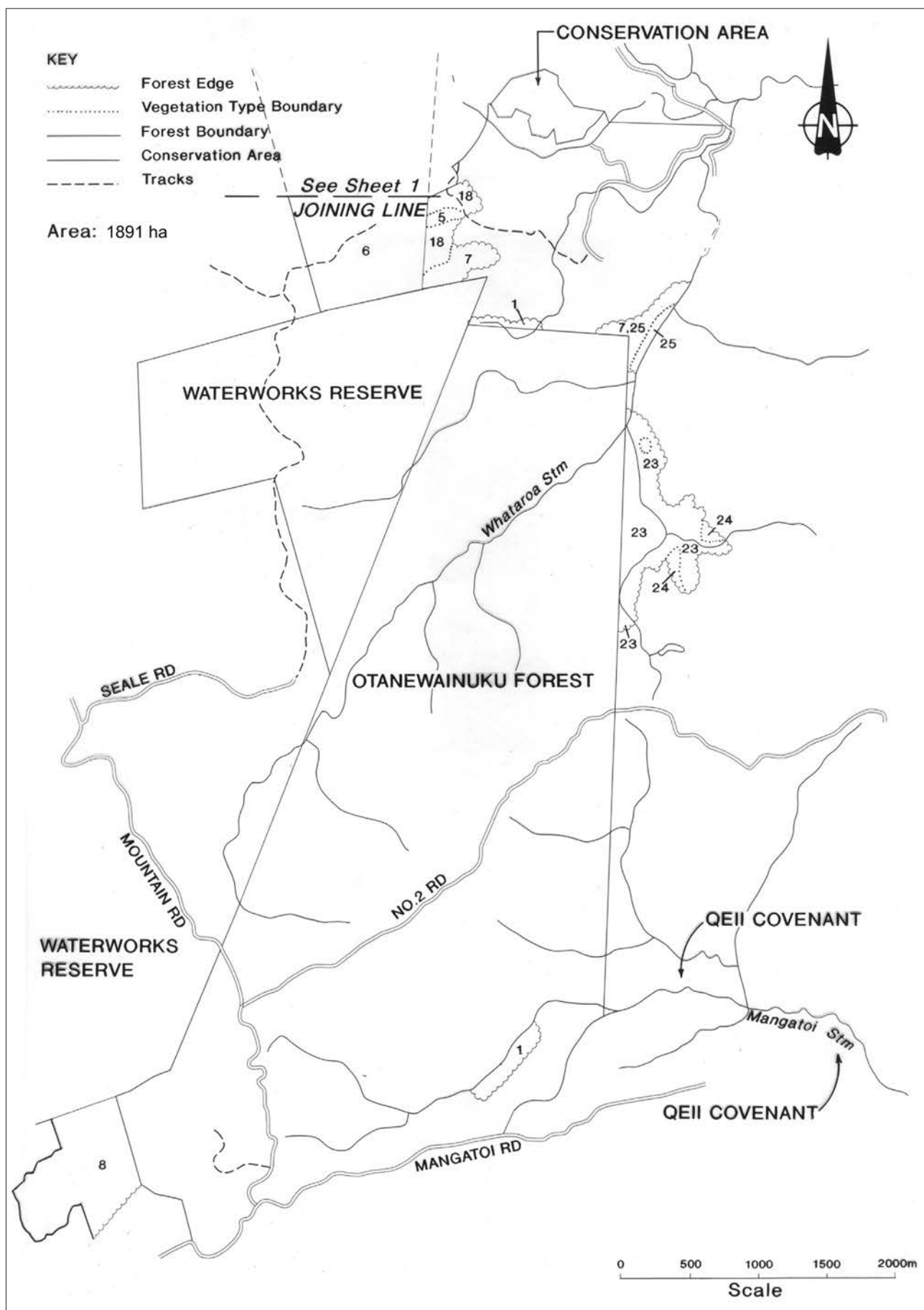
Discussion

This RAP is relatively large and diverse and contains representative examples of the vegetation in the ecological district. It is contiguous with an extensive tract of indigenous vegetation (Kaimai-Mamaku Forest Park). It comprises part of one of the best examples of hard beech forest in the lowland zone of the ecological district.

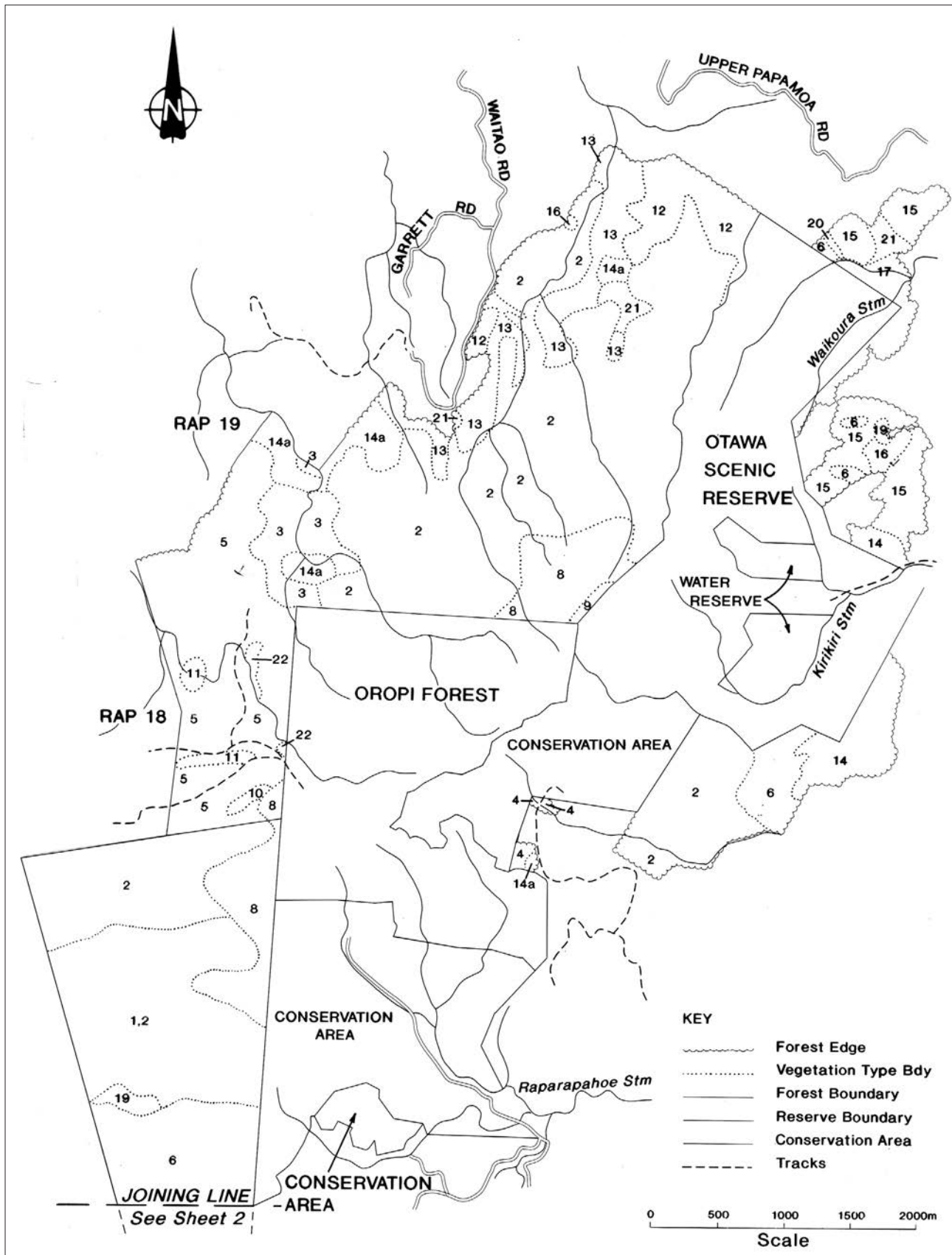
RAP 8 OTAWA-OTANEWAINUKU



RAP 8 OTAWA-OTANEWAINUKU



RAP 8 OTAWA-OTANEWAINUKU



RAP 8 OTAWA-OTANEWAINUKU

Area	1,891.1 ha
Altitudinal Range	60–564 m
Grid Reference	NZMS 260 U14 960744
Land System	Northern Mamaku Plateau and Papamoa Hills
Study Area No	46a and 41; see also Beadel 1985a
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Rimu/tawa-kohekohe-kamahi forest	Hillslope
Semi-coastal	2. Tawa-kohekohe forest	Hillslope
Semi-coastal	3. Tawa-kamahi-tawari forest	Hillslope
Semi-coastal	4. Tawa forest	Hillslope
Semi-coastal	5. Tawa-kamahi-kohekohe-mamaku forest	Hillslope
Semi-coastal	6. Tawa-kohekohe forest ⇔ rewarewa-kamahi-mangeao forest	Hillslope
Semi-coastal	7. Tawa-rewarewa-kohekohe forest	Hillslope
Lowland	8. Tawa forest	Hillslope
Lowland	9. Rewarewa/tawa-hinau-kamahi forest	Hillslope
Semi-coastal	10. Kauri/tawari forest	Hillslope
Semi-coastal	11. Tawari forest	Hillslope
Semi-coastal	12. Mangeao-rewarewa-kamahi-kohekohe forest	Hillslope
Semi-coastal	13. Rewarewa/kamahi-kohekohe-mangeao forest	Hillslope
Semi-coastal	14. Rewarewa/kamahi forest	Hillslope
Semi-coastal	14a. Rewarewa/kamahi forest (without small areas of tawa forest in gullies)	Hillslope
Semi-coastal	15. Rewarewa-kamahi forest ⇔ kanuka forest	Hillslope
Semi-coastal	16. Kanuka forest	Hillslope
Semi-coastal	17. Treeland	Hillslope
Semi-coastal	18. Whauwhaupaku/bracken fern-shrubland ⇔ mamaku forest	Hillslope
Semi-coastal	19. Kanuka shrubland	Hillslope
Semi-coastal	20. Bracken-gorse shrub-fermland	Hillslope
Semi-coastal	21. Bracken-fermland	Hillslope
Semi-coastal	22. Grassland	Hillslope
Semi-coastal	23. Rimu/tawa-rewarewa-tanekaha forest	Hillslope
Semi-coastal	24. Mamaku-mahoe-rewarewa-whauwhaupaku shrubland	Hillslope
Semi-coastal	25. Rewarewa-kamahi forest	Hillslope

Landform

The Ottawa-Otanewainuku forest tract occurs over two major physiographic features; the broad plateau of the Mamaku ignimbrite sheet in the south, and the moderately steep to steep hill country of the Papamoa Range to the north.

The plateau extends to the northern end of Otanewainuku and Oropi (southern portion) Conservation Areas and is generally rolling but in places is dissected by moderately incised streams. The plateau is interrupted by Otanewainuku Mountain (645 m), an almost certainly extinct late Pleistocene rhyolite dome.

The Papamoa Range, aligned north-south, rises to a northern high point, Ottawa, at 564 m. Along the eastern side of the range slopes are steep with bluffs in places, whereas on the western side the slopes are more gradual. East of Ottawa trig are two conical hills (Otara and an unnamed hill) which are also old volcanic domes (Healy *et al.*, 1964).

Vegetation

The vegetation cover of this forest tract is diverse and varies from secondary forest (present in varying stages of development and composed of various assemblages of plant species) to relatively unmodified forest. Towards the northern end there is a strong coastal influence present in the vegetation (such as puriri), while to the south (Otanewainuku) the vegetation is upper lowland in character.

Forests include tall relatively unmodified semi-coastal rimu/tawa-kohekohe-kamahi forest; modified semi-coastal tawa-kohekohe forest; lowland tawa-dominant forest; and secondary forest, induced following burning of forest in pre-European times, now dominated by rewarewa and kamahi with local mangeao, kohekohe, pole tawa, rimu and kanuka. There are also examples of secondary scrub and shrubland where dominant canopy species include whauwhaupaku, bracken, mamaku, rewarewa and mahoe. There is a small stand of kauri/tawari forest on “Kauri Knob”, a sharp ridge in the north-west quarter.

Flora

The notably large fern *Marattia salicina* (classed as Chronically Threatened, Serious Decline in de Lange *et al.* 2004) occurs near Ottawa Trig (A.J. Saunders pers. comm. 1984). Kauri nears its eastern limit of distribution on the Dean's property, and maire tawake also occurs here. Over 300 indigenous plant species have been recorded from the Ottawa-Otanewainuku forests (see Beadel 1985a).

A range of other threatened plant species have been recorded in this forest tract, as follows: Acutely Threatened, Nationally Endangered—*Rorippa divaricata*; Chronically Threatened, Serious Decline—*Brachyglottis kirkii*; Chronically Threatened, Gradual Decline—*Raukawa edgerleyi*, *Mida salicifolia*; At Risk, Sparse—*Lindsaea viridis*, *Microsorium novae-zelandiae*.

Fauna

The majority of this area was ranked as outstanding for wildlife values by Saunders (1983) because of its large size and diversity of bird species present (a small portion east of Mt Misery was ranked as moderate). The North Island kokako (Acutey Threatened, Nationally Endangered in Hitchmough 2002) occurs at two sites, whilst the North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) occurs locally throughout the RAP (Owen 1992; Saunders 1983).

Other forest birds present include kaka (Acutey Threatened, Nationally Endangered in Hitchmough 2002), North Island robin, whitehead, pied tit and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) (Fauna Survey Unit unpublished 1982; and current survey.)

Threat / modification

This site is threatened by continued grazing of domestic stock and fallow deer and possible development for exotic forestry. The Water Works Reserve (which is not included in the RAP as Water Works Reserves are treated as protected lands in this report) has been heavily grazed recently. Domestic stock should be excluded from this reserve, and from the parts of the RAP which are grazed.

Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	H
Naturalness	H	Size & Shape	H
Special Features	H	Threats	H

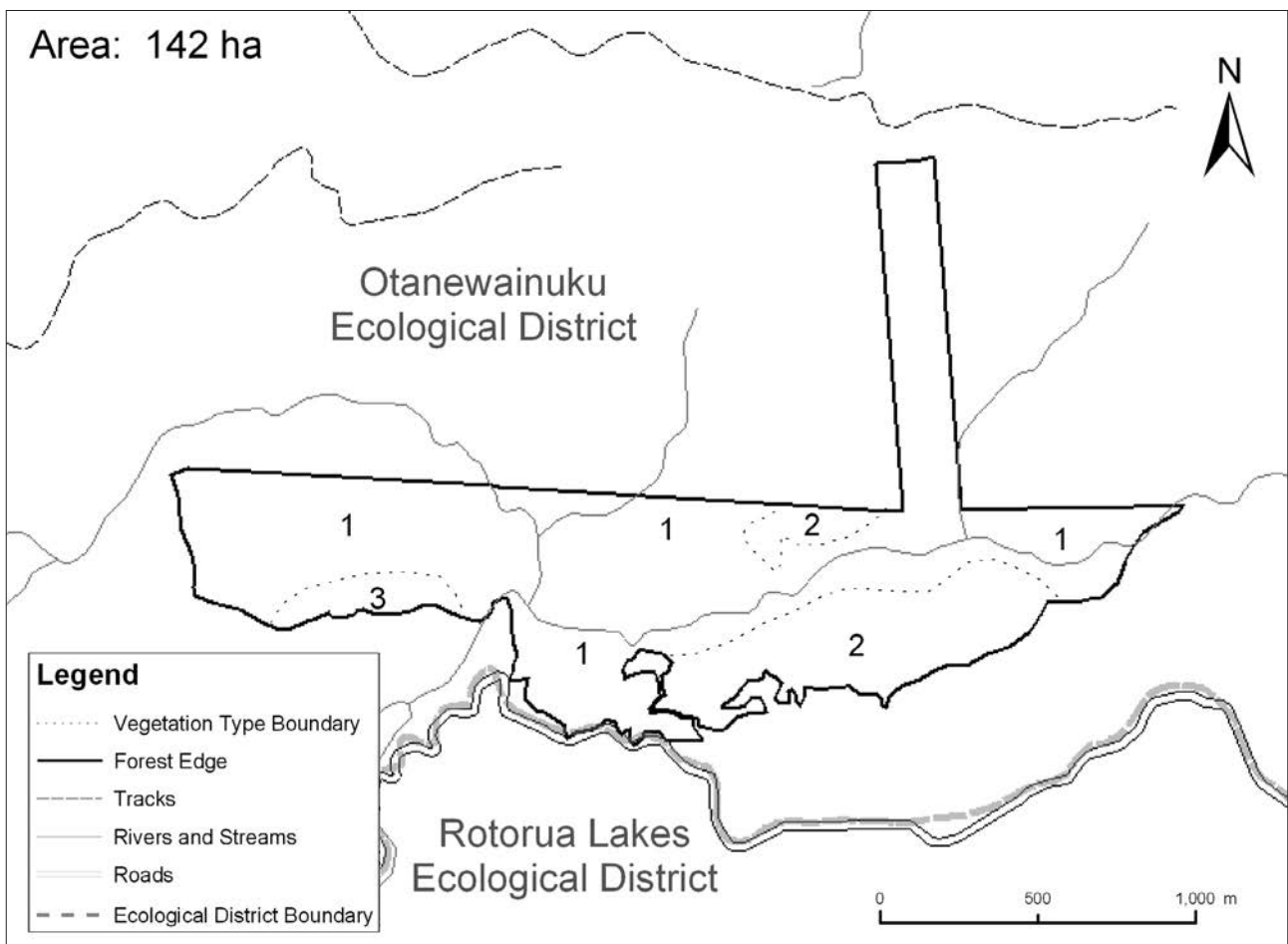
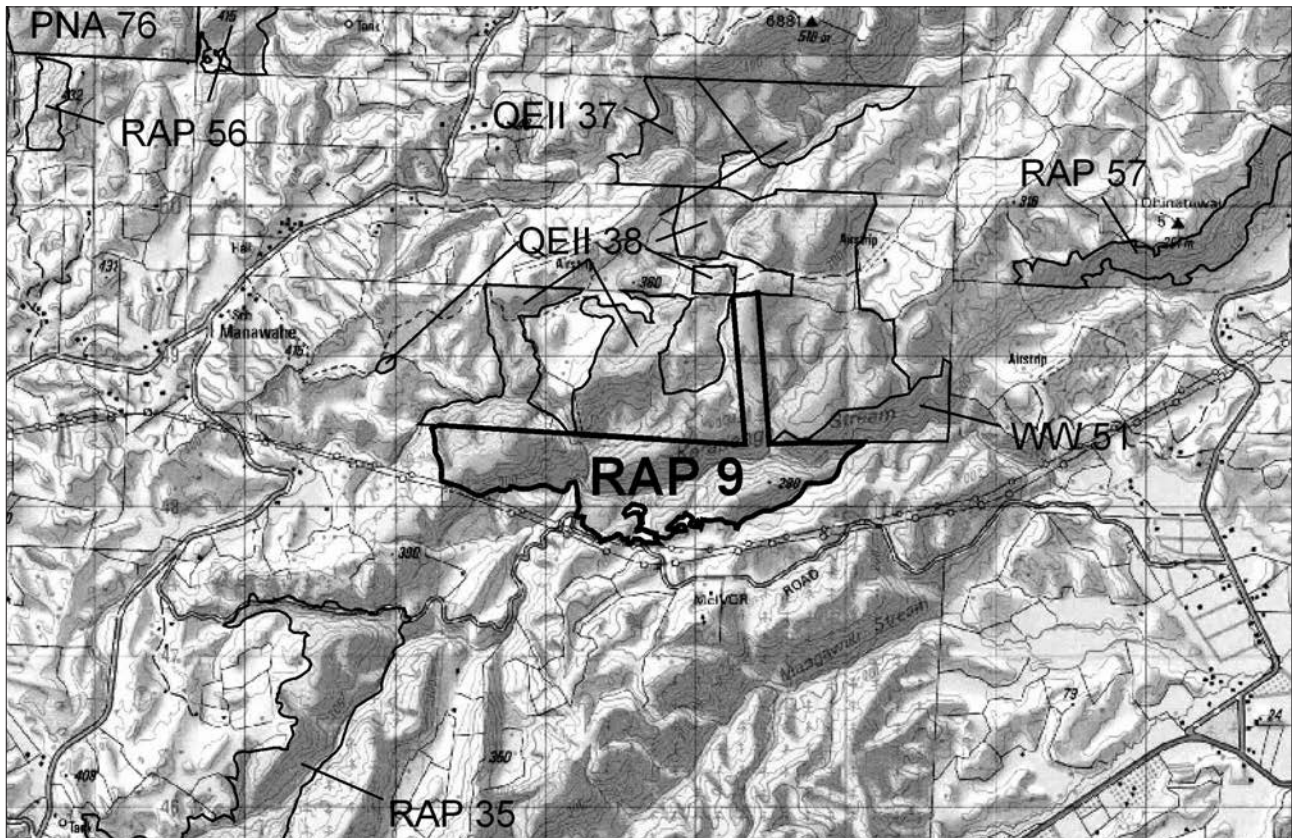
Discussion

This RAP comprises several disjunct areas which together comprise the remaining unprotected parts of the Ottawa-Otanewainuku Reserve proposed in Beadel (1985a). The Ottawa-Otanewainuku forest tract extends from the lower semi-coastal zone to the upper lowland zone and contains a wide, diverse range of vegetation. It is a representative example of the semi-coastal vegetation of the ecological district. The majority of this RAP was ranked as outstanding for wildlife value by Saunders (1983).

References

- Beadel, S.M. 1985a: A vegetation survey and an assessment of the biological conservation values of the Ottawa-Otanewainuku area. Western Bay of Plenty. Department of Lands and Survey. 61pp.

RAP 9 MCIVOR RD



RAP 9 MCIVOR RD

Area	142.5 ha
Altitudinal Range	180–320 m
Grid Reference	NZMS 260 V15 335484
Land System	Rotoiti Breccia Ignimbrite Fan and Matata Hills
Study Area No.	7
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Tawa-rewarewa forest	Hillslope, gully
Semi-coastal	2. Rewarewa-kamahi forest	Hillslope
Semi-coastal	3. Rewarewa/mamaku-putaputaweta forest	Ridge

Landform

Comprises steep-sided gullies and hillslopes with broad ridges which form part of the upper catchment of the Karaponga Stream.

Vegetation

The majority of this site is tawa-rewarewa forest with infrequent emergent northern rata and rimu. Occasional hinau, kamahi, mamaku, pukatea and mangeao are also present. Small areas of rewarewa/kamahi forest with local kohuhu (*Pittosporum tenuifolium*) occur on hillslopes and rewarewa/mamaku-putaputaweta forest on ridges.

Flora

No species of special significance were noted at this site.

Fauna

Several North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) were located at this site during a survey in July 1993. Some of the birds were removed as their long term survival prospects were considered low in small isolated pockets of forest such as this. (P. Jansen pers. comm. 1994). However a population was still present in the area in 2006, with predators being managed on an ongoing basis.

Threat / modification

Although the majority of the area is fenced there are signs of grazing damage in the block indicating that the area is intermittently grazed. However pine plantations are currently being established locally on surrounding farmland, and this is likely to eventually reduce continued grazing damage at the site.

Evaluation

Representativeness	H	Viability	M
Diversity	L	Buffering	M
Naturalness	M	Size & Shape	H
Special Features	H	Threats	M

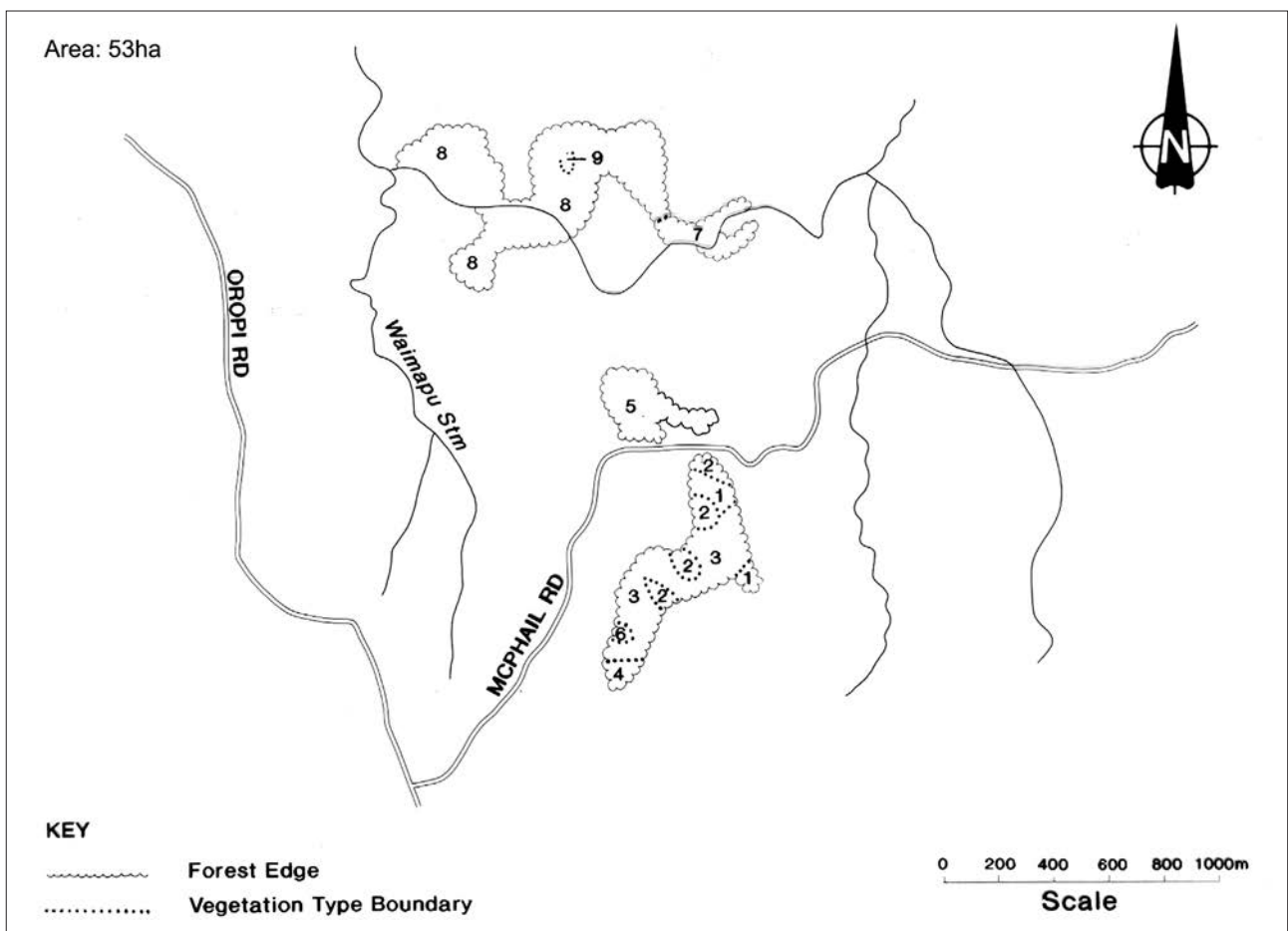
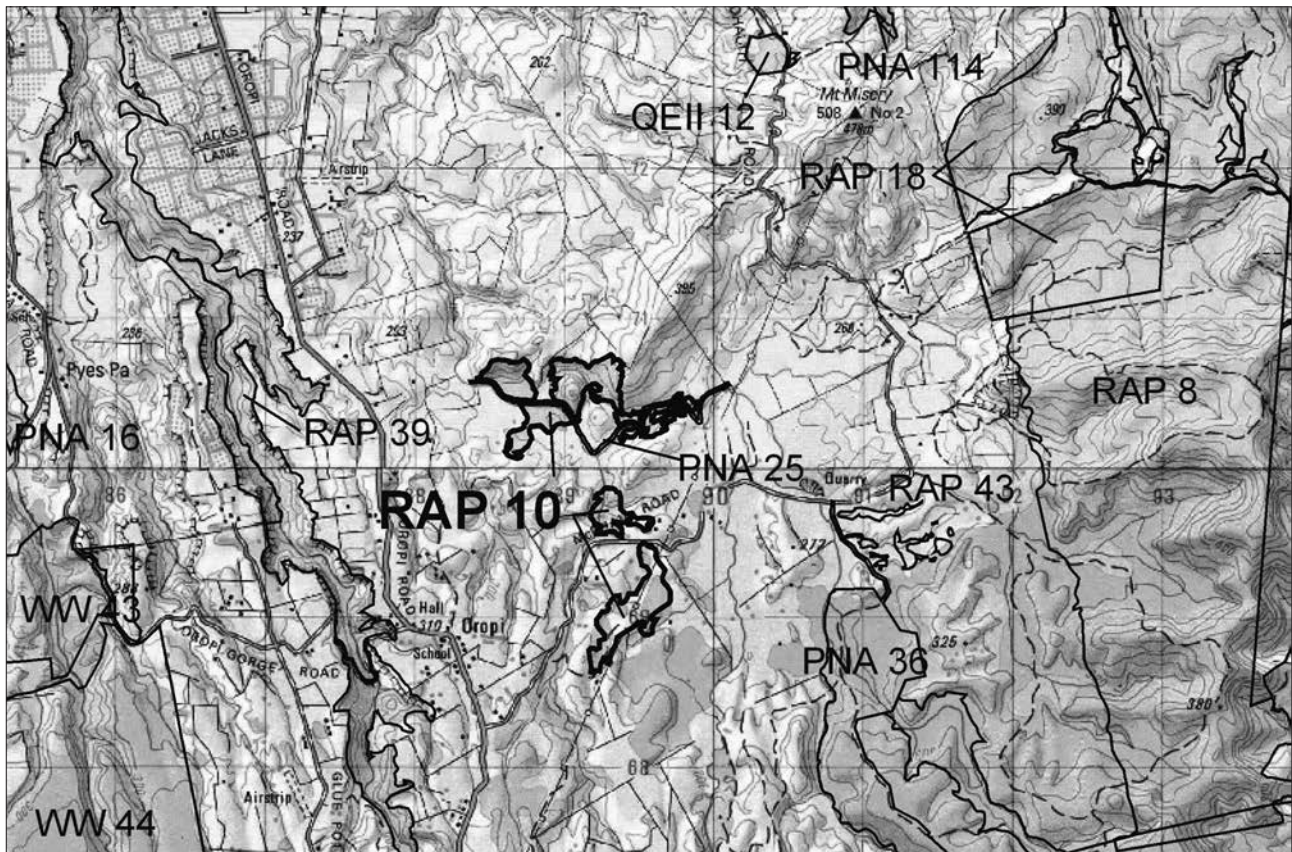
Discussion

This site is proposed as a RAP as it contains threatened fauna and is part of an almost unbroken vegetation sequence extending from RAP 35 (adjoining Mangaone Scenic Reserve of the inland boundary of the district) to Matata Scenic Reserve and the adjacent coastal sand dunes. It is part of a highly visible and sensitive landscape adjacent to the Rangitaiki Plains which was identified as a significant natural feature and landscape for the Whakatane District Council (Boffa-Miskell 1993b).

References

Hudson, J. 1993: Kokako survey of Manawahe hills including the Mangaone and Rotoma Reserves. Department of Conservation. 14 pp.

RAP 10 MCPHAIL ROAD



RAP 10 MCPHAIL ROAD

Area	52.9 ha
Altitudinal Range	280 m
Grid Reference	NZMS 260 U15 896694
Land System	Northern Mamaku Plateau
Study Area No.	106, 14
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Pole kahikatea forest	Plateau
Lowland	2. Kahikatea/manuka-gorse scrub and shrubland	Plateau
Lowland	3. Maire tawake-kamahi-tawa-pukatea-kahikatea forest	Plateau
Lowland	4. Pukatea/tawa forest	Hillslope
Lowland	5. Tanekaha-kahikatea forest	Hillslope
Lowland	6. Manuka scrub	Plateau
Lowland	7. Pole rimu-tanekaha-kahikatea-totara-matai forest	Alluvial terrace
Lowland	8. Tawa-rewarewa forest and pole tanekaha-rimu forest (with local miro and totara) ⇔ pole kahikatea forest	Alluvial terrace, hillslope
Lowland	9. Rewarewa/kamahi forest	Hillslope

Landform

The northern area comprises part of a small poorly-drained plateau, underlain by Mamaku ignimbrite in the headwaters of the Waimapu Stream. In the southern area the steep hillslopes rising from the true right side of the Waimapu Stream are broken by gentle flat-bottomed valleys.

Vegetation

Maire tawake, kamahi, tawa, pukatea and kahikatea dominate the forest cover in the southern area. Elsewhere pole stands of podocarps including kahikatea, tanekaha, miro, rimu, totara and matai are predominant. Tawa-rewarewa forest occurs on several of the hillslopes arising from the true right side of the Waimapu Stream.

Flora

The largest population of maire tawake known in the district occurs in this RAP, including seedlings, saplings, poles and mature trees.

Fauna

Forest birds include tui.

Threat / modification

Most of this RAP is grazed by domestic stock which threatens its long-term viability. It should be fenced.

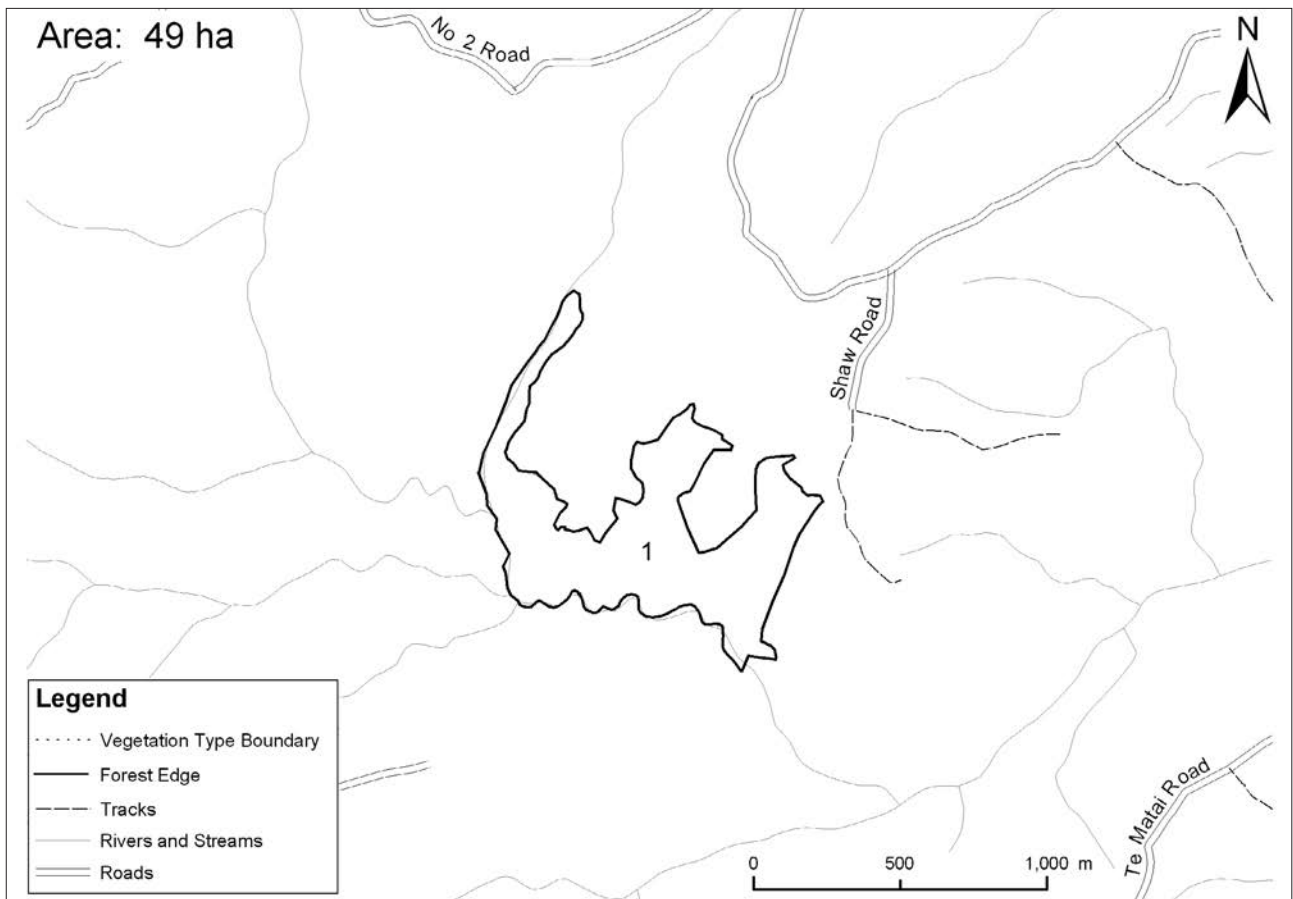
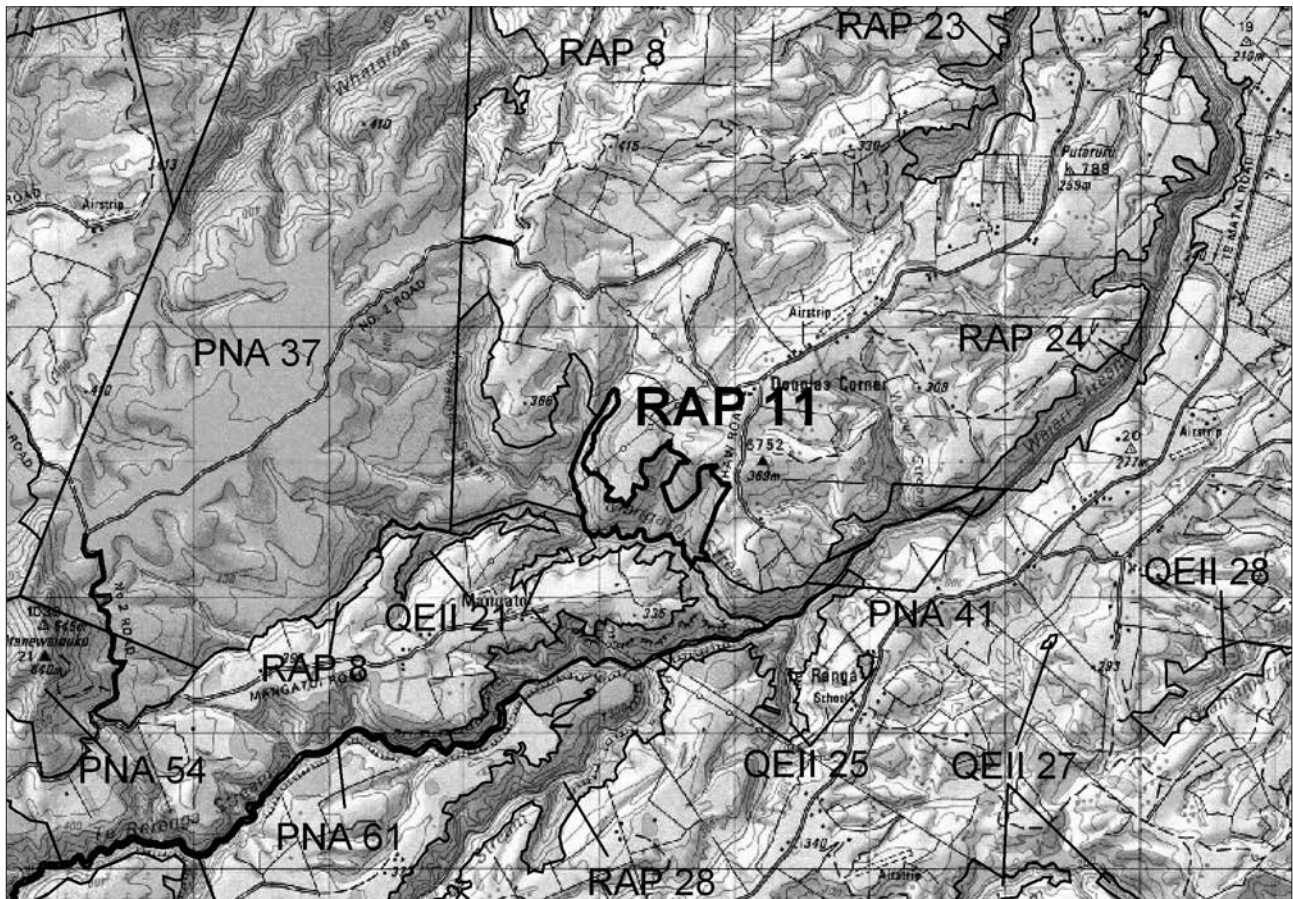
Evaluation

Representativeness	H	Viability	M
Diversity	H	Buffering	L
Naturalness	L	Size & Shape	L
Special Features	H	Threats	H

Discussion

This RAP was selected because it contains the largest known example of maire tawake-dominant forest in the district, and representative examples of the rare pole podocarp stands of the district.

RAP 11 MANGATOI STREAM



RAP 11 MANGATOI STREAM

Area	48.8 ha
Altitudinal Range	300 m
Grid Reference	NZMS 260 U15 965626
Land System	Northern Mamaku Plateau
Study Area No.	42
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland, semi-coastal	1. (Rimu)/tawa-rewarewa-hinau-(pukatea) forest	Gully and hillslope

Landform

Steep hillslopes and gullies on Mamaku ignimbrite in the Mangatoi Stream catchment.

Vegetation

Tawa-rewarewa forest with occasional hinau, pukatea, kamahi, rimu and local kohekohe. Miro, tanekaha, totara and rimu occur on ridges. Previously logged for podocarps.

Flora

No significant species were recorded during the survey.

Fauna

North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) occurs in the adjacent QE II covenant (Owen 1992). Whio (Acutely Threatened, Nationally Endangered in Hitchmough 2002) were recorded in this RAP and North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) were recorded in a block downstream (Saunders 1983).

Assessed as having outstanding wildlife values by Saunders (1983) for the large example of indigenous habitat of diversity and rarity of bird species present.

Threat / modification

This RAP is reported to be completely fenced but this was not confirmed during the survey nor was any assessment made of the standard of the existing fencelines. In view of the important wildlife values at this site, an assessment of the extent and standard of the fenceline is recommended.

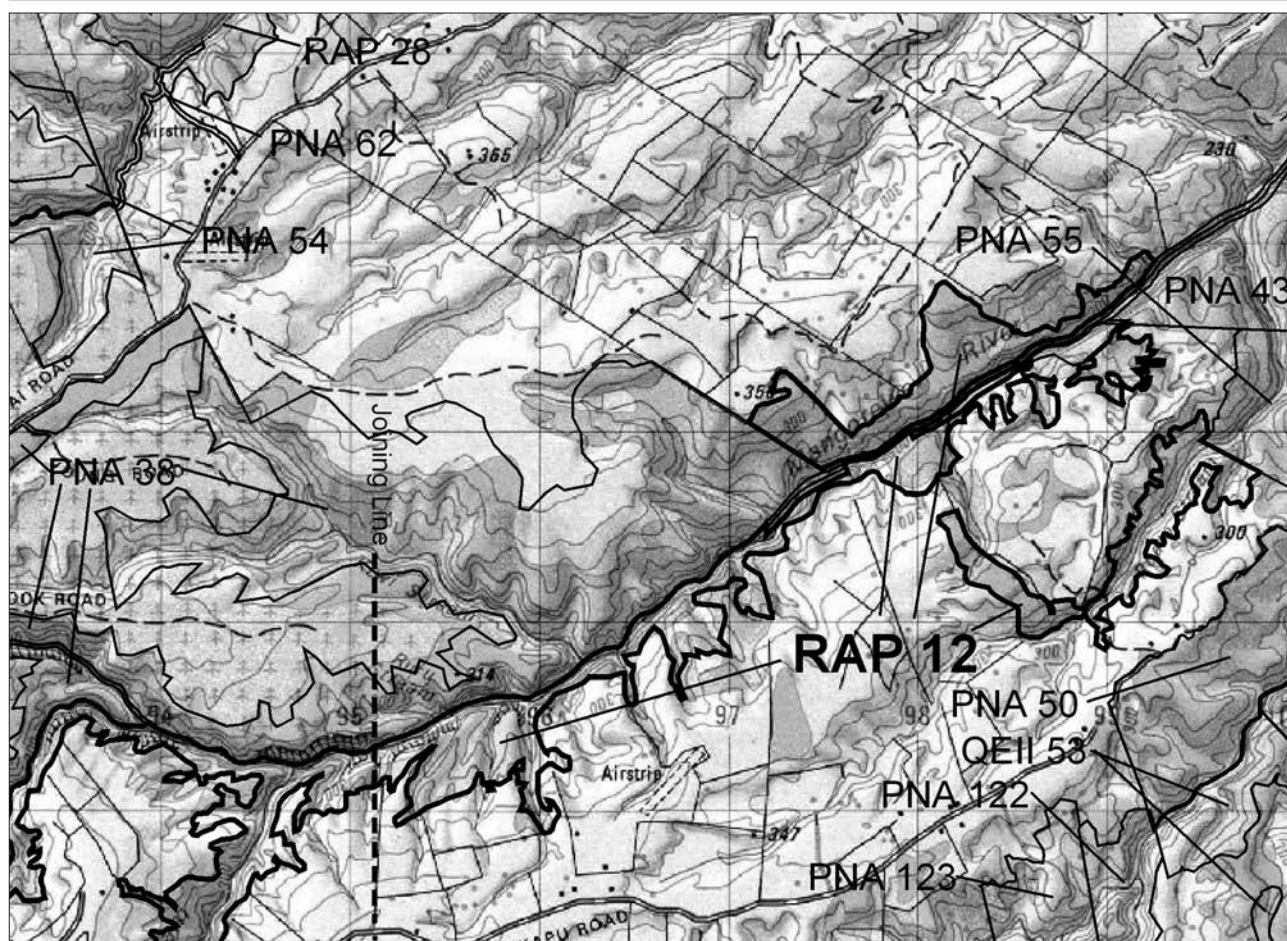
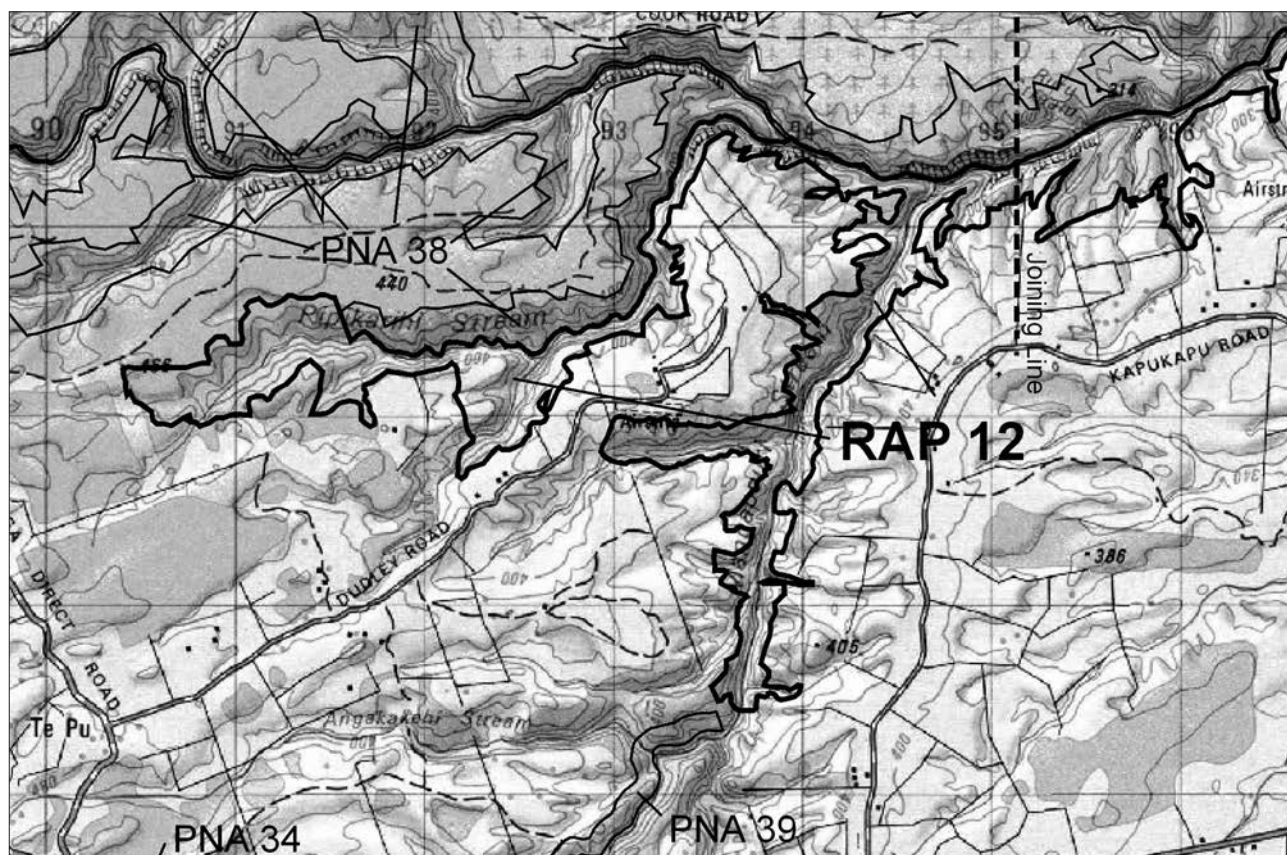
Evaluation

Representativeness	M	Viability	H
Diversity	M	Buffering	M
Naturalness	H	Size & Shape	M
Special Features	H	Threats	M

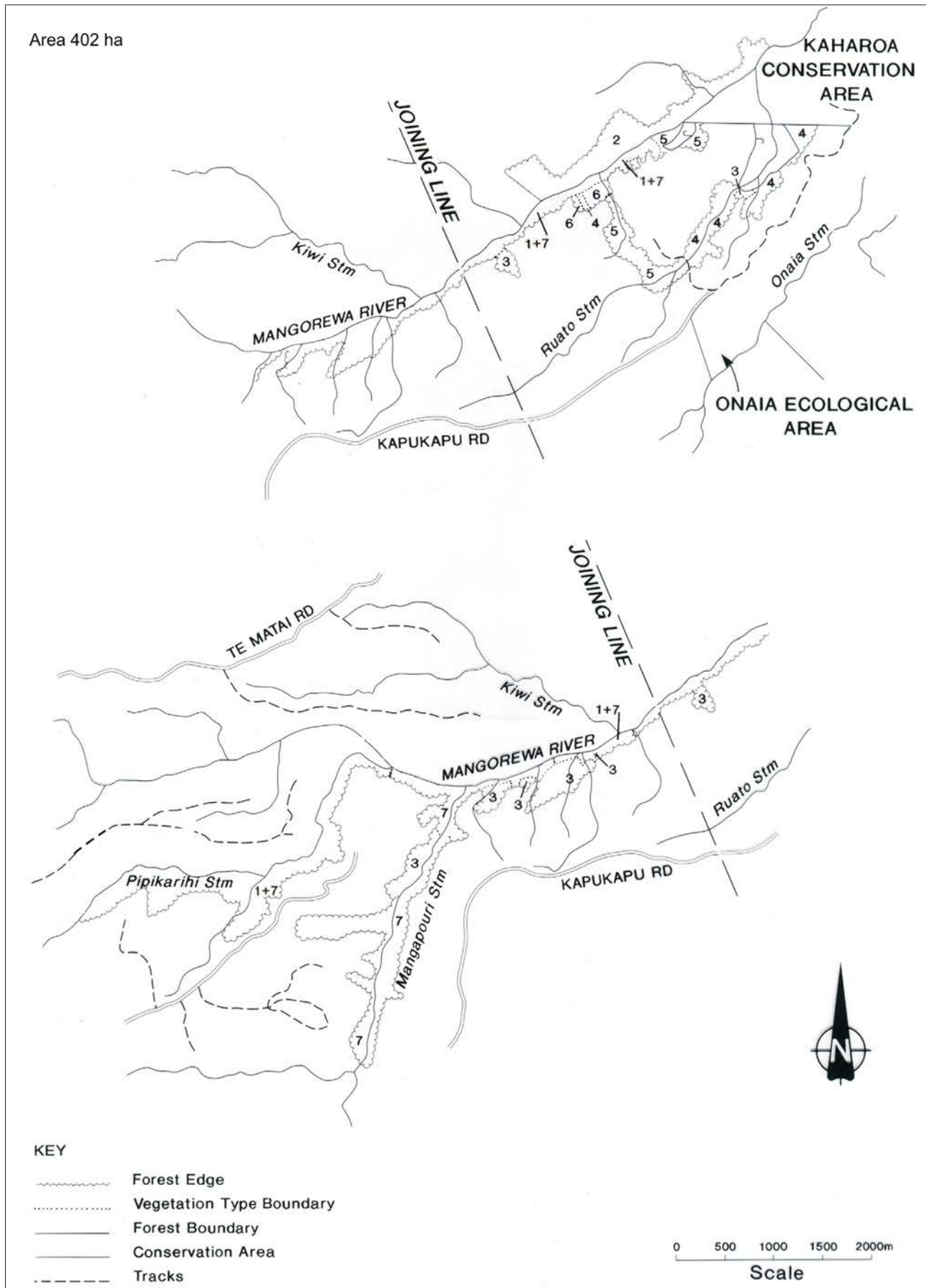
Discussion

This RAP has outstanding wildlife values and contains good quality forest. It adjoins a large tract of protected forest which includes Otanewainuku Conservation Area, Ottawa Scenic Reserve and several QE II covenants.

RAP 12 MID MANGOREWA GORGE



RAP 12 MID MANGOREWA GORGE



RAP 12 MID MANGOREWA GORGE

Area	401.7 ha
Altitudinal Range	180–340 m
Grid Reference	NZMS 260 U15 971563
Land System	Northern Mamaku Plateau
Study Area No.	40b, 40c, 26, 28, 137
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Tawa-rewarewa-mangeao-(hinau) forest	Hillslope
Lowland Semi-coastal	2. Rimu-rewarewa/tawa-tanekaha-(hinau) forest	Ridges, hillslope
Lowland	3. Rewarewa/tawa forest	Hillslope
Semi-coastal	4. Rewarewa-(rimu)/tawa-kamahi forest with local rewarewa/kamahi forest	Ridges, hillslope Ridge
Semi-coastal	5. Tawa-rewarewa-pukatea-kohekohe forest	Gully, hillslope
Semi-coastal	6. Tanekaha-rewarewa/kamahi forest	Hillslope
Lowland	7. Tanekaha forest; Tawa-rewarewa forest; Tanekaha-rewarewa/manuka scrub ⇔ manuka-bracken-kiokio fernland Hard beech forest	Spur Hillslope Gorge, hillslope Spur

Landform

A deep gorge formed by the Mangorewa Stream and two of its tributaries, the Pipikarahi and Mangapouri Streams flowing across the Mamaku rhyolite plateau. The Mangorewa is characteristic of virtually all streams on the plateau and flows over rock pavements.

Vegetation

Steep gorges characterised by hard beech and tanekaha on spurs and ridges. In the upper tributary streams (Pipikarahi and Mangapouri) much of the vegetation has developed following burning and is dominated by tanekaha, manuka, bracken and kiokio with small pockets of remnant tawa-rewarewa forest in gullies, and hard beech forest on spurs. Tawa-rewarewa dominant forest is predominant along the Ruato Stream and along the Mangorewa in the lower reaches of the RAP. Canopy associates include hinau, mangeao, tanekaha, kamahi and emergent rimu with local kohekohe on the eastern side of the RAP in the semi-coastal zone.

Flora

No species of significance were recorded during the survey.

Fauna

This site was classed as outstanding wildlife habitat in Saunders (1983) for its relatively large size and diversity of bird species present. North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002), whio and North Island kaka (both Acutely Threatened, Nationally Endangered in Hitchmough 2002) have all been recorded at the site and bats have been noted (Fauna Survey Unit 1982, unpublished). More recent records of kiwi exist (Owen 1992). North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) are present in the adjacent Kaharoa Conservation Area and the Lempriere QE II Covenant.

Threat / modification

All accessible parts of this RAP have been heavily logged but pockets of unlogged forest remain on the more inaccessible sites. Fire has modified the vegetation in places and some areas have a history of grazing. Many sections of the site are still unfenced and feral deer, goats and possums are known to occur throughout. Weed infestation is common on the margins and some species, for example: radiata pine, have penetrated well into the gorge.

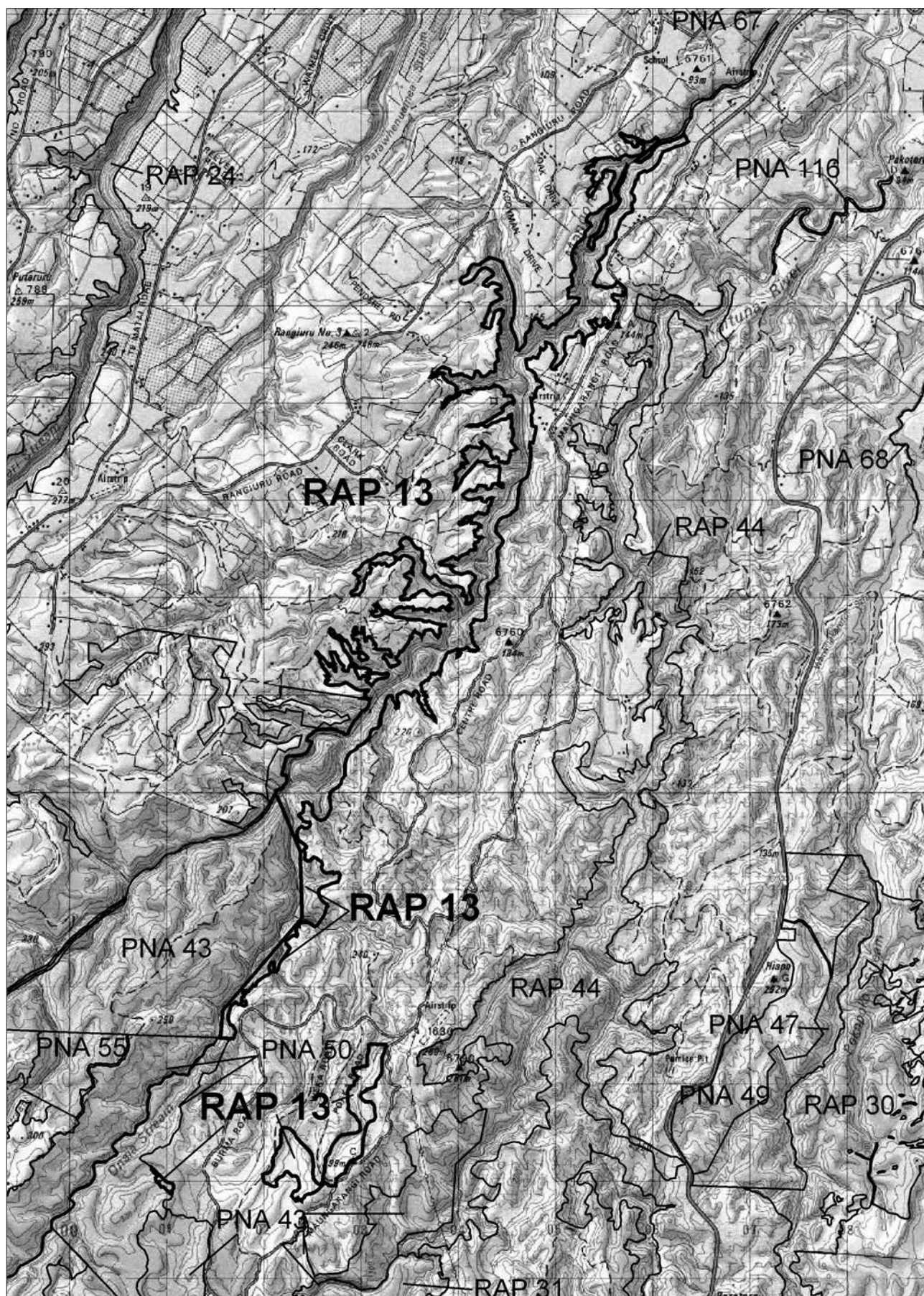
Evaluation

Representativeness	H	Viability	H
Diversity	M	Buffering	M
Naturalness	H	Size & Shape	M
Special Features	M	Threats	L

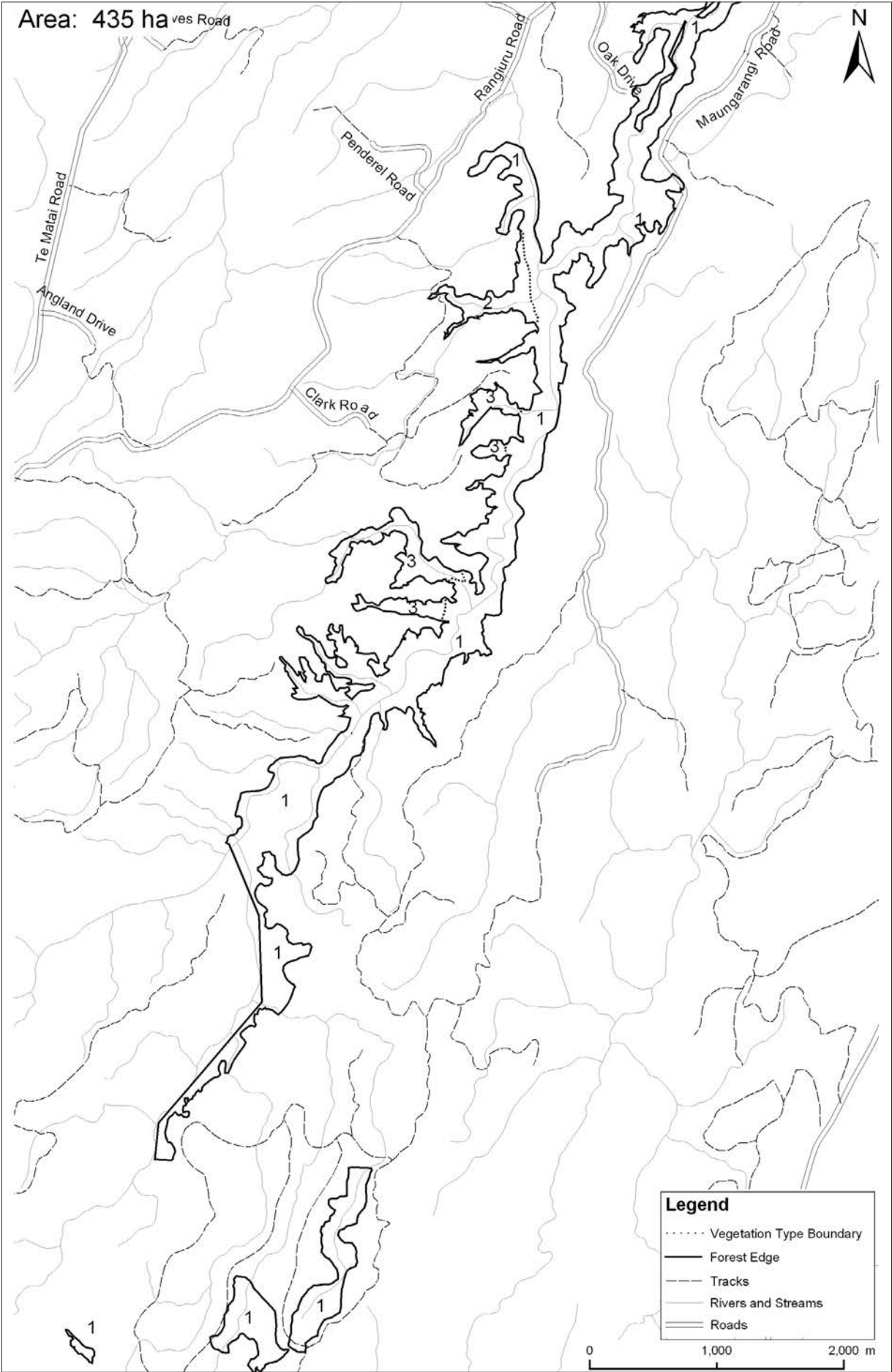
Discussion

This RAP has outstanding wildlife values and contains representative examples of semi-coastal and lowland indigenous forest on a wide variety of sites.

RAP 13 LOWER MANGOREWA GORGE



RAP 13 LOWER MANGOREWA GORGE



RAP 13 LOWER MANGOREWA GORGE

Area	435.4 ha
Altitudinal Range	50–180 m
Grid Reference	NZMS 260 U15 045645
Land System	Northern Mamaku Plateau
Study Area No.	40a, 40d
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Rewarewa/kanuka-kamahi forest	Hillslope
Semi-coastal	2. Mamaku-mahoe-bracken-hangehange shrubland	Gully head
Semi-coastal	3. Tawa-rewarewa forest	Side gully head

Landform

A gorge formed by the Mangorewa and tributary streams flowing across the north-east margin of Mamaku rhyolite plateau. The Mangorewa is typical of virtually all streams on the plateau, flowing over rock pavements.

Vegetation

Kanuka-kamahi forest with emergent rewarewa and local mamaku covers most of the upper and north facing hillslopes of the main gorge. Tawa-rewarewa forest with occasional mangeao, tanekaha, kohekohe, pukatea, local puriri and a few emergent rimu occurs in the tributary streams and on the lower slopes, southerly faces and bottom of the Mangorewa gorge. There are small areas of mamaku-mahoe-bracken-hangehange shrubland in tributary gully heads.

Flora

No species of special significance were noted during the survey.

Fauna

Whio (Acutely Threatened, Nationally Endangered in Hitchmough 2002) are present in the Mangorewa River below the confluence of the Ruato Stream (P. Jansen pers comm. 1994). North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) have been recently reported throughout the RAP. North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) occur in an adjacent QE II covenant block. This site was classed as of outstanding wildlife value by Saunders (1983) because of its relatively large size and diverse bird population.

Threat / modification

Feral goats and fallow deer are reported to be in the gorge and possums are common. Wilding pines are scattered throughout and wild kiwifruit vines have established on the edge of the gorge in places. Much of the RAP requires fence maintenance or replacement to exclude grazing domestic stock. Radiata pine plantations have been established in several places along the rim of the gorge.

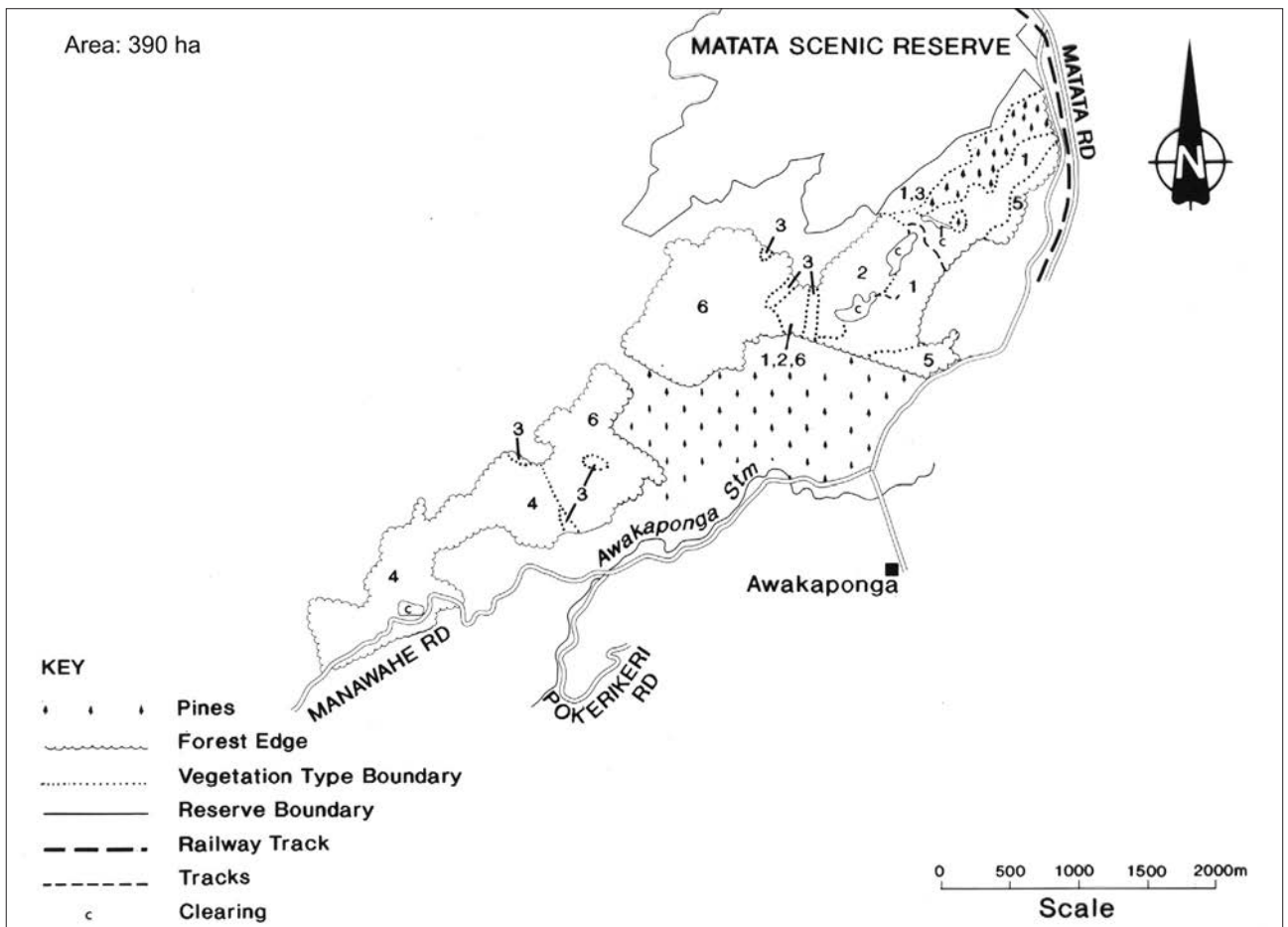
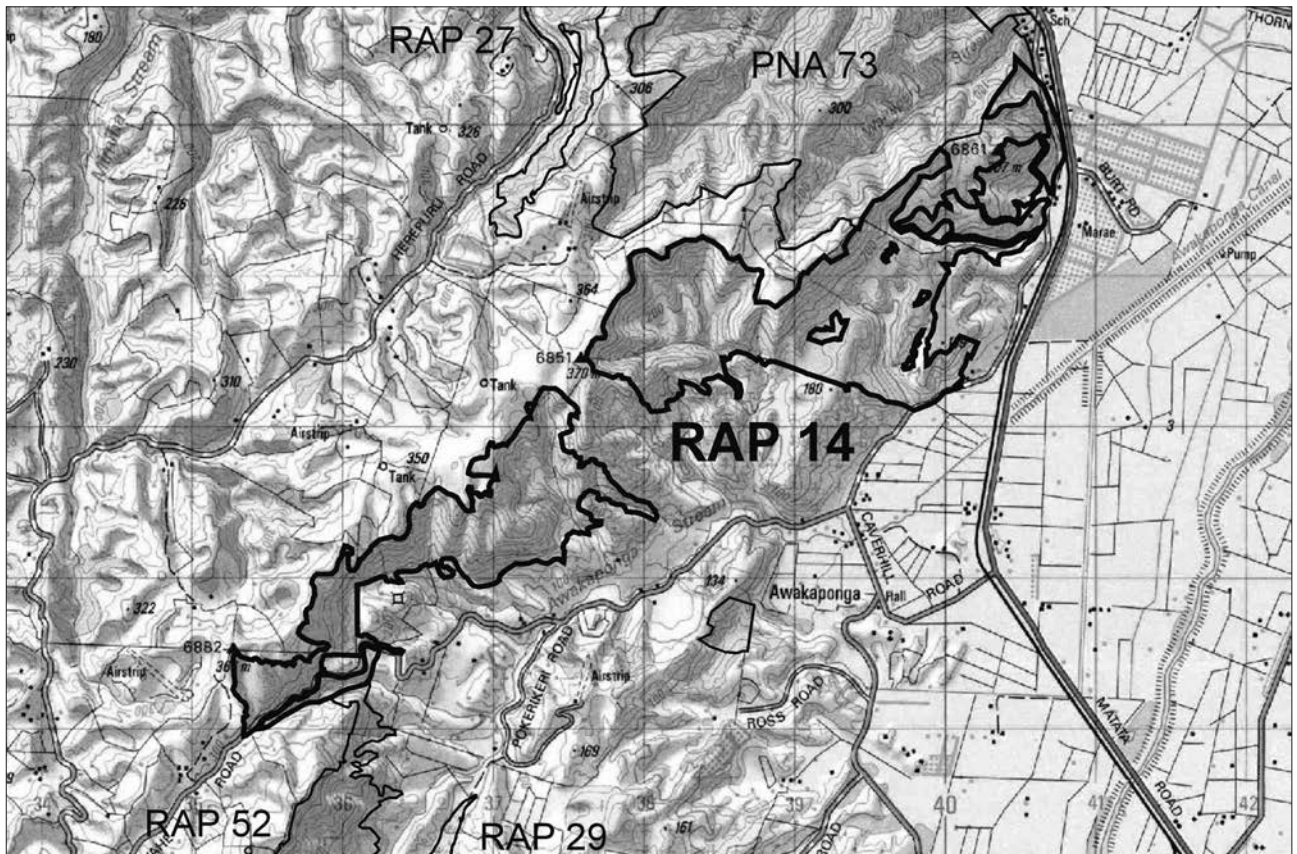
Evaluation

Representativeness	M	Viability	H
Diversity	M	Buffering	L
Naturalness	M	Size & Shape	M
Special Features	H	Threats	M

Discussion

This RAP is proposed primarily for its outstanding wildlife values (Saunders 1983), but also contains representative examples of semi-coastal forest. Semi-coastal vegetation is under-represented in the existing reserve system of the district.

RAP 14 AWAKAPONGA



RAP 14 AWAKAPONGA

Area	390.3 ha
Altitudinal Range	5-370 m
Grid Reference	NZMS 260 V15 385588
Land System	Matata Hills
Study Area No.	1 b &c
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Rewarewa/kanuka forest	Ridge, face and gully
Semi-coastal	2. Northern rata/tawa-pukatea-rewarewa-puriri-mamaku forest	Ridge, face, gully
Semi-coastal	3. Manuka-mingimingi-taumingi scrub and shrublands	Ridge
Semi-coastal	4. (Rimu)/tawa-rewarewa-pukatea-mangeao-hinau-mamaku forest	Ridge
Semi-coastal	5. Kanuka-pohutukawa-rewarewa-mamaku-black wattle forest	Face
Semi-coastal	6. Hard beech forest	Face

Landform

Steep hill country, dissected by small streams with bluffs throughout. Forms part of the steep broken marine sandstone scarp along the eastern margin of the Rangitaiki Plains.

Vegetation

Hard beech is dominant on the steep northern portion of this RAP with local manuka-mingimingi shrublands and northern rata/tawa-pukatea-rewarewa-puriri-mamaku forest. Along the north-eastern side is rewarewa/kanuka forest with local pohutukawa, manuka and black wattle. At the southern end is (rimu)/tawa-rewarewa-pukatea-mangeao-hinau-mamaku forest.

Flora

Pimelea tomentosa (classed as Chronically Threatened, Serious Decline in de Lange *et al.* 2004) occurs in the adjacent Matata Scenic Reserve. Although not recorded during the survey, the RAP contains suitable habitat for this species and it may occur here. A few pohutukawa are present in vegetation type 6. This is the local inland limit of pohutukawa in this part of the ecological district.

Fauna

Kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) and common forest birds are present.

Threat / modification

The secondary vegetation is the result of a long history of burning and clearing (both Polynesian and following European settlement). Parts are grazed by domestic stock which should be excluded. Firewood has been cut from the north-eastern portion.

Evaluation

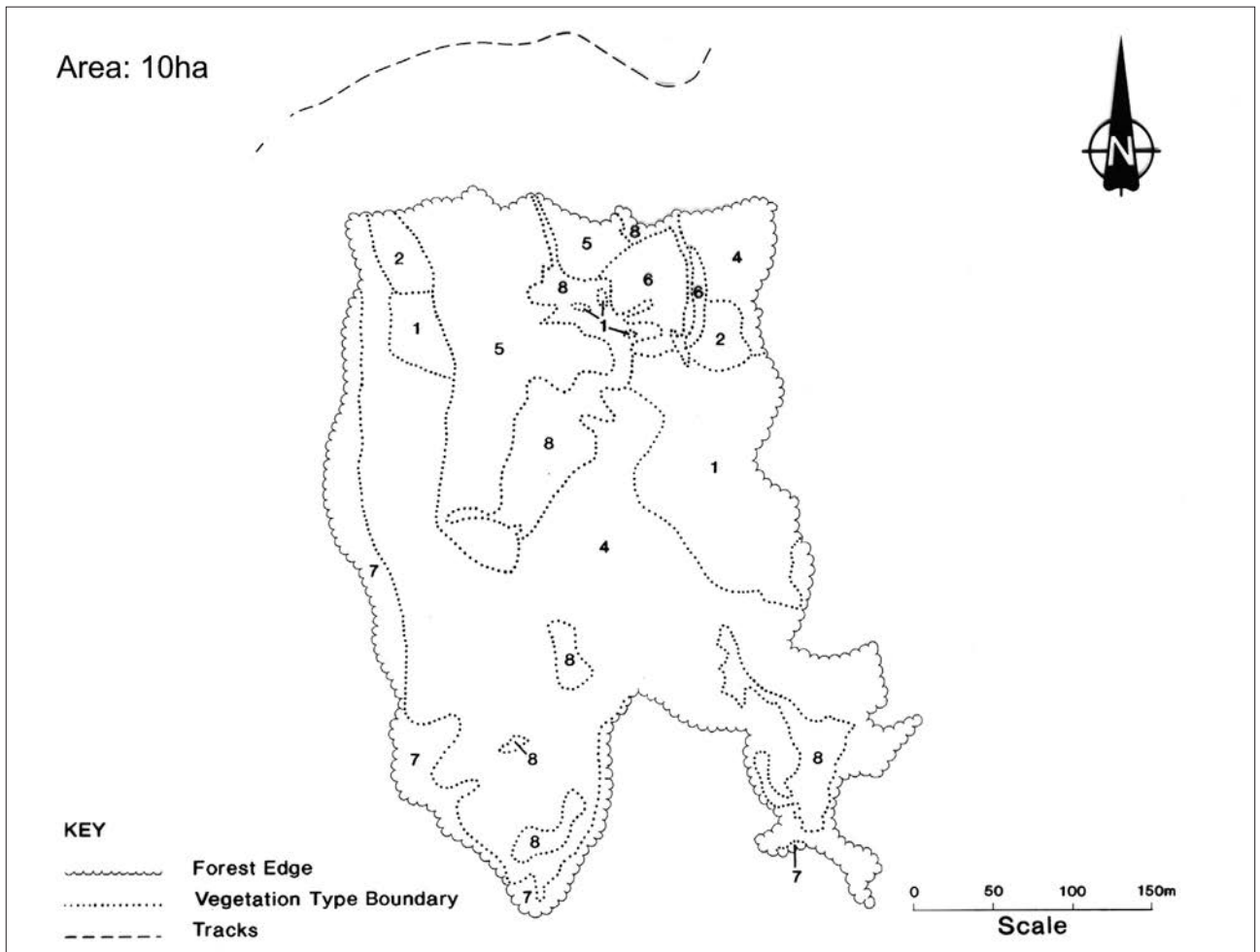
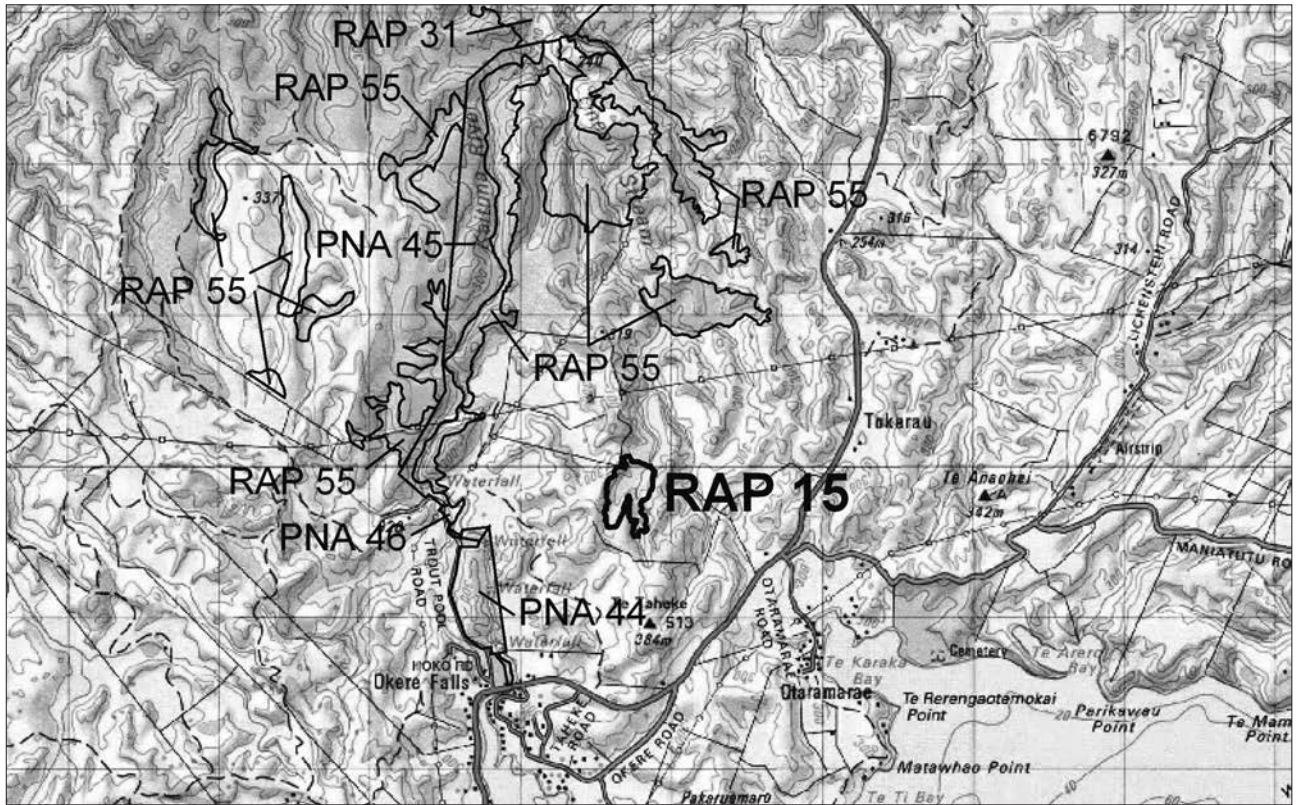
Representativeness	H	Viability	H
Diversity	M	Buffering	M
Naturalness	M	Size & Shape	M
Special Features	H	Threats	M

Discussion

This RAP contains representative good examples of the vegetation of the district. It is part of a culturally interrupted altitudinal vegetation sequence from the coast to the inland region. It is contiguous and complementary to Matata Scenic Reserve (exceptional botanical conservation value; Beadel 1991).

It is part of a highly visible and sensitive landscape adjacent to the Rangitaiki Plains, identified as a significant natural feature and landscape for the Whakatane District Council (Boffa-Miskell 1993b).

RAP 15 TAHEKE GEOTHERMAL



RAP 15 TAHEKE GEOTHERMAL

Area	10.4 ha
Altitudinal Range	280–320 m
Grid Reference	NZMS 260 U15 047499
Land System	Northern Mamaku Plateau
Study Area No.	34
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Pohutukawa × northern rata-kamahi forest Pohutukawa × northern rata (<i>Metrosideros excelsa</i> × <i>M. robusta</i>) (to c.20 m) and kamahi (<i>Weinmannia racemosa</i>) with occasional wheki (<i>Dicksonia squarrosa</i>) and karamu. <i>Gabnia setifolia</i> and <i>Histiopteris incisa</i> , mingimingi, and manuka are common in the understorey. Patches of bracken (<i>Pteridium esculentum</i>), turutu (<i>Dianella nigra</i>), <i>Hypolepis distans</i> , <i>Paesia scaberula</i> and <i>Gleichenia microphylla</i> are present. No obvious surface geothermal activity was evident.	Hillslope, stream gully, terrestrial
	2. Pohutukawa × northern rata/ mingimingi-prostrate kanuka forest Pohutukawa forms an open canopy over an understorey dominated with mingimingi, prostrate kanuka and <i>Histiopteris incisa</i> . Kamahi and <i>Gabnia setifolia</i> are also present.	Hillslope, terrestrial
	3. Prostrate kanuka-manuka-mingimingi scrub Prostrate kanuka to 2 m tall and, manuka and mingimingi are dominant. Occasional <i>Histiopteris incisa</i> , <i>Lycopodiella cernua</i> and pohutukawa × northern rata seedlings. Gorse and kanuka become common on cooler margins.	Hillslope, terrestrial
	4. (Dead pohutukawa × northern rata)/ prostrate kanuka-mingimingi scrub Dead trees of pohutukawa × northern rata are emergent over prostrate kanuka to 2 m and mingimingi are dominant. Occasional <i>Histiopteris incisa</i> , <i>Lycopodiella cernua</i> and pohutukawa × northern rata seedlings.	Hillslope, terrestrial

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
	5. Mingimingi-prostrate kanuka-manuka scrub ⇔ <i>Histiopteris incisa</i> fernland ⇔ <i>Hypolepis distans</i> fernland ⇔ gorse scrub A varied vegetation type where mingimingi is dominant; smaller areas dominated by prostrate kanuka, manuka, <i>Histiopteris incisa</i>, and gorse (<i>Ulex europaeus</i>). Occasional wilding radiata pine and pohutukawa × northern rata are emergent in this vegetation type, with gorse become more abundant on cooler soils. Scattered dead pohutukawa × northern rata are also present. In open steep areas <i>Gabnia setifolia</i>, <i>Histiopteris incisa</i>, <i>Hypolepis distans</i>, and bracken become common. Blackberry, turutu, wheki, <i>Lycopodiella cernua</i>, kamahi, hangchange (<i>Geniostoma ligustrifolium</i>), kohuhu (<i>Pittosporum tenuifolium</i> subsp. <i>tenuifolium</i>), and mamaku (<i>Cyathea medullaris</i>) are also present. Towards the boundary with pine plantation, mingimingi is still the dominant species with increasing amounts of gorse, hangchange, mamaku, <i>Histiopteris incisa</i>, and wheki. Much of this vegetation type was difficult to access due to very active geothermal activity.	Hillslope, gully, terrestrial
	6. (Dead pohutukawa × northern rata)/prostrate kanuka-mingimingi scrub Dead trees of pohutukawa × northern rata are emergent over prostrate kanuka to 2 m and mingimingi are dominant. Occasional <i>Histiopteris incisa</i>, <i>Lycopodiella cernua</i> and pohutukawa × northern rata seedlings.	Hillslope, terrestrial
	7. <i>Lycopodiella cernua</i> fernland A small unit of vegetation dominated by <i>Lycopodiella cernua</i>.	Hillslope, terrestrial
	8. (Dead pohutukawa × northern rata)/wheki-<i>Gabnia setifolia</i> treefernland Several dead pohutukawa × northern rata trees occur over wheki and <i>Gabnia setifolia</i>. Occasional pohutukawa × northern rata to 10 m tall with manuka, mingimingi, hangchange, kohuhu are also present. <i>Lycopodiella cernua</i> is present in the understorey.	Hillslope, terrestrial
	9. (Dead pohutukawa × northern rata)/wheki-kamahi treefernland Dead trees of pohutukawa × northern rata are emergent over wheki and kamahi (viewed from the distance).	Hillslope, terrestrial

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
	10. Non-vegetated raw-soilfield Heated bare ground, mudpools, steaming ground, fumaroles, hot springs and sulphur deposits. Occasional small patches of mingimingi and manuka are present.	Flat, hillslope, cliff, stream margins, terrestrial

Landform

The soils contain large quantities of sulphur and are very acidic and limit plant establishment and growth. This is reflected in the low species diversity of the thermal vegetation types. This low species diversity, and dominance of mingimingi, is also characteristic of the thermal vegetation at Tikitere and on the Paehinahina-Mourea Trust lands adjacent to Tikitere. Mingimingi and matata are dominant over large areas, with prostrate kanuka locally common. There are several unvegetated areas, some because of geothermal activity and some induced by mining.

Vegetation

There are several examples of pohutukawa × northern rata forest and kamahi forest. However, there are also large areas containing dead pohutukawa × northern rata and kamahi spars. The cause of death is not known and could be the result of one or a combination of the following factors: fires (when the surrounding area was cleared for exotic afforestation); mining activity; possum browse; or changes in thermal activity. Some of the other vegetation types present have also experienced local dieback. The RAP is surrounded by gorse scrub and radiata pine plantations.

Flora

A small population of prostrate kanuka is present, a species ranked as At Risk, Range Restricted in de Lange *et al.* (2004). The site also contains an interesting stand of pohutukawa × northern rata forest associated with geothermal activity. Other species typical of geothermal habitats are present, including manuka, kanuka, mingimingi, turutu, *Histiopteris incisa*, bracken, *Lycopodiella cernua*, *Schizaea bifida*, *Gleichenia microphylla*, and *Hypolepis distans*.

Fauna

Fernbird (a species ranked as At Risk, Sparse in Hitchmough 2002) were recorded on the margins of the RAP. Other common indigenous and exotic species typical of the habitat are present, including whitehead, bellbird, grey warbler, harrier, silvereye, spur-winged plover, fantail, and paradise shelduck.

Threat / modification

The margins of the site are dominated by thick gorse. Other species present include broom and blackberry. Occasional wilding radiata pines

(<1% cover) encroach into geothermal vegetation. However, much of the RAP is relatively free of pest plants.

Previous open cast extraction of silica deposits has resulted in extensive modification of the Taheke site, with resultant changes to the vegetation and landforms. However, there is no sign of recent mining at the site. Several overgrown vehicle tracks criss-cross the site. An unformed track is present.

The current vegetation composition at Taheke may be under threat if a proposed geothermal power station becomes operative. This would draw off geothermal fluid and/or heat energy from the Taheke field and may result in changes to surface geothermal activity.

Possums are a potential threat to pohutukawa, northern rata, and kamahi trees at this site.

Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	M
Naturalness	M	Size & Shape	H
Special Features	H	Threats	H

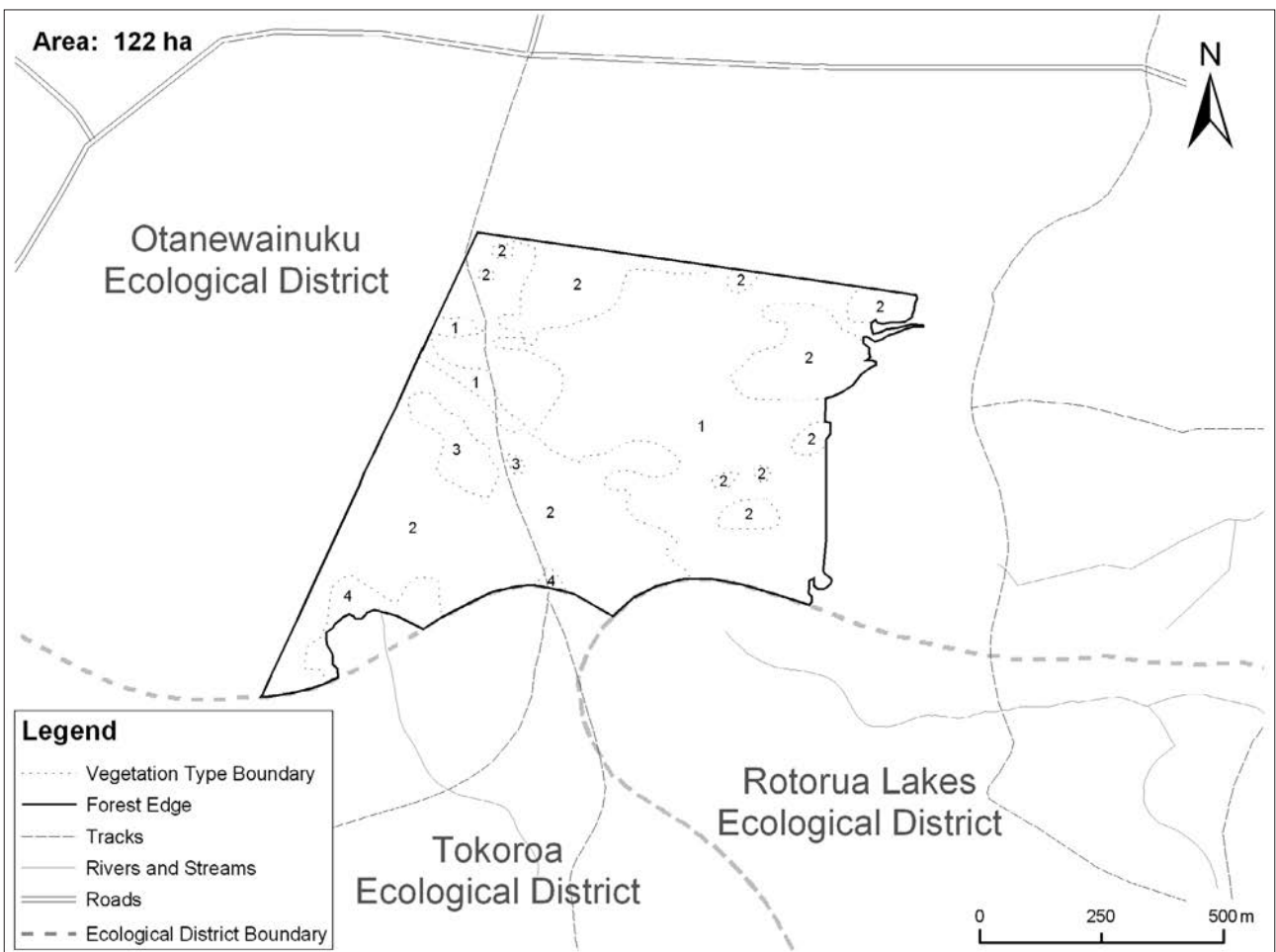
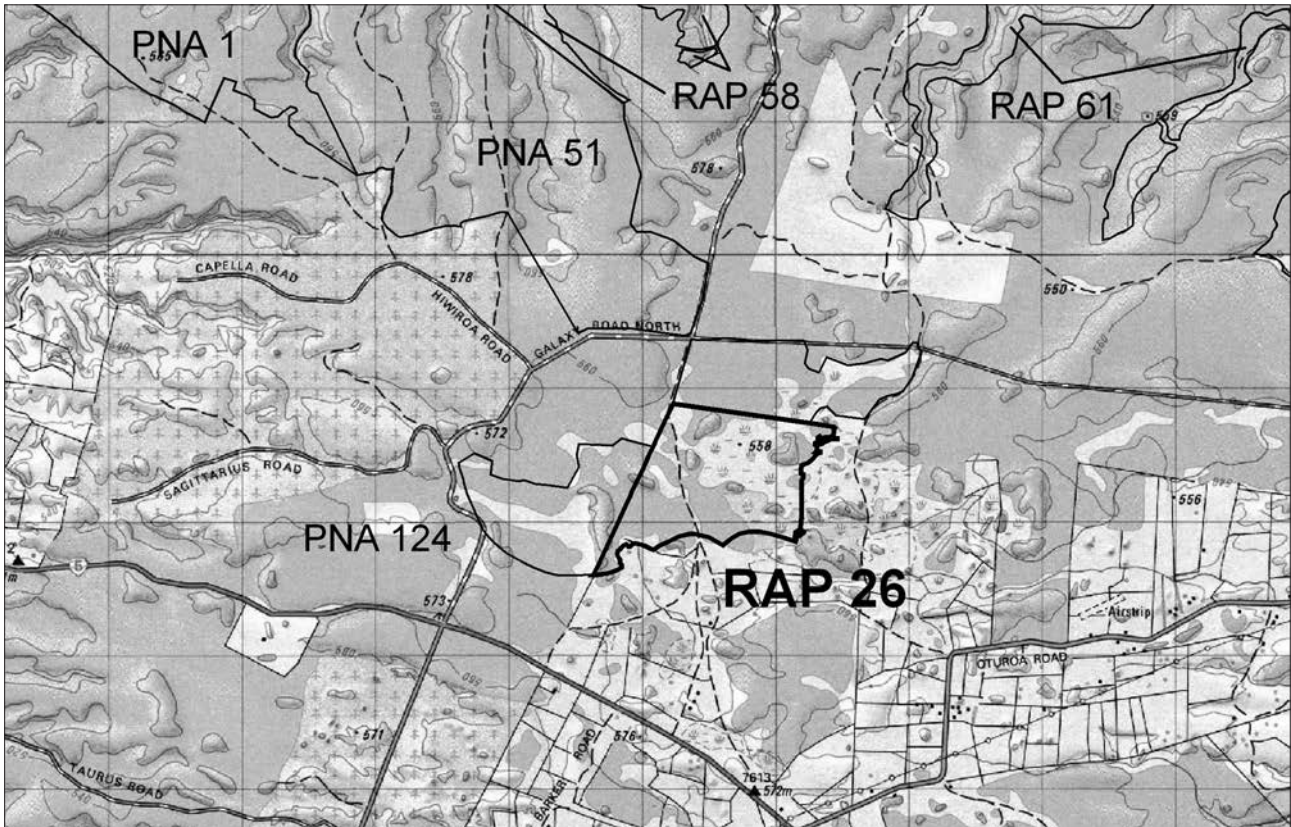
Discussion

This site contains a good quality example of geothermal vegetation. It is an area of high geothermal activity with a unique suite of vegetation types associated with geothermal activity—examples present include the largest and best quality examples of pohutukawa × northern rata forest associated with geothermal habitat in New Zealand as well as areas of prostrate kanuka scrub and shrubland. It contains a good-sized population of prostrate kanuka (At Risk, Range Restricted) and is the largest area of geothermal vegetation remaining in the Otanewainuku Ecological District. Taheke is the only geothermal field in the Otanewainuku Ecological District. This site is of national ecological significance.

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- Beadel S.M., Townsend A.J. and Shaw W.B. 1996a: Natural heritage of the Whakatane District. *Wildland Consultants Ltd Contract Report No. 140*. 280 pp plus maps.
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RAP 26 CAPELLA ROAD WETLAND



RAP 26 CAPELLA ROAD WETLAND¹

Area	122.4 ha
Altitudinal Range	558-560 m
Grid Reference	NZMS 260 U15 805493
Land System	Northern Mamaku Plateau
Study Area No.	N/A
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Manuka/ <i>Baumea rubiginosa</i> - <i>Gleichenia</i> sp./ <i>Sphagnum</i> fern-sedge-shrubland (with locally common <i>Astelia grandis</i> , <i>Gabnia</i> sp., <i>Baumea tenax</i> , raupo and <i>Eleocharis acuta</i>) ⇔ (manuka)/ <i>Baumea rubiginosa</i> -(<i>Gleichenia</i> sp.)/ <i>Sphagnum</i> shrub-sedgeland.	Wetland
Lowland	2. Silver beech-hard beech-(tawari)-(kamahi) forest (with locally common toatoa, and local pole rimu and pole kahikatea around the margins).	Flat
Lowland	3. Manuka-monoao/ <i>Gabnia</i> sp.- <i>Astelia grandis</i> - <i>Gleichenia</i> sp./ <i>Sphagnum</i> shrubland.	Wetland
Lowland	4. Manuka/ <i>Baumea rubiginosa</i> - <i>Gabnia xanthocarpa</i> -toetoe/ <i>Sphagnum</i> shrubland (with scattered <i>Coprosma tayloriae</i> , local wild strawberry, and scattered gorse and browntop around margins).	Flat; wetland

Landform

Lagoon and surrounding wetlands in a shallow depression on the Mamaku ignimbrite plateau. The lagoon sometimes completely drains out and at other times is a relatively large, open water body.

Vegetation

Beech forest modified by logging, and wetlands induced by clearing and logging of indigenous forests.

Flora

Taxa present include *Drosera binata*, *Thelymitra cyanea*, karetu, *Eleocharis sphacelata*, *Baumea tenax*, *Euchiton limosus*, and *Nertera*

1. This RAP is part of a larger unprotected natural area which also extends over Tokoroa and Rotorua Lakes Ecological Districts, and was identified as a Natural Heritage Site (NHS 650) in a 1998 study on the Rotorua District (Shaw & Beadel 1998). The site was also identified as a RAP in the Rotorua Lakes Ecological District protected natural area programme survey (Beadel *et al.* 1998).

scapanioides. *Pterostylis paludosa* (Chronically Threatened, Serious Decline in Hitchmough 2002) was recorded from this site in 1985 (NZFRI 15753).

Fauna

Fernbird (At Risk, Sparse in Hitchmough 2002) and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) occur at this site.

Threat / modification

This site is fenced where necessary to exclude stock, and much of it is surrounded by plantation forest. This site is intact and relatively undisturbed by animal pests. Logging tracks bisect the area, and appear to have been recently extended and developed.

Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	H
Naturalness	M	Size & Shape	H
Special Features	M	Threats	M

Discussion

Comparatively large, good quality induced wetland and tall forest. This site is of value as a representative example of wetland vegetation in this vicinity, and as wetland habitat for wildlife. Induced wetlands such as these were probably present before logging occurred, developing as a result of natural forest destruction. The water table on the Mamaku Plateau is typically very close to the surface, the underlying ignimbrite preventing drainage. (Wallace 1994.)

Many of the wetlands in this general area have been destroyed or degraded by draining, grazing, and trampling. (Wallace 1994.)

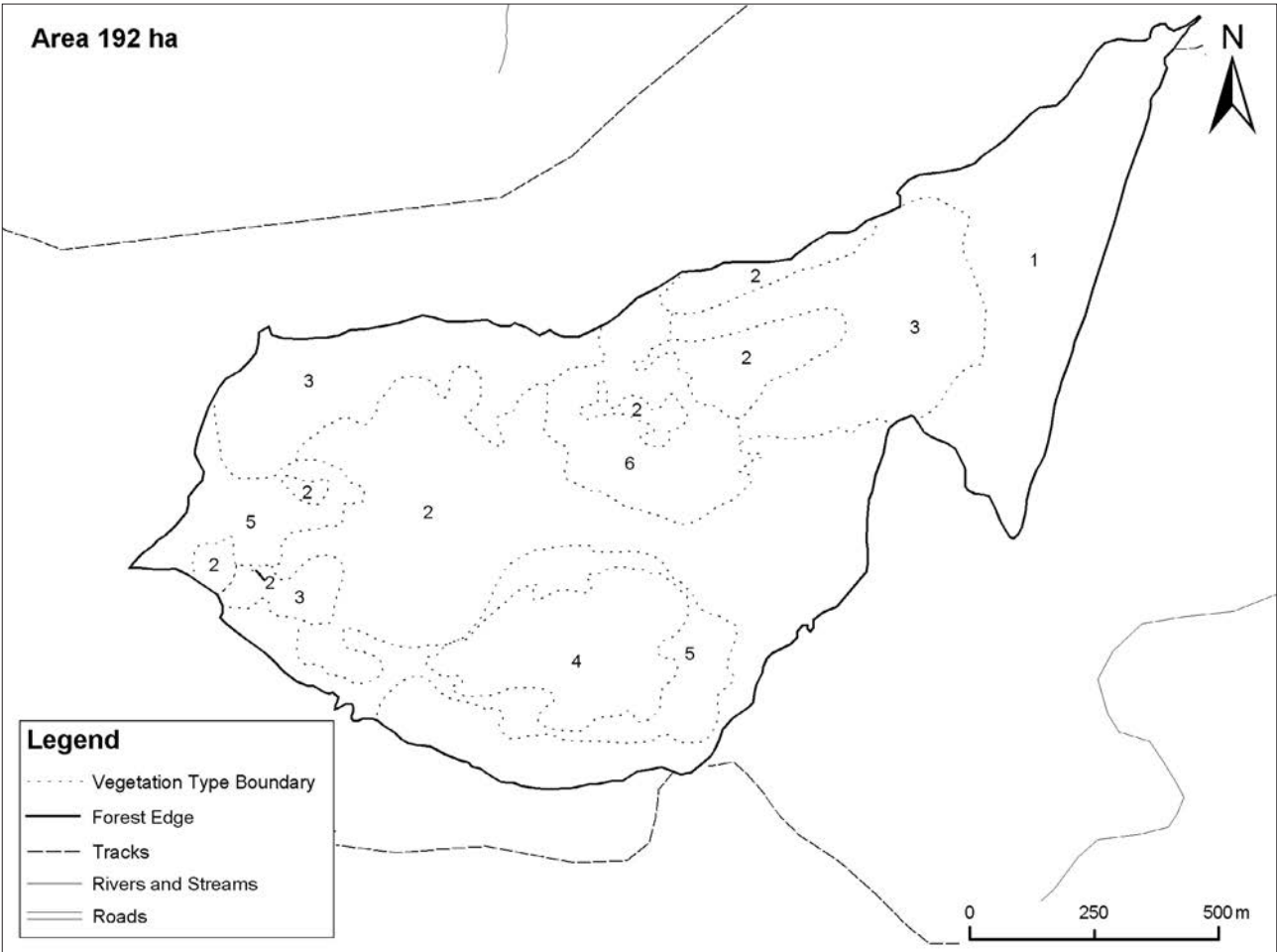
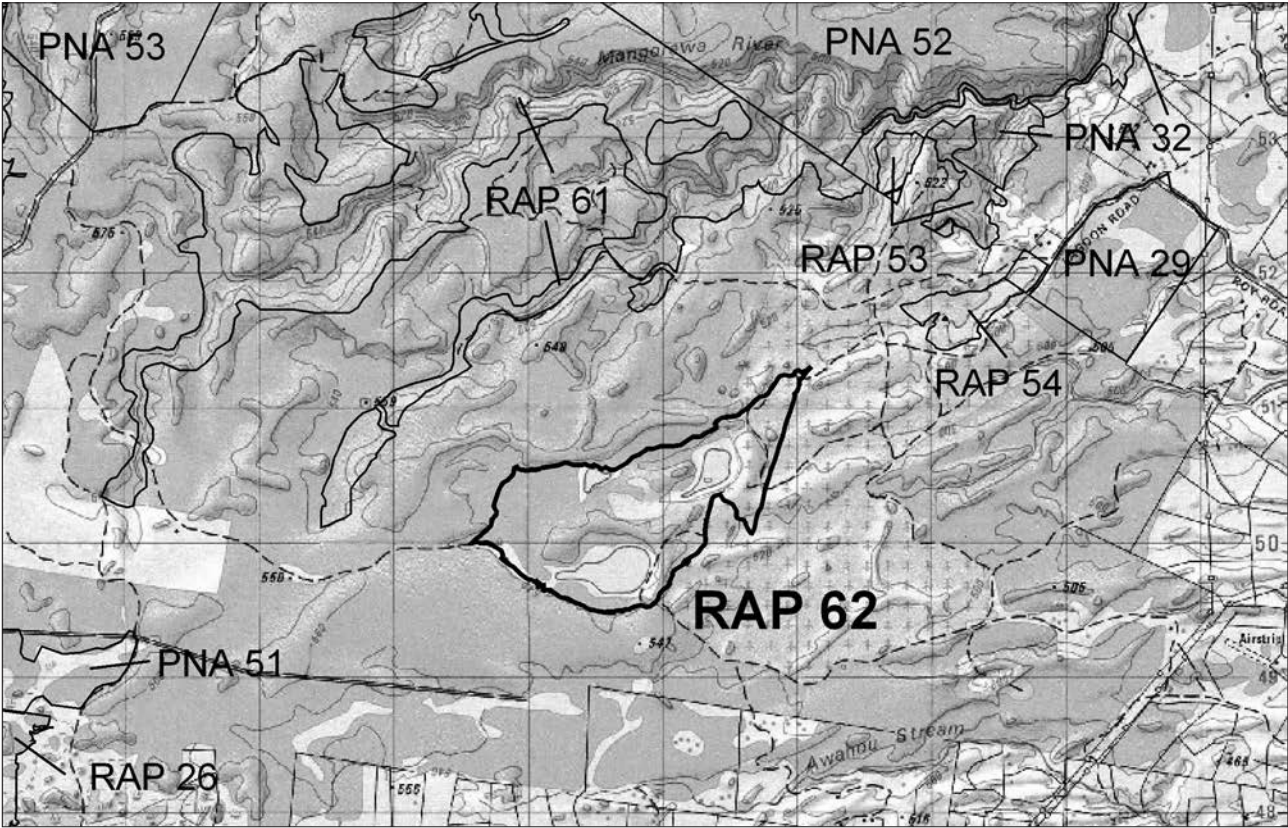
Notes

Most of this wetland is in Otanewainuku Ecological District, however the southern end (not mapped) is in the Tokoroa Ecological District and a small part of the site is in the Rotorua Lakes Ecological District.

References

Wallace S.W. 1994: Wetlands between Roy Road, Te Pu and Galaxy Road north on the Mamaku Plateau. *Unpublished notes*. 10 pp.

RAP 62 MAMAKU LAGOON



Area	192.2 ha
Altitudinal Range	520–560 m
Grid Reference	NZMS 260 U15 845500
Land System	Northern Mamaku Plateau
Study Area No.	N/A
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Tawa-kamahi-red beech-hard beech/wheki-wheki ponga-makomako-manuka-mahoe forest and scrub (with tawari, toatoa, and rimu).	Flat and gentle hillslopes
Lowland	2. Hard beech-silver beech forest (pole rimu, toatoa).	Flat and gentle hillslopes
Lowland	3. Manuka-monoao / <i>Baumea teretifolia</i> - <i>Gleichenia dicarpa</i> - <i>Sphagnum</i> sedge-shrubland (with local swamp coprosma) ⇔ Manuka-monoao / <i>Gabnia-Astelias grandis</i> - <i>Gleichenia dicarpa</i> / <i>Sphagnum</i> shrubland and scrub.	Wetland
Lowland	4. Manuka-swamp coprosma scrub and shrubland and manuka scrub ⇔ <i>Baumea teretifolia</i> sedgeland ⇔ <i>Myriophyllum pedunculatum</i> subsp. <i>novae-zelandiae</i> herbfield ⇔ open water (lake).	Wetland
Lowland	5. Manuka-toetoe shrubland (other broad-leaved species locally dominant).	Flat
Lowland	6. Indigenous shrubland.	Flat

Landform

Comparatively large, good quality induced wetland and tall forest. This site is of value as a representative example of wetland vegetation in this vicinity, and as wetland habitat for wildlife. Induced wetlands such as these were probably present before logging occurred, developing as a result of natural forest destruction. The water table on the mamaku plateau is typically very close to the surface, the underlying ignimbrite preventing drainage. (Wallace 1994.)

Many of the wetlands in this general area have been destroyed or degraded by draining, grazing, and trampling. (Wallace 1994.)

Vegetation

Diverse range of wetland vegetation types virtually surrounded by tall indigenous forest.

Flora

Taxa present include *Lilaeopsis novae-zelandiae*, *Carex dipsacea*, and *Eleocharis acuta*. Good numbers of *Gabnia rigida* are present. *G. rigida* reaches its northern limit at these wetlands (Wallace 1986).

Fauna

Australasian bittern (Acutely Threatened, Nationally Endangered in Hitchmough 2002), North Island fernbird (At Risk, Sparse in Hitchmough 2002), and New Zealand scaup have been recorded (Wallace 1994).

Threat / modification

Cattle were previously present in the wetland and there were drains. This area should not be grazed and drains should be filled. Grey willow are present on the north western side of the larger mire. These should be removed.

This area is within the area managed by the Awahou-Mangorewa Hunting Club for pig hunting.

Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	H
Naturalness	H	Size & Shape	H
Special Features	H	Threats	M

Discussion

This site contains a relatively large, good quality wetland. It is an important habitat for *Gabnia rigida* at its northern limit.

Apart from its value as habitat for *Gabnia rigida*, this site is valuable as an example of a relatively old (at least 4,500 years by carbon-dating) wetland in the Otanewainuku Ecological District.

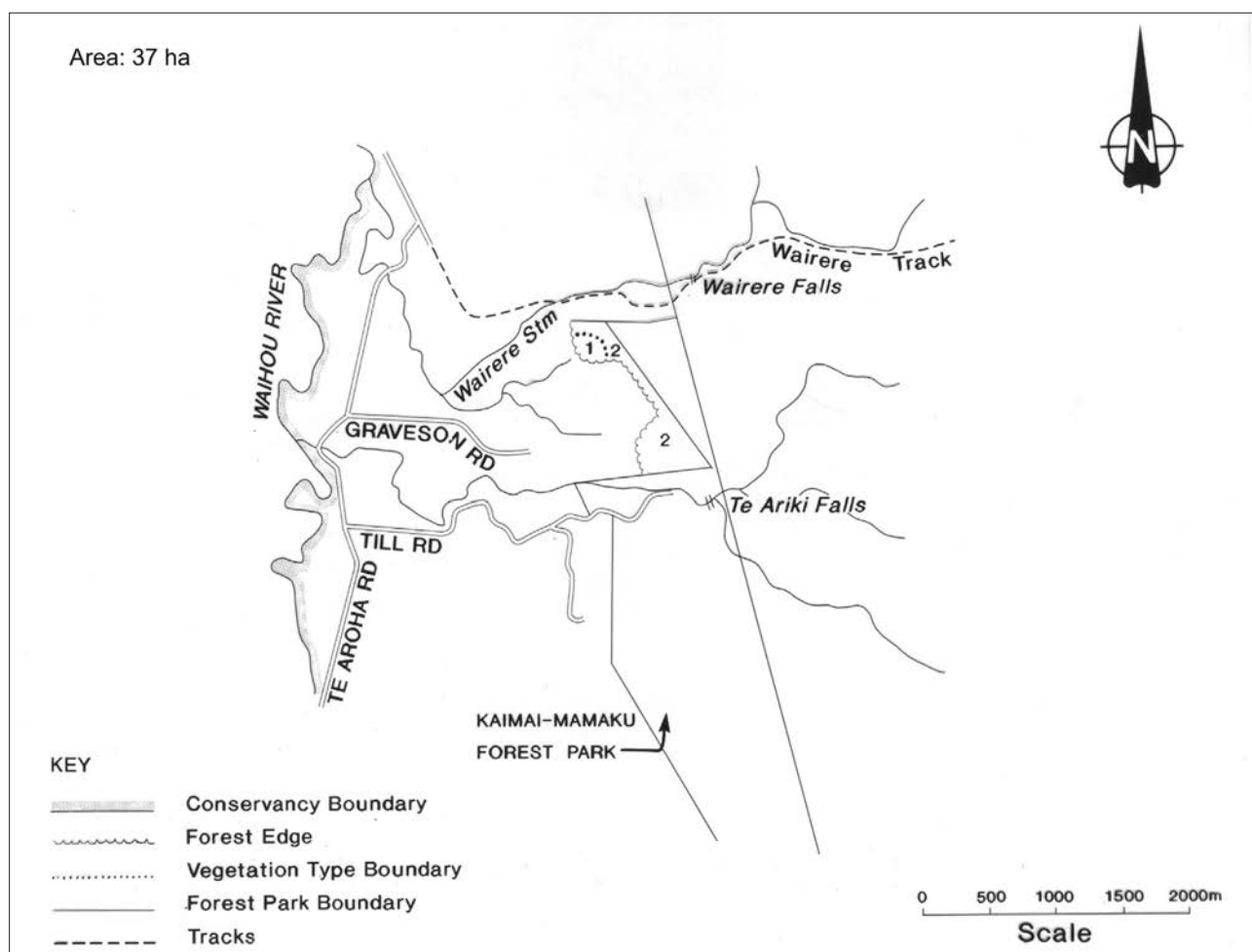
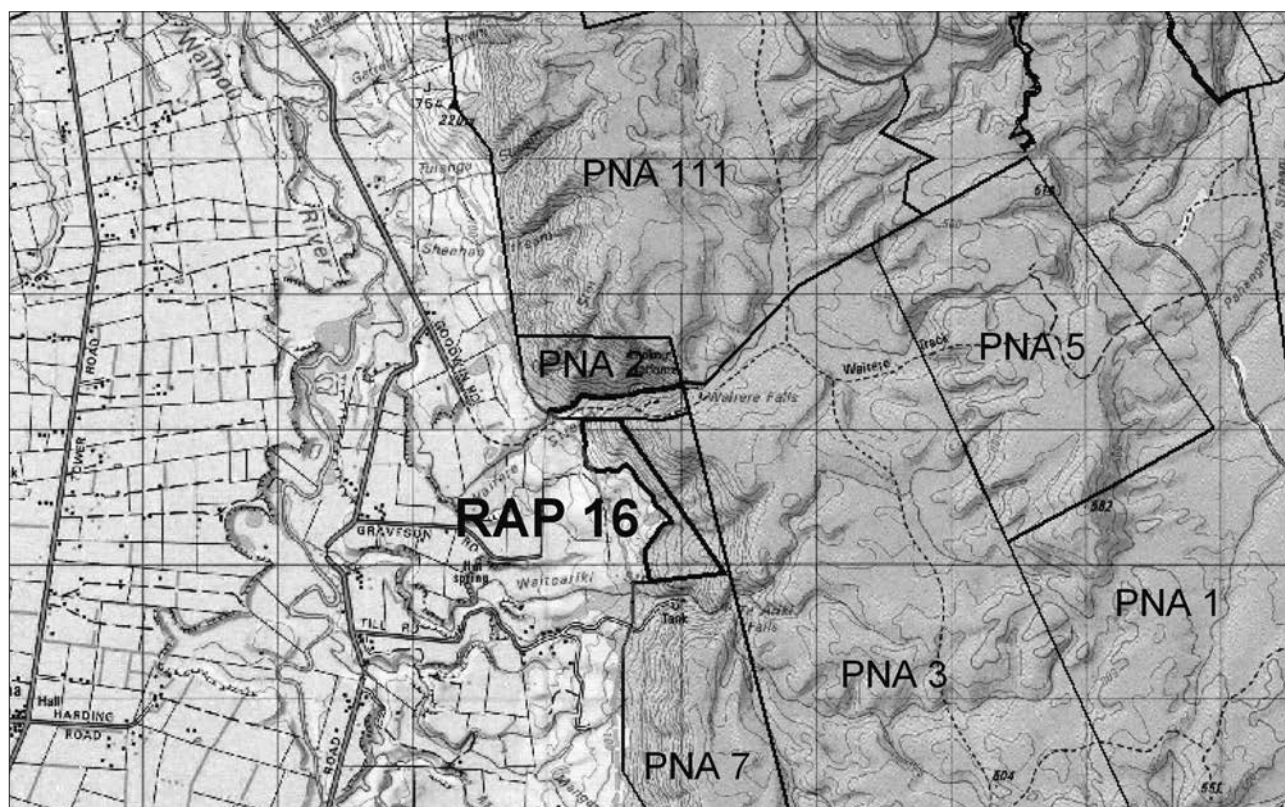
“It is a key area for elucidation of the post-Pleistocene environmental and biological history of the Rotorua region of current ecological trends.” (Nicholls 1982 in Wallace 1994)

References

Wallace S.W. 1994: Wetlands between Roy Road, Te Pu and Galaxy Road north on the Mamaku Plateau. *Unpublished notes*. 10 pp.

Category 2 RAPs

RAP 16 GRAVESON ROAD



RAP 16 GRAVESON ROAD

Area	36.7 ha
Altitudinal Range	80–280 m
Grid Reference	NZMS 260 T14 638805
Land System	Whakamarama Plateau
Study Area No.	96
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Mamaku-mahoe-pukatea forest	Hillslope
Semi-coasta	2. Tawa-rewarewa-pukatea-kohekohe forest	Hillslope

Landform

Comprises a small area on the lower slopes of the steep escarpment forming the western edge of the Whakamarama rhyolite plateau.

Vegetation and flora

The vegetation has a distinctive semi-coastal character. Tawa, rewarewa, pukatea and kohekohe form the canopy, with infrequent emergent kahikatea. One karaka was seen. Understorey species include nikau, kohekohe, titoki, karaka saplings, *Asplenium lamprophyllum*, *Anarthropteris tenella*, *Peperomia urvilleana* and kiekie.

Fauna

Common forest birds occur in this RAP.

Threat / modification

Secondary mamaku-mahoe-pukatea forest has developed following burning at one site and the lower slopes have been subject to light logging and crown fires. Although the RAP has been heavily grazed by domestic stock in the past it is now lightly grazed. Fences to exclude domestic stock should be erected.

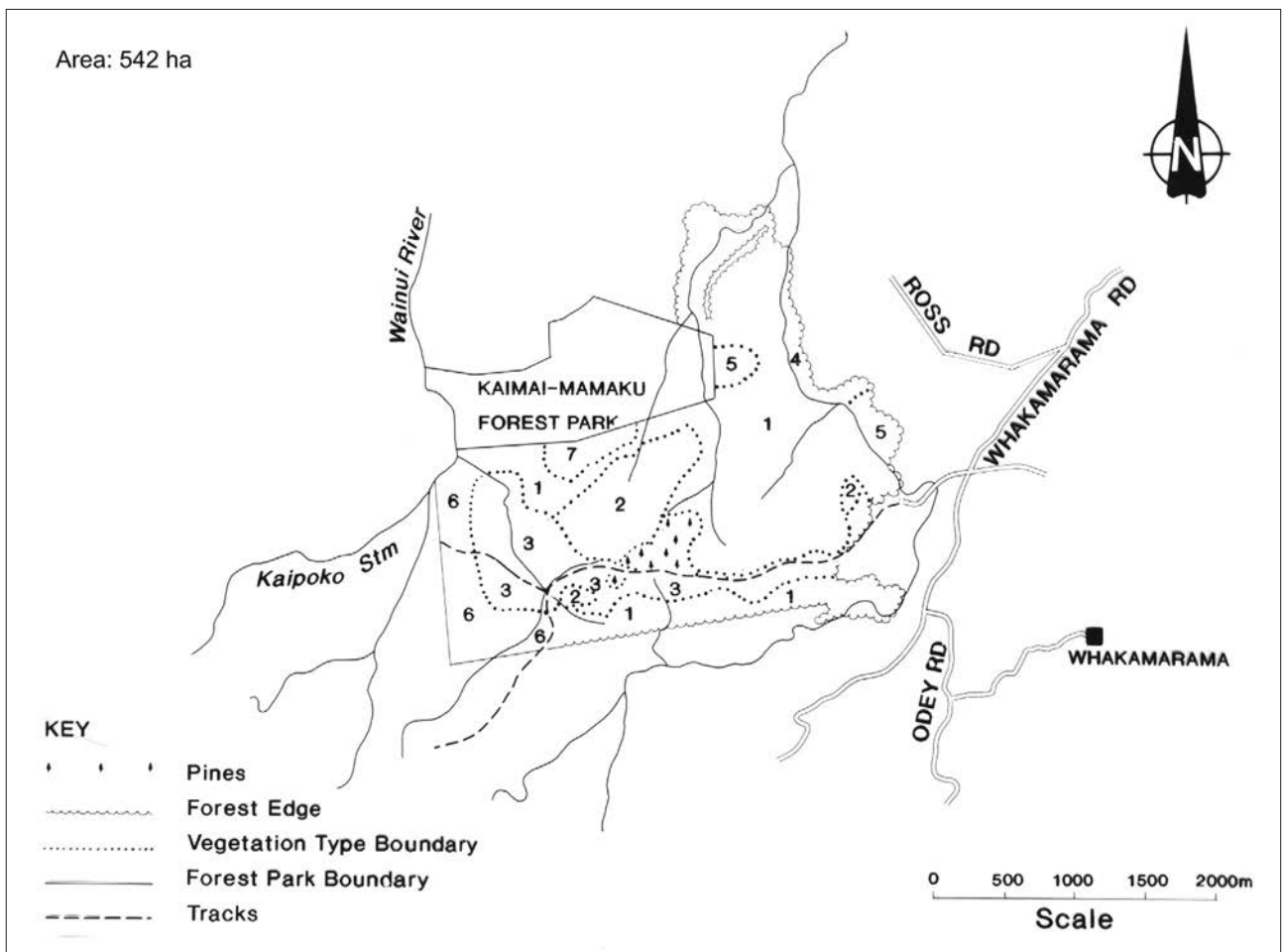
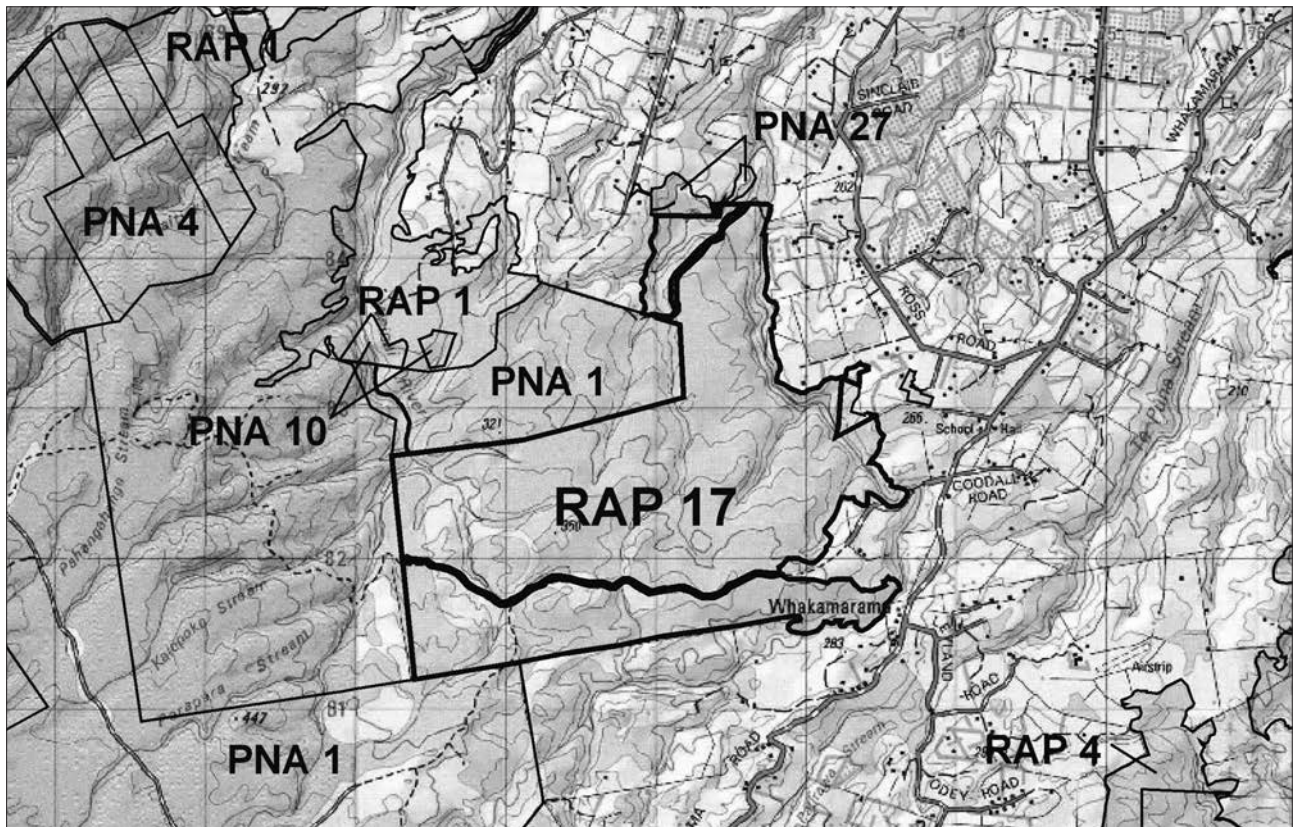
Evaluation

Representativeness	H	Viability	H
Diversity	L	Buffering	H
Naturalness	M	Size & Shape	H
Special Features	L	Threats	L

Discussion

This RAP contains good quality representative examples of semi-coastal vegetation in a district where this is under-represented in the existing reserve system. It adjoins an extensive forest tract (Kaimai-Mamaku Forest Park).

RAP 17 WAIPAPA



RAP 17 WAIPAPA

Area	541.5 ha
Altitudinal Range	160–440 m
Grid Reference	NZMS 260 U14 705820
Land System	Whakamarama Plateau
Study Area No.	51
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal and lowland	1. (Northern rata)-rewarewa/tawa-pukatea forest (with local puriri)	Undulating plateau, hillslope
Semi-coastal and lowland	2. Mamaku treefernland	Undulating plateau, hillslope
Lowland	3. Bracken-gorse-mihimihi-kamahi shrub-fernland	Shallow poorly drained basin
Semi-coastal	4. (Northern rata)-rimu-rewarewa/kamahi-rimu-tawa forest	Undulating plateau, hillslope
Semi-coastal	5. Kamahi forest	Undulating plateau, hillslope
Lowland	6. Pukatea-tawa-mamaku forest	Undulating plateau, hillslope
Lowland and semi-coastal	7. Secondary scrub	Undulating plateau, hillslope

Landform

Forms a gently undulating part of Whakamarama rhyolite plateau near its eastern margin. Drained on the eastern side by the Waipapa River and the western side by the Wainui River.

Vegetation

Much of this RAP has been heavily logged in the past. Secondary vegetation makes up about 30% of the RAP and, apart from a narrow example of (northern rata)-rimu-rewarewa/kamahi-rimu-tawa forest along the Waipapa River, the remainder is logged tawa forest. Podocarp regeneration is present throughout the block with local tanekaha stands.

Flora

No significant species were recorded during the survey.

Fauna

Avifauna present include kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), tui, bellbird, little shag and grey duck (Fauna Survey Unit unpublished 1982).

Threat / modification

The majority of the RAP has been heavily logged and parts have been burnt (for example vegetation type 3). Wilding pines occur locally. This RAP has been threatened by clearance for conversion to exotic forestry plantations in the past.

Evaluation

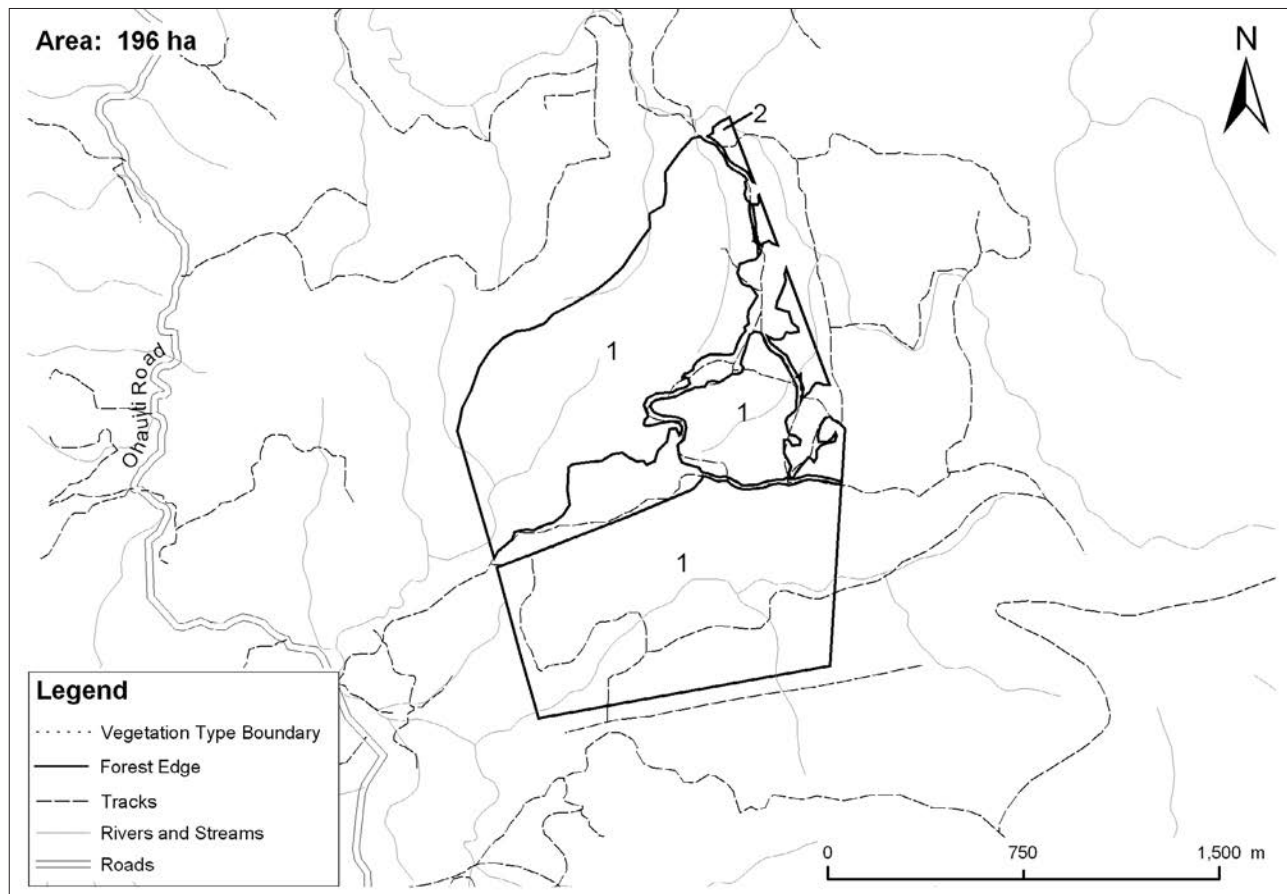
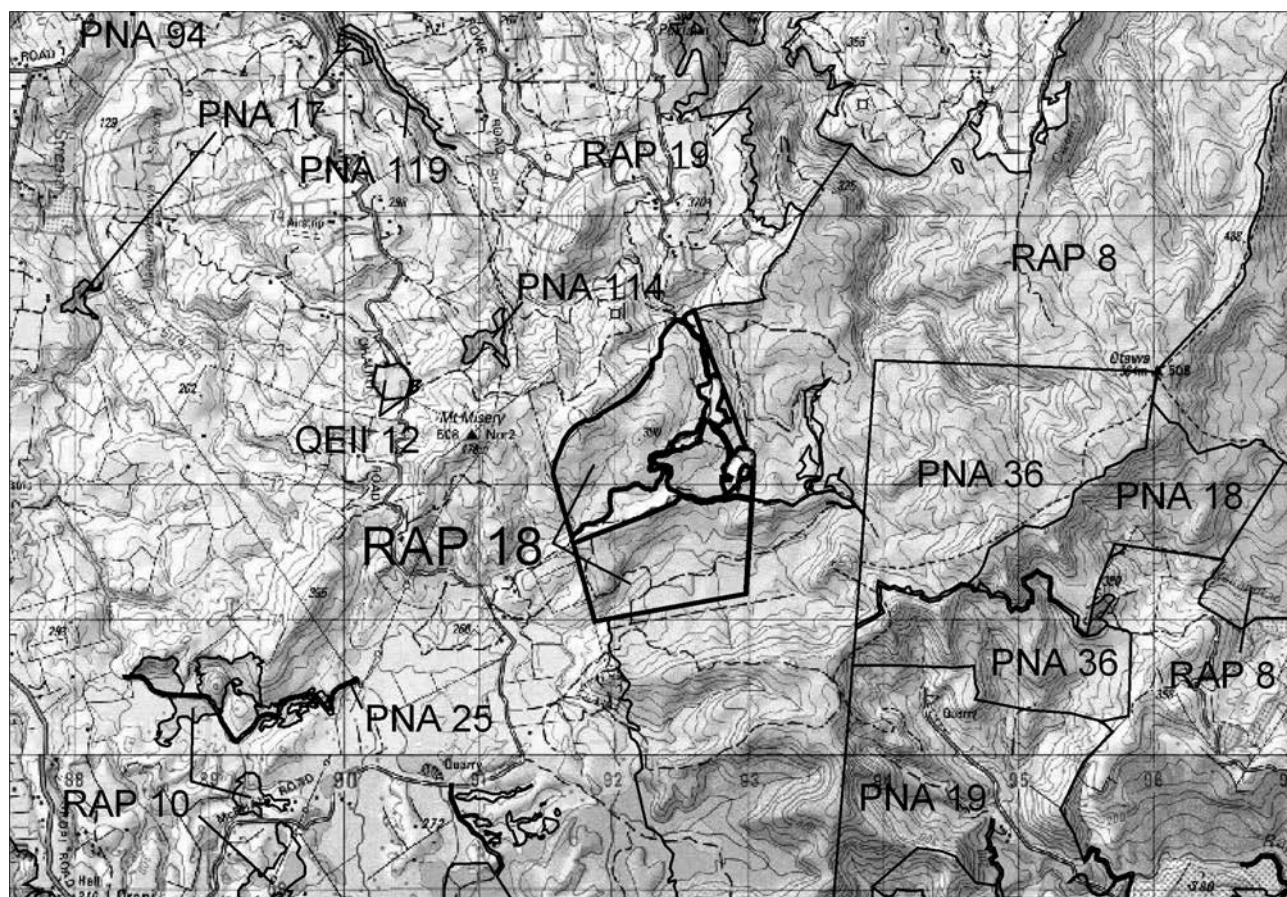
Representativeness	M	Viability	M
Diversity	M	Buffering	H
Naturalness	L	Size & Shape	H
Special Features	L	Threats	H

Discussion

This RAP contains a sizeable area of indigenous vegetation adjoining an extensive tract (Kaimai-Mamaku Forest Park) and thus complements the existing reserve system. Together with RAPs 1 and 4 it provides examples of vegetation in the semi-coastal bioclimatic zone on the slopes of the Whakamarama Plateau.

Semi-coastal vegetation is under-represented in the existing reserve system in this ecological district.

RAP 18 OTAWA WEST



RAP 18 OTAWA WEST

Area	196.3 ha
Altitudinal Range	280–420 m
Grid Reference	NZMS 260 U14 925716
Land System	Papamoa Hills
Study Area No.	129
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Rewarewa/tawa-hinau-mamaku-mahoe forest (70%) Rewarewa-pukatea/tawa-kohekohe-hinau forest (30%)	Hillslope
Semi-coastal	2. Kamahi-rewarewa forest	Hillslope

Landform

This RAP comprises gentle hillslopes on eroded Te Puke breccia and Minden rhyolite in the headwaters of the Waimapu Stream.

Vegetation

Common canopy species include tawa, rewarewa, hinau, mamaku and mahoe with local mangeao, pukatea, kohekohe, pole rimu and kamahi. A climbing red-flowered rata, *Metrosideros fulgens*, is common.

Flora

No significant species were recorded from this RAP.

Fauna

This RAP contains common forest bird species. Parts were ranked as moderate by Saunders (1983), because it contains habitat typical of the ecological district.

Threat / modification

This RAP has been extensively logged and tracked. There are several clearings for house sites and grazing of domestic stock. Domestic stock graze much of the RAP and should be excluded.

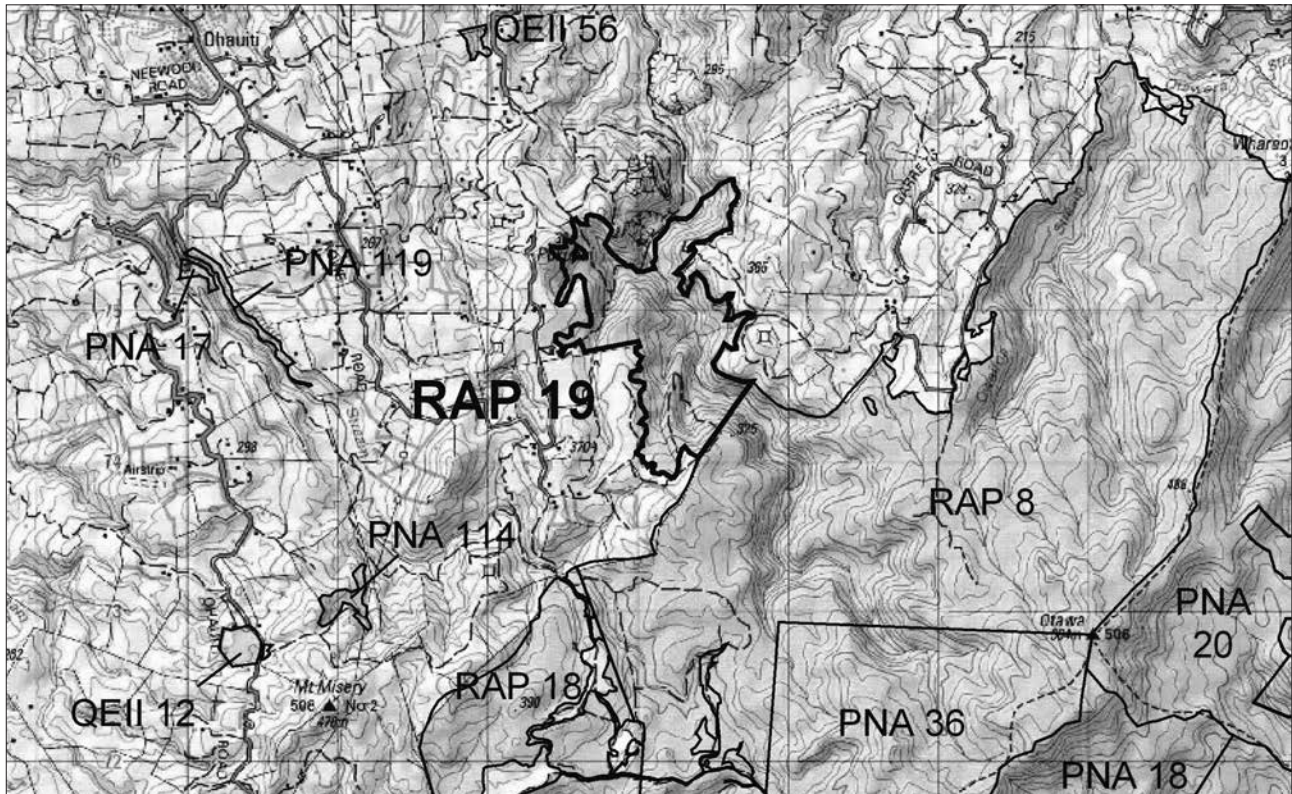
Evaluation

Representativeness	M	Viability	H
Diversity	L	Buffering	H
Naturalness	M	Size & Shape	M
Special Features	L	Threats	H

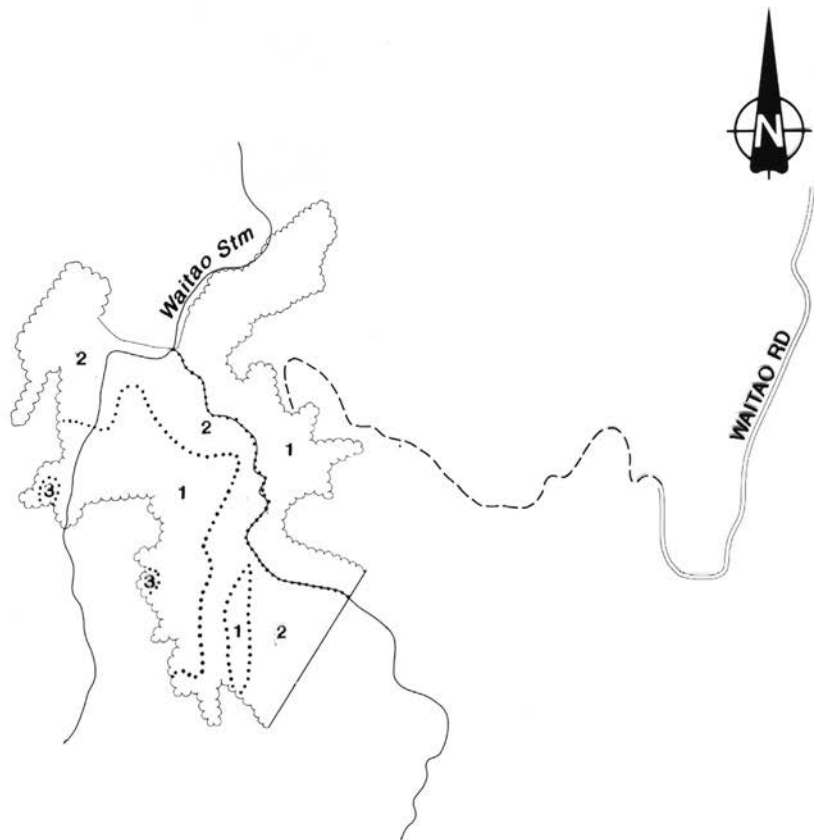
Discussion

This RAP is relatively large and is contiguous with the extensive Ottawa-Otanewainuku Forests (Beadel 1985a; see RAP 8).

RAP 19 PUKUNUI



Area: 117 ha



KEY

- ~~~~~ Forest Edge
- Vegetation Type Boundary
- Tracks

0 200 400 600 800 1000m
Scale

Area	117.0 ha
Altitudinal Range	350 m
Grid Reference	NZMS 260 U14 925753
Land System	Papamoa Hills
Study Area No.	130
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Tawa-rewarewa-mangeao-(puriri)-(hinau) forest	Gully and lower hillslope
Semi-coastal	2. Rewarewa/manuka-mahoe shrubland	Steep face
Semi-coastal	3. Gorse-mamaku-bracken-mahoe shrubland	Gentle hillslope

Landform

A steep gully which forms part of the upper catchment of the Waitao Stream. Located to the south-east of the Pukunui Trig (364 m).

Vegetation

The steep faces and upper hillslopes are mainly rewarewa/manuka-mahoe shrubland with a small area of rewarewa-kamahi forest. The lower hillslopes and gullies are tawa-rewarewa-mangeao forest with occasional puriri and hinau, which were logged for rimu earlier this century.

Flora

Pockets of gorse-mamaku-bracken shrubland occur on the margins of the site. No species of special significance were recorded.

Fauna

Ranked as having moderate wildlife values by Saunders (1983), because it contains habitat typical of the ecological district.

Threat / modification

The margins of the block are grazed by domestic stock and the vegetation showed signs of severe possum damage. Scattered wilding radiata pine occur throughout. Gorse and barberry are frequent on the margins.

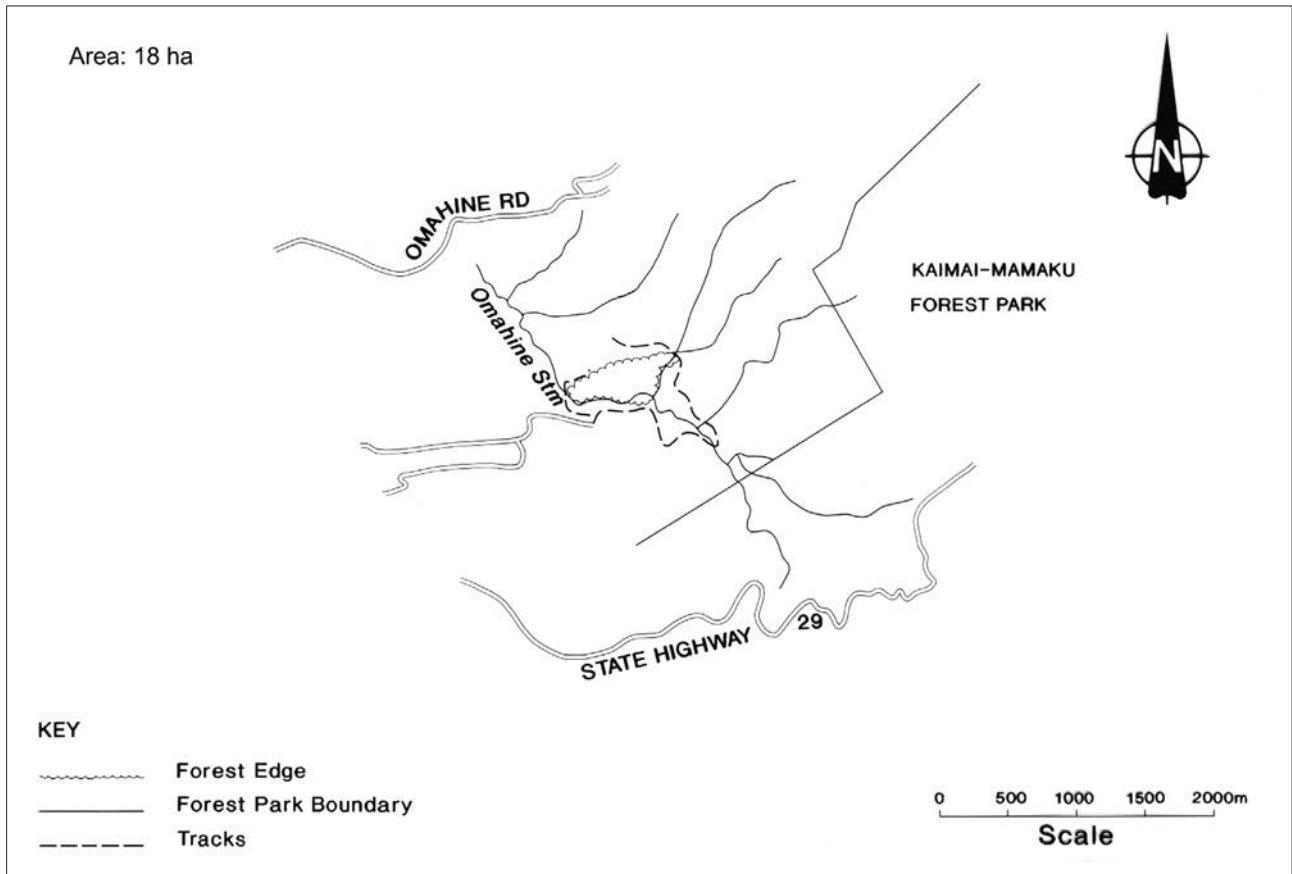
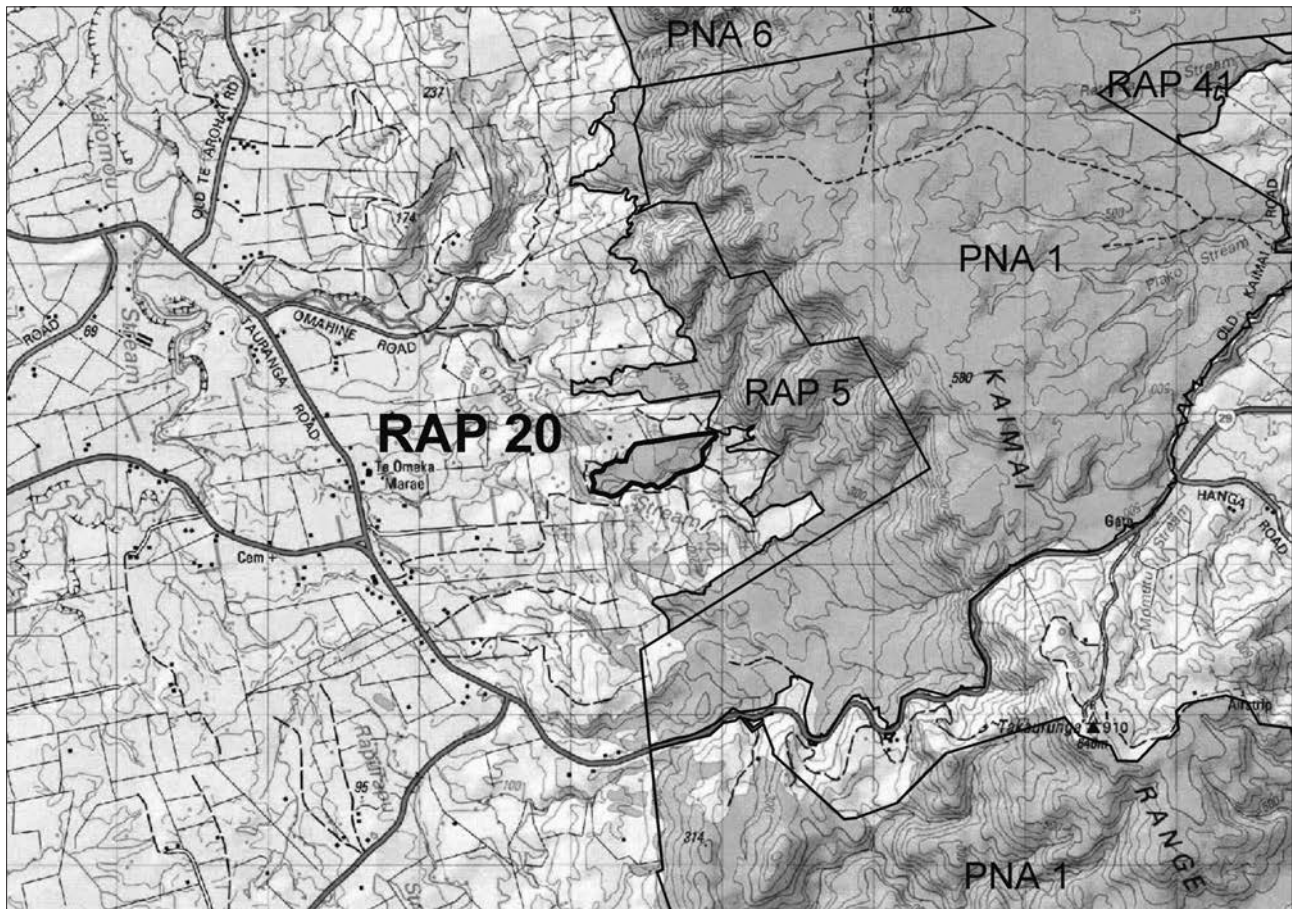
Evaluation

Representativeness	H	Viability	H
Diversity	M	Buffering	M
Naturalness	M	Size & Shape	M
Special Features	M	Threats	M

Discussion

This RAP is part of a large continuous tract of indigenous vegetation, some of which is protected (for example Ottawa Scenic Reserve, Otanewainuku Conservation Area) and some is included in RAPs (see RAP 8 Category 1; and RAP 18 Category 2). It contains semi-coastal vegetation which is under-represented in the existing reserve system of the district.

RAP 20 OMAHINE STREAM B



RAP 20 OMAHINE STREAM B

Area	17.8 ha
Altitudinal Range	150–200 m
Grid Reference	NZMS 260 T15 656667
Land System	Whakamarama Plateau
Study Area No.	98
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. (Rimu)-(kahikatea)/tawa-pukatea-rewarewa forest	Terrace

Landform

A small terrace adjacent to the Omahine Stream underlain by Waiteariki ignimbrite.

Vegetation

Rimu and kahikatea are emergent. Tawa, pukatea and rewarewa dominate the canopy in association with emergent rimu and kahikatea. Other species present include titoki, mangeao, porokaiwhiri, nikau, ponga and fuchsia.

Flora

Two species of significance which occur in this RAP are parataniwha and *Streblus heterophyllus*. Elsewhere in the district, parataniwha is known from the nearby Rapurapu ecological area. Although probably once more common, the distribution of these species in the district has been reduced through land clearance to very few known sites. *Streblus heterophyllus* is uncommon in the ecological district.

Fauna

No species of significance were recorded.

Threat / modification

This RAP has been only lightly logged. It is almost entirely fenced and has not been grazed for at least 20 years. Selaginella occurs along the road margin on the western side.

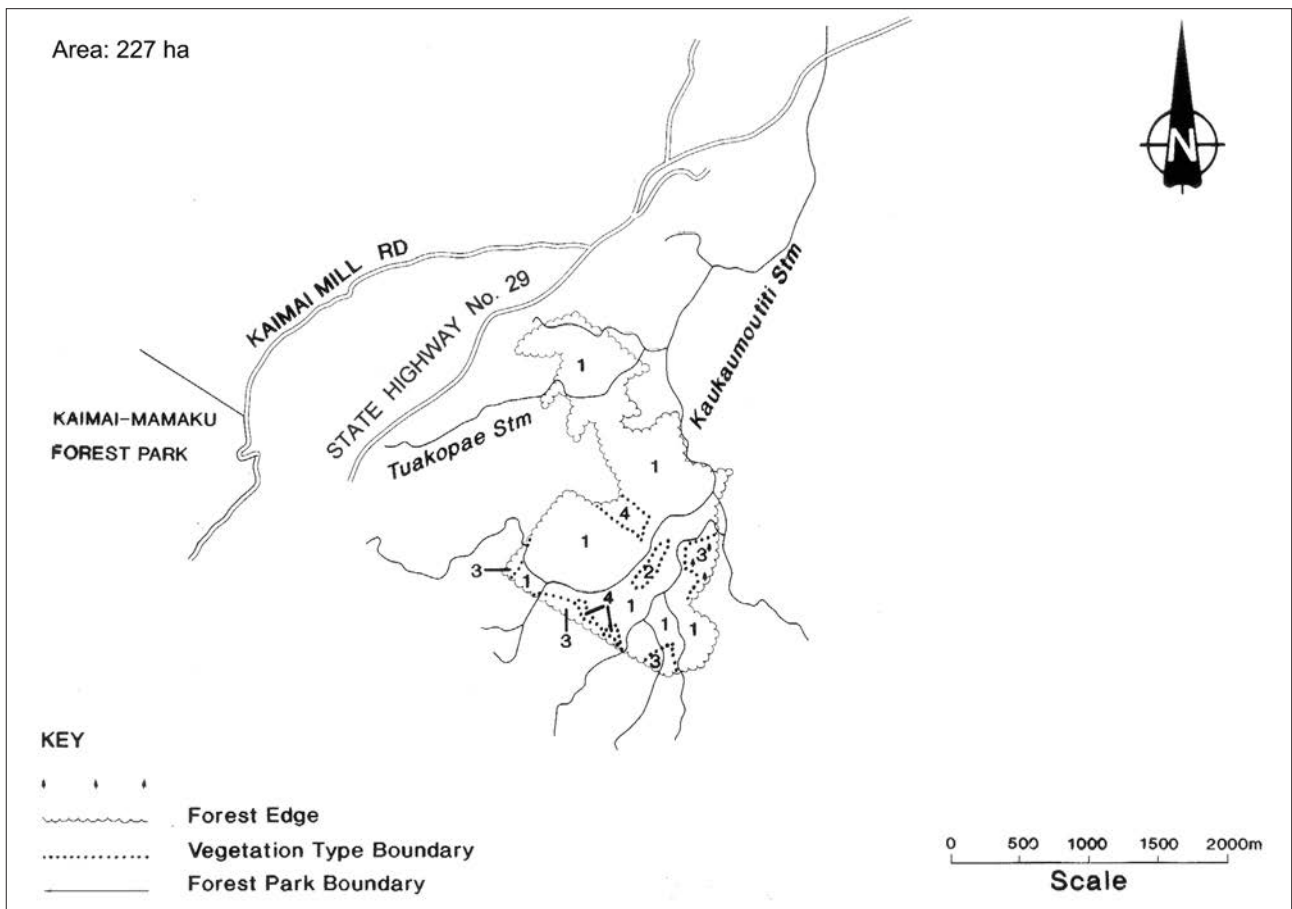
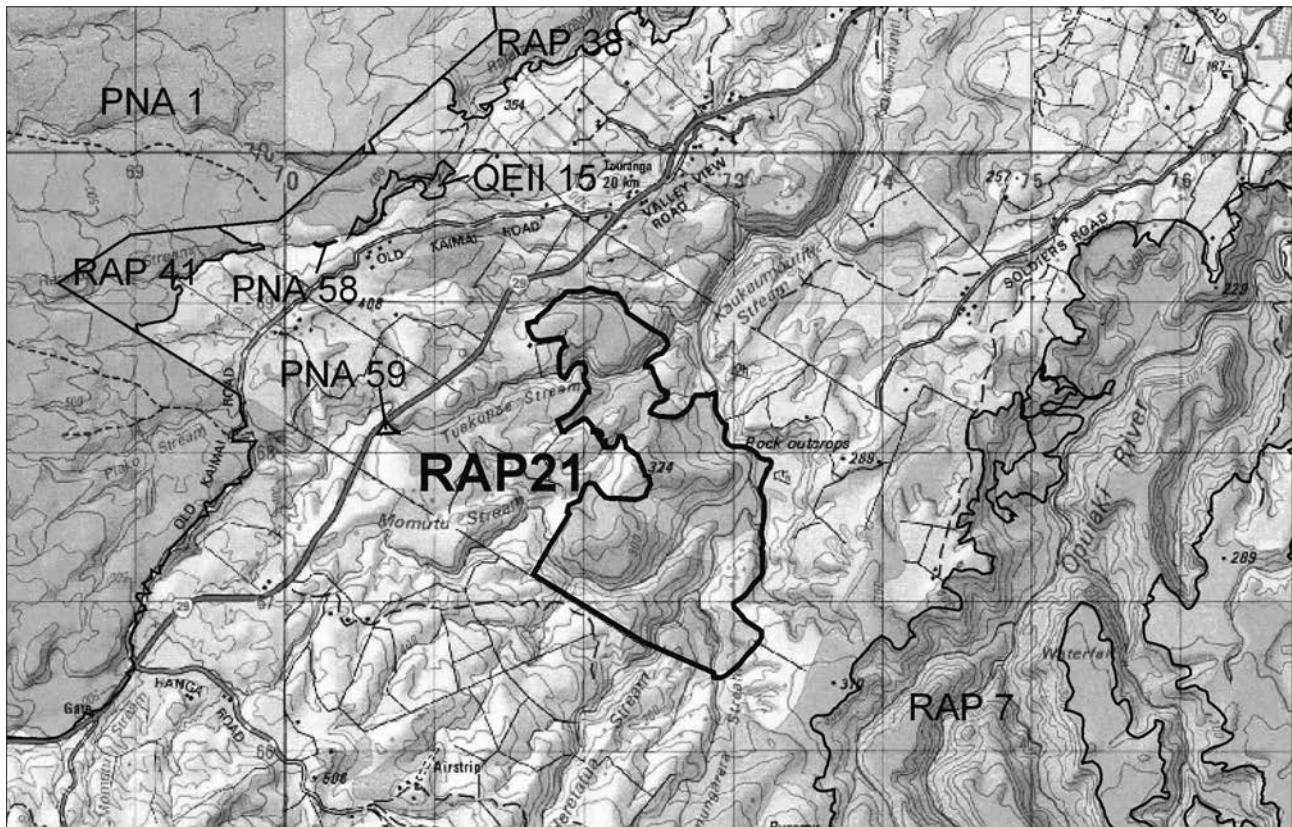
Evaluation

Representativeness	H	Viability	H
Diversity	M	Buffering	L
Naturalness	H	Size & Shape	L
Special Features	M	Threats	M

Discussion

This RAP is proposed because it contains probably the best example of semi-coastal vegetation on a relatively flat terrace on the western side of the Kaimai Range. Semi-coastal vegetation is under-represented in the existing reserve system in the district.

RAP 21 KAUKAUMOUTITI STREAM



RAP 21 KAUKAUMOUTITI STREAM

Area	227.5 ha
Altitudinal Range	200–320 m
Grid Reference	NZMS 260 U15 723675
Land System	Northern Mamaku Plateau and Whakamarama Plateau
Study Area No.	60a
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Rimu-pukatea-(kahikatea)/tawa rewarewa forest	Hillslope
Lowland	2. Tanekaha-rimu forest	Hillslope
Lowland	3. Spanish heath-gorse-bracken-barberry shrubland	Hillslope
Lowland	4. Mamaku-ponga-wheki-treefernland	Hillslope

Landform

The north-western edge of the Mamaku rhyolite plateau, deeply dissected by the Kaukaumoutiti Stream, a tributary of the Wairoa River.

Vegetation and flora

This RAP has been lightly logged for rimu and the present forest cover is rimu-pukatea-(kahikatea)/tawa-rewarewa forest with local hard beech, tanekaha, kamahi, tawari and miro. There is a large area of secondary shrub and fernland, containing mamaku, wheki, Spanish heath, gorse, bracken, ponga and barberry, and has been retired from grazing on the eastern side of the RAP.

Fauna

Common forest bird species include North Island robin, whitehead, pied tit and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) (Fauna Survey Unit, Unpublished data 1982). Forty-eight species of land snails have been recorded for this RAP. Several of these species are of limited distribution, including *Rhytida greenwoodii*, *Schizoglossa novaseelandica*, *Otoconcha dimidiata*, *Mocella prestoni*, *Lotula microbrunnens*, and *Chaureopa subdepressa*.

Paryphanta busbyi—a Northland endemic land snail—occurs in the RAP, having been introduced by the previous owner of the forest (Mayhill 1994).

Threat / modification

Domestic stock have been removed from this RAP, and rimu have been logged in the past.

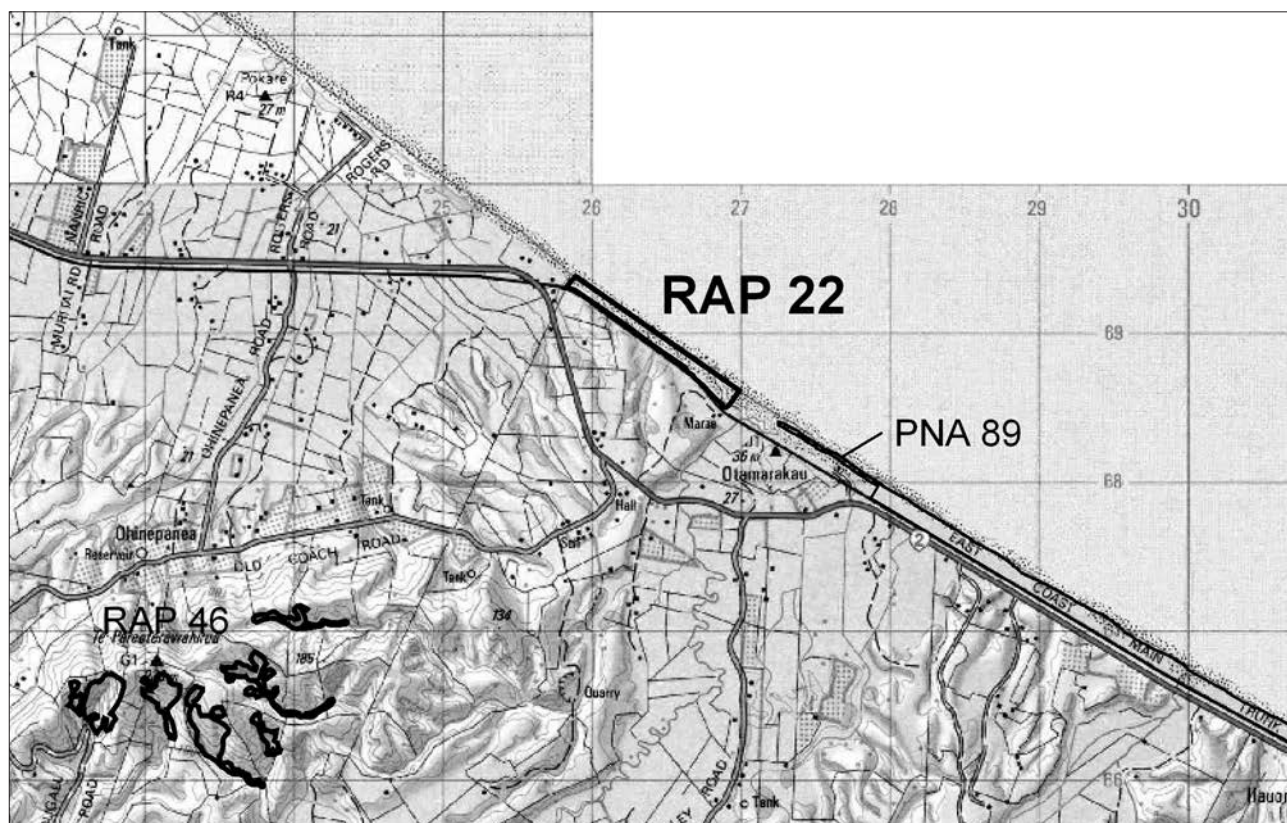
Evaluation

Representativeness	M	Viability	H
Diversity	M	Buffering	L
Naturalness	M	Size & Shape	M
Special Features	M	Threats	L

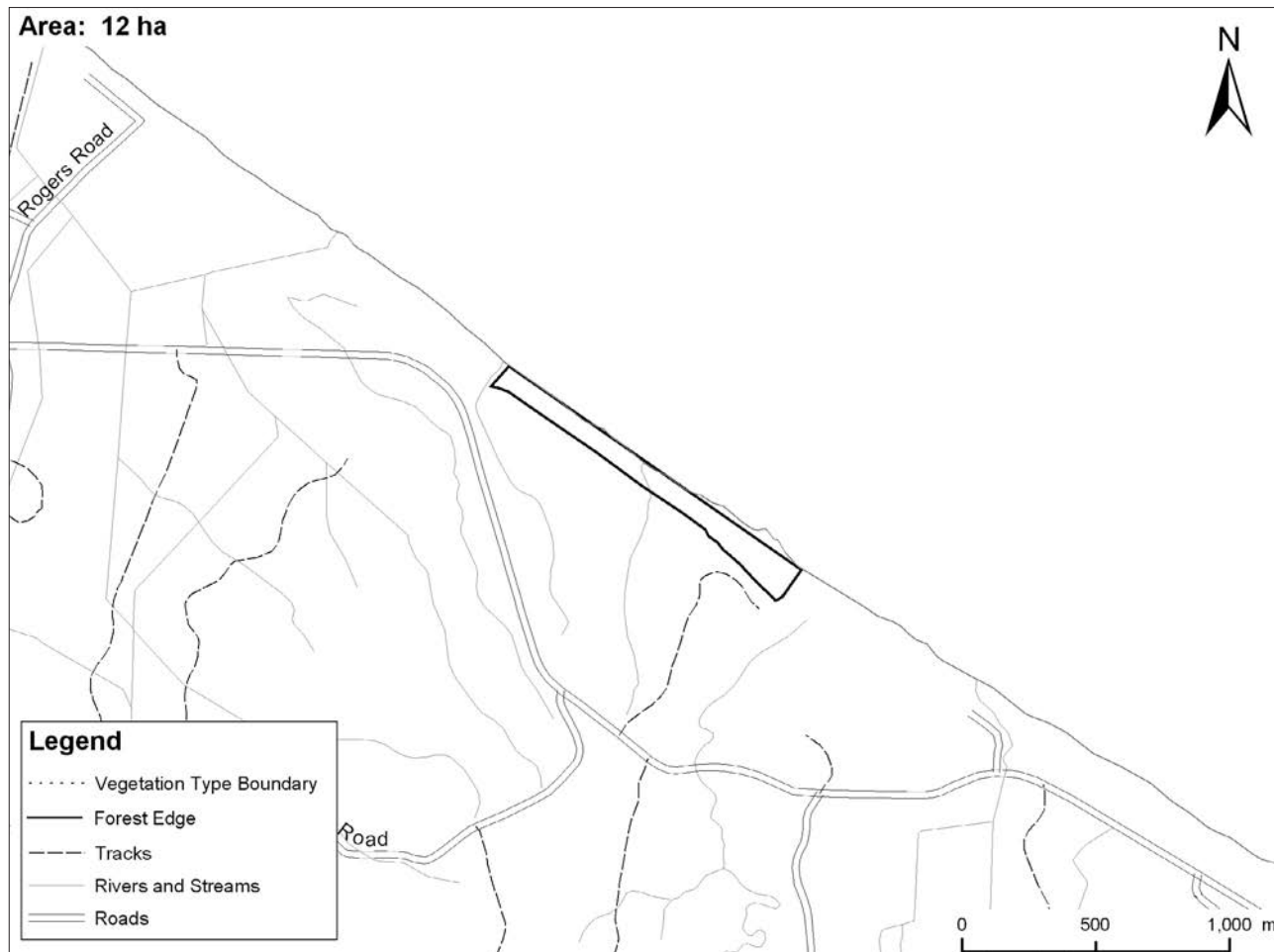
Discussion

This RAP contains good quality, representative examples of the vegetation of the district.

RAP 22 OTAMARAKAU (FROM BEADEL 1994A)



Area: 12 ha



RAP 22 OTAMARAKAU (FROM BEADEL 1994A)

Area	12.3 ha
Altitudinal Range	0 m
Grid Reference	NZMS 260 V15 262691
Land System	Sand dunes
Study Area No	Beadel 1994a
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Coastal	(Taupata)/ <i>Ficinia nodosa</i> / <i>Muehlenbeckia complexa</i> vineland	Rear dune
Coastal	Spinifex sandfield	Rear dune

Landform

A narrow sand foredune behind which rises a low scarp of Rotoiti breccia.

Vegetation

On the foredune is scattered spinifex in association with *Calystegia soldanella* and catsear. *Ficinia nodosa*/*Muehlenbeckia complexa* vineland with occasional taupata occurs on the scarp behind the foredune. Adventive species are common.

This site was identified as of high botanical conservation value in Beadel 1993a.

Flora

A small population (five plants) of *Austrofestuca littoralis* (hinarepe) occurred in the RAP up until recently. This species is classified as Chronically Threatened, Gradual Decline (de Lange *et al.* 2004). It was once relatively widespread in sand dune communities in New Zealand, however only 14 colonies now known to occur in the North Island (Partridge 1992; Beadel 1990 and 1992a and pers. obs.).

Pingao (*Desmoschoenus spiralis*; classed as Chronically Threatened, Gradual Decline in de Lange *et al.* 2004) also occurs at this site.

Fauna

New Zealand dotterel (At Risk, Sparse in Hitchmough 2002) occur on the beach.

Threat / modification

This site is a popular local camping and fishing spot. Ongoing damage to the dune system is occurring from trampling, camping activities, trail bike riding, and rabbit browse. Following trail bike damage in 1993 the *Austrofestuca littoralis* (classed as Chronically Threatened, Gradual

Decline in de Lange *et al.* 2004) population was fenced, a joint Western Bay District Council/DOC initiative. This population was browsed by rabbits.

Evaluation

Representativeness	M	Viability	M
Diversity	L	Buffering	L
Naturalness	H	Size & Shape	L
Special Features	H	Threats	H

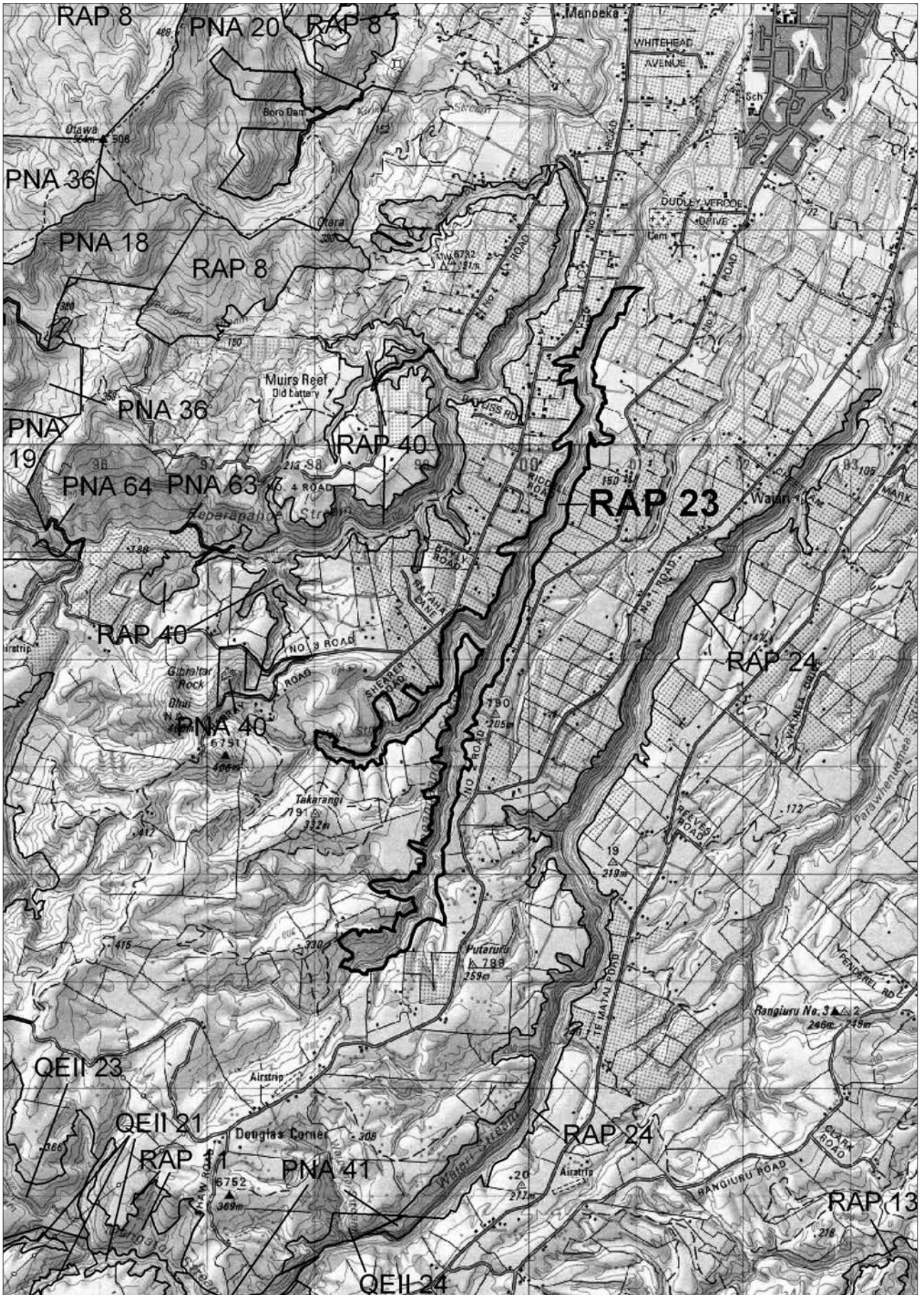
Discussion

Although small, this was the only population of *Austrofestuca littoralis* in the ecological district. The RAP is proposed to protect this site.

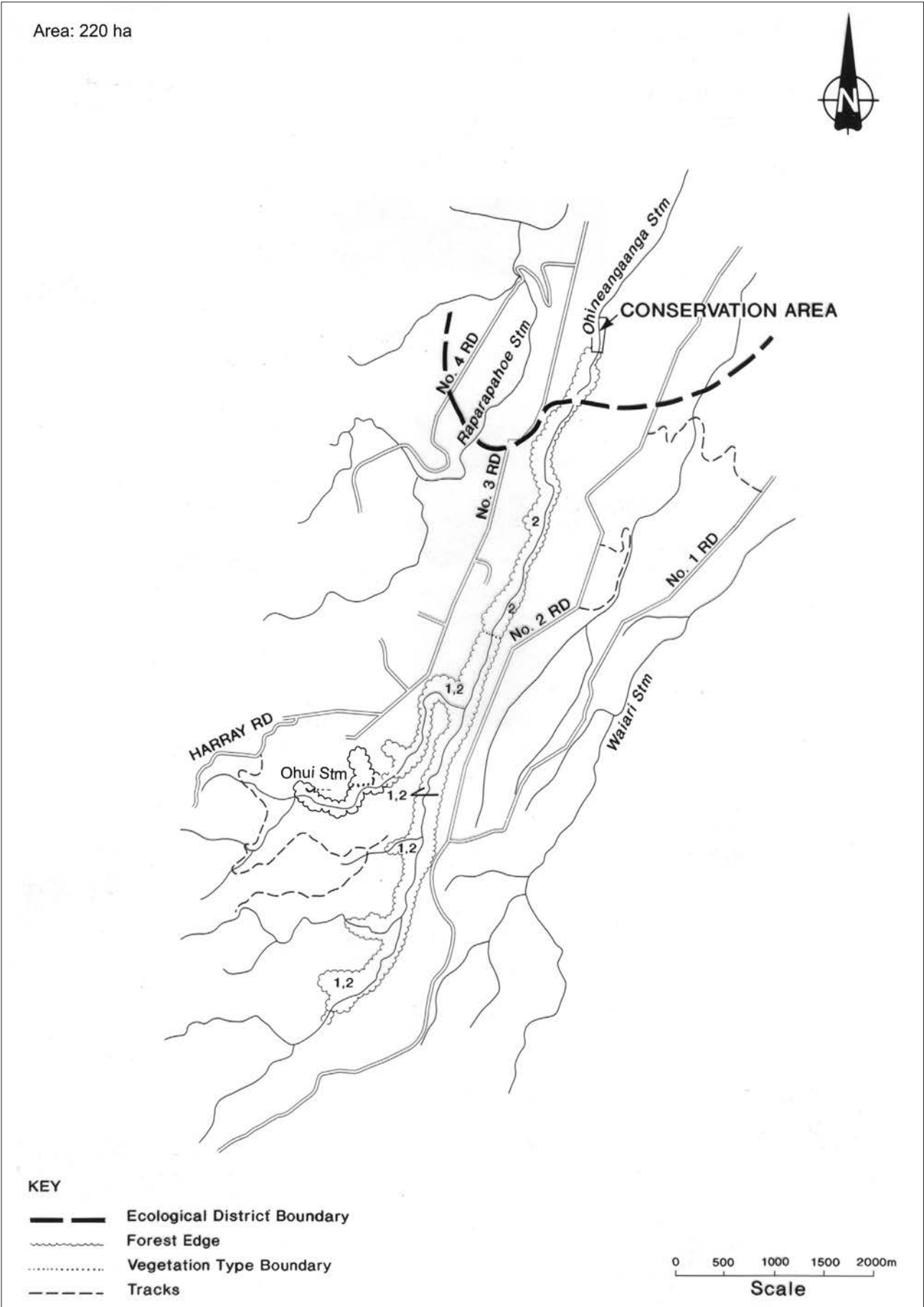
References

Beadel, S.M. 1994a: Significant indigenous vegetation of the Bay of Plenty coastal zone. Report prepared for the Bay of Plenty Regional Council. 412 pp.

RAP 23 OHINEANGAANGA STREAM



RAP 23 OHINEANGAANGA STREAM



RAP 23 OHINEANGAANGA STREAM

Area	219.5 ha
Altitudinal Range	40–280 m
Grid Reference	NZMS 260 U15 997683
Land System	Northern Mamaku Plateau; Papamoa Hills
Study Area No.	38
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. (Rimu)/tawa-rewarewa-puriri-kohekohe-pukatea forest (60%)	Ridge, gully
Semi-coastal	2. Rewarewa-kanuka/kamahi-mamaku forest (40%)	Steep face

Landform

A long, narrow and deeply incised gorge formed by the Ohineangaanga Stream cutting through Mamaku ignimbrite. The stream is characteristic of streams on the plateau and flows shallow and rapid over a rock pavement.

Vegetation

(Rimu)/tawa-rewarewa forest with occasional mangeao, puriri, kohekohe and pukatea on leading ridges and in gully bottoms. Rewarewa-kanuka forest with kamahi and mamaku in the understorey occurs on the steeper faces, predominantly in the lower and mid-gorge area.

Flora

King fern (*Marattia salicina*) is reported to be present in this gorge (D.J. Roberts pers. comm. 1974 in Saunders 1983). This fern is classed as Chronically Threatened, Serious Decline and occurs at only a few sites in the ecological district

Fauna

Saunders (1983) assessed the wildlife values of this site as moderate because of its moderate size and habitat typical of the ecological district. Grey warbler, tui, North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002), whitehead and fantail were recorded in 1982 (Fauna Survey Unit 1982, unpublished).

Threat / modification

Scattered wilding pines occur throughout the mid and lower reaches of the gorge and feral goats are likely to occur throughout (goats are currently being farmed adjacent to the upper gorge area). Pines have been planted on the easier country along the lip of the gorge and further clearing and planting may occur. Some fencing is required at the upper

end of the gorge. Recent logging of pines has occurred and locally the heads of the logged trees have been left in the gorge.

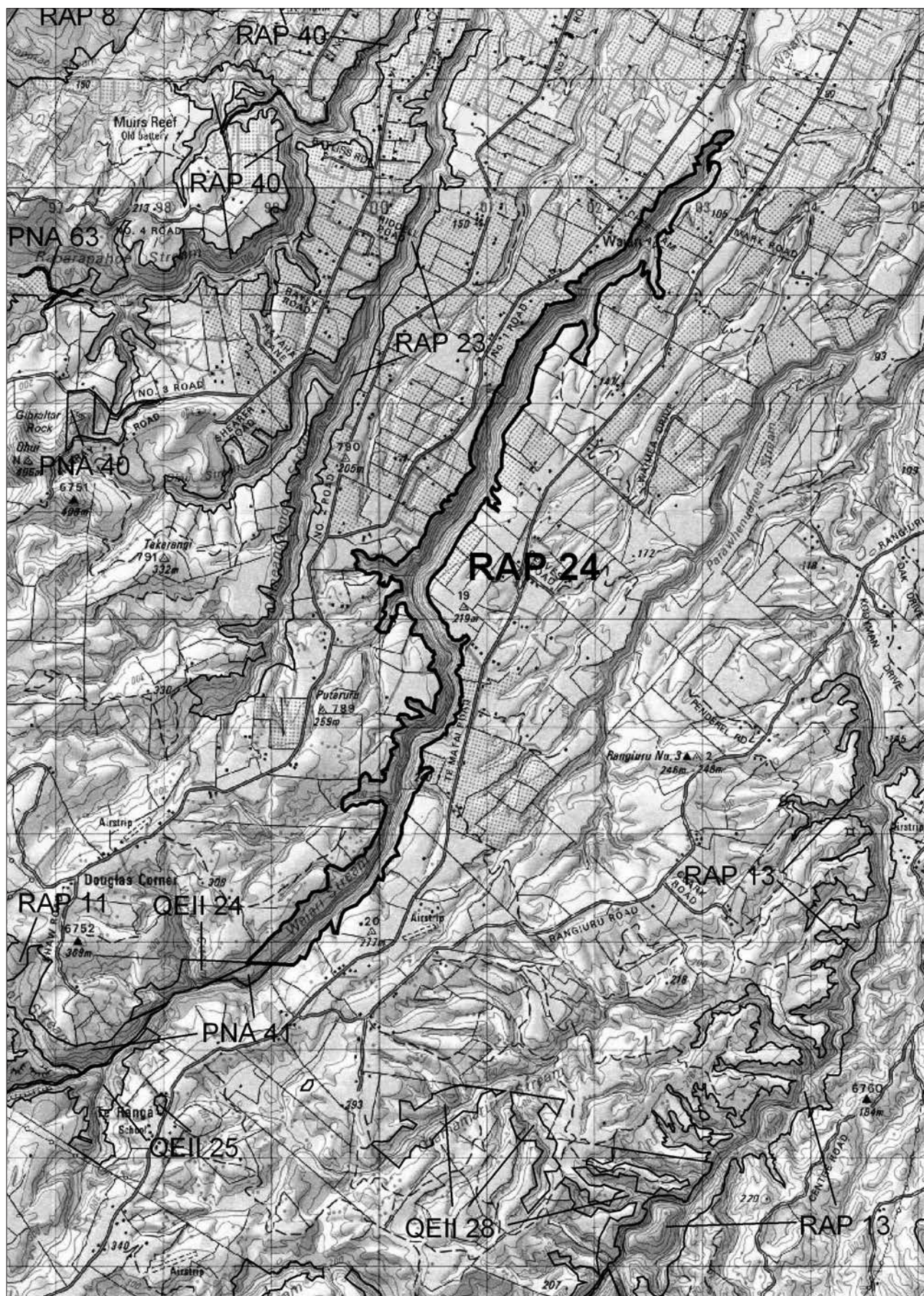
Evaluation

Representativeness	H	Viability	H
Diversity	M	Buffering	L
Naturalness	H	Size & Shape	M
Special Features	M	Threats	M

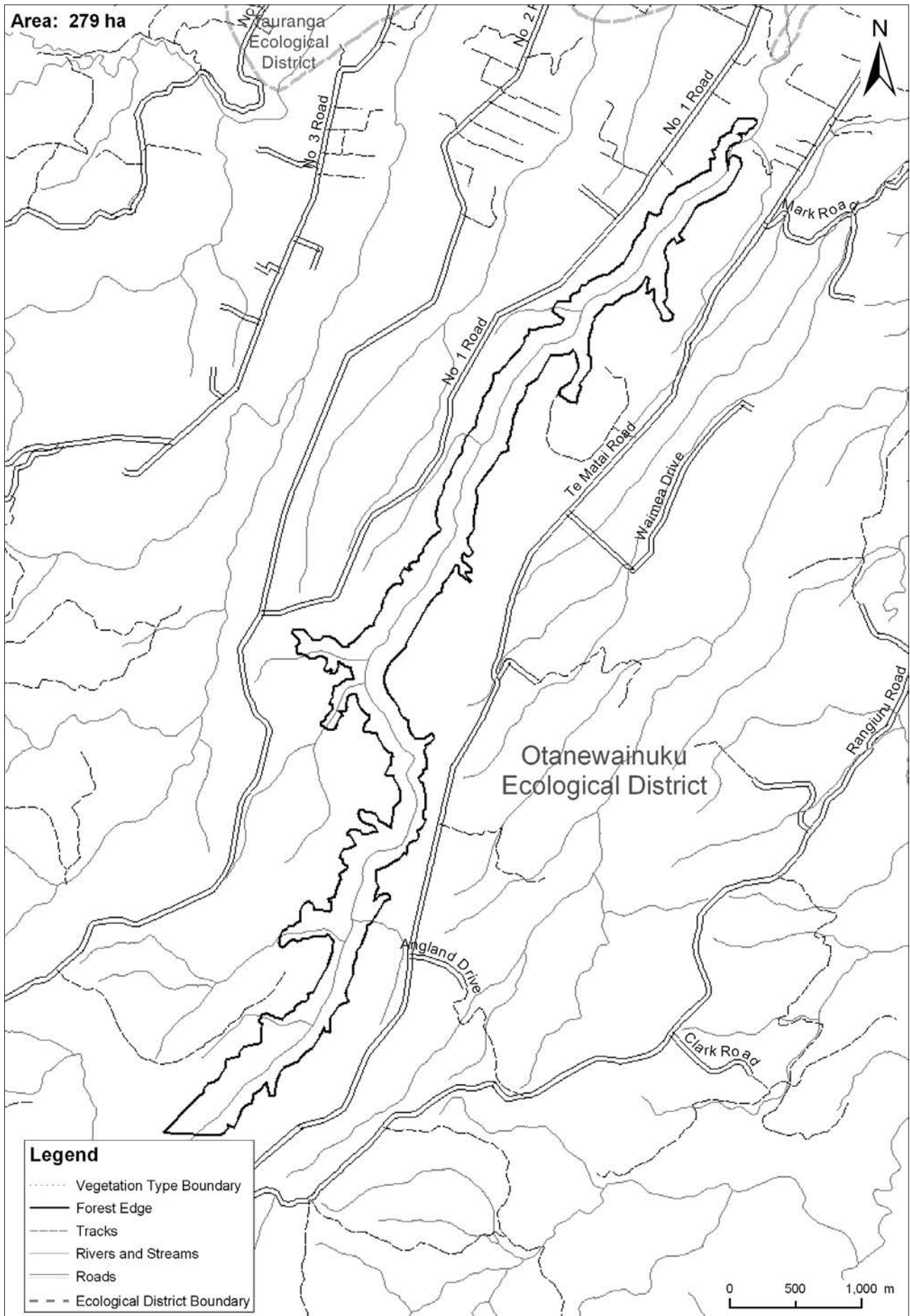
Discussion

This RAP contains some very good quality examples of semi-coastal forest which are representative of the remaining vegetation in the district. Semi-coastal vegetation is under-represented in the existing reserve system in the district.

RAP 24 WAIARI STREAM



RAP 24 WAIARI STREAM



RAP 24 WAIARI STREAM

Area	279.2 ha
Altitudinal Range	100–300 m
Grid Reference	NZMS 260 U15 012682
Land System	Northern Mamaku Plateau
Study Area No.	39
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	A mosaic of : • Tawa-puriri-mangeao-rewarewa/kamahi-mamaku-mapou forest (50%) • Rewarewa/mamaku-kanuka-kamahi-rangiora-mahoe-porokaiwhiri forest (35%) • (Rimu)-(matai)-(kahikatea)/tawa-hinau (mangeao)-(puriri) forest (15%)	Hillslope Hillslope Hillslope

Landform

A deeply incised narrow gorge formed by the Waiari Stream flowing through Mamaku ignimbrite. The stream is shallow and rapid, flowing over bedrock.

Vegetation

In the upper reaches of the stream where the gorge opens out, tawa-puriri-mangeao-rewarewa forest occurs on steep slopes and along stream margins. Small pockets of rimu, matai and kahikatea/tawa-hinau-mangeao forest remain in the more inaccessible parts of the gorge. Local hard beech occurs on ridges in the upper reaches of the gorge. Down in the lower end of the RAP on the drier, steep slopes, rewarewa/mamaku-kanuka kamahi forest is predominant. The RAP has a long history of clearance, fire, and, more recently, logging for podocarps (Nicholls, 1965b).

Flora

King fern (*Marattia salicina* (classed as Chronically Threatened, Serious Decline, de Lange et al. 2004) has been recorded at this site (Beadel 1992a) and whau occurs near its inland limit here.

Fauna

This site was recorded as having moderate wildlife values in the lower reaches of the gorge, and moderate-high values in the upper reaches (Saunders 1983) because of its habitat which is typical of habitat in the ecological district, and diversity of bird species present. North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) were recorded by Saunders (1983). Common forest bird species present include pied tit, North Island robin, and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002).

Threat / modification

Clearance for pasture or afforestation is occurring on the easier topography along the rim of the gorge. In places the gorge has been used as a dump for kiwifruit and shelterbelt prunings.

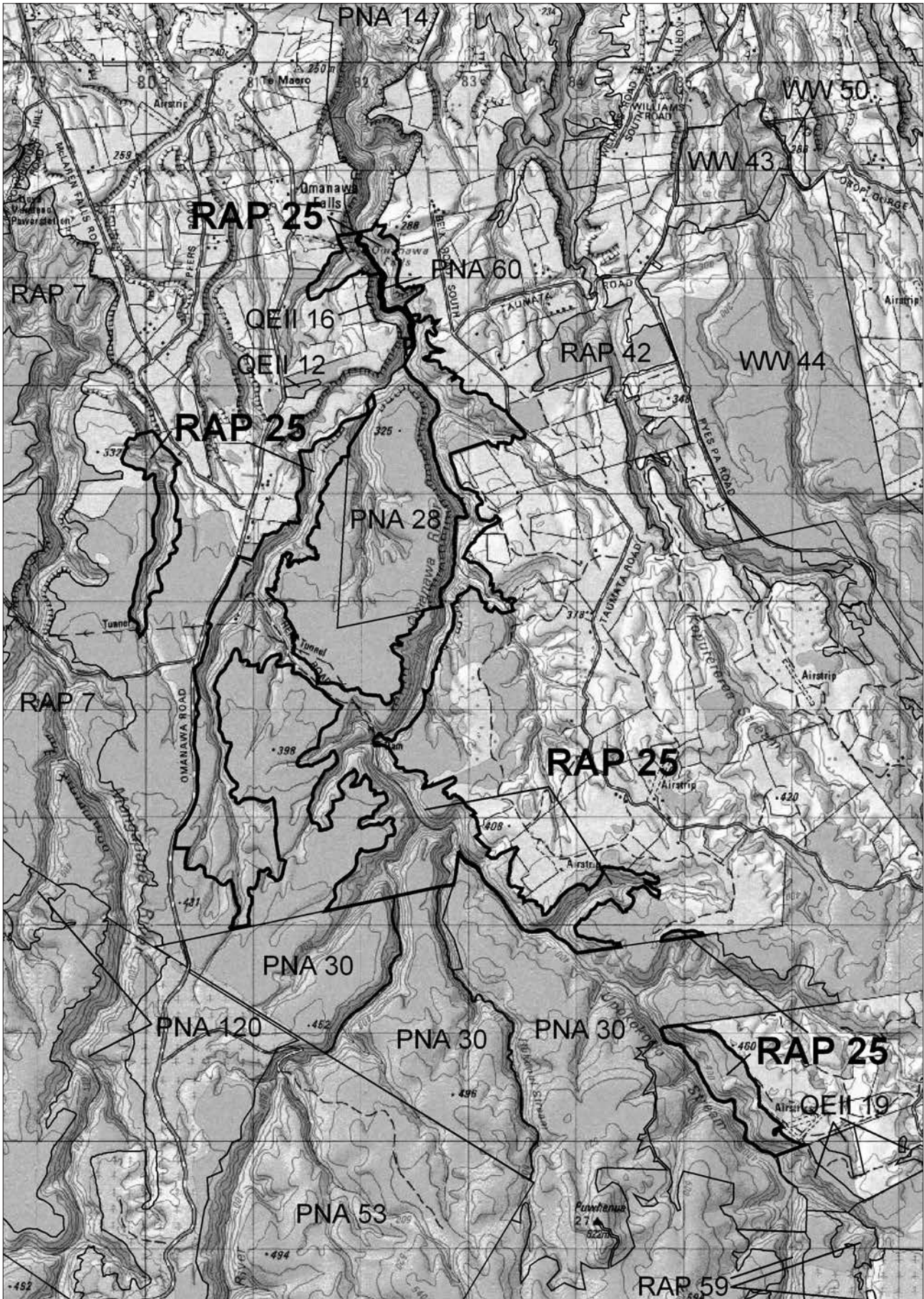
Evaluation

Representativeness	H	Viability	M
Diversity	M	Buffering	L
Naturalness	M	Size & Shape	M
Special Features	M	Threats	M

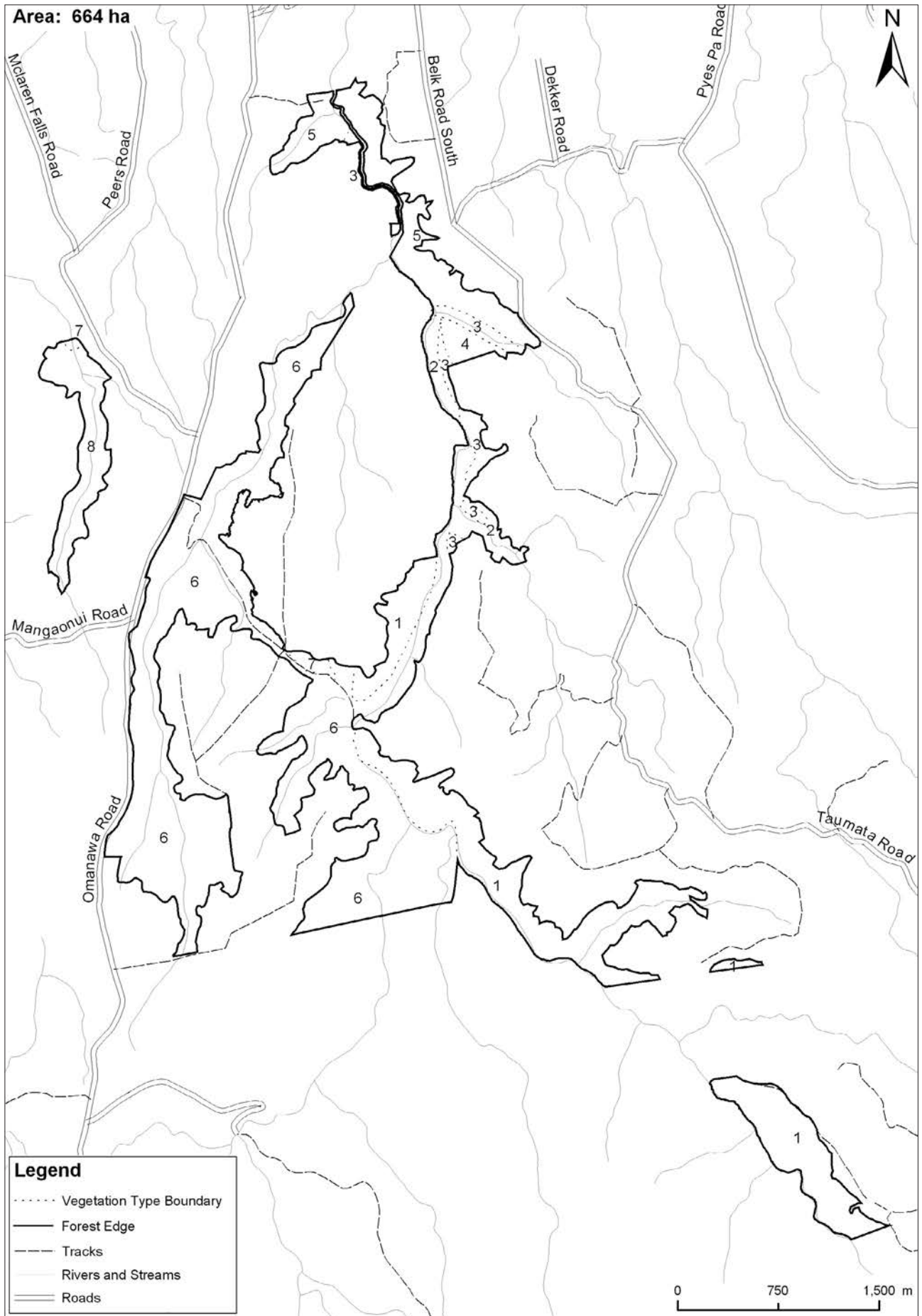
Discussion

Vegetation in the upper reaches of the gorge is more intact than that in the lower reaches. Pockets of unlogged forest occur on the more inaccessible sites. This RAP contains representative examples of semi-coastal forest in this district. It is a long very narrow extension towards the coast of the extensive Otanewainuku/Otawa vegetation tract and provides habitat for North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002).

RAP 25 OMANAWA EAST EXTENSION



RAP 25 OMANAWA EAST EXTENSION



Area	664.6 ha
Altitudinal Range	300 m
Grid Reference	NZMS 260 U15 825671
Land System	Northern Mamaku Plateau
Study Area No.	50
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Tawa-rewarewa-hinau-kamahi forest with local emergent rimu (a few Hall's totara)	Steep face
Lowland	Hard beech forest	Spur
Lowland	Porokaiwhiri-mahoe-mamaku-wheki-kamahi-tawari-(miro) forest	Steep face
Lowland	Tawa-hard beech forest with local tanekaha, tawari, black maire	Steep face
Lowland	Mingimingi-kiokio-kamahi scrub and shrubland (with local kohuhu, horoeka, and other broadleaved species)	Steep face
Lowland	2. Rewarewa-(rimu)/tawa-mangeao forest	Gully
Lowland	3. Rewarewa-(pine)/kamahi-whauwhaupaku-(tanekaha)- <i>Coprosma robusta</i> shrubland	Steep face
Lowland	4. Pukatea-(rimu)/tawa-(hinau) forest	Plateau
Lowland	5. Rewarewa/kamahi-mamaku-(mihimihi) forest	Steep hillslope
Lowland	6. (Rimu)/tawa-kamahi-tawari forest	Hillslope
Lowland	7. Rimu-northern rata/tawa-kamahi-tawari forest	Hillslope
Lowland	8. Rimu/tawa-kamahi-tawari-forest	Hillslope

Landform

Steep hillslopes and gullies on the true right of the Upokokotio Gorge and along a tributary of the Omana River, and a small outlier on a tributary of the Opuiaki River.

Vegetation

Tawa-rewarewa forest with occasional tanekaha, rimu, Hall's totara and hinau is predominant on the hillslopes above the stream. Tawa-mangeao forest with emergent rimu and rewarewa occurs on the lower hillslopes and gully bottoms. There are local areas of hard beech on some spurs and small areas of kamahi-whauwhaupaku-*Coprosma robusta* shrubland and forest with occasional emergent rewarewa on the steeper faces.

A small area of tawa-pukatea forest with emergent rimu and pukatea occurs on a plateau on the lip of the gorge, heavily logged in the past and in places grazed extensively.

An example of rimu-tawa-kamahi-tawari forest occurs alongside a tributary of the Opuia River. On the western side of the RAP there are large areas of rimu/tawa-rewarewa-kamahi-tawari forest with local pockets of hard beech forest.

Flora

No species of significance were noted during the survey.

Fauna

Common forest birds occur at this site (Fauna Survey Unit 1982, unpublished).

Threat / modification

Extensive grazing occurring locally along the margins has eliminated most of the understorey and groundcover vegetation. Areas where grazing is now excluded are heavily infested with weeds, including blackberry and barberry. Radiata pine has been planted in places along the rim of the gorge and scattered wilding pines have established locally throughout the valley on the eastern side.

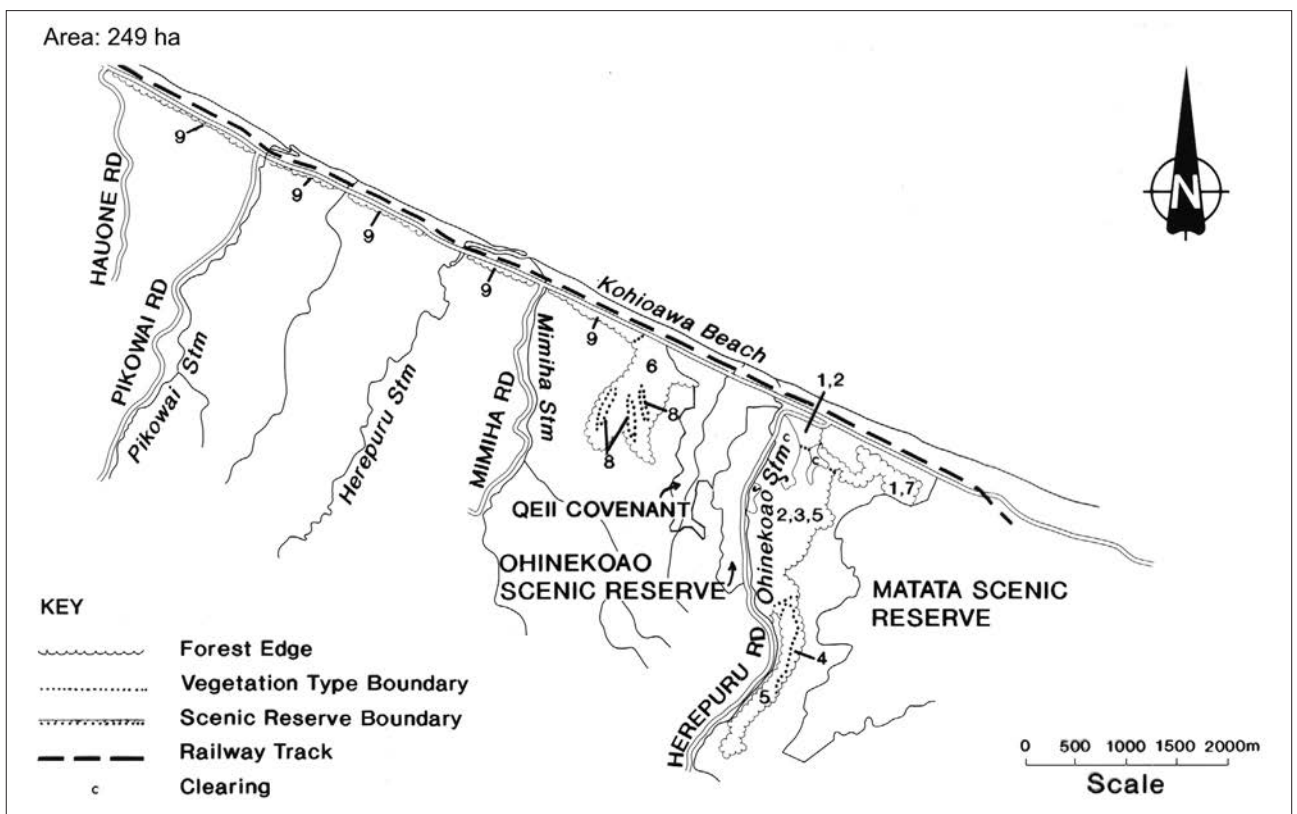
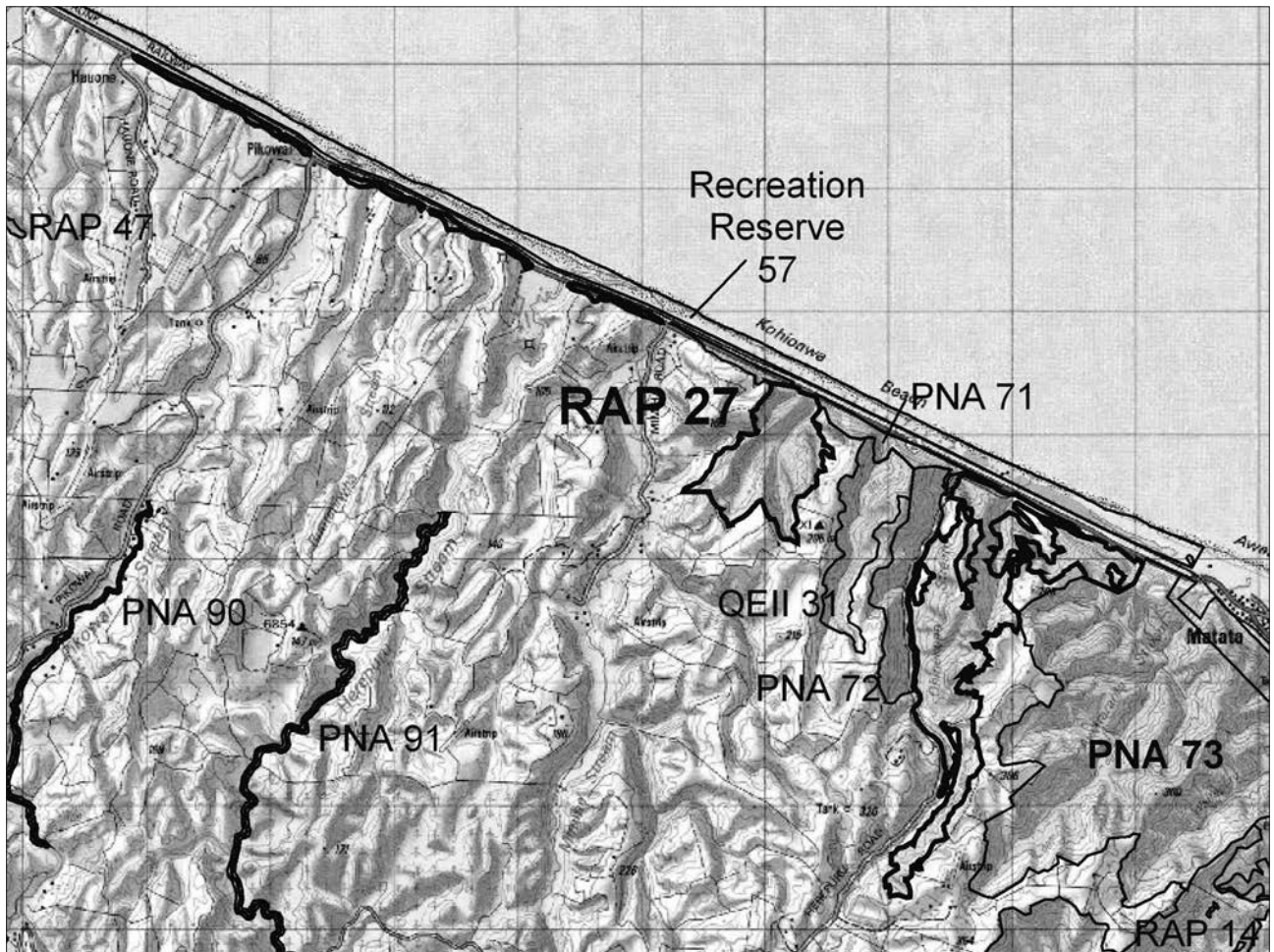
Evaluation

Representativeness	M	Viability	H
Diversity	M	Buffering	H
Naturalness	M	Size & Shape	H
Special Features	L	Threats	M

Discussion

This RAP is contiguous and complementary to an extensive tract of indigenous vegetation (Puwhenua and Gammon Conservation Areas, Omanawa Stewardship Area, and the Kaimai-Mamaku Forest Park). It contains good quality examples of lowland hard beech forest—a type not well represented in the existing reserve system (although good quality examples occur in Mangorewa Ecological Area and in RAP 7).

RAP 27 OHINEKOAO



Area	249.5 ha
Altitudinal Range	0–300 m
Grid Reference	NZMS 260 V15 375613
Land System	Matata Hills
Study Area No.	1a
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Coastal	1. Pohutukawa-kanuka forest	Escarpment
Coastal and semi-coastal	2. Rewarewa/kanuka forest	Ridge, face
Coastal and semi-coastal	3. Rewarewa/kamahi-kanuka forest	Ridge, face
Semi-coastal	4. Manuka scrub	Face
Coastal and semi-coastal	5. Northern rata/tawa-pukatea-rewarewa-mangeao forest	Gully, face
Coastal and semi-coastal	6. Tawa forest, rewarewa forest, rewarewa-mamaku treefernland	Ridge, gully
Coastal	7. Manuka-mingimingi-taumingi scrub and shrublands	Ridge, face
Coastal	8. Raupo reedland and manuka shrubland	Gully
Coastal	9. Pohutukawa forest and treeland	Cliff

Landform

Portion of the Rotoiti breccia fan bounded by steep marine sandstone cliffs rising up to 180 m high.

Vegetation

Pohutukawa forest and treeland is prominent along the coastal cliffs. Inland there is a mosaic of modified northern rata / tawa-pukatea-rewarewa-mangeao forest and secondary forest, scrub and shrublands.

Flora

Pimelea tomentosa, classed as Chronically Threatened, Serious Decline (de Lange et al. 2004) occurs in the adjacent Ohinekoao and Matata Scenic Reserves. It is also likely to occur in this RAP.

Fauna

Two snail species of interest occur in this RAP: *Liarea egea*, near its southern limit of distribution, and *Iotula microbrunneus* (Mayhill 1994).

Common forest bird species are present.

Threat / modification

Much of this RAP is grazed by domestic stock, which should be excluded. Clearance of at least one site has been considered.

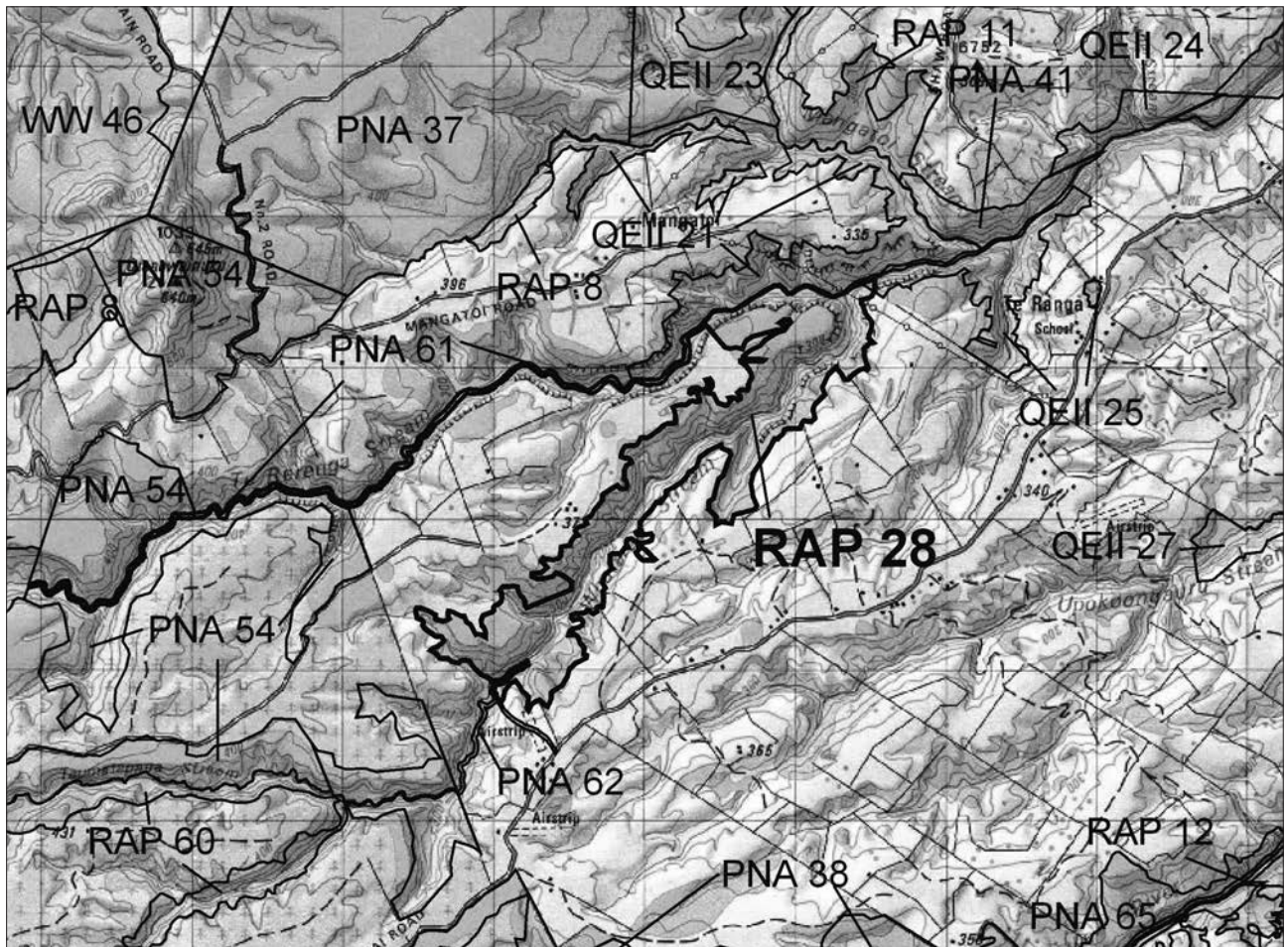
Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	M
Naturalness	M	Size & Shape	M
Special Features	M	Threats	M

Discussion

Includes the best exposed sequence of Pleistocene marine sedimentary strata in northern North Island (Kenny and Hayward 1996). Contains good quality examples of coastal and semi-coastal vegetation. It is contiguous and complementary to Matata and Ohinekoao Scenic Reserves, containing examples of wetland vegetation contiguous with forest. This RAP is part of a “significant” natural feature and landscape identified by Boffa-Miskell (1993b).

RAP 28 WHATAROA GORGE



Area: 186 ha

CONSERVATION AREA

QEII COVENANT

Te Rerenga Stream

Whataroa Stream

TE MATAI RD

KEY

- Forest Edge
- Vegetation Type Boundary
- Conservation Area

0 500 1000 1500 2000m
Scale

RAP 28 WHATAROA GORGE

Area	186.0 ha
Altitudinal Range	300–420 m
Grid Reference	NZMS 260 U15 950604
Land System	Northern Mamaku Plateau
Study Area No.	43a
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Hard beech-tawa-tanekaha-(rimu)/ tawari-kamahi-mahoe-pole rimu forest	Ridge and spur
Lowland	2. (Rimu)-(totara)/tawa-rewarewa- mangeao-hinau forest	Ridge and face
Lowland	3. Rewarewa-tanekaha/kamahi forest with local toru and mahoe	Face and plateau
Lowland	4. Manuka scrub	Face
Lowland	5. Bracken-broadleaved shrubs shrubland	Face

Landform

Steep-sided gorge through Mamaku ignimbrite south of Mt Otanewainuku. Rocky precipices occur in places and the stream flows over a rock pavement.

Vegetation

Tawa-rewarewa forest with occasional hinau and mangeao is predominant on the faces and ridges of the gorge. Emergent rimu and Hall's totara occur infrequently. Local areas of hard beech forest and hard beech-tawa-tanekaha forest occur on ridges and spurs. Canopy associates in this type include pole rimu, tawari, kamahi and mahoe. On the steeper rock faces, rewarewa-tanekaha forest about 6–8 metres tall occurs.

Fauna

This site has been classed as outstanding wildlife habitat for its large size and diversity of species present (Saunders 1983). Whio, North Island brown kiwi and bats (all classed as threatened species in Hitchmough 2002) were reported by Saunders 1983, and kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) were present until 1981 on this site (Fauna Survey Unit, unpublished 1982). North Island robin, kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), whiteheads and bellbirds have been recorded (Fauna Survey Unit, unpublished 1982).

Copper skink (*Cyclodina aenea*) occurs in this RAP (Fauna Survey Unit, Unpublished data 1982).

Cultural

There are reports of prehistoric Maori gardens at the north-eastern end of the RAP.

Threat / modification

In more accessible areas, grazing has extended down into the gorge from adjacent farmland. Much of the area is now protected under an Environment BOP land improvement agreement and several of the landowners are considering QEII covenants.

Possums and goats are present. Blackberry, barberry and pines are locally common.

Evaluation

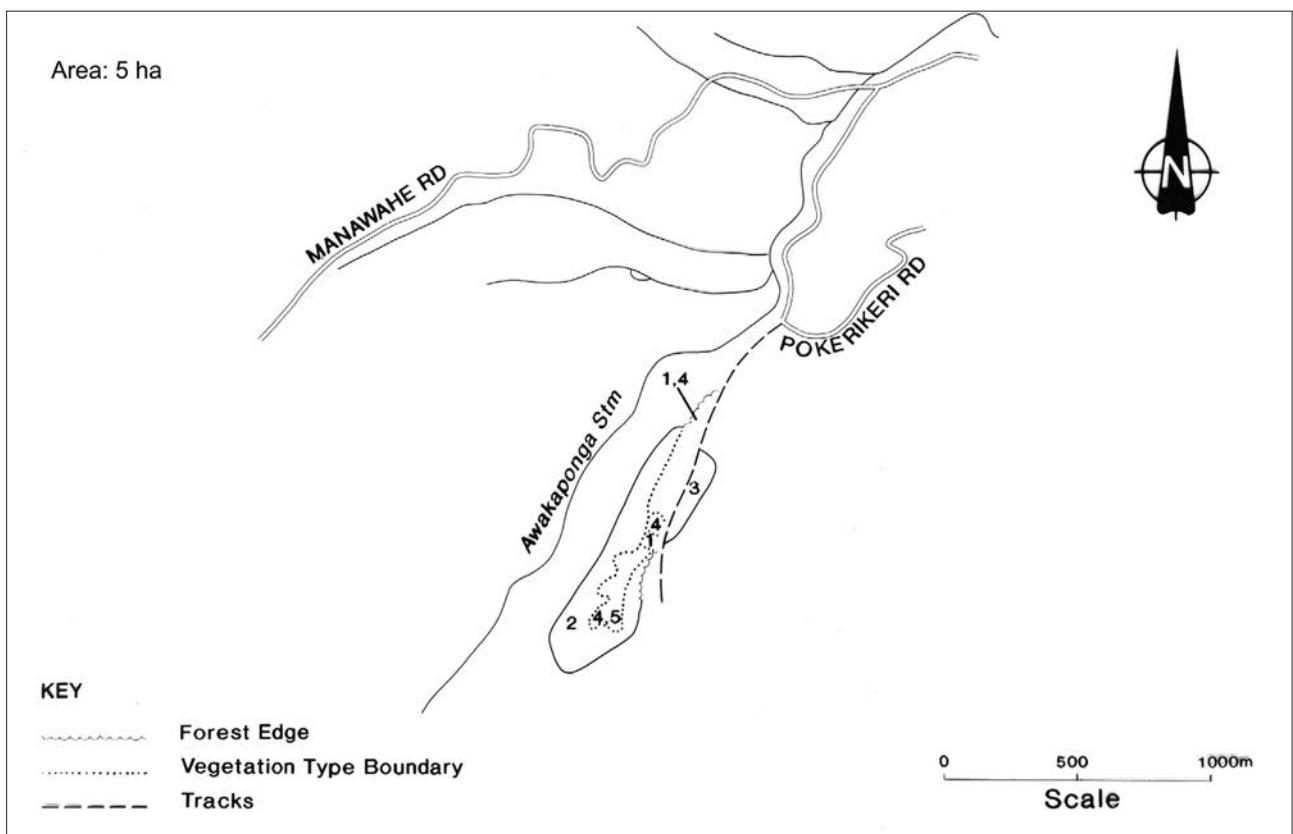
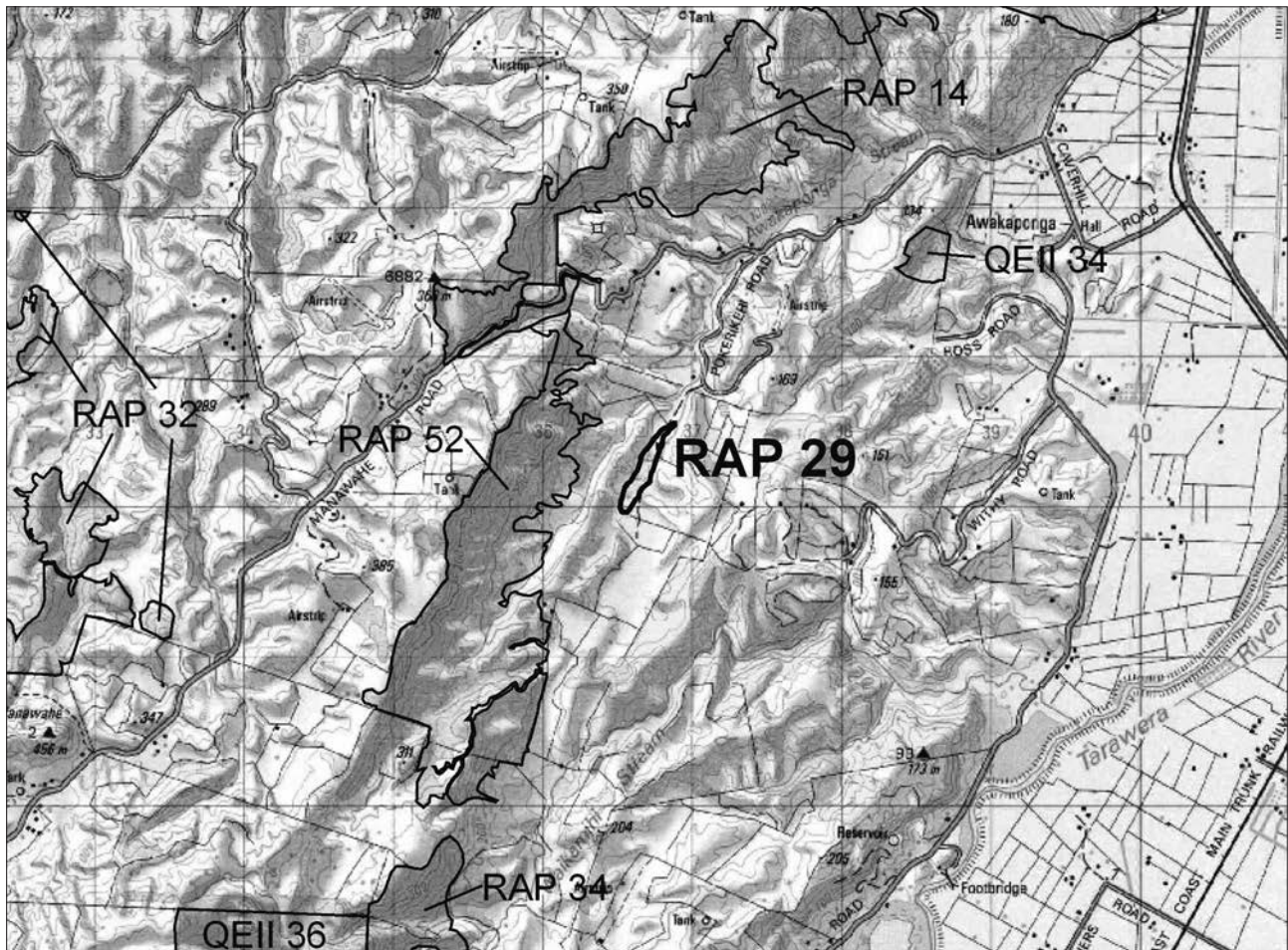
Representativeness	M	Viability	M
Diversity	H	Buffering	M
Naturalness	L	Size & Shape	M
Special Features	H	Threats	M

Discussion

This RAP has outstanding wildlife values and contains areas of representative lowland forest, including hard beech forest.

It is part of a corridor of indigenous vegetation linking Otanewainuku Conservation Area.

RAP 29 TUHUA WETLAND



RAP 29 TUHUA WETLAND

Area	5.3 ha
Altitudinal Range	100 m
Grid Reference	NZMS 260 V15 366552
Land System	Rotoiti Breccia Ignimbrite Fan
Study Area Nos.	4 & 4a
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. (Manuka)-(grey willow)-(<i>Coprosma tenuicaulis</i>)/raupo- <i>Gleichenia microphylla</i> - <i>Baumea teretifolia</i> /Sphagnum shrub-sedge-fern-reedland	Alluvial flat
Semi-coastal	2. Black wattle-rewarewa/kanuka-manuka-whauwhaupaku-mamaku scrub	Hillslope
Semi-coastal	3. Manuka-Spanish heath-bracken shrubland	Alluvial flat
Semi-coastal	4. Raupo reedland	Alluvial flat
Semi-coastal	5. (Manuka)/raupo- <i>Baumea rubiginosa</i> -swamp millet sedge-reedland	Alluvial flat

Landform

Long narrow swamp in a broad valley bottom in the Manawahe foothills. The small stream that runs through the wetland is a sidestream of the Awakaponga.

Vegetation

Raupo reedland, (manuka)/raupo-*Baumea rubiginosa*-swamp millet sedge-reedland, and (manuka)-(grey willow)-(*Coprosma tenuicaulis*)/raupo-*Gleichenia microphylla*-*Baumea teretifolia*/sphagnum shrub-sedge-fern-reedland comprise the wetland vegetation. Black wattle-rewarewa/kanuka-manuka-whauwhaupaku-mamaku scrub and manuka-Spanish heath-bracken shrubland occur on the hillslopes around the wetland.

Flora

Several species which are now relatively uncommon in the district occur at this site: maru (burr reed; *Sparganium subglobosum*), karetu (*Hierochloa redolens*), and *Lepidosperma australe*.

Fauna

North Island fernbird (At Risk, Sparse in Hitchmough 2002) occurs here. The wetland contains habitat suitable for crake, however no bird call tapes were played at this site (Fauna Survey Unit unpublished 1982).

Threat / modification

Manuka scrub adjacent to the wetland has been cleared, and the lower portion has been drained. Further modification should be prevented. Grey willow encroaching on the wetland needs control.

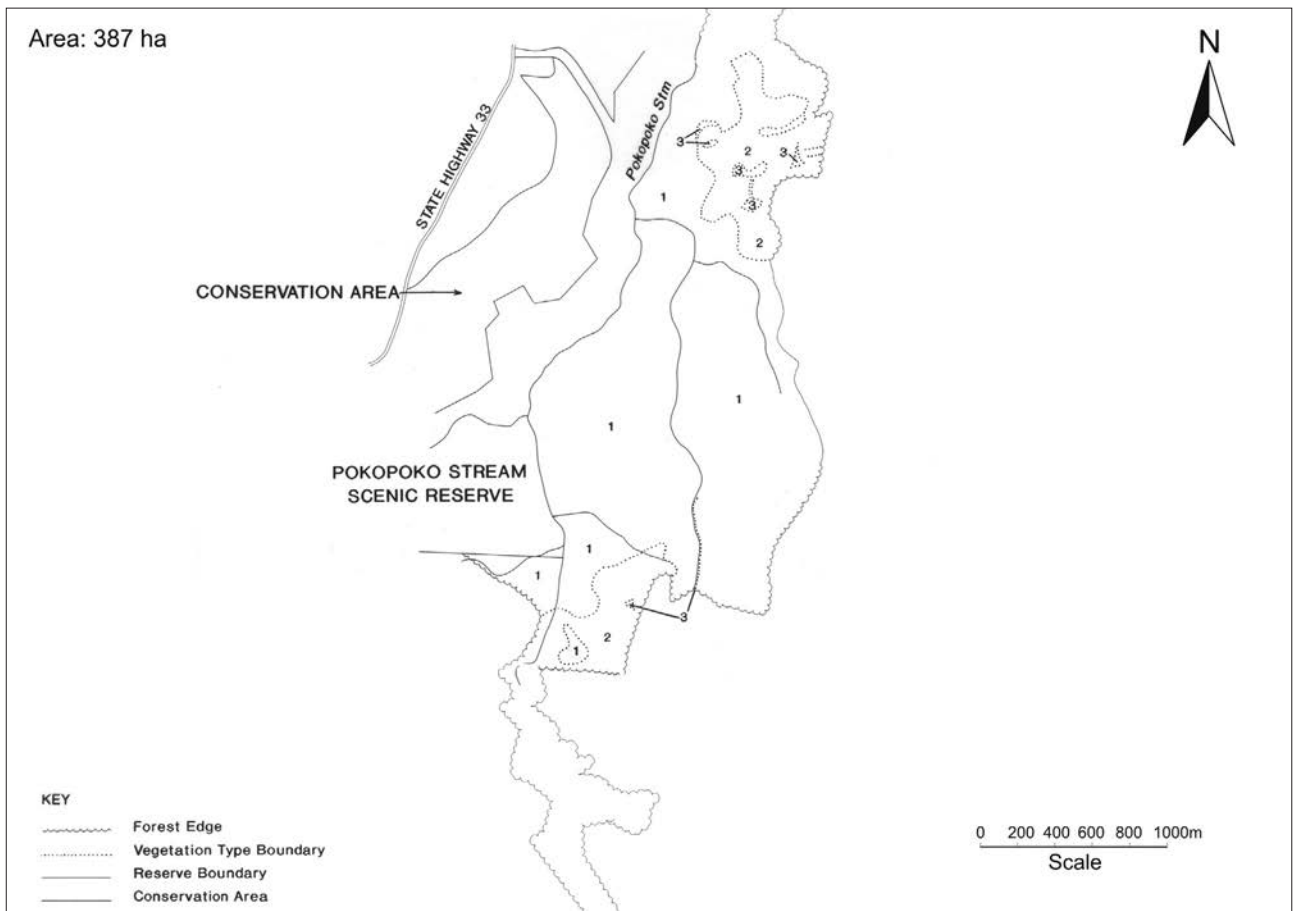
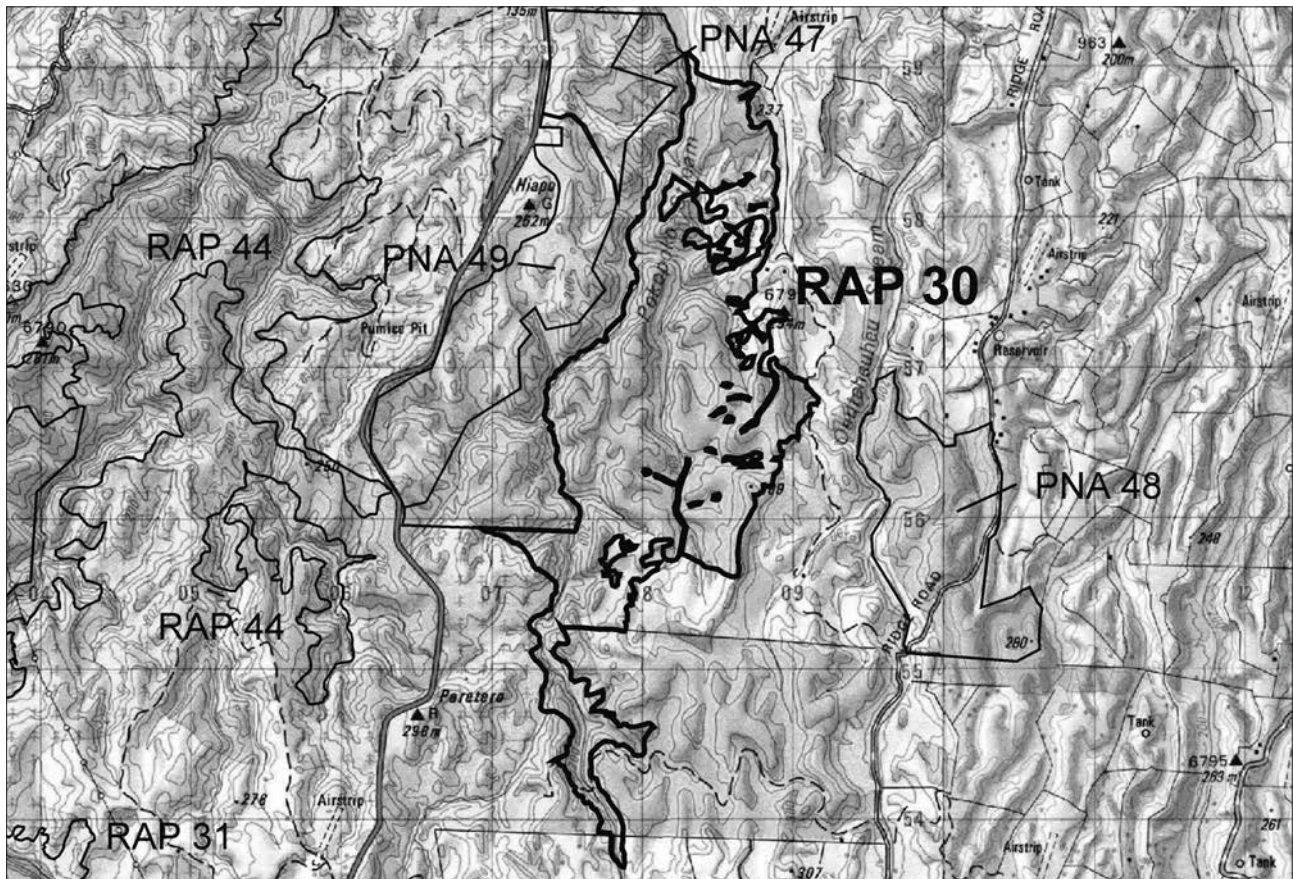
Evaluation

Representativeness	H	Viability	M
Diversity	H	Buffering	L
Naturalness	H	Size & Shape	L
Special Features	H	Threats	H

Discussion

This RAP is proposed to protect one of the few remaining wetlands in the semi-coastal zone of the district. The central portion of the wetland is still essentially intact. The secondary scrub on the hills is included as a protective buffer to the headwaters of the wetland.

RAP 30 POKOPOKO



RAP 30 POKOPOKO

Area	387.3 ha
Altitudinal Range	120–289 m
Grid Reference	NZMS 260 U15 082567
Land System	Rotoiti Breccia Ignimbrite Fan and Northern Mamaku Plateau
Study Area No.	35
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Tawa-rewarewa-kohekohe-kamahi forest (75%), rewarewa/kamahi-mangeao forest (15%), and local kanuka forest (10%)	Gully, hillslope Hillslope
Semi-coastal	2. Kanuka/manuka scrub and shrubland	Valley floor
Semi-coastal	3. Pasture	Valley floor

Landform

Part of a rhyolite breccia plateau which has eroded to form rolling hillslopes. Bounded on the western side by the steep-sided Pokopoko gully.

Vegetation

The present forest cover has been induced through logging, burning and grazing. The main type is tawa-rewarewa-kohekohe-kamahi forest with scattered pukatea, mangeao, hinau and local puriri and kamahi.

There are a few pockets of rewarewa/kamahi-mangeao forest with scattered mamaku, kohekohe and kanuka. Kanuka/manuka scrub and shrubland with local Spanish heath in the understorey occurs locally.

The site is grazed throughout and there are tracks along the valley bottoms with rank pasture.

Flora

No species of significance were recorded during the survey.

Fauna

Common forest birds present including kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), pied tit and grey warbler (Fauna Survey Unit, unpublished report 1982).

A land snail (*Liarea egea*) which occurs in the nearby Roydon Downs Scenic Reserve near its southern limit (Mayhill 1994) may occur in this RAP.

Threat / modification

Much of the surrounding land has been planted in pines and this RAP may be threatened by further development. It is heavily grazed by domestic stock, threatening long-term survival. Stock should be excluded, and feral goats which occur in moderate numbers should be removed.

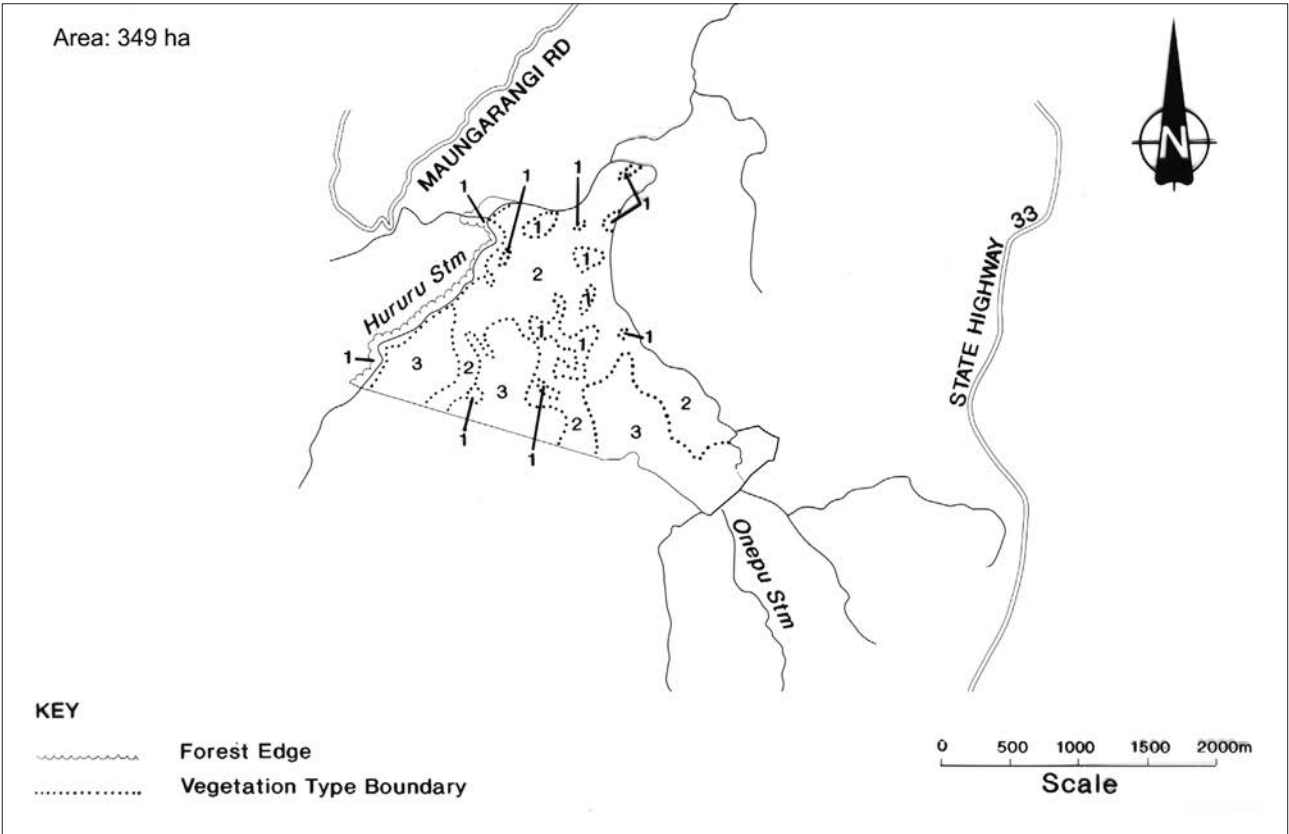
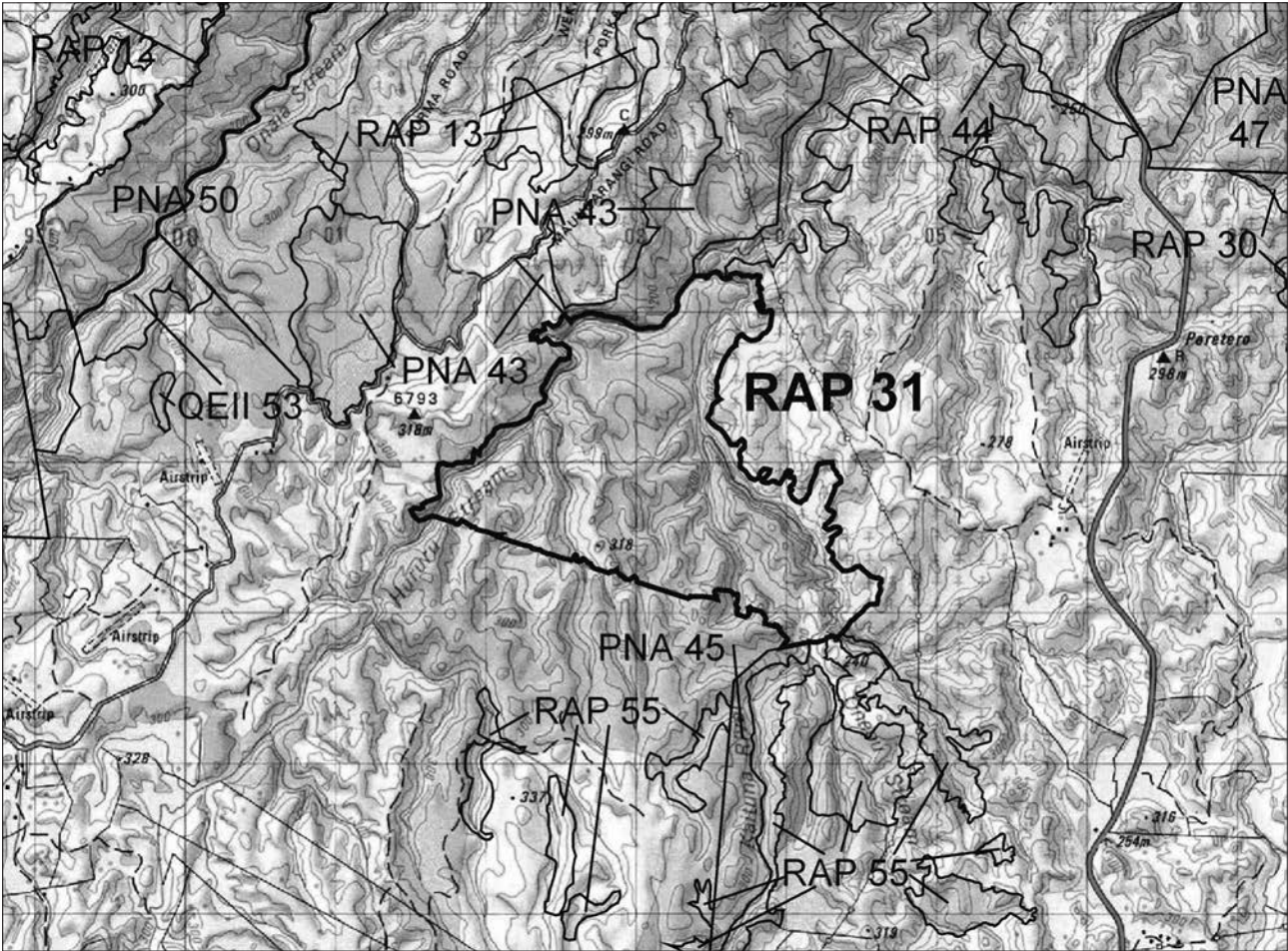
Evaluation

Representativeness	M	Viability	M
Diversity	L	Buffering	M
Naturalness	L	Size & Shape	H
Special Features	L	Threats	H

Discussion

This RAP was selected because it is a relatively large representative example of the remaining semi-coastal indigenous vegetation of the district which is under-represented in the existing reserve system in the district. It adjoins Pokopoko Scenic Reserve (134 ha).

RAP 31 TE IRINGA



RAP 31 TE IRINGA

Area	349.5 ha
Altitudinal Range	160–320 m
Grid Reference	NZMS 260 U15 030540
Land System	Northern Mamaku Plateau
Study Area No.	32
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Rewarewa-tawa-kamahi forest	Gully
Semi-coastal	2. Rewarewa/kamahi-kanuka-mamaku forest	Ridge, hillslope
Semi-coastal	3. Manuka-tutu-Spanish heath-bracken-karamu scrub and shrubland ⇔ rewarewa/mahoe-mamaku forest	Hillslope, ridge Gully, hillslope

Landform

This RAP comprises rolling hillslopes on part of the Rotoiti breccia fan, falling to deeply incised streams flowing shallow and rapid over Mamaku ignimbrite rock pavements. Waterfalls are common.

Vegetation

Secondary forest, scrub and shrubland, induced following repeated burning, covers much of this RAP with small pockets of remnant tawa-dominated forest. The secondary vegetation comprises a mosaic of rewarewa/kamahi-kanuka-mamaku forest, rewarewa-tawa-kamahi forest, manuka-tutu-Spanish heath-bracken-karamu scrub and shrubland, and rewarewa/mahoe-mamaku forest. Other species present include makomako, mingimingi, putaputaweta and mangeao. Kiokio and *Gabnia* are common on the steeper faces. Rewarewa, kamahi, mangeao, pukatea, Hall's totara, tawari, hinau and emergent rimu occur in association with the tawa. Local small tanekaha stands on spurs and ridges occur at the north end of the RAP.

Flora and Fauna

No species of significance were recorded.

Threat

This RAP is threatened by clearance for conversion to exotic pine plantations.

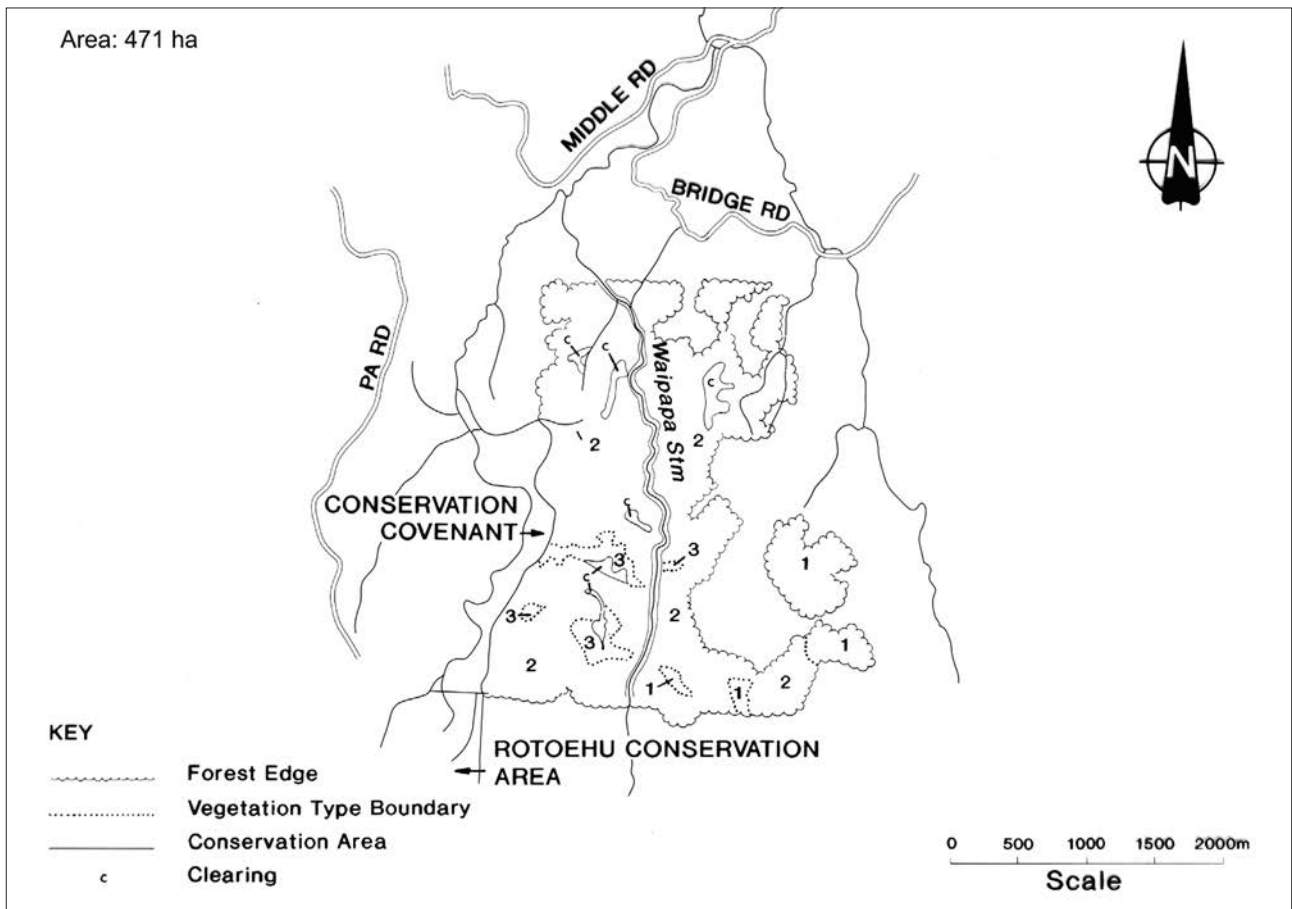
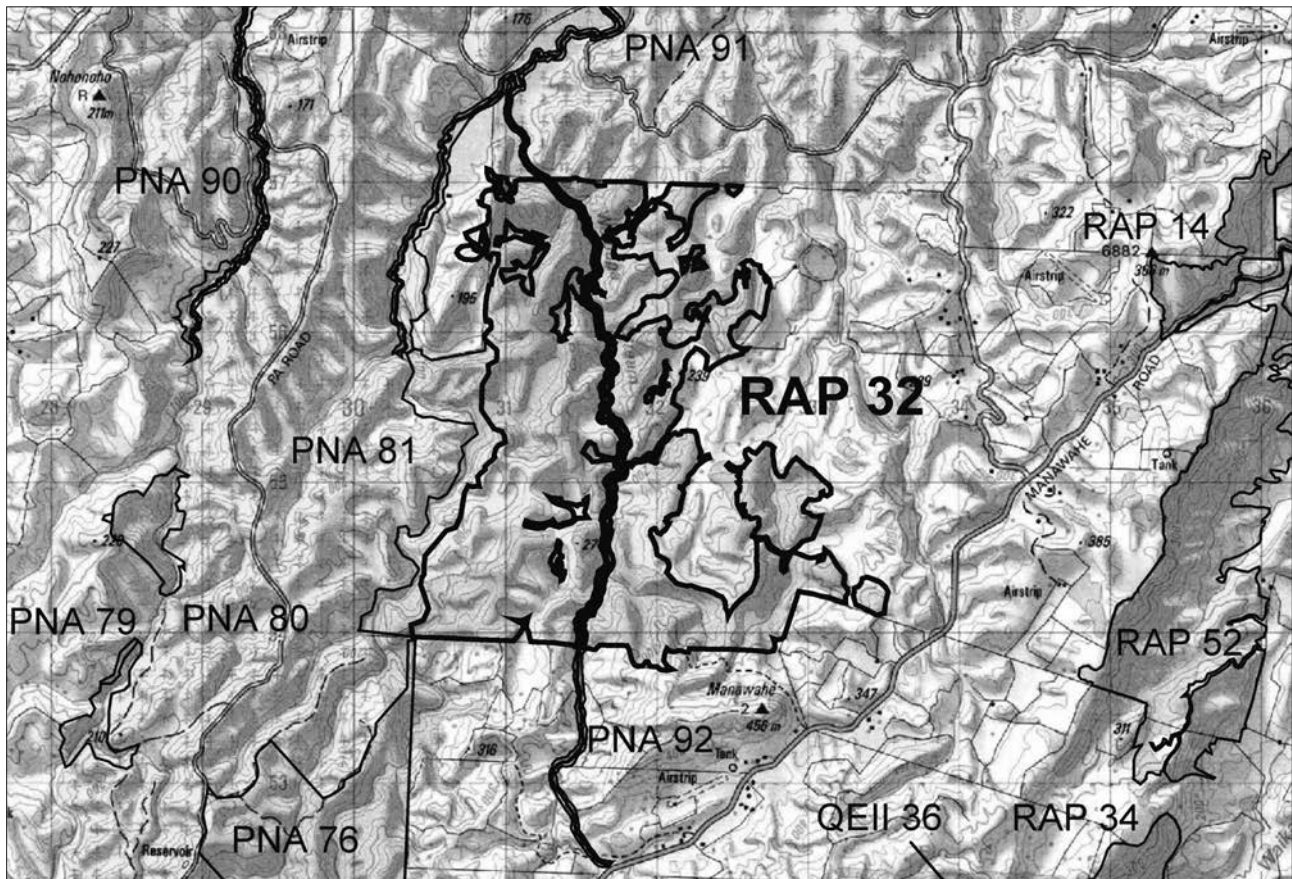
Evaluation

Representativeness	H	Viability	H
Diversity	H	Buffering	H
Naturalness	M	Size & Shape	H
Special Features	L	Threats	H

Discussion

This RAP contains representative, good quality examples of secondary vegetation in the semi-coastal zone of the ecological district. Vegetation in this zone is under-represented in the existing reserve system.

RAP 32 WAIPAPA STREAM



RAP 32 WAIPAPA STREAM

Area	471.0 ha
Altitudinal Range	100–300 m
Grid Reference	NZMS 260 V15 315555
Land System	Matata Hills; Rotoiti Breccia Ignimbrite Fan; and Otuhepo Hills
Study Area No.	11
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Tawa-mangeao-rewarewa forest	Low rolling hillslope
Semi-coastal	2. Rewarewa/kanuka forest	Low rolling hillslope
Semi-coastal	3. Manuka scrub	Valley floor and lower hillslope

Landform

Rolling hillslopes forming the erosion surface of the Rotoiti Breccia fan.

Vegetation

Secondary forest dominated by rewarewa and kanuka covers much of this site with small pockets of modified tawa forest. Manuka scrub and shrubland-pasture occur in some valley bottoms.

Flora

No significant species were recorded.

Fauna

Common forest bird species occur in this RAP.

Threat / modification

This site is regularly grazed. To ensure the long term survival of this forest, stock should be excluded. Clearance for firewood and farm development has taken place, making protection a high priority.

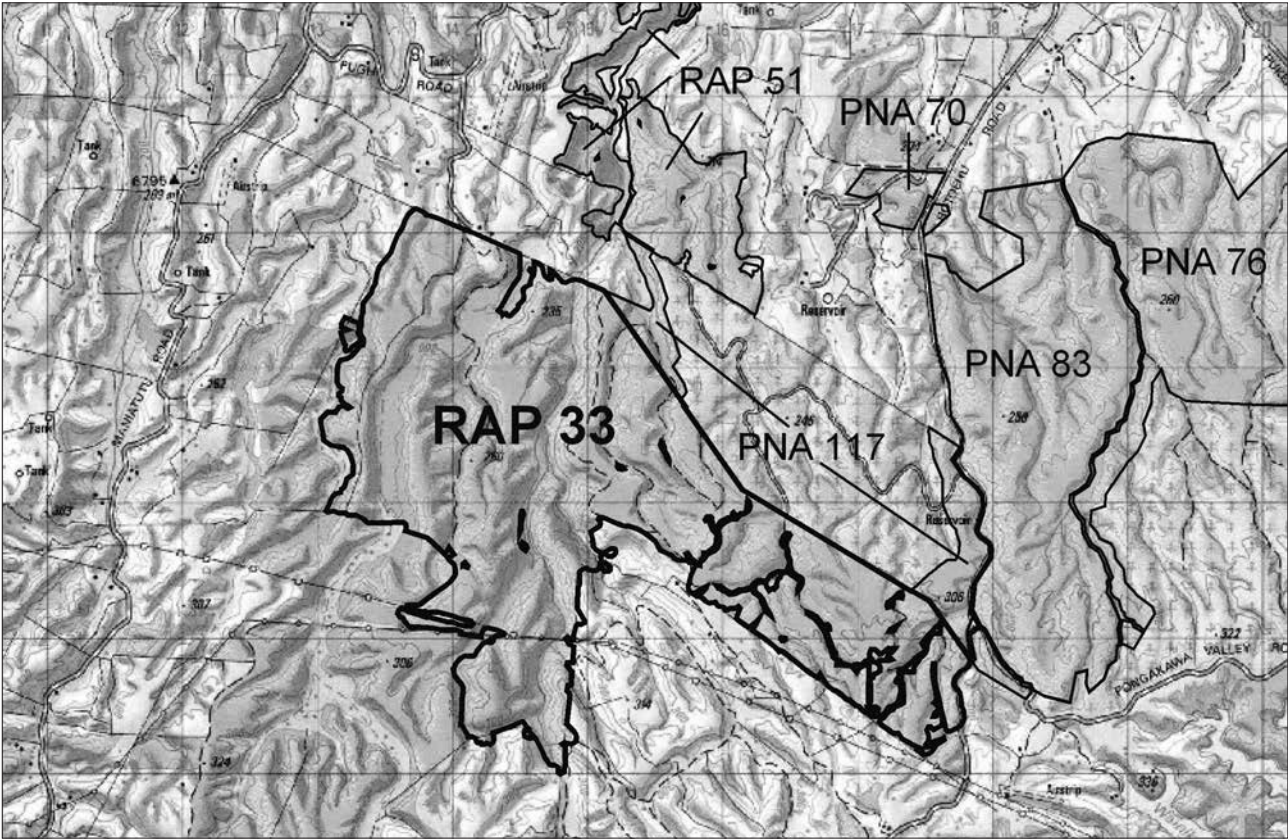
Evaluation

Representativeness	H	Viability	H
Diversity	L	Buffering	M
Naturalness	M	Size & Shape	H
Special Features	L	Threats	H

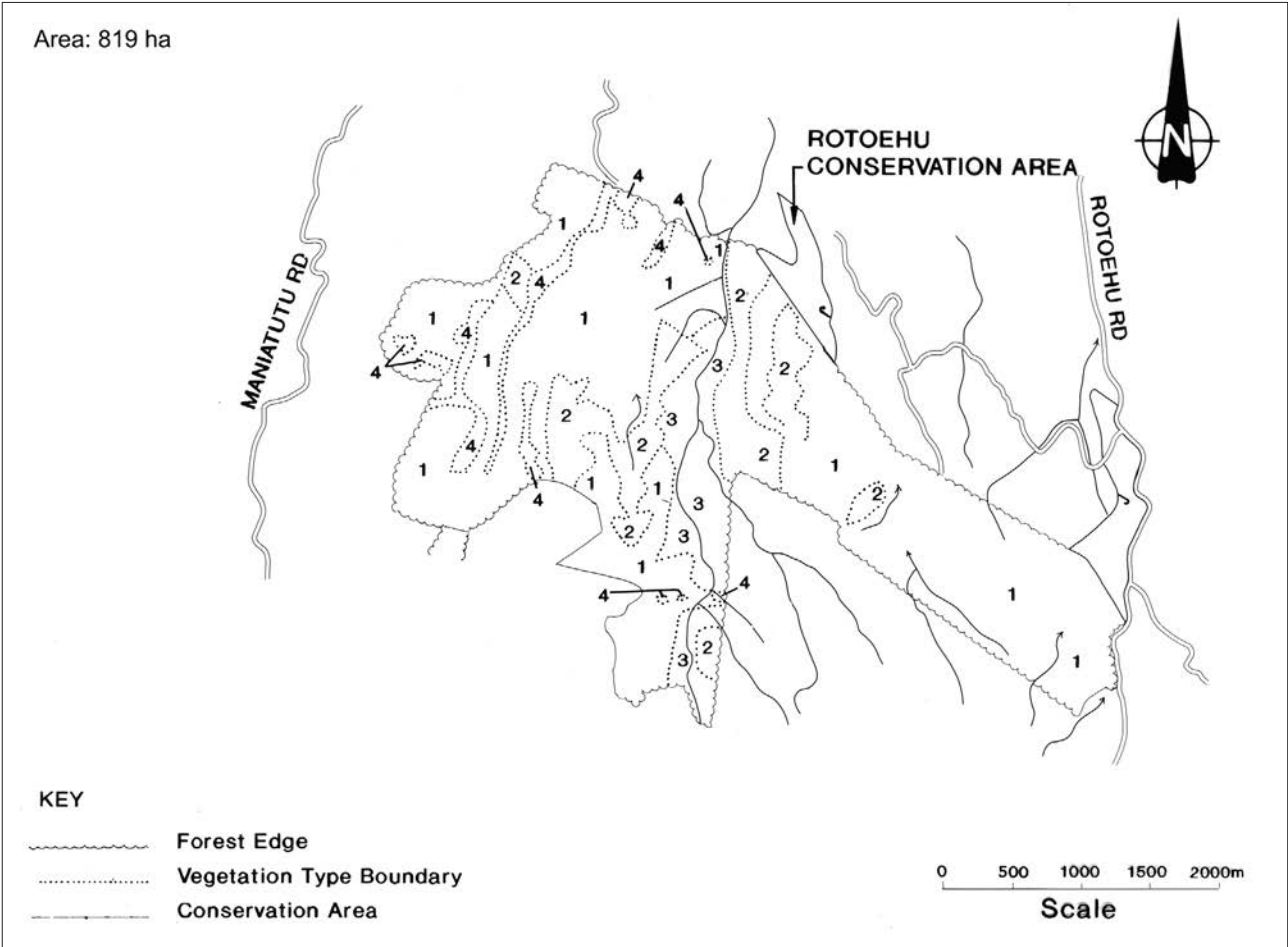
Discussion

This site contains a large representative example of secondary semi-coastal vegetation straddling Rotoiti Breccia and Matahina ignimbrite on the eastern side of the district. Semi-coastal vegetation is under-represented in the reserve system of the district.

RAP 33 TOKERAU



Area: 819 ha



RAP 33 TOKERAU

Area	819.9 ha
Altitudinal Range	200–300 m
Grid Reference	NZMS 260 V15 140525
Land System	Rotoiti breccia ignimbrite fan
Study Area No.	12
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Tawa-mangeao-rewarewa-pukatea forest	Rolling hillslope
Semi-coastal	2. Rewarewa/kamahi forest	Rolling hillslope
Semi-coastal	3. Tawa-kamahi-tawari forest (from Nicholls 1965d)	Gully hillslope
Semi-coastal	4. Bracken-matata-(blackberry)-(gorse) shrub-fermland	Valley floor, broad ridge crest

Landform

Rolling breccia plateau broken by long, narrow, north-running valleys with flat floors.

Vegetation

A mosaic of logged tawa-dominant forest and secondary rewarewa/kamahi forest. The latter forest type contains local pole rimu and has probably developed following pre-European burning.

Flora

No significant species were recorded during the survey.

Fauna

The North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) occurs at this site. Other forest bird species present include North Island rifleman, kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), whitehead and pied tit (Owen 1994).

Threat / modification

Much of this RAP has been heavily logged. However the areas of rewarewa/kamahi forest (comprising 10–15% of the RAP) contained no merchantable trees and were not logged.

Winter grazing of domestic stock occurs on the western side of the RAP; stock should be excluded from the RAP.

Exotic forest plantations are being considered for part of the RAP.

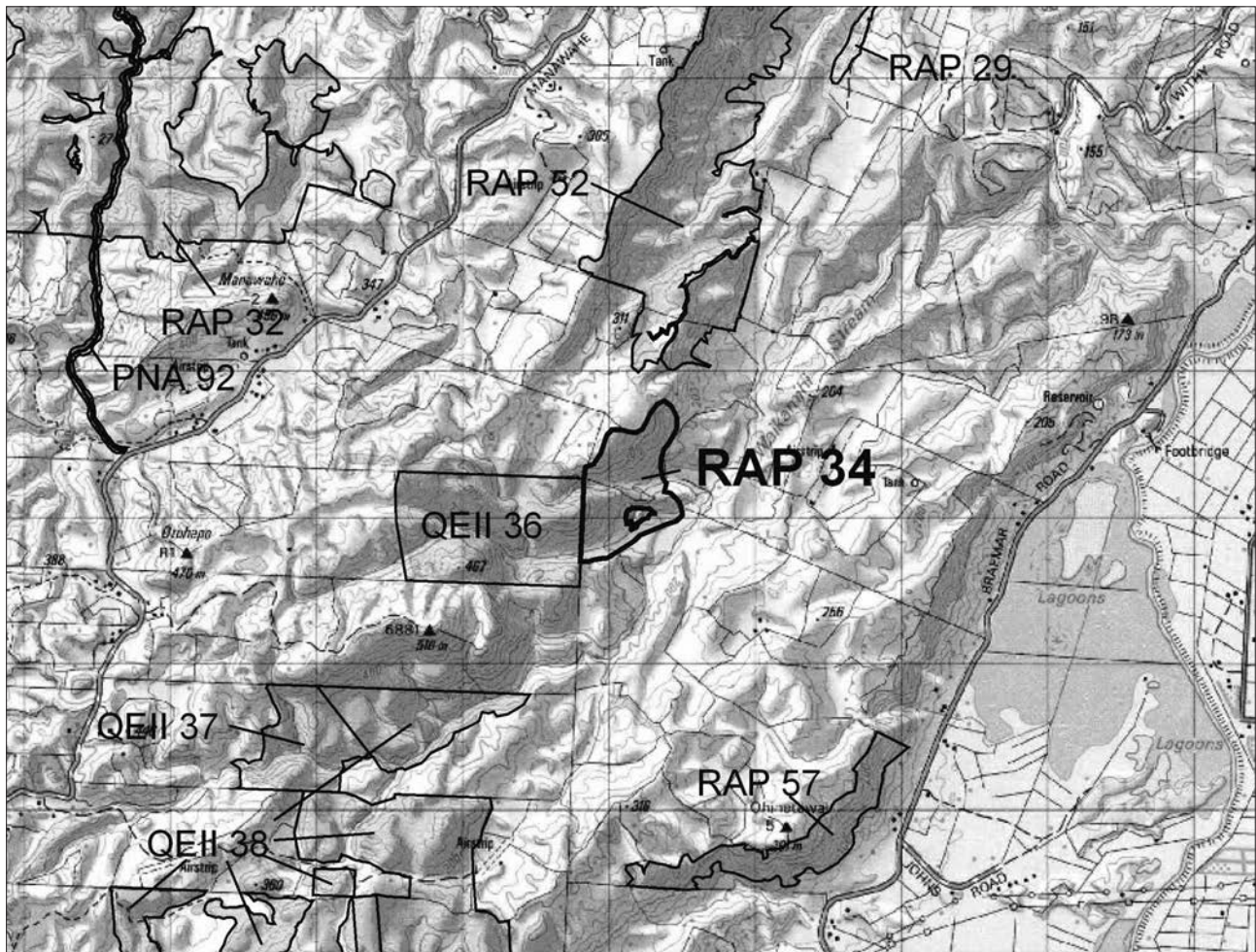
Evaluation

Representativeness	M	Viability	M
Diversity	M	Buffering	M
Naturalness	M	Size & Shape	M
Special Features	M	Threats	H

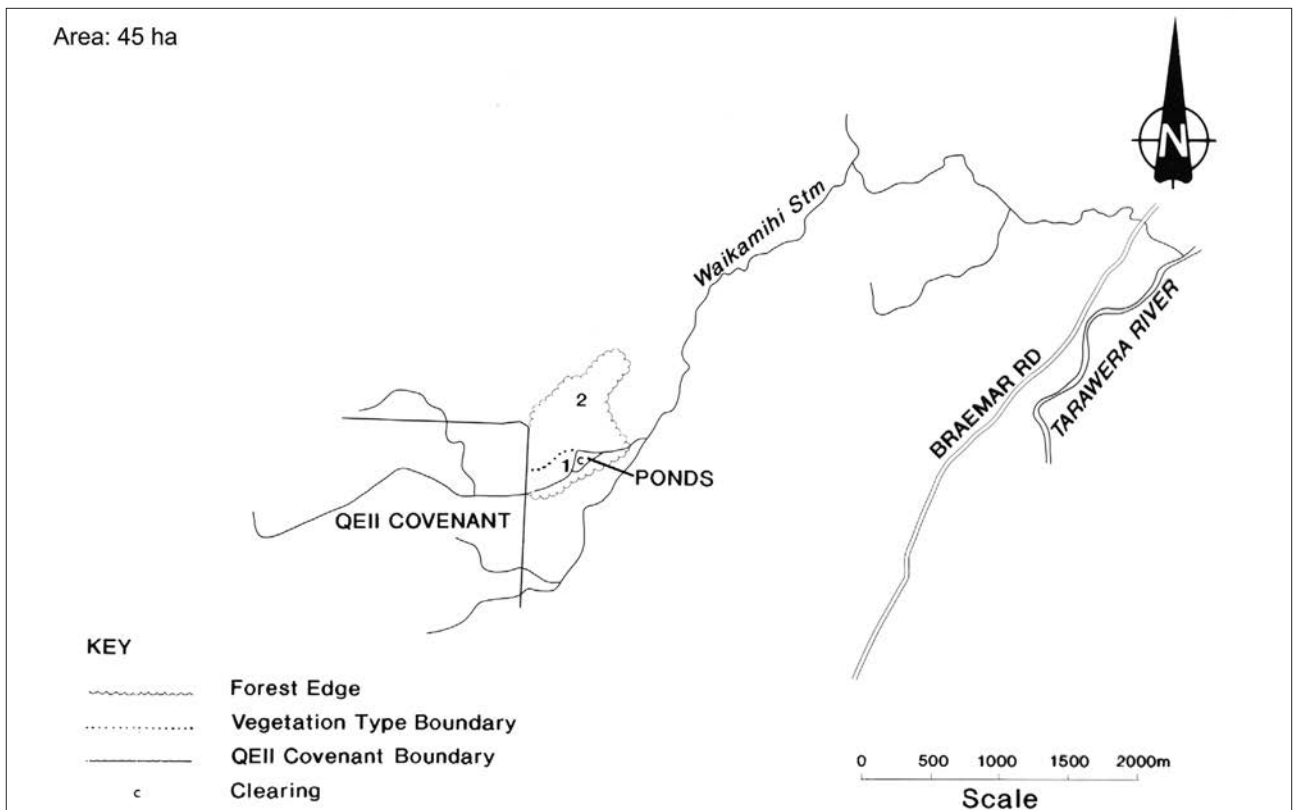
Discussion

Although modified, this site is relatively large and extends the available habitat for the North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002). It contains semi-coastal vegetation, which is under-represented in the existing reserve system of the district.

RAP 34 OTUHEPO



Area: 45 ha



RAP 34 OTUHEPO

Area	45.0 ha
Altitudinal Range	180–340 m
Grid Reference	NZMS 260 V15 350524
Land System	Otuhepo Hills
Study Area No.	6
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Tawa-pukatea-rewarewa forest	Gentle hillslope
Semi-coastal	2. Tawa-rewarewa-mangeao-mamaku forest	Hillslope

Landform

An outcrop of andesitic rock forming dissected hill country with relatively flat toeslopes. Two artificial ponds occur at the eastern side.

Vegetation

This RAP contains tawa-rewarewa-mangeao-mamaku forest on the steeper hillslopes with tawa-pukatea-rewarewa forest on the flatter toeslopes. There are occasional hinau and mamaku with a few emergent rimu.

Flora

No significant species were recorded during the survey.

Fauna

North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) (reported during current survey), kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) and whitehead (Fauna Survey Unit, unpublished 1982) are present in addition to common forest birds. The threatened North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) occur in the adjoining forest (Hudson 1993).

Threat / modification

This site has been logged for rimu and kohekohe, and periodically grazed in the past, but stock have been excluded for more than 10 years.

Evaluation

Representativeness	H	Viability	H
Diversity	L	Buffering	M
Naturalness	H	Size & Shape	H
Special Features	M	Threats	L

Discussion

This RAP is part of a relatively large and intact representative example of vegetation (protected by QE II Covenant) and is an extension of habitat for the endangered North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002).

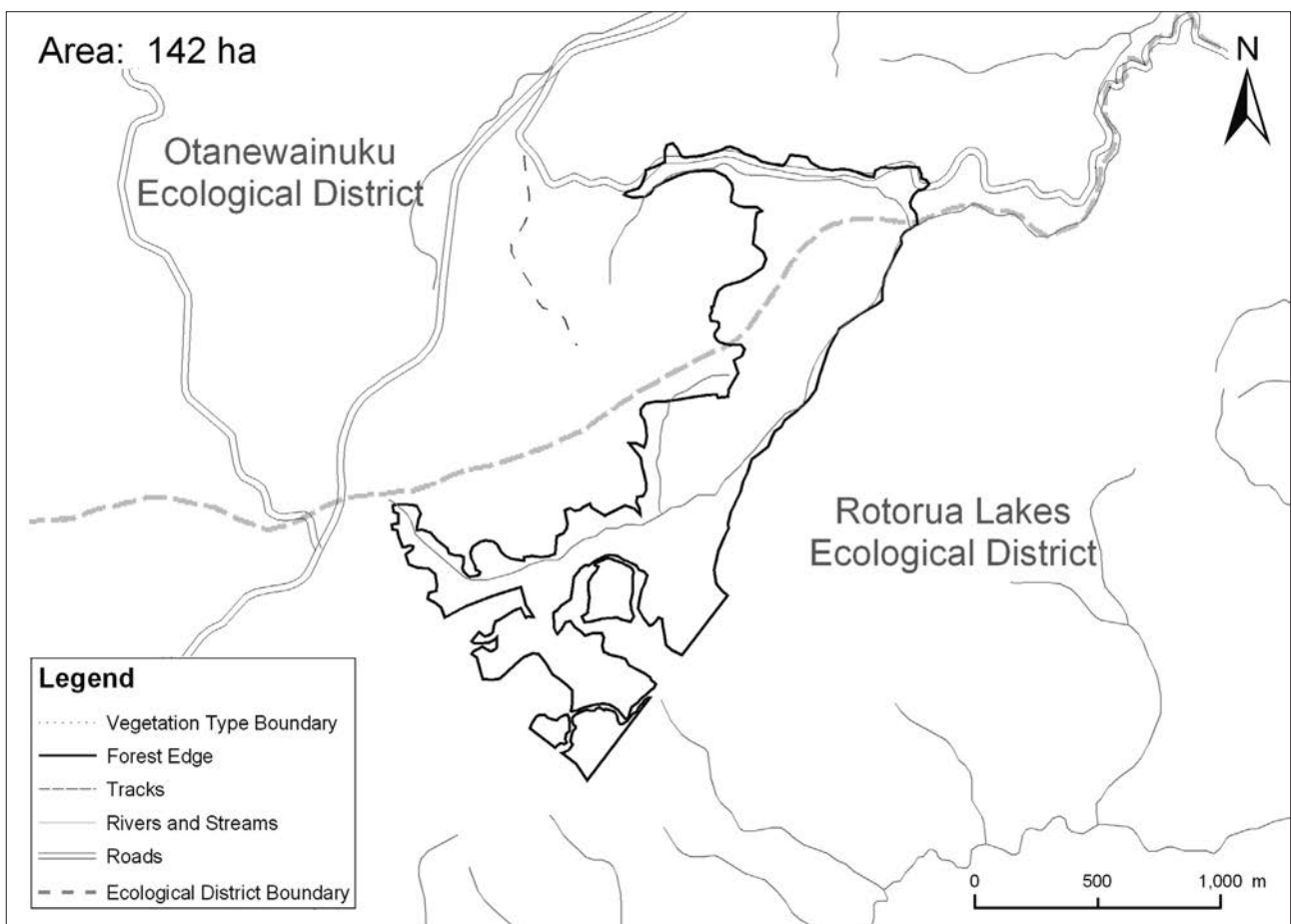
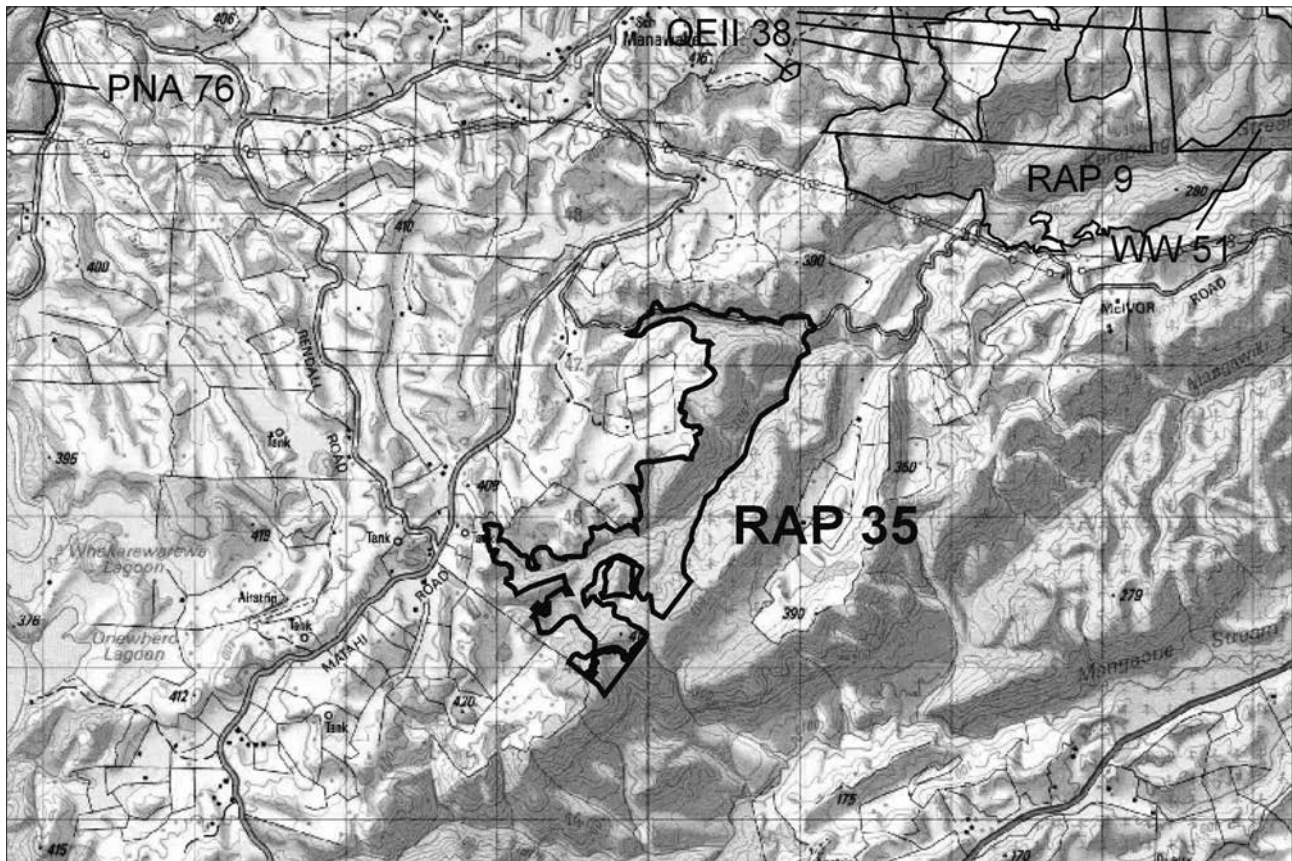
It is part of an almost unbroken vegetation sequence stretching from the south-eastern inland boundary of the district to the coast. This vegetation sequence includes Matata Scenic Reserve, several QE II covenants and the coastal sand dune reserves.

The RAP contains examples of vegetation on a small andesitic land system (Otuhepo Hills) which are surrounded by the large ignimbrite and breccia plateaus characteristic of the district.

There is only one small (c.5ha) protected natural area on this land system in the ecological district and this is the only RAP in this land system.

This area is part of a highly visible and sensitive landscape adjacent to the Rangitaiki Plains which was identified as a significant natural feature and landscape for the Whakatane District Council (Boffa-Miskell 1993b).

RAP 35 MANGAONE EXTENSION



RAP 35 MANGAONE EXTENSION

Area	141.9 ha
Altitudinal Range	300–380 m
Grid Reference	NZMS 260 V15 296455
Land System	Rotoiti Breccia Ignimbrite Fan
Study Area Nos.	152 a &b
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	Tawa-rewarewa forest	Hillslope

Landform

Relatively steep hillslopes along the true left of the upper Karaponga Stream.

Vegetation

This RAP is predominantly tawa-rewarewa forest with occasional mangeo, hinau and kohekohe. Several emergent rimu and northern rata were noted. Mamaku, kanono, mahoe and pate are frequent in gullies and small areas of pole rimu occur in canopy gaps, mainly on the ridges. This area was logged for podocarps some 30 years ago and logging tracks are still visible in places.

Flora

No species of note were recorded.

Fauna

During a recent survey for the North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) in the Manawahe district, one bird was observed in this RAP (Hudson 1993). There are several records of North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) for this area. Two New Zealand falcon (Acutely Threatened, nationally vulnerable in Hitchmough 2002) and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), were recorded during the site survey.

Threat / modification

Some grazing by domestic stock occurs, particularly on the forest margins where extensive areas are unfenced. Possums, goats, deer and wallabies are all known to occur in this area.

Evaluation

Representativeness	M	Viability	H
Diversity	L	Buffering	M

Naturalness	M	Size & Shape	H
Special Features	H	Threats	L

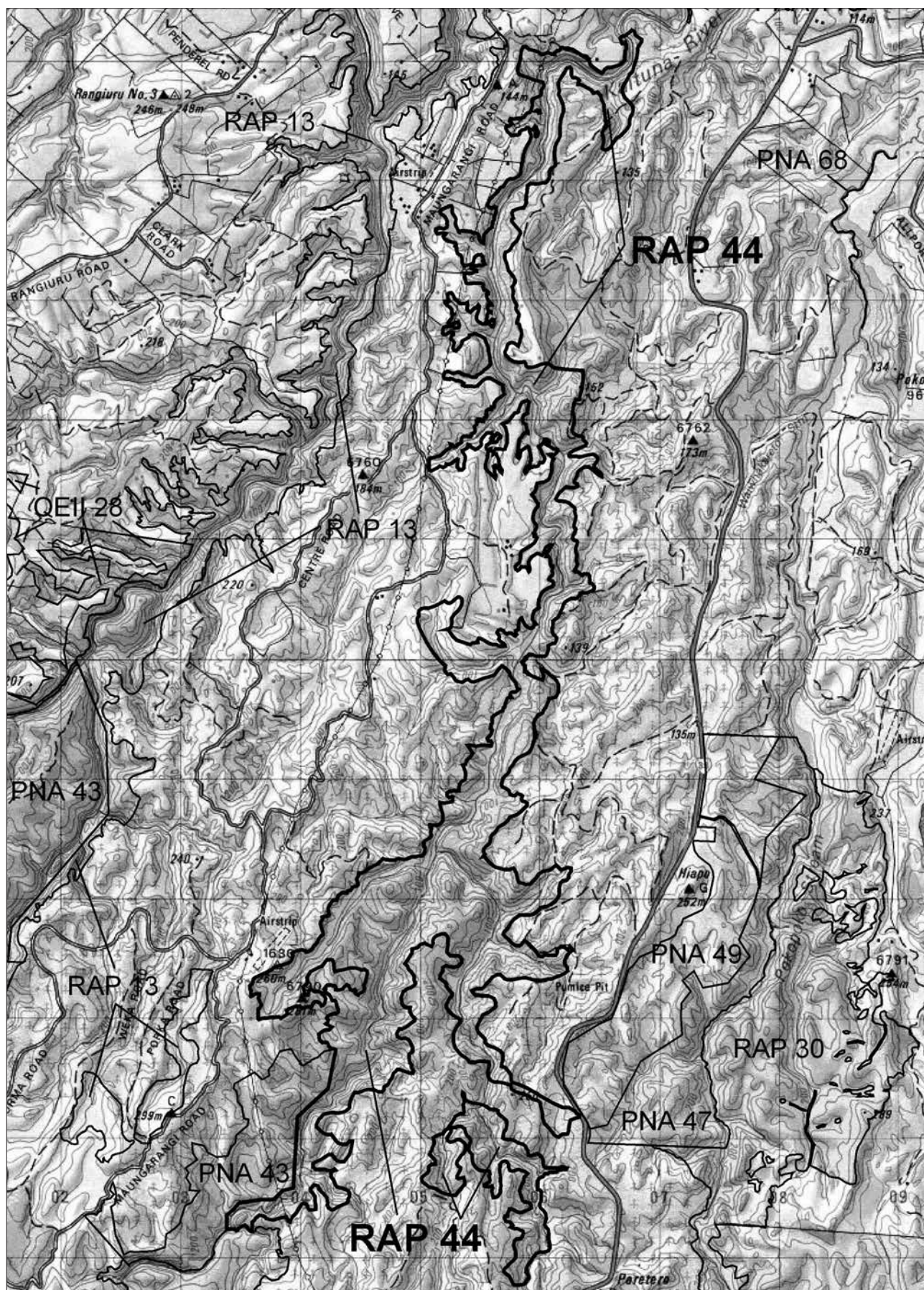
Discussion

This area is proposed as a RAP as it forms part of the territory for at least one kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) and adjoins the Mangaone Scenic Reserve, which in turn forms part of a very large tract of indigenous forest (about 550 ha) on the Rotoma hills. Part of this RAP is in the Rotorua Lakes Ecological District.

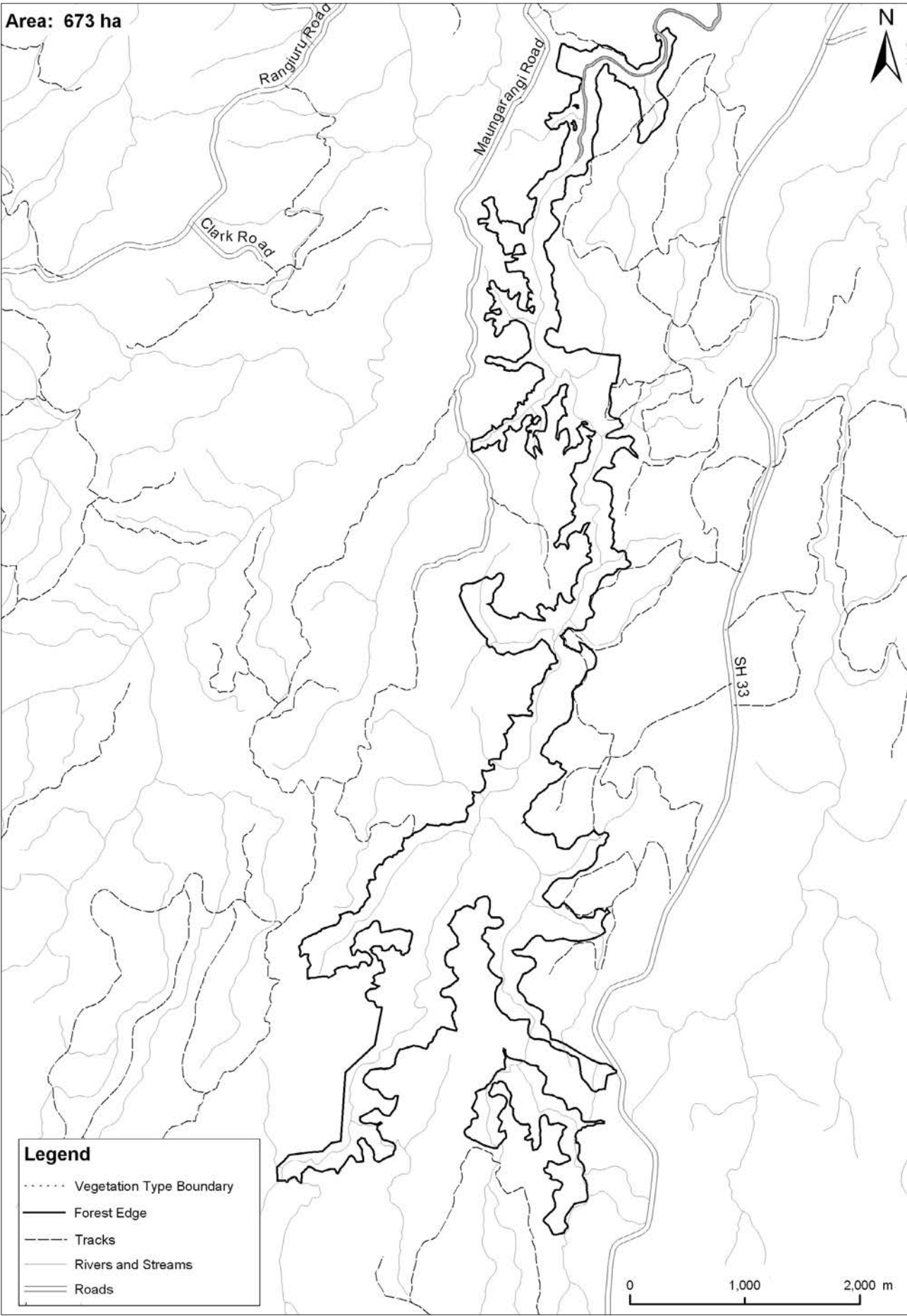
References

Gosling 1993a & b.

RAP 44 KAITUNA RIVER



RAP 44 KAITUNA RIVER



RAP 44 KAITUNA RIVER

Area	672.9 ha
Altitudinal Range	50–281 m
Grid Reference	NZMS 260 U15 058597
Land System	Northern Mamaku Plateau
Study Area No.	37
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi coastal	Rewarewa/kanuka-kamahi-(mangeao)-(titoki) forest ⇔ Rewarewa-kanuka-kamahi-kiokio-mamaku shrubland	Steep hillslope and gorge face, ridge
Semi coastal	Podocarp/tawa-broad-leaved species forest	Alluvial terrace, gully
Semi coastal	Tanekaha forest	Spur

Landform

The deeply incised gorge of the Kaituna River draining Lakes Rotoiti and Rotorua.

Vegetation

Kanuka-kamahi forest and shrubland with occasional mangeao and titoki and scattered emergent rewarewa covers the steep hillslopes and ridges. Rewarewa is more frequent on the drier sites while kamahi is predominant on moister sites. Tawa-kamahi forest with emergent podocarps occurs on river terraces and in gullies in the upper reaches of the river, and tanekaha on steep spurs.

Flora

Marattia salicina (classed as Chronically Threatened, Serious Decline, de Lange *et al.* 2004) is reported to be present at this site (Grant Matheson pers. comm. 1994).

Fauna

Common forest bird species include kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), whitehead, pied tit and North Island robin (Fauna Survey Unit, unpublished 1982). Whio (Acutely Threatened, Nationally Endangered in Hitchmough 2002) occur in the Kaituna River gorge just upstream of this RAP; North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) occur in low numbers within the RAP (P. Jansen pers. comm. 1994). This site is ranked as moderate-high wildlife habitat (Saunders 1983).

Threat / modification

Much of the forest at this site has apparently developed since burning in Polynesian times (Nicholls 1965b). Scattered wilding pines occur throughout and black wattle and gorse are locally common. Feral goats are present, particularly in the lower reaches of the river, and should be eliminated.

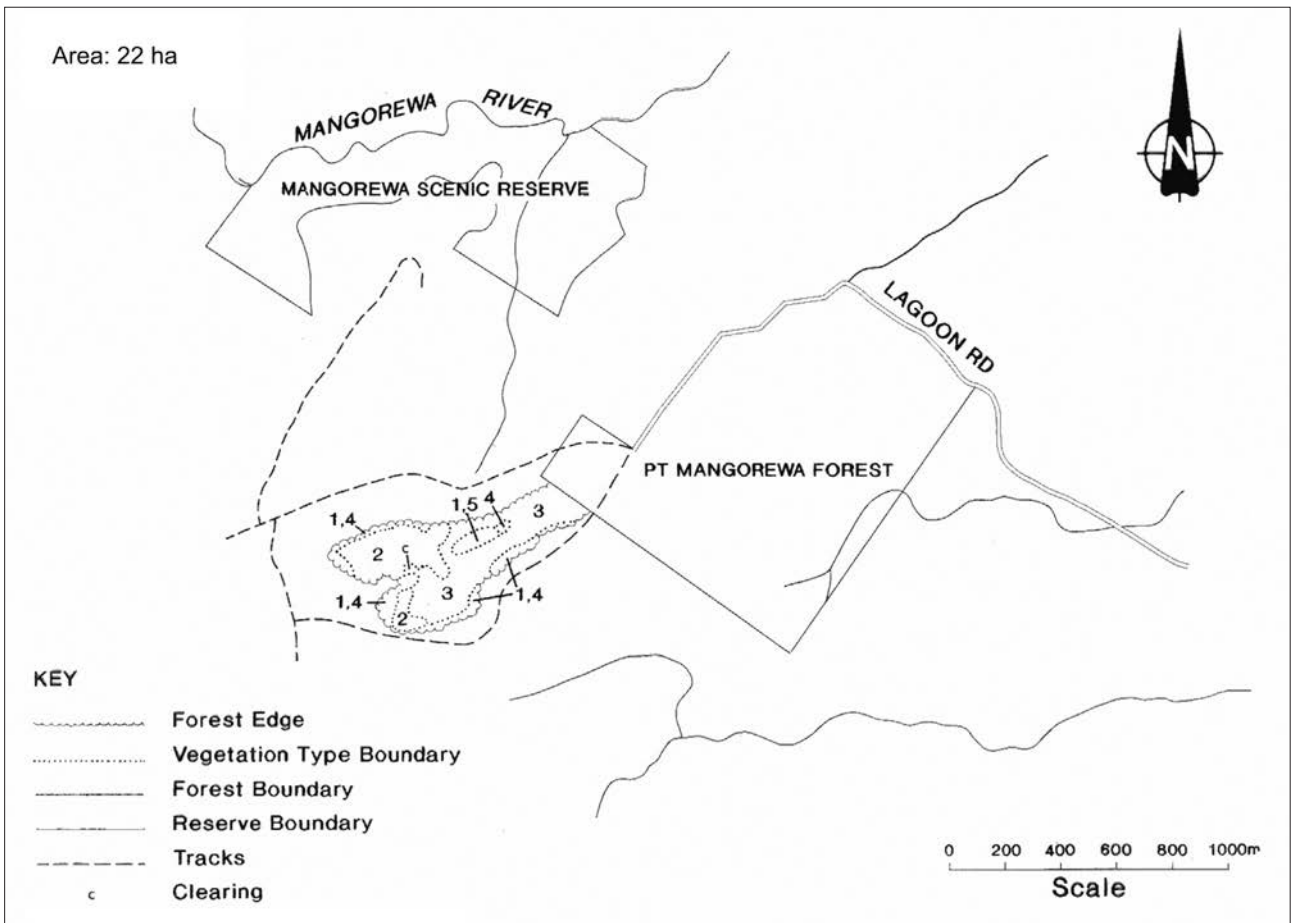
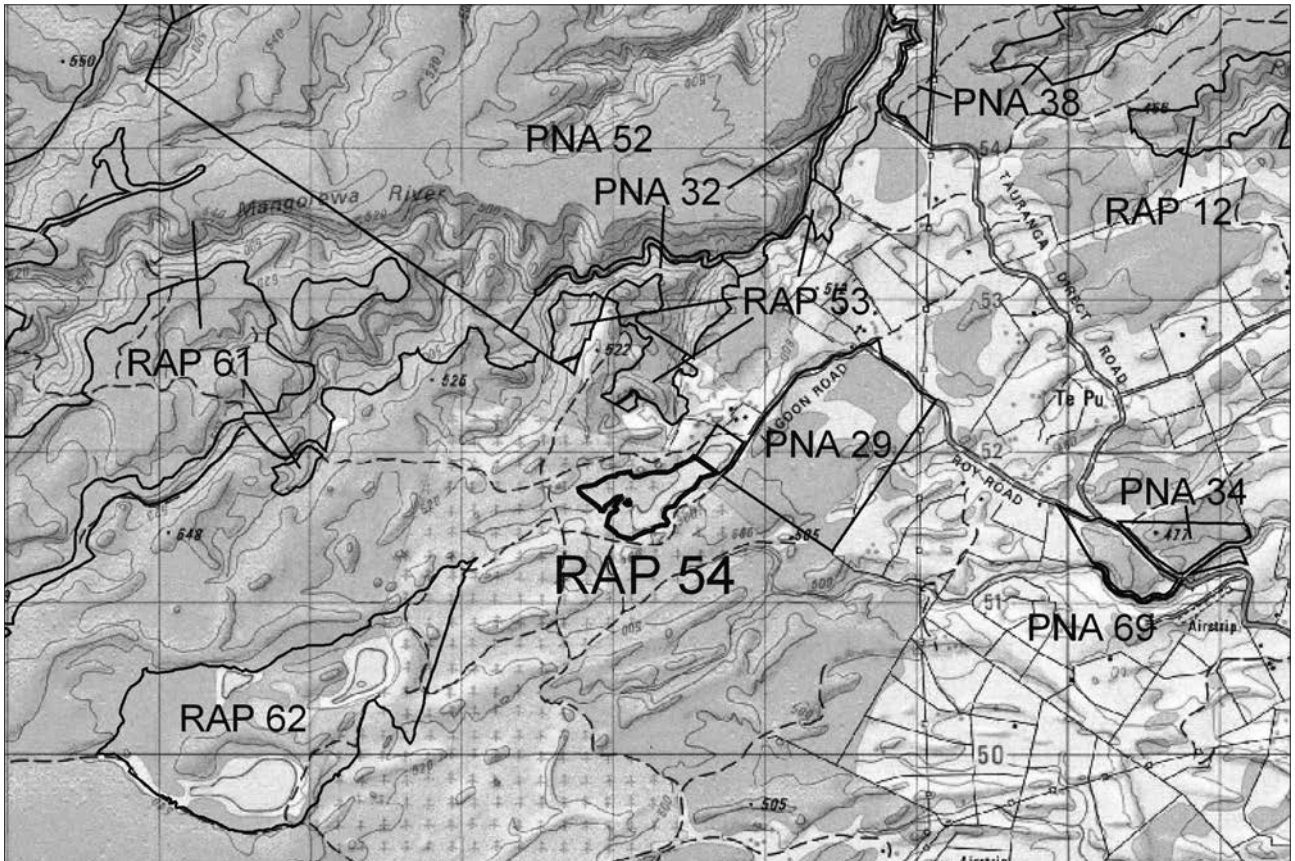
Evaluation

Representativeness	M	Viability	M
Diversity	M	Buffering	M
Naturalness	M	Size & Shape	L
Special Features	M	Threats	H

Discussion

This RAP provides habitat for North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) and whio (Acutely Threatened, Nationally Endangered) populations, and contains relatively good examples of semi-coastal forest. Semi-coastal vegetation is under-represented in the existing reserve system.

RAP 54 LAGOON ROAD



RAP 54 LAGOON ROAD

Area	22.0 ha
Altitudinal Range	500 m
Grid Reference	NZMS 260 U15 875518
Land System	Northern Mamaku Plateau
Study Area No.	24
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. Pole kahikatea-pukatea/ <i>Coprosma tenuicaulis</i> scrub	Wetland
Lowland	2. Grey willow/ <i>Coprosma tenuicaulis</i> scrub and shrubland	Wetland
Lowland	3. <i>Juncus bulbosus</i> - <i>Myriophyllum pedunculatum</i> - <i>Eleocharis acuta</i> rushland (with scattered grey willow)	Lagoon
Lowland	4. Pole kahikatea/ <i>Coprosma tenuicaulis</i> -grey willow-manuka shrubland	Wetland
Lowland	5. Kamahi forest	Flat

General

The eastern end of this wetland is protected in a Department of Conservation Reserve (outlier of Mangorewa Forest).

Landform

Lagoon and surrounding wetlands in a shallow depression on a gently undulating part of Mamaku Plateau. The lagoon is about 1 to 1.5 m deep in winter but usually dries out completely in summer (Wallace 1994).

Vegetation and flora

The vegetation grades from low herffield and rushland at the eastern end to shrubland and scrub at the western end with scattered *Gabnia xanthocarpa* and pole kahikatea. Pole kahikatea is common around the margins and grey willow is locally common. Other species present include *Astelia grandis*, *Sphagnum cristatum*, *Blechnum penna-marina* and *Rubus australis*.

Fauna

The regionally threatened North Island fernbird (At Risk, Sparse in Hitchmough 2002) occurs at this site. Other species that were recorded here include pied stilt, grey duck, grey teal and pied tit. Spotless crane may be present (Fauna Survey Unit, unpublished 1982). Rasch (1989) assessed it as of moderate wildlife habitat value because it contains habitat typical of the ecological district.

Threat / modification

The lagoon margins have been highly modified by grazing and forestry operations. A large number of tree stumps occur throughout the lagoon (probably kahikatea and rimu), and it is likely that the present vegetation cover has arisen following burning (Wallace 1994).

The entire wetland is currently grazed by domestic stock. Grazing should be removed from both the reserve and the portion proposed in this RAP.

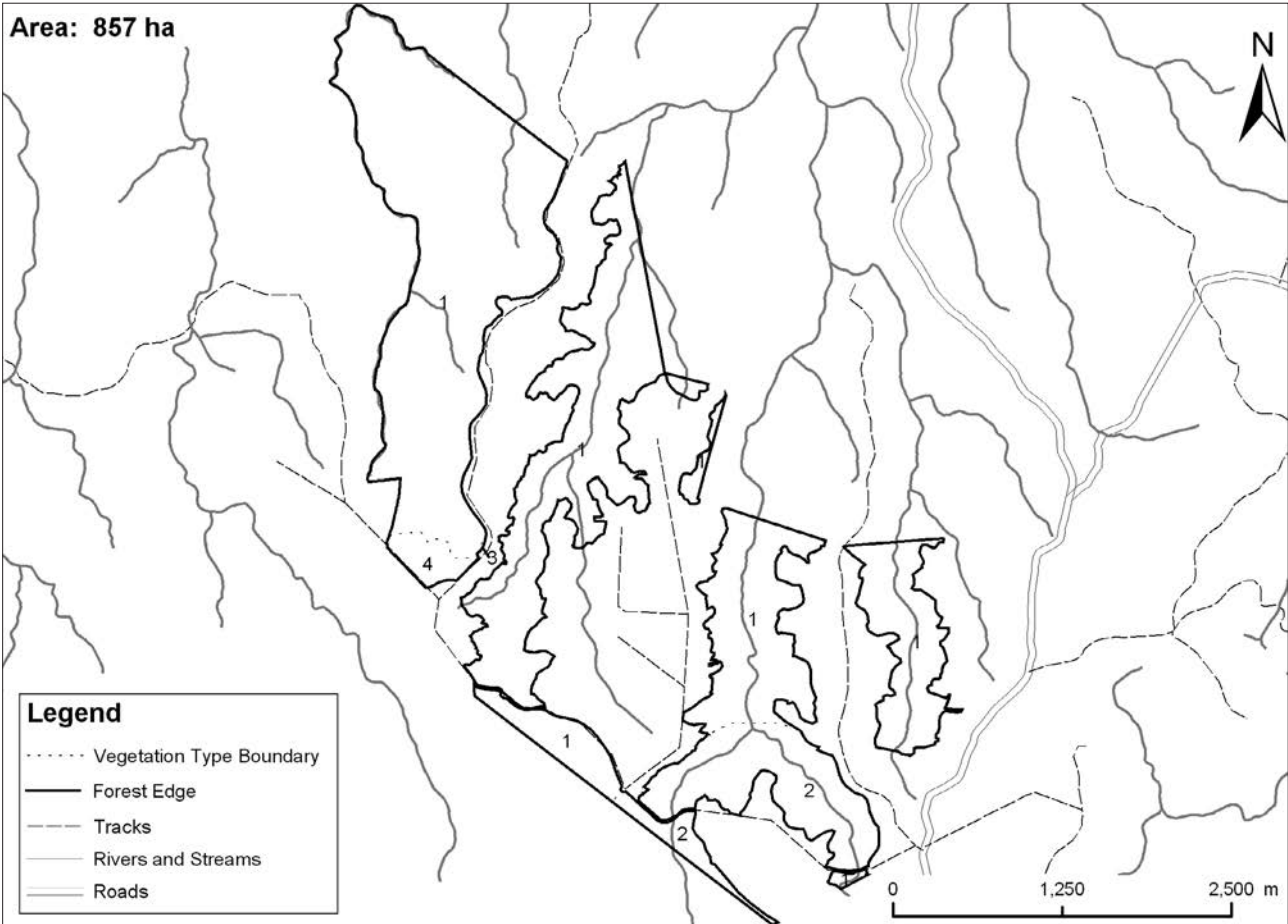
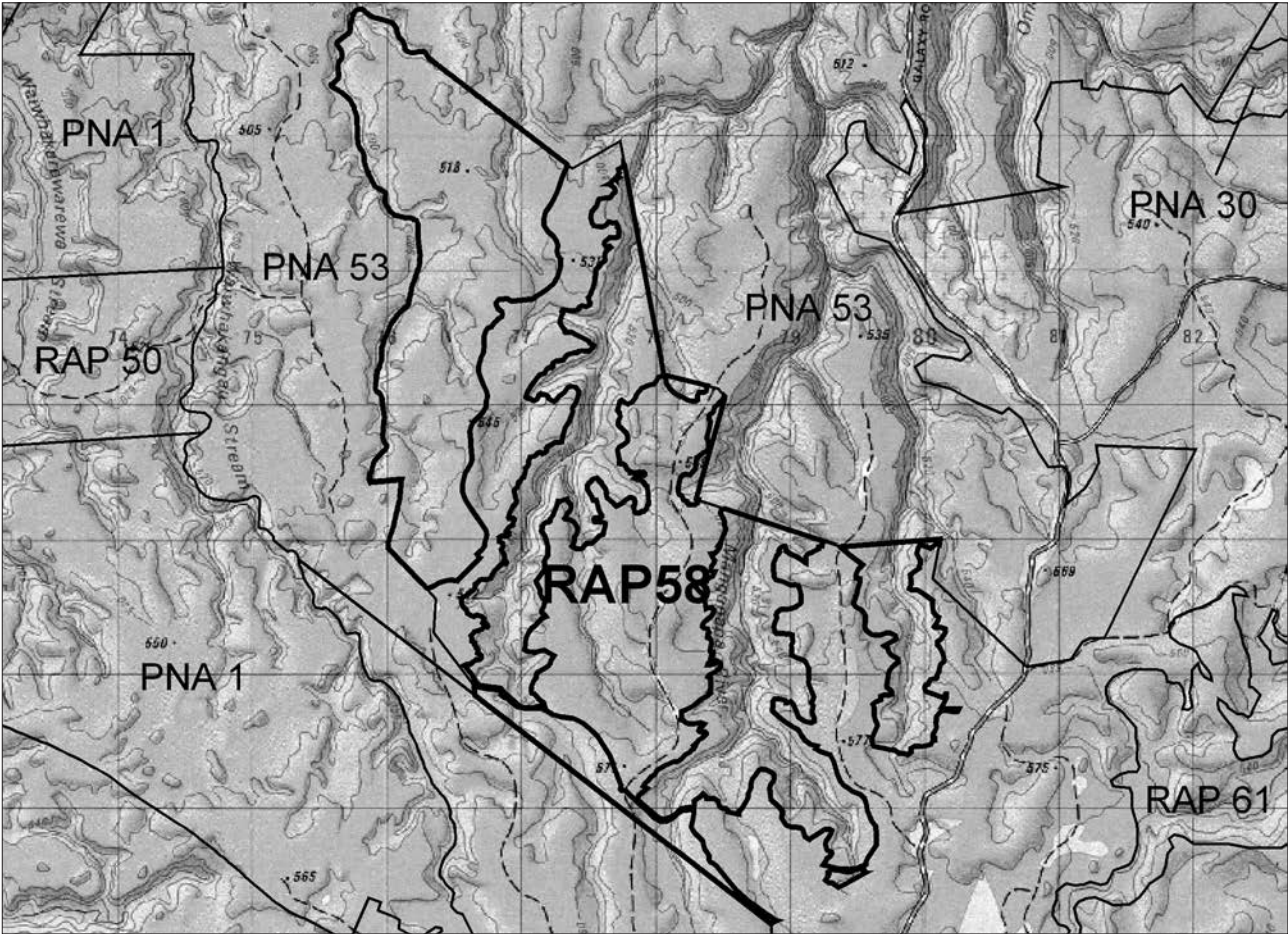
Evaluation

Representativeness	M	Viability	L
Diversity	H	Buffering	L
Naturalness	L	Size & Shape	M
Special Features	M	Threats	H

Discussion

This wetland is one of a chain of wetlands on the central Mamaku Plateau. Although modified it is worthy of protection. This RAP is contiguous and complementary to Mangorewa Forest (outlier) (land administered by the Department of Conservation).

RAP 58 GAMMONS



RAP 58 GAMMONS

Area	856.9 ha
Altitudinal Range	440–560 m
Grid Reference	NZMS 260 U15 776544
Land System	Northern Mamaku Plateau
Study Area No.	N/A
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	1. (Northern rata)-(rimu)-(miro)/tawa-hinau-kamahi forest	Gully
Lowland	2. Tawa-kamahi-hard beech-tawari-hinau forest	Gully
Lowland	3. Kamahi-toetoe-kanono-mahoe-wao scrub and shrubland	Gully
Lowland	4. Tawa-hinau/kamahi-toetoe-kanono-mahoe-wao treeland	Gully

Landform

Ignimbrite plateau and deeply incised streams.

Vegetation

Dominated by tall forest, tawa, hinau, and kamahi with occasional emergent northern rata, rimu and miro. There is also occasional hard beech. Most of these areas have been logged and there is a heavily logged area on the western side. On the southern side of the RAP is an area dominated by tawa and kamahi with hard beech prominent on the ridges. Tawari and hinau are also components of the canopy in this area.

Flora

One species present, raukawa (*Raukawa edgerleyi*) is included in the list of threatened and uncommon plants of New Zealand (de Lange *et al.* 2004) classed as “Chronically Threatened, Gradual Decline”.

Fauna

Birds present include North Island robin, whitehead, tomtit, tui, bellbird and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002).

Threat / modification

This site is surrounded by indigenous forest and plantation forest, and is not grazed by domestic stock.

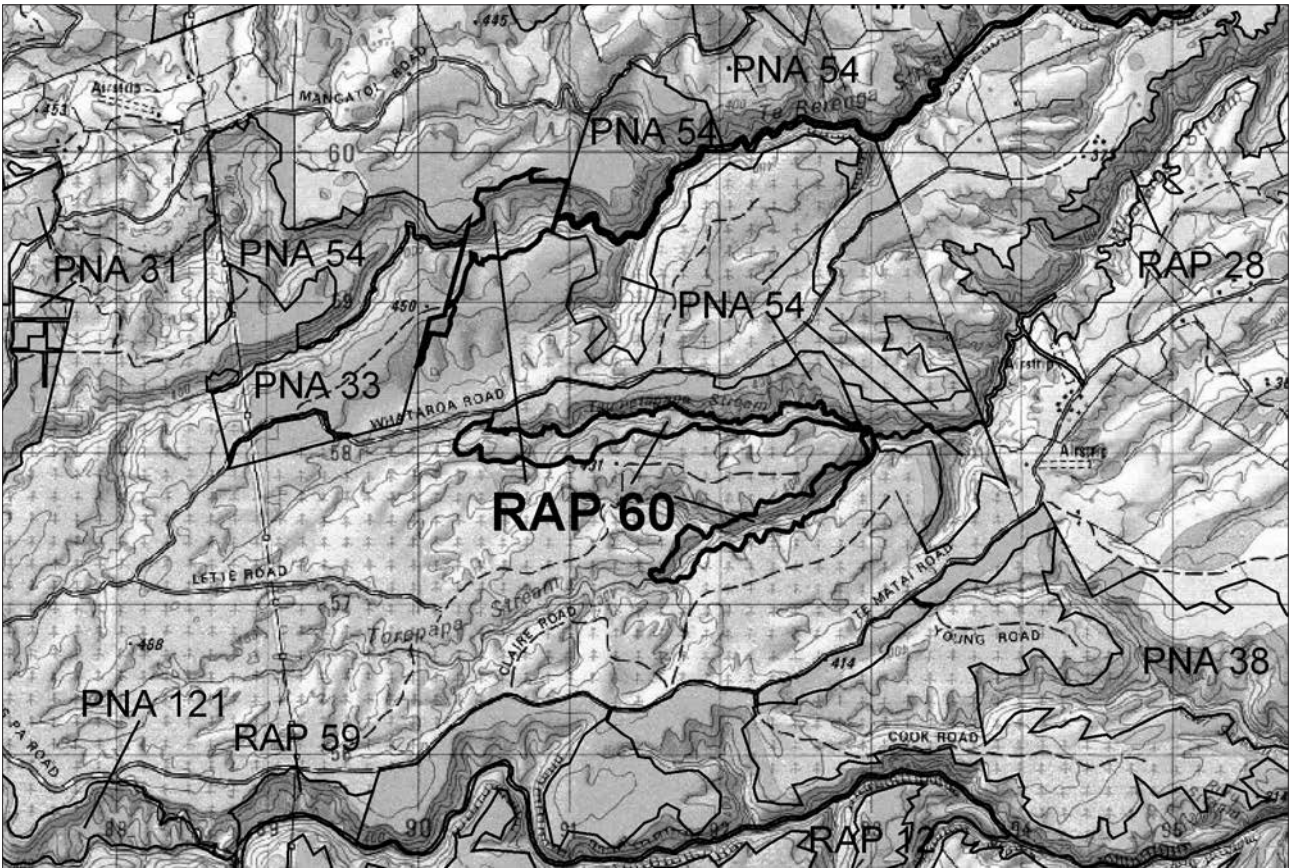
Evaluation

Representativeness	H	Viability	H
Diversity	M	Buffering	H
Naturalness	M	Size & Shape	M
Special Features	M	Threats	M

Discussion

A relatively large example of indigenous vegetation, parts of which connect with an extensive tract of indigenous vegetation and protected areas (Kaimai-Mamaku Forest Park and Puwhenua Forest).

RAP 60 TAUMATA-TE MATAI



RAP 60 TAUMATA-TE MATAI

Area	94.4 ha
Altitudinal Range	320–440 m
Grid Reference	NZMS 260 U15 912582
Land System	Northern Mamaku Plateau
Study Area No.	N/A
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Lowland	(Rimu)/tawa-rewarewa-hinau forest (with a few tanekaha and miro).	Hillslope
Lowland	Mahoe-mahoe-wao-kohuhu-toetoe-bracken-wheki-pate scrub and shrubland are the most common components.	Bluffs

Landform

Deeply incised gorges along the Te Rerenga, Taumatapaua and Torepapa Streams which have cut deep gullies into the relatively flat ignimbrite Mamaku Plateau.

Vegetation

Tall forest covers much of these areas dominated by tawa, rewarewa, hinau with tawari and kamahi locally common. There are occasional emergent rimu. Other indigenous tree species present as individuals or in local patches in the forest canopy include miro (*Prumnopitys ferruginea*), Hall's totara (*Podocarpus hallii*), toatoa (*Phyllocladus toatoa*) and tanekaha (*P. trichomanoides*).

There are several small areas of secondary shrub and shrubland on bluffs and around the margins, dominated by mahoe, mahoe-wao, kohuhu, toetoe, bracken, wheki and pate. Other species present include makomako (*Aristotelia serrata*), wheki ponga (*Dicksonia fibrosa*), seedling podocarps (especially rimu and totara), koromiko (*Hebe stricta*), lancewood, hangehange, mingimingi, mamaku, kiokio, buddleia (*Buddleja davidii*) and gorse (*Ulex europaeus*).

Flora

No threatened species were recorded.

Fauna

Birds present include the bellbird and tomtit.

Threat / modification

The boundaries of this RAP are adjacent to plantation forestry. Care should be taken during logging operations not to damage the margins of the site.

Evaluation

Representativeness	M	Viability	H
Diversity	L	Buffering	M
Naturalness	M	Size & Shape	M
Special Features	L	Threats	M

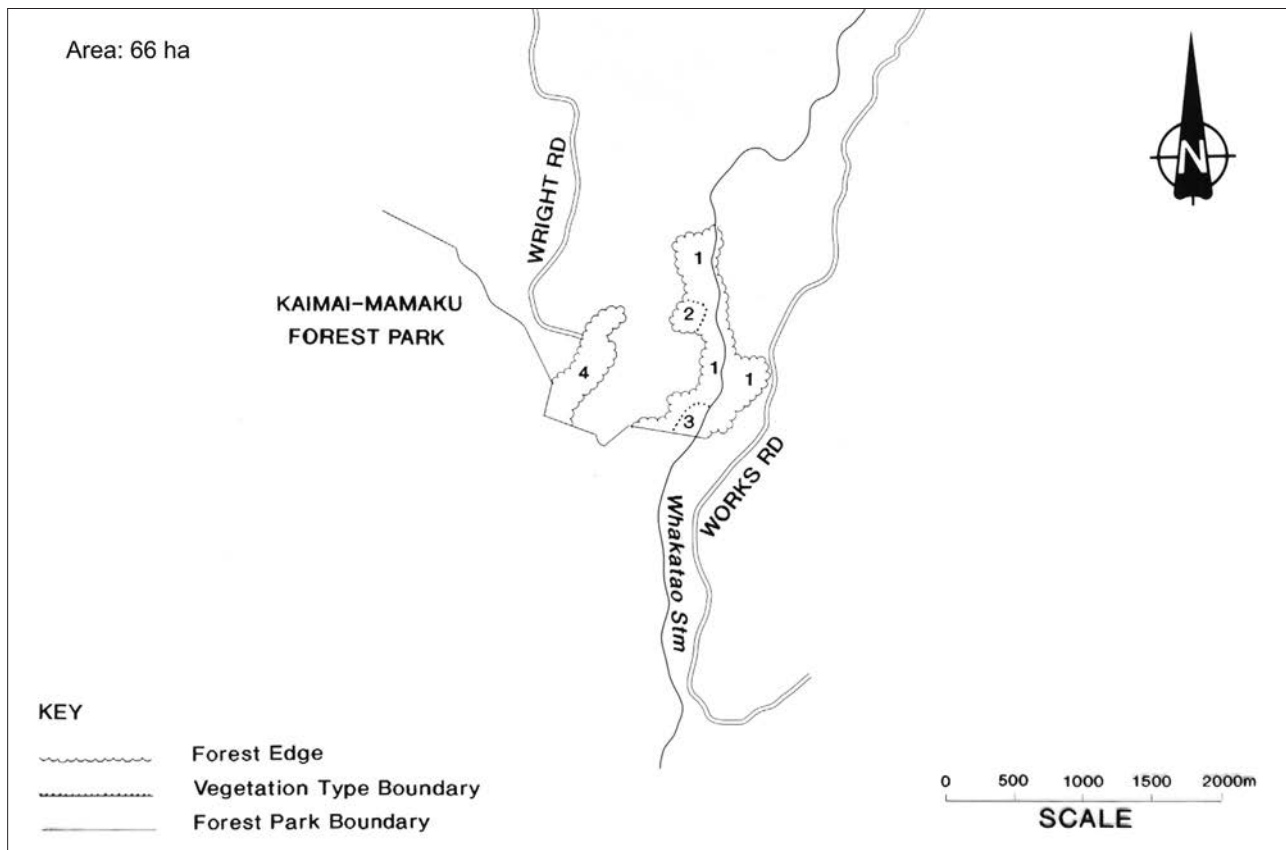
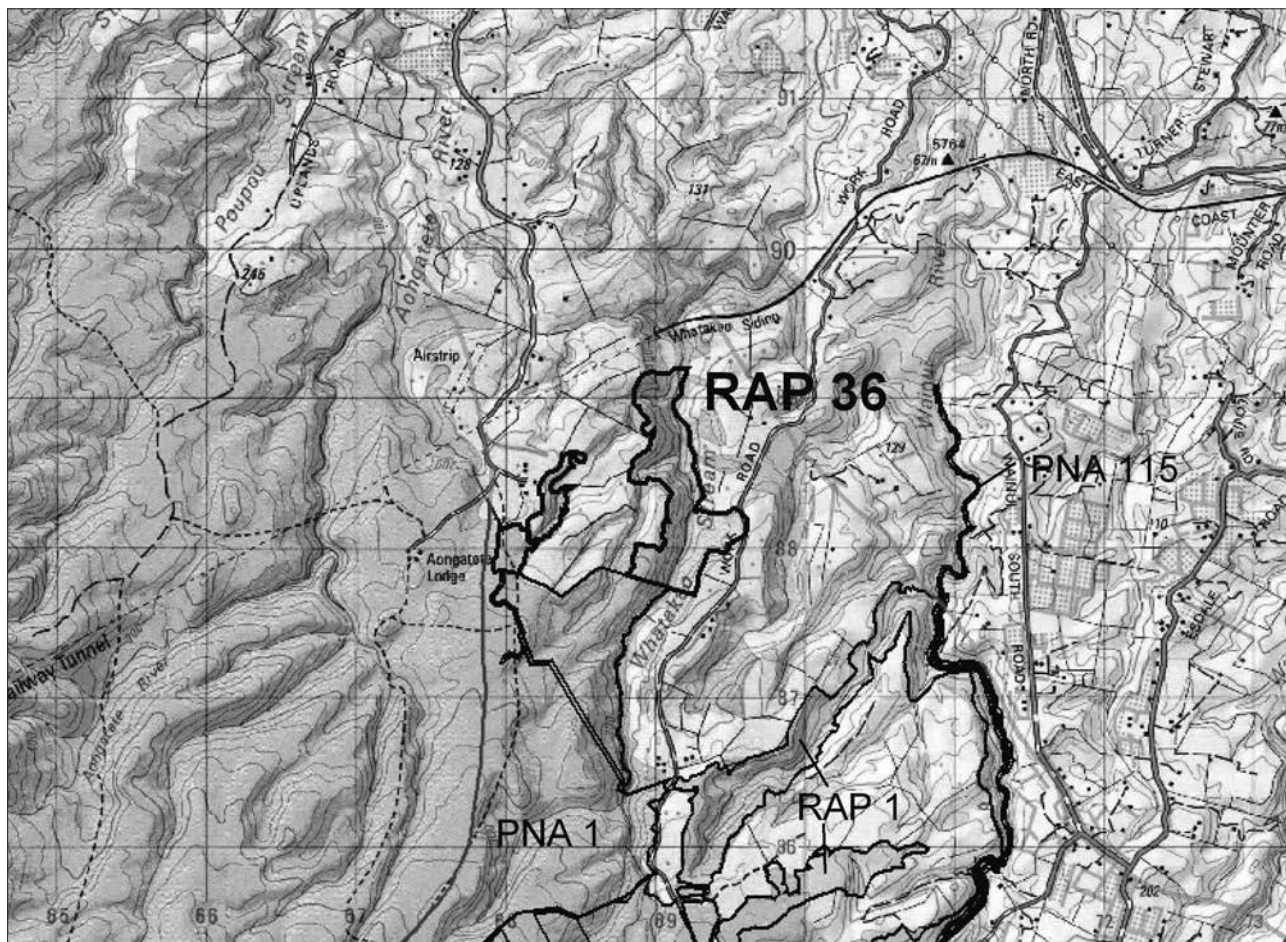
Discussion

This RAP comprises two areas of indigenous vegetation—one which connects two reserves (Whataroa Stewardship Area and Te Matai Forest), and one which is contiguous with a reserve (Te Matai Forest).

This RAP extends and complements the existing protected natural areas.

Category 3 RAPs

RAP 36 WHATAKAO STREAM



RAP 36 WHATAKAO STREAM

Area	66.0 ha
Altitudinal Range	160–200 m
Grid Reference	NZMS 260 T14 681882
Land System	Whakamarama Plateau
Study Area No.	65, 66
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. Rewarewa/kanuka-kamahi-mamaku forest	Hillslope
Semi-coastal	2. Puriri-rewarewa forest	Hillslope
Semi-coastal	3. Rimu/tawa-puriri forest	Hillslope and gully
Semi-coastal	4. (Rimu)/tawa-rewarewa-kamahi-puriri-kohekohe forest	Hillslope

Landform

This RAP encompasses steep slopes dropping into the Whatakao Stream and small side streams. It includes a small area of ignimbrite plateau.

Vegetation and flora

(Rimu)/tawa-rewarewa-kamahi-puriri-kohekohe forest comprise the forest cover in the western portion of this RAP. Other species present include nikau, kamahi, tanekaha, mamaku and pukatea. The canopy is relatively open in places, probably reflecting the impact of previous logging of emergent podocarps (Shaw 1993).

The eastern portion is mainly secondary forest dominated by rewarewa/kamahi-kanuka forest. Different species are dominant or prominent on different sites, reflecting site conditions and history. Mamaku and mahoe occur locally. Some remnant examples of rimu/tawa-puriri forest are still present in gullies and tanekaha occurs locally and is dominant in one place. There are a few kauri rickers present.

Fauna

Common forest bird species occur in this RAP, including tui, bellbird and grey warbler. North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) were present in the northern portion of this RAP 20 years ago (Fauna Survey Unit, unpublished) and may still be present.

Land snails are common, with a total of fifty-three species having been identified. Several of these species are of restricted distribution, including *Mocella prestoni*, *Therasiella serrata*, *Rhytida greenwoodi* and *Schizoglossa novoseelandiae* (Mayhill 1994).

Threat / modification

Some trees have been removed for firewood along the western margin of the western section. There is evidence of domestic stock grazing damage throughout but its intensity varies markedly. The understorey in the eastern section has been heavily depleted by domestic stock grazing whilst in the western section the understorey is particularly open adjacent to the farm access track that bisects this block. This RAP should be fenced to exclude domestic stock.

Evaluation

Representativeness	M	Viability	M
Diversity	L	Buffering	L
Naturalness	M	Size & Shape	L
Special Features	M	Threats	H

Discussion

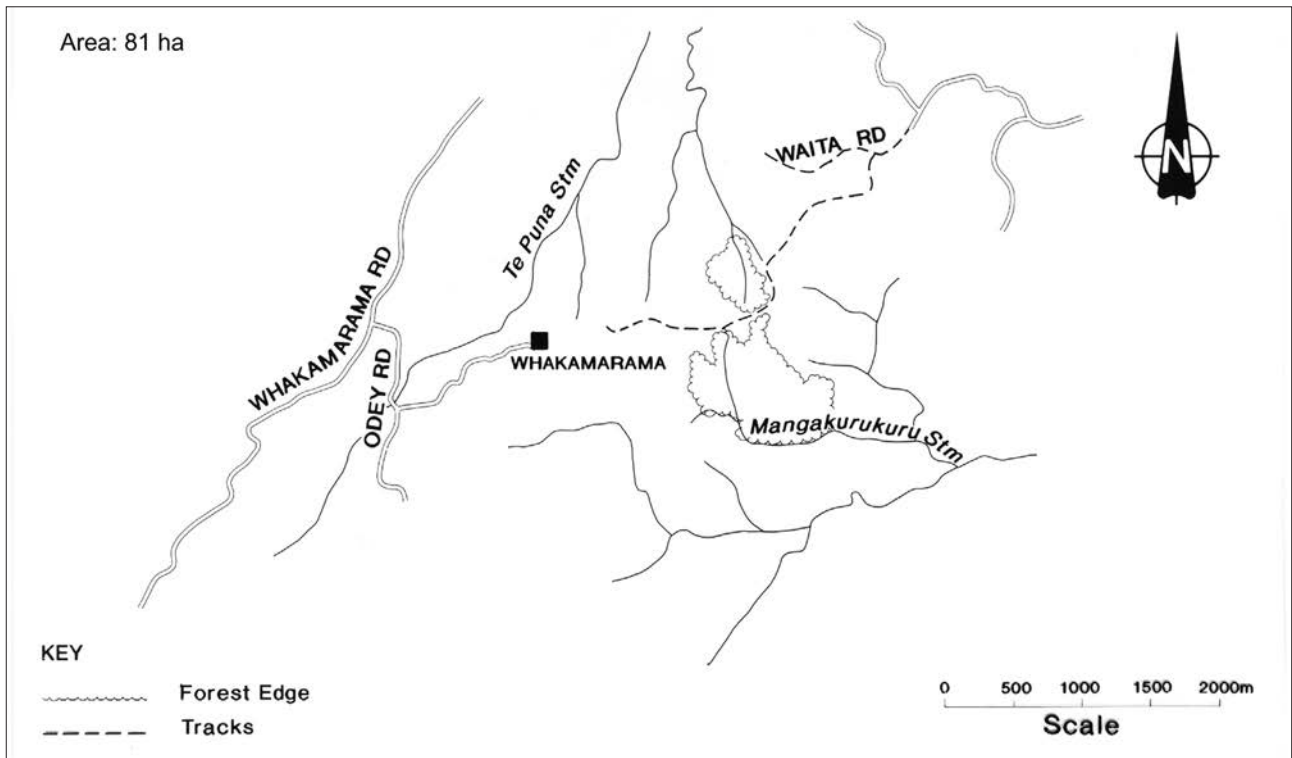
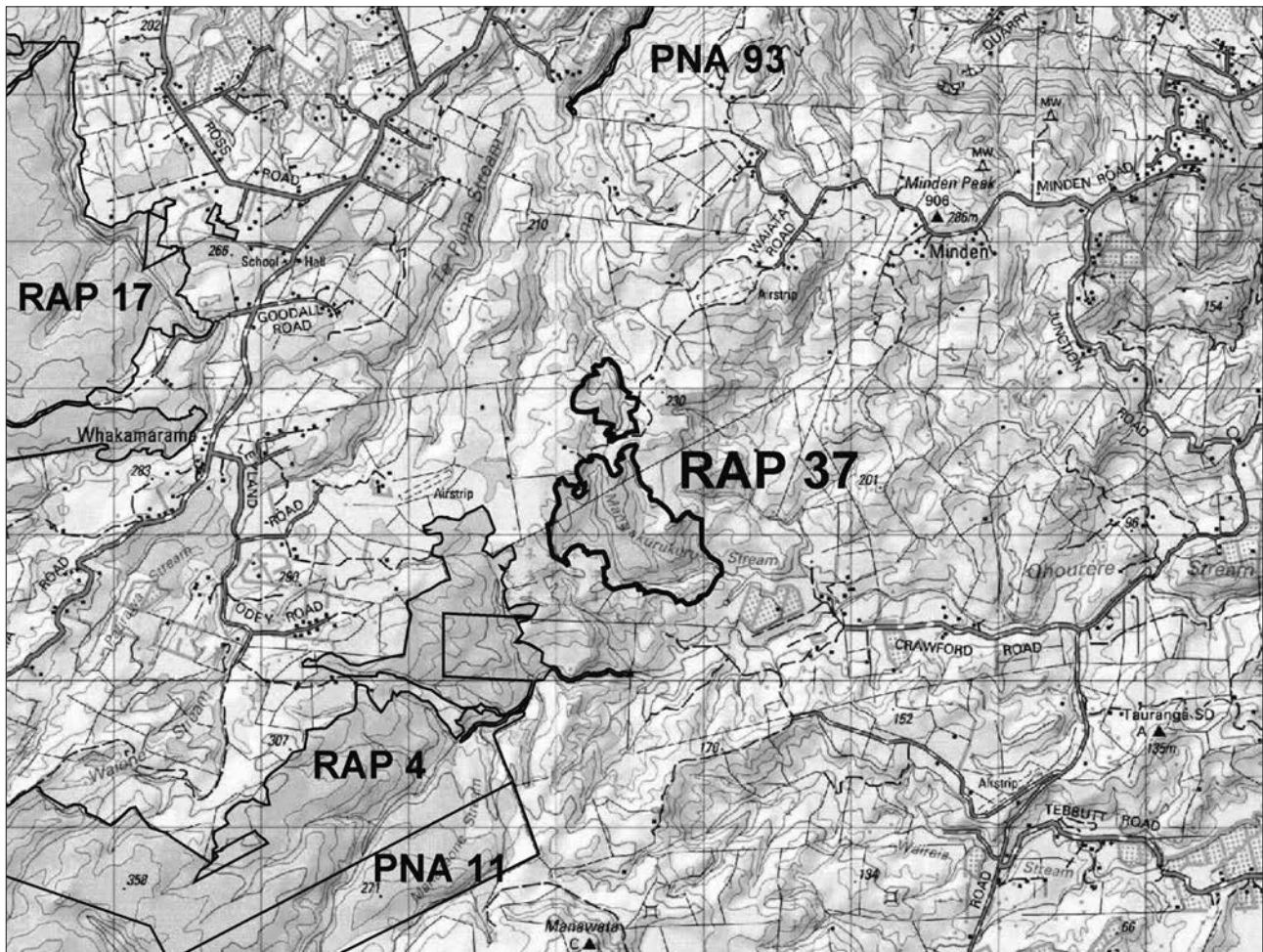
The western section contains a reasonably intact remnant of semi-coastal tall forest contiguous with an extensive forest tract (Kaimai-Mamaku Forest Park). Semi-coastal forest is under-represented in the existing reserve system in the district.

The eastern section comprises part of a long narrow tongue of vegetation extending from the Kaimai-Mamaku Park down the Whatakao Stream into the Tauranga ecological district. As such, the RAP provides a vegetation sequence extending towards the coast. It contains semi-coastal vegetation which is under-represented in the reserve system in the Otanewainuku ecological district. Very little indigenous forest remains in Tauranga ecological district, which enhances the values of contiguous vegetation in adjoining ecological districts.

References

Shaw 1993

RAP 37 MANGAKURUKURU STREAM



RAP 37 MANGAKURUKURU STREAM

Area	80.8 ha
Altitudinal Range	160–220 m
Grid Reference	NZMS 260 U14 764820
Land System	Whakamarama Plateau
Study Area No.	90
Status	Unprotected

BIOCLIMATIC ZONE	VEGETATION TYPE	LANDFORM
Semi-coastal	1. (Rewarewa)/tawa-puriri-pukatea-mangeao-hinau forest	Rolling hillslope

Landform

Rolling hill country underlain by Waiteariki ignimbrite. The southern block comprises the headwaters of a tributary stream of the Wairoa River and the northern block contains headwaters of Te Puna Stream.

Vegetation

Tawa, puriri, pukatea, mangeao and hinau form the canopy with scattered emergent rewarewa and kohekohe along the western edge. Small groves of tanekaha occur locally on ridges.

Flora and Fauna

No significant species were recorded during this survey.

Threat / modification

These forests have been logged in the past and trees are still being logged in low numbers. This should stop. Domestic stock which are grazed in the forests should be excluded.

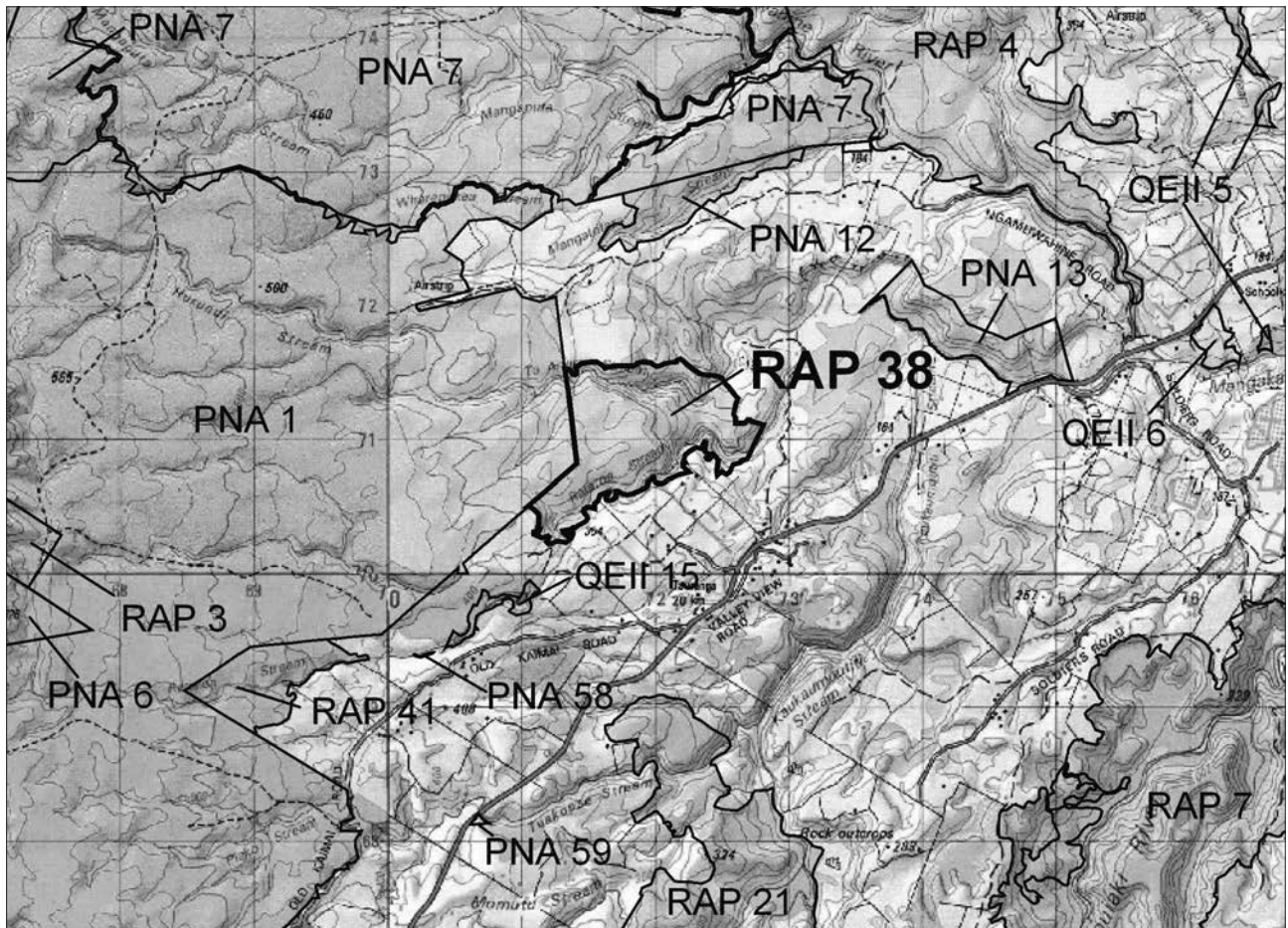
Evaluation

Representativeness	M	Viability	M
Diversity	L	Buffering	M
Naturalness	M	Size & Shape	L
Special Features	L	Threats	H

Discussion

This RAP, together with RAP 4, forms part of a broken altitudinal sequence of vegetation stretching inland from the semi-coastal zone to the top of the Kaimai Range.

RAP 38 RATAROA STREAM-TE AHURU



Area: 121ha

KAIMAI MAMAKU FOREST PARK



Te Ahuru Strm

Rataroa Strm

KAIMAI MILL RD

STATE HIGHWAY 29

KEY

~~~~~ Forest Edge  
 \_\_\_\_\_ Forest Park Boundary

0 500 1000 1500 2000m  
 Scale

## RAP 38 RATAROA STREAM-TE AHURU

|                   |                     |
|-------------------|---------------------|
| Area              | 120.9 ha            |
| Altitudinal Range | 160–380 m           |
| Grid Reference    | NZMS 260 U14 717710 |
| Land System       | Whakamarama Plateau |
| Study Area No.    | 27                  |
| Status            | Unprotected         |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                                                      | LANDFORM           |
|------------------|------------------------------------------------------------------------------------------------------|--------------------|
| Lowland          | 1. Rewarewa-pukatea-(hard beech)/tawa-mahoe-pigeonwood-whelki-miro-totara-tawari-kamahi-hinau forest | Plateau, hillslope |

### Landform

Gently sloping ignimbrite plateau dissected by Te Ahuru Stream, a tributary of the Wairoa River.

### Vegetation and flora

Heavy logging for podocarps in the past has induced the discontinuous canopy present today. This canopy comprises rewarewa, pukatea, hard beech, tawa, mahoe, porokaiwhiri, wheki, miro, Hall's totara, tawari, kamahi, and hinau with local tanekaha and ponga.

### Fauna

No significant species were recorded during the survey.

### Threat / modification

The RAP has been heavily logged and a network of logging tracks is still visible. There is one deer capture pen. It is grazed by domestic stock and a few feral goats (escaped from neighbouring farms). The goats should be eliminated and domestic stock excluded.

### Evaluation

|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | M |
| Diversity          | L | Buffering    | M |
| Naturalness        | M | Size & Shape | M |
| Special Features   | L | Threats      | H |

### Discussion

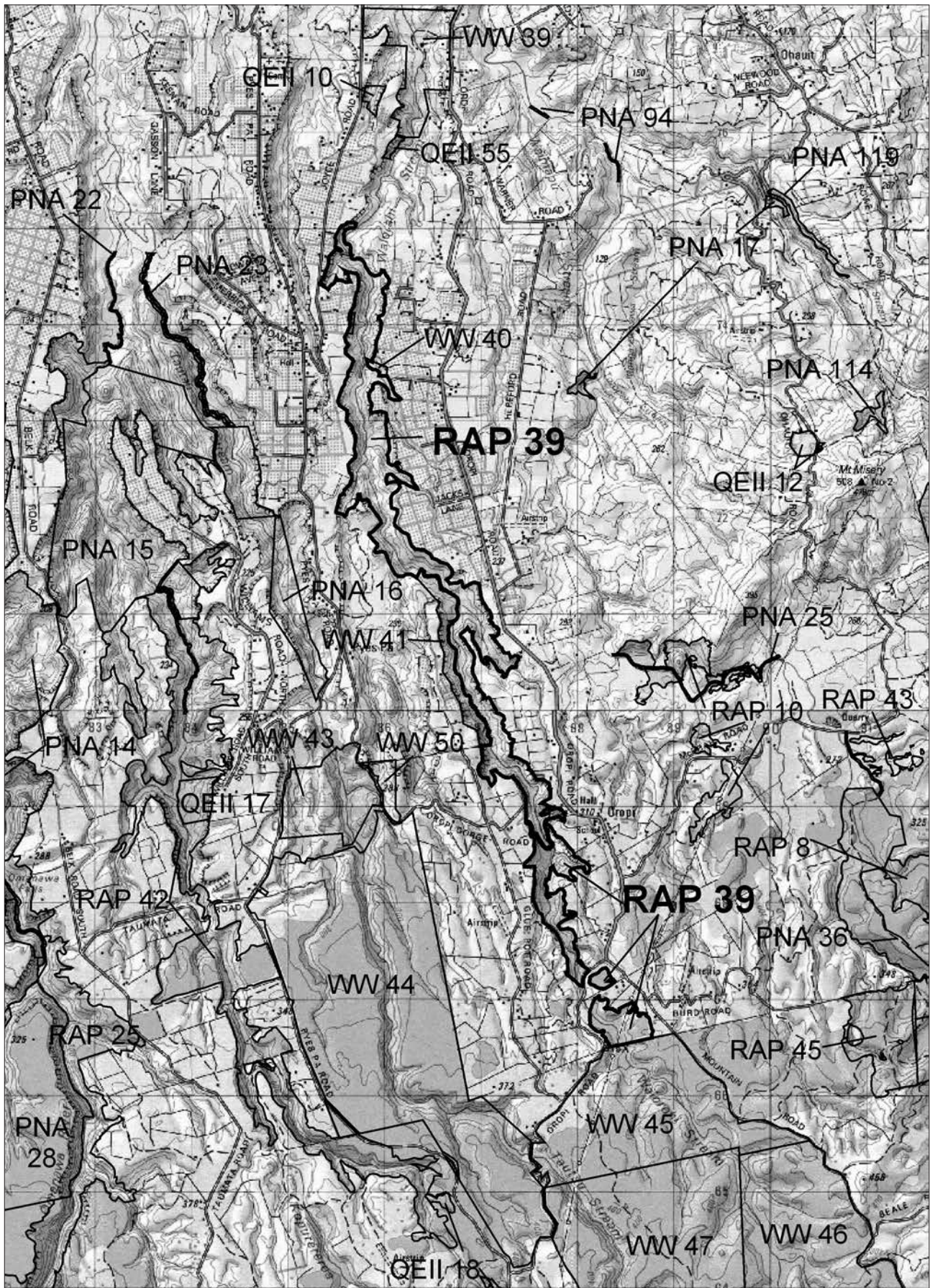
This RAP is proposed because it is contiguous with an extensive tract of indigenous vegetation (Kaimai-Mamaku Forest Park) which extends across several ecological districts.

### References

Shaw, W.B. 1990: Field inspection of Archer property, near Kaimai Summit, Otanewainuku ecological district. *Unpublished report*. Department of Conservation, Rotorua. 3 pp.

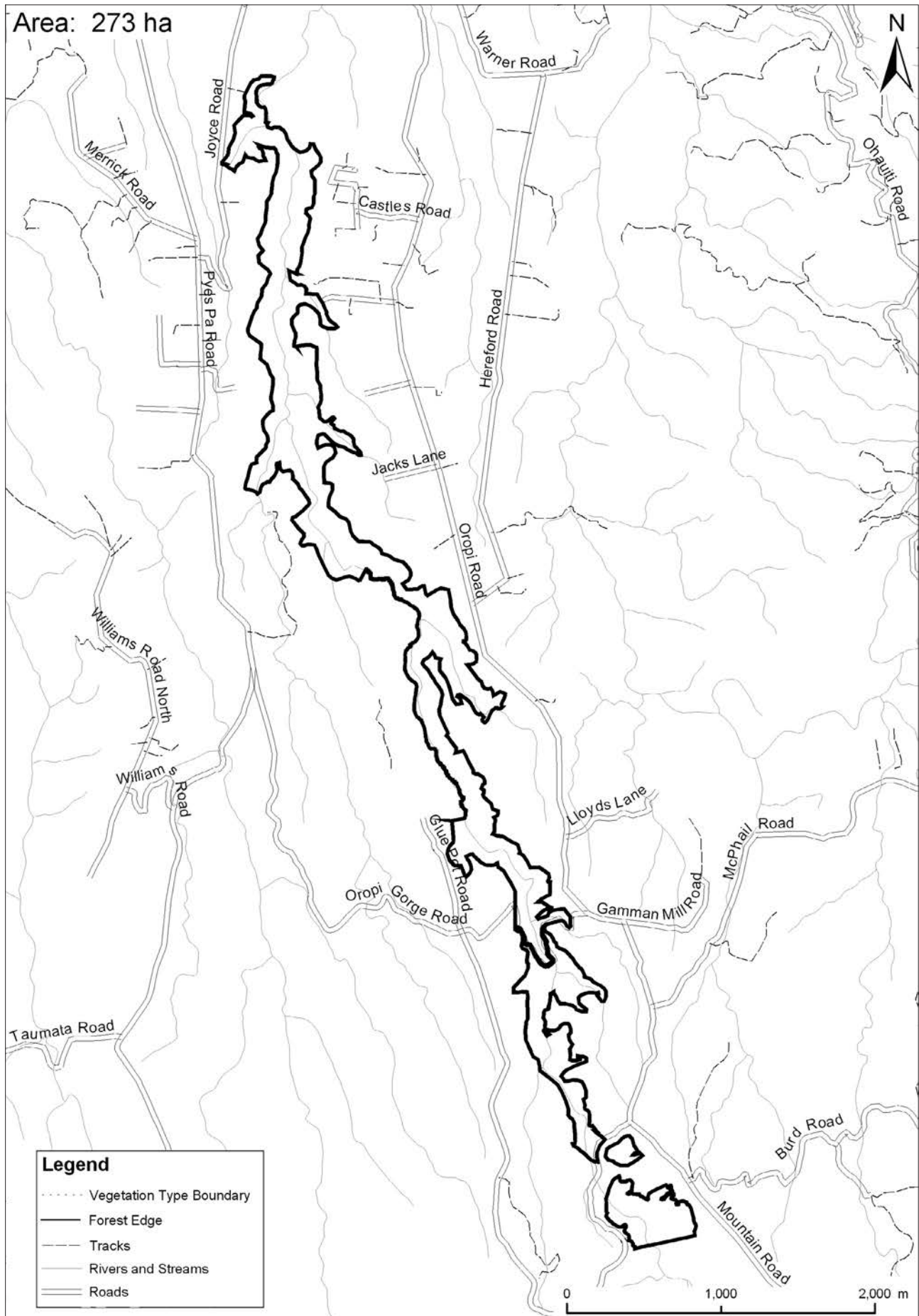


# RAP 39 WAIORAHI STREAM





# RAP 39    WAIORAHĪ STREAM



## RAP 39 WAIORAHİ STREAM

|                   |                         |
|-------------------|-------------------------|
| Area              | 272.9 ha                |
| Altitudinal Range | 40–300 m                |
| Grid Reference    | NZMS 260 U14 860719     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | 94                      |
| Status            | Unprotected             |

| BIOCLIMATIC ZONE         | VEGETATION TYPE                                                                                                                                                                                                         | LANDFORM  |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Semi-coastal and Lowland | Mosaic of : <ul style="list-style-type: none"> <li>Rewarewa/kanuka-mamaku-kamahi forest (20%)</li> <li>Tawa-mangeao-rewarewa-(kahikatea)-(pukatea)-(hinau) forest (79%)</li> <li>Bracken-gorse fernland (1%)</li> </ul> | Hillslope |

### Landform

A deeply incised gorge formed by the Waiorahi Stream cutting through Mamaku ignimbrite. The stream is shallow and rapid, flowing over bedrock.

### Vegetation and flora

A mosaic of tawa-mangeao-rewarewa forest with rimu and local tanekaha, pukatea and hinau. Kanuka-mamaku-kamahi forest with scattered emergent rewarewa occurs on the upper hillslopes with a small area of bracken-gorse fernland on rolling hillslopes where the gorge opens out. Local pockets of hard beech occur, mainly on spurs and ridges.

### Fauna

Common forest birds are present and there is an unconfirmed report of bats in the gorge (Fauna Survey Unit, unpublished data 1982).

### Threat / modification

Most of the easier terrain has been cleared in the past and the vegetation is now in varying stages of regeneration. Small areas of inaccessible primary forest remain. Much of the easier country is probably under threat from clearing for afforestation or pasture. Wilding pines occur scattered throughout much of the gorge and weeds (including blackberry and tradescantia) occur along the margins.

### Evaluation

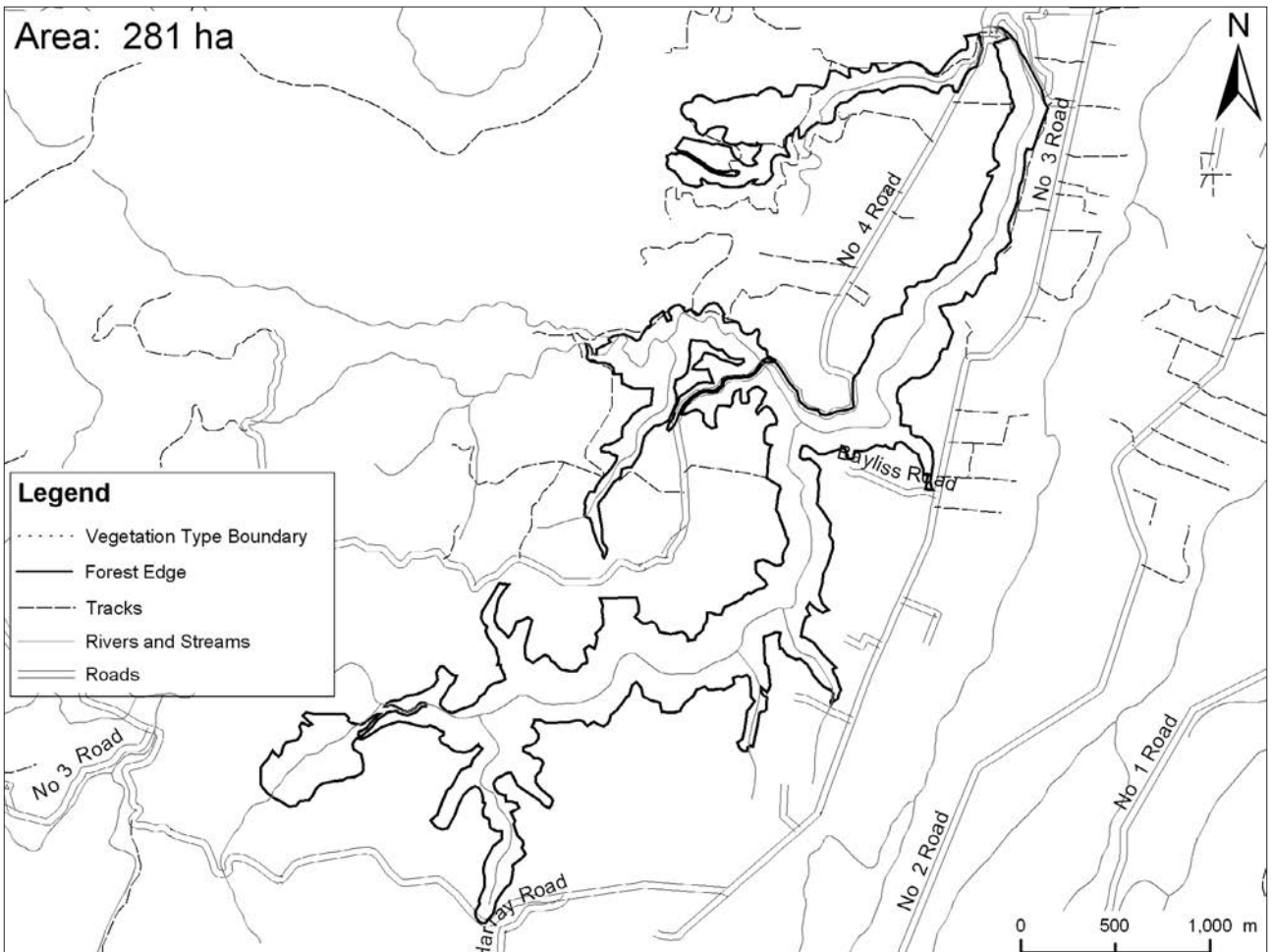
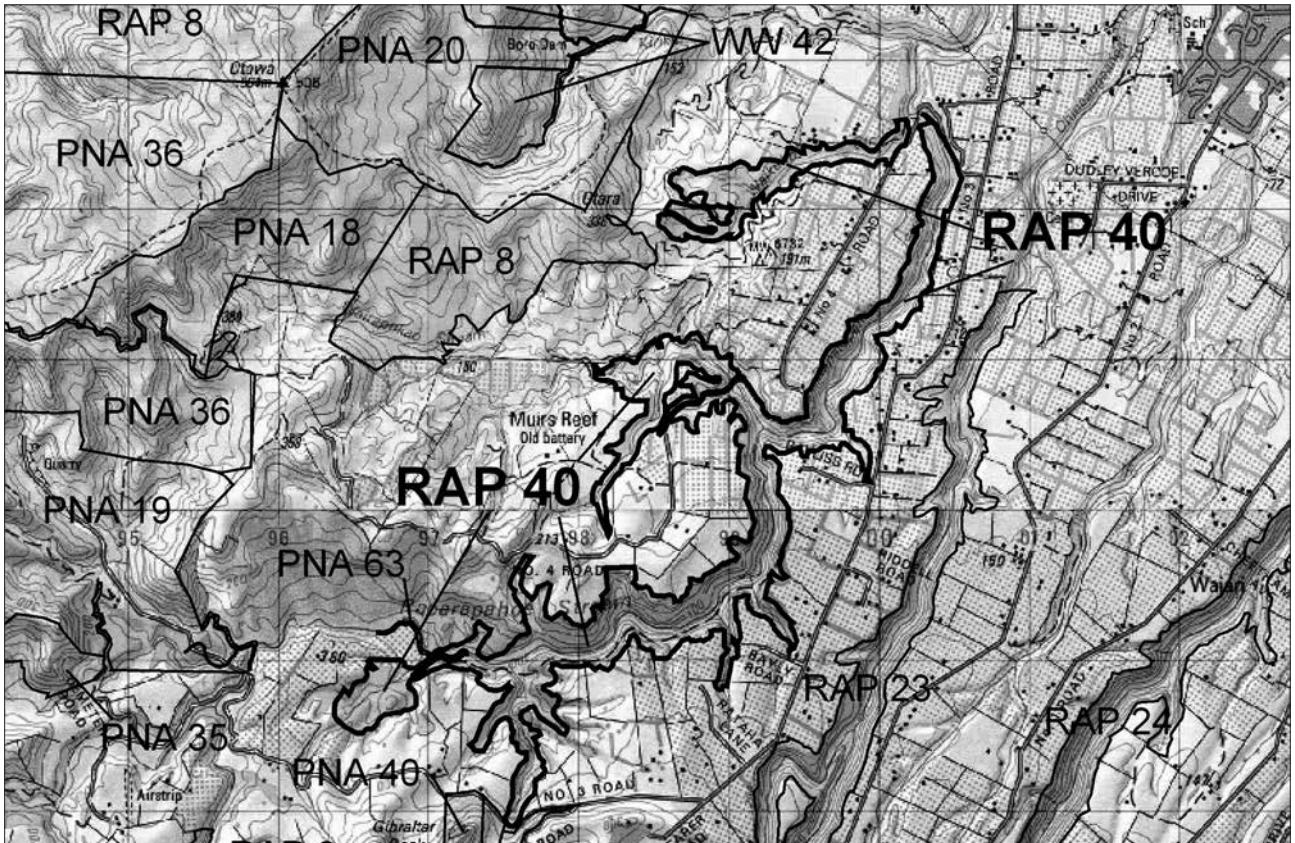
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | M |
| Diversity          | M | Buffering    | L |
| Naturalness        | M | Size & Shape | L |
| Special Features   | L | Threats      | M |

## **Discussion**

A relatively large example of the indigenous vegetation of the district which contains good quality examples of secondary forest in the semi-coastal zone. Semi-coastal vegetation is under-represented in the existing reserve system in the district.



# RAP 40 RAPARAPAHOE STREAM



## RAP 40 RAPARAPAHOE STREAM

|                   |                                        |
|-------------------|----------------------------------------|
| Area              | 281.1 ha                               |
| Altitudinal Range | 60–160 m                               |
| Grid Reference    | NZMS 260 U14 995705                    |
| Land System       | Papamoa Hills; Northern Mamaku Plateau |
| Study Area No.    | 76                                     |
| Status            | Unprotected                            |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                                                                                                                                                                                                              | LANDFORM                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Semi-coastal     | A mosaic of : <ul style="list-style-type: none"> <li>Rewarewa-kanuka/mamaku-kamahi-mangeao-(kohekohe) forest (55%)</li> <li>Mamaku treefernland (20%)</li> <li>Tawa-titoki-mangeao-hinau-puriri-karaka/pigeonwood mapou-mamaku-mahoe forest (25%)</li> </ul> | Steep face, spur<br>Steep face<br>Gully |

### Landform

A deeply incised gorge running north through Mamaku ignimbrite on a broad plateau inland of Te Puke. The stream is typical of streams on the plateau, flowing shallow and rapid over rock pavements.

### Vegetation

Rewarewa-kanuka/mamaku-kamahi-mangeao-(kohekohe) forest occurs on the steep faces and spurs with local pockets of mamaku treefernland. In the gullies tawa-dominant forest with occasional titoki, mangeao, hinau, puriri and karaka occurs. This type becomes more frequent in the upper reaches of the gorge. All but the most inaccessible parts of the gorge have been logged for podocarps.

### Flora

*Marattia salicina* (classed as Chronically Threatened, Serious Decline, de Lange et al. 2004) was recorded at this site during the survey. *Tupeia antarctica* (classed as Chronically Threatened, Gradual Decline, de Lange et al. 2004) occurs on the edge of this RAP (P. Cashmore pers. comm.) along with *Peperomia tetraphylla* (classed as At Risk, Sparse, de Lange et al. 2004) (Hobbs 2001) which reaches its northern limit of distribution in the ecological district.

### Fauna

This site was ranked moderate-high by Saunders (1983). The North Island kaka (Acutely Threatened, Nationally Endangered in Hitchmough 2002) uses this RAP (1990 record; Department of Conservation 1993a) and North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) have been recorded in the nearby Ottawa Scenic Reserve because although its size is fairly large, similar habitat is represented elsewhere

in the ecological region and contains a diverse range of species.

The At Risk, Sparse (Hitchmough 2002) Hochstetter frog has been recorded in an adjacent Department of Conservation reserve (Department of Conservation 1993f) and a survey of this RAP for frogs may be warranted.

### **Threat / modification**

Some of the easier country in the lower gorge is threatened by clearance for afforestation or grazing. Fencing is poor in places and stock damage has occurred. Infestations of tradescantia and Japanese honeysuckle are locally common in the lower reaches on the gorge.

### **Evaluation**

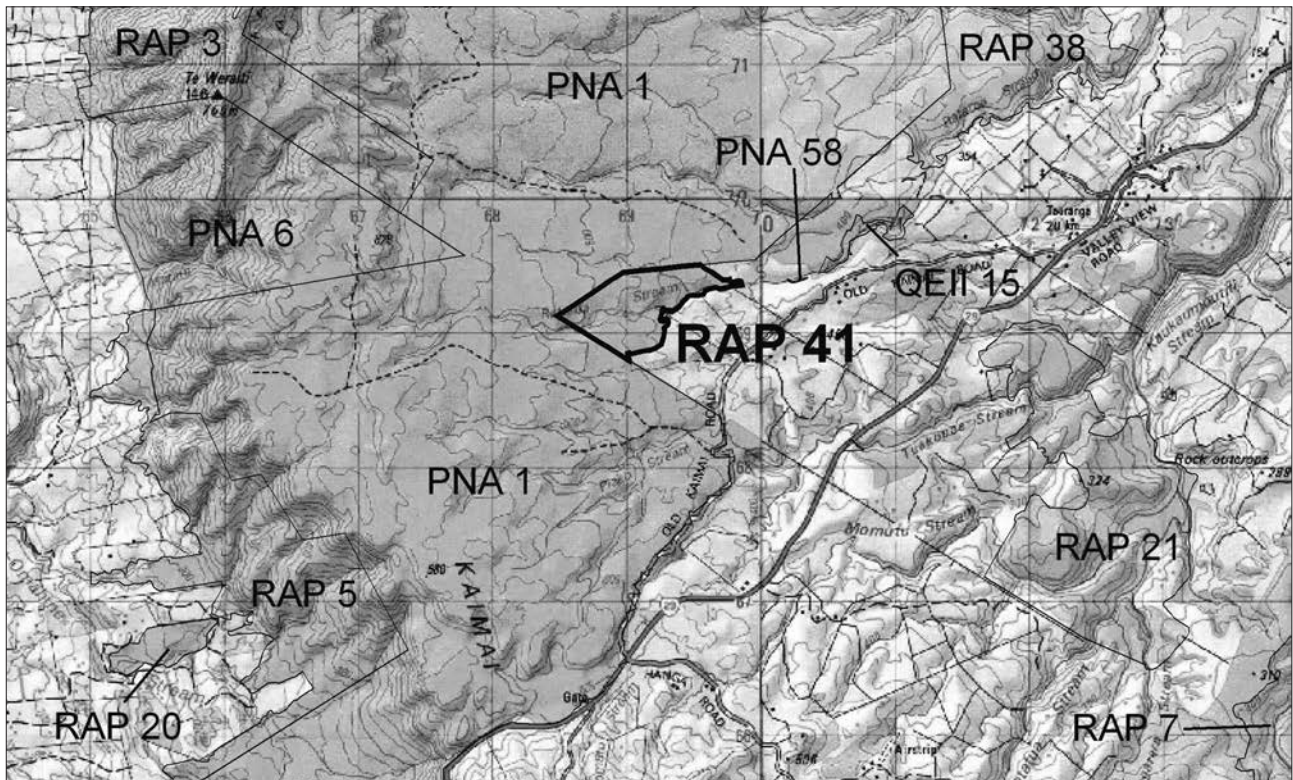
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | L | Viability    | M |
| Diversity          | M | Buffering    | L |
| Naturalness        | L | Size & Shape | L |
| Special Features   | M | Threats      | M |

### **Discussion**

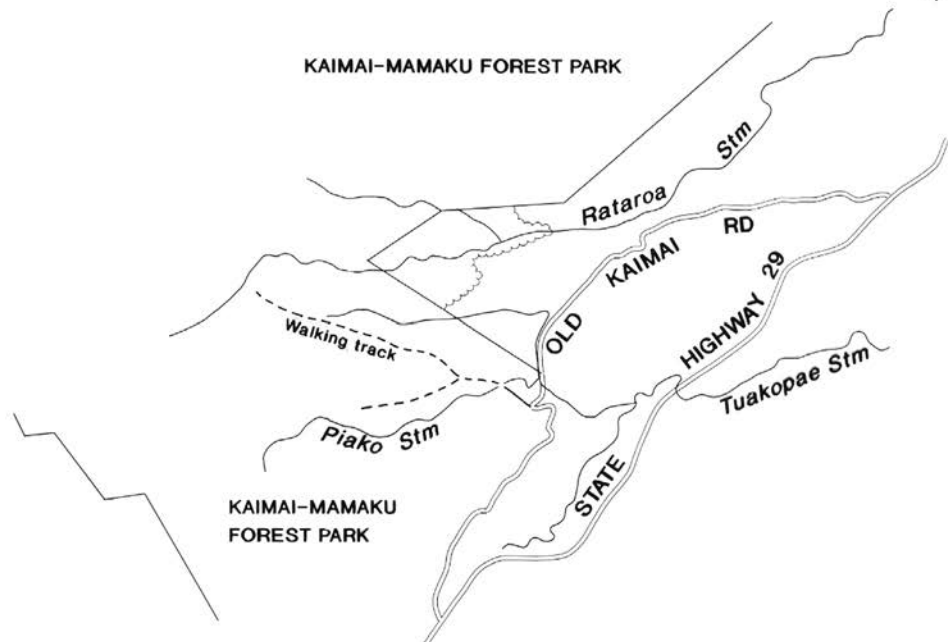
This RAP has been selected for its relatively good quality large examples of semi-coastal vegetation. Semi-coastal vegetation is under-represented in the existing reserve system in the district. Much of the main part of the gorge has recovered well from logging and clearance which took place in the early part of this century. The site provides good habitat for *Marattia salicina* and is ranked as moderate-high for wildlife habitat.



# RAP 41 HENDERSON WESTERN TRAM



Area: 44ha



## KEY

- Forest Edge
- Vegetation Type Boundary
- Forest Park Boundary

0 500 1000 1500 2000m  
Scale



## RAP 41 HENDERSON WESTERN TRAM

|                   |                     |
|-------------------|---------------------|
| Area              | 44.0 ha             |
| Altitudinal Range | 420–510 m           |
| Grid Reference    | NZMS 260 T15 690690 |
| Land System       | Whakamarama Plateau |
| Study Area No.    | 69                  |
| Status            | Unprotected         |

| BIOCLIMATIC ZONE | VEGETATION TYPE                    | LANDFORM |
|------------------|------------------------------------|----------|
| Lowland          | 1. Tawa-kamahi-hinau-tawari forest | Plateau  |

### Landform

A small triangular portion of the gently sloping Whakamarama rhyolite plateau, broken by the Rataroa Stream (a tributary of the Wairoa River).

### Vegetation

Tawa-kamahi-hinau-tawari forest induced through heavy logging is the dominant cover.

### Flora and Fauna

No significant species were recorded during the survey.

### Threat / modification

This RAP is used by Tauranga College for outdoor education. Logging and walking tracks dissect the block. Feral deer and possum browse damage is common.

### Evaluation

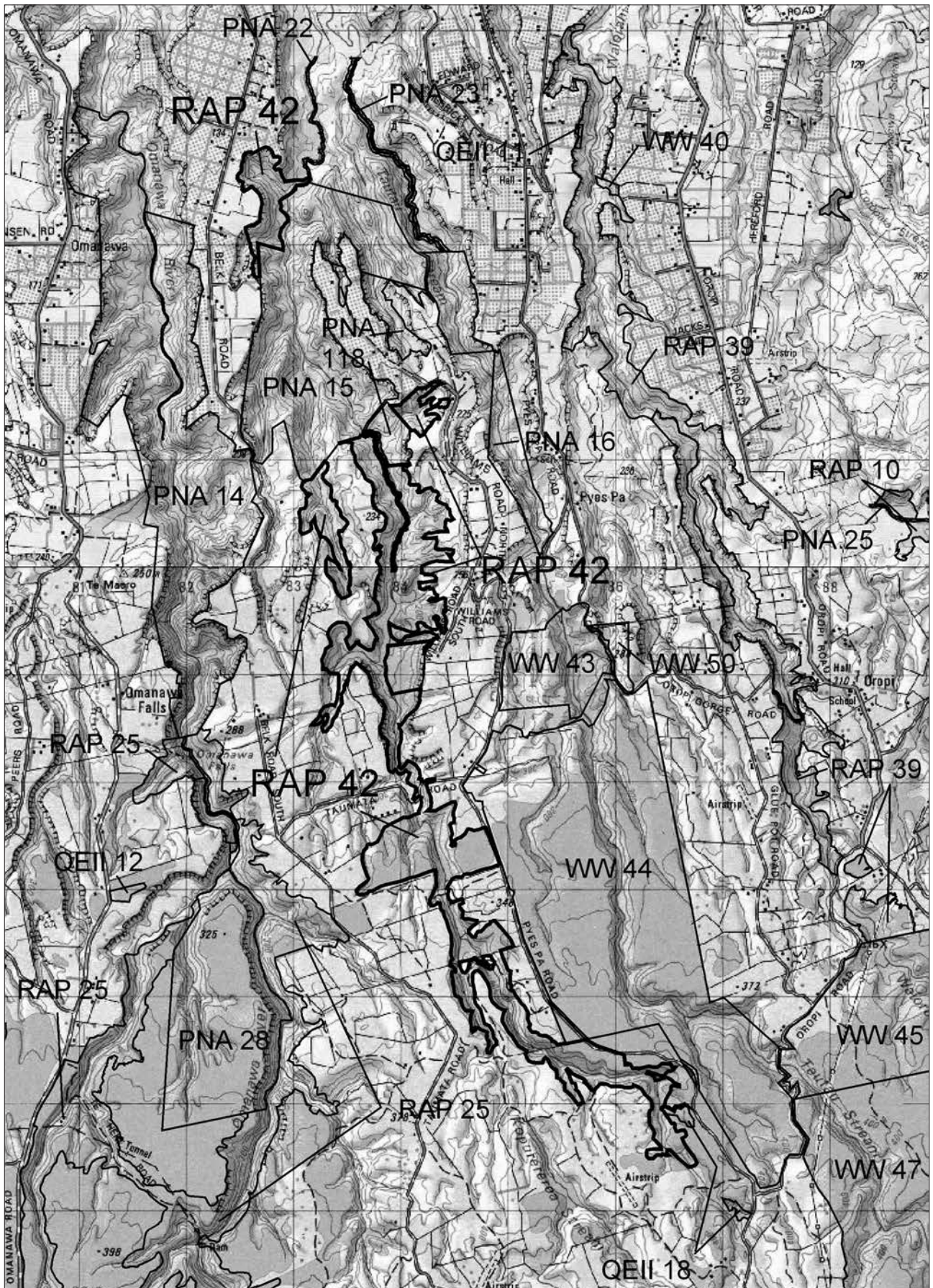
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | L | Viability    | M |
| Diversity          | L | Buffering    | H |
| Naturalness        | M | Size & Shape | H |
| Special Features   | N | Threats      | L |

### Discussion

This RAP has been proposed because it is contiguous with and complementary to the Kaimai-Mamaku Forest Park.



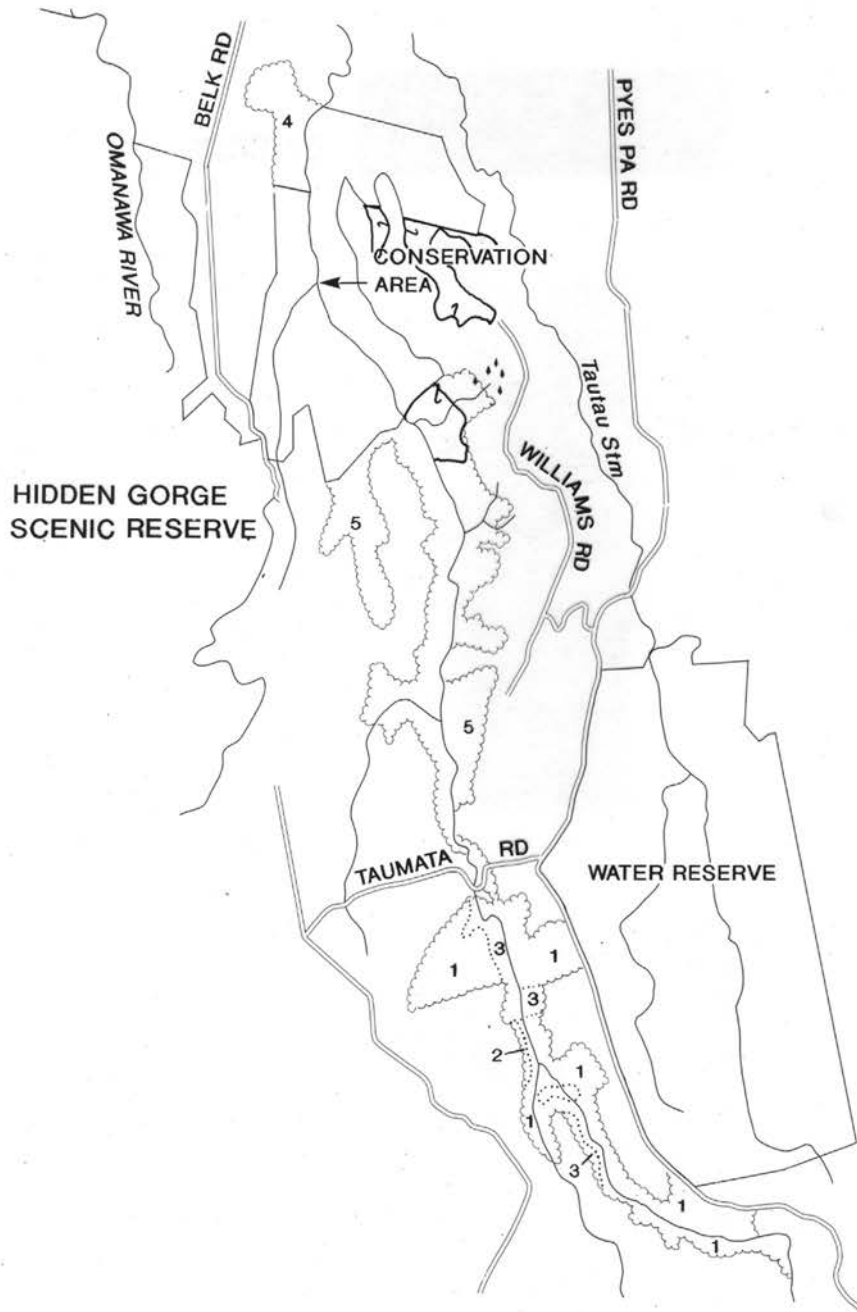
## RAP 42 TAUTAU STREAM-KOPURERERUA STREAM





# RAP 42 TAUTAU STREAM-KOPURERERUA STREAM

Area 372 ha



## KEY

- Pines
- Forest Edge
- Vegetation Type Boundary
- Reserve Boundary
- Conservation Area
- Clearing

0 500 1000 1500 2000m

Scale

## RAP 42 TAUTAU STREAM-KOPURERERUA STREAM

|                   |                         |
|-------------------|-------------------------|
| Area              | 371.6 ha                |
| Altitudinal Range | 40–400 m                |
| Grid Reference    | NZMS 260 U15 845660     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | 45, 56a, 93             |
| Status            | Unprotected             |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                                                                                                 | LANDFORM                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Lowland          | 1. Tawa-rewarewa-(hinau)-(pukatea)-(mangeao) forest                                                                                             | Hillslope                  |
| Lowland          | 2. Scattered radiata pine/bracken fernland                                                                                                      | Hillslope                  |
| Lowland          | 3. Kamahi-whauwhaupaku-tawa shrubland                                                                                                           | Hillslope                  |
| Semi-coastal     | 4. Rewarewa/kanuka-tawa-kamahi-(hinau) forest                                                                                                   | Steep hillslope and ridge  |
| Lowland          | 5. Mosaic of:<br>Mamaku-gorse-bracken fernland (15%)<br>Tawa-rewarewa-mangeao forest (70%)<br>Mamaku-mahoe-whauwhaupaku-bracken shrubland (15%) | Hillslope, ridge and gully |

### Landform

This RAP incorporates some of the steep hillslopes in the headwaters of the Kopurererua Stream and a small side gully of the Tautau Stream. Both these streams cut through the Mamaku rhyolite plateau.

### Vegetation

Tawa-rewarewa forest with occasional hinau, pukatea and mangeao occurs on the steep hillslopes. Bracken fernland and kamahi-whauwhaupaku-tawa shrubland occur in small areas along the margins where fire or clearing has destroyed the previous vegetation. On less steep terrain is a mosaic of mamaku-gorse-bracken fernland and mamaku-mahoe-whauwhaupaku-bracken shrubland. Kanuka-tawa-kamahi forest with occasional hinau and emergent rewarewa occurs on steep hillslopes in the small northern block of the RAP contiguous with a Department of Conservation Stewardship Area (U14032).

### Flora

No species of special significance were noted in this RAP, although there are unconfirmed reports of *Dactylanthus taylorii* (classed as Chronically Threatened, Serious Decline in de Lange *et al.* 2004).

### Fauna

Common forest birds including North Island robin, whitehead, pied tit and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002),



as well as Pacific gecko, forest gecko and green gecko were recorded at this site (Fauna Survey Unit 1982, unpublished).

### **Threat / modification**

This RAP has a long history of logging, clearing and burning and the present vegetation pattern reflects these activities. Gorse, blackberry and wilding pines are common. Feral goats with a few deer are likely to be present throughout.

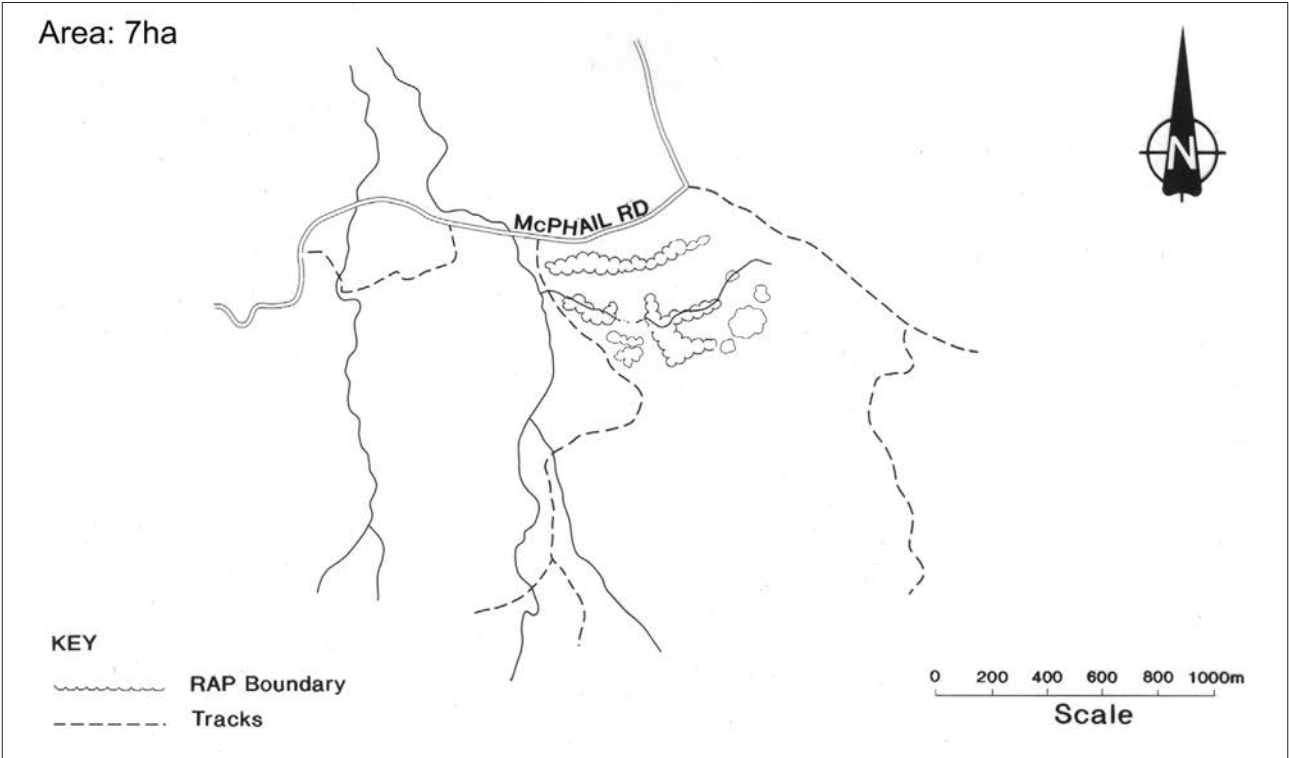
### **Evaluation**

|                    |   |              |       |
|--------------------|---|--------------|-------|
| Representativeness | M | Viability    | L     |
| Diversity          | M | Buffering    | L & H |
| Naturalness        | M | Size & Shape | M     |
| Special Features   | L | Threats      | M     |

### **Discussion**

These sites are contiguous with a relatively large tract of protected land including the Oropi Gorge Waterworks Reserve and Department of Conservation Stewardship Area, Hidden Gorge Scenic Reserve and Wood QEII Covenant. This RAP extends and complements the existing protected natural areas.

RAP 43 OROPI FOREST



## RAP 43 OROPI FOREST

|                   |                         |
|-------------------|-------------------------|
| Area              | 6.5 ha                  |
| Altitudinal Range | 260 m                   |
| Grid Reference    | NZMS 260 U15 912695     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | 107                     |
| Status            | Unprotected             |

| BIOCLIMATIC ZONE | VEGETATION TYPE | LANDFORM         |
|------------------|-----------------|------------------|
| Lowland          | Manuka scrub    | Plateau, wetland |

### Landform

Narrow, low-lying depressions underlain by Mamaku ignimbrite.

### Vegetation and flora

The vegetation on this site may have developed following forest clearance (logging or burning) in the past. Manuka forms the dominant cover with a few emergent pole kahikatea and ti kouka at the western end of the southern block. Species present include *Sphagnum cristatum*, *Nertera scapanioides*, karetu, spike sedge, *Gnaphalium limosum*, swamp kiokio (*Blechnum minus*), *Gleichenia microphylla*, Spanish heath and gorse.

### Fauna

North Island fernbird (At Risk, Sparse in Hitchmough 2002) occurs at this site.

### Threat / modification

Scattered grey willow saplings have colonised the wetlands and should be controlled. The surrounding exotic pine plantation may lower the water table in the wetland which would result in a long term change in vegetation cover.

### Evaluation

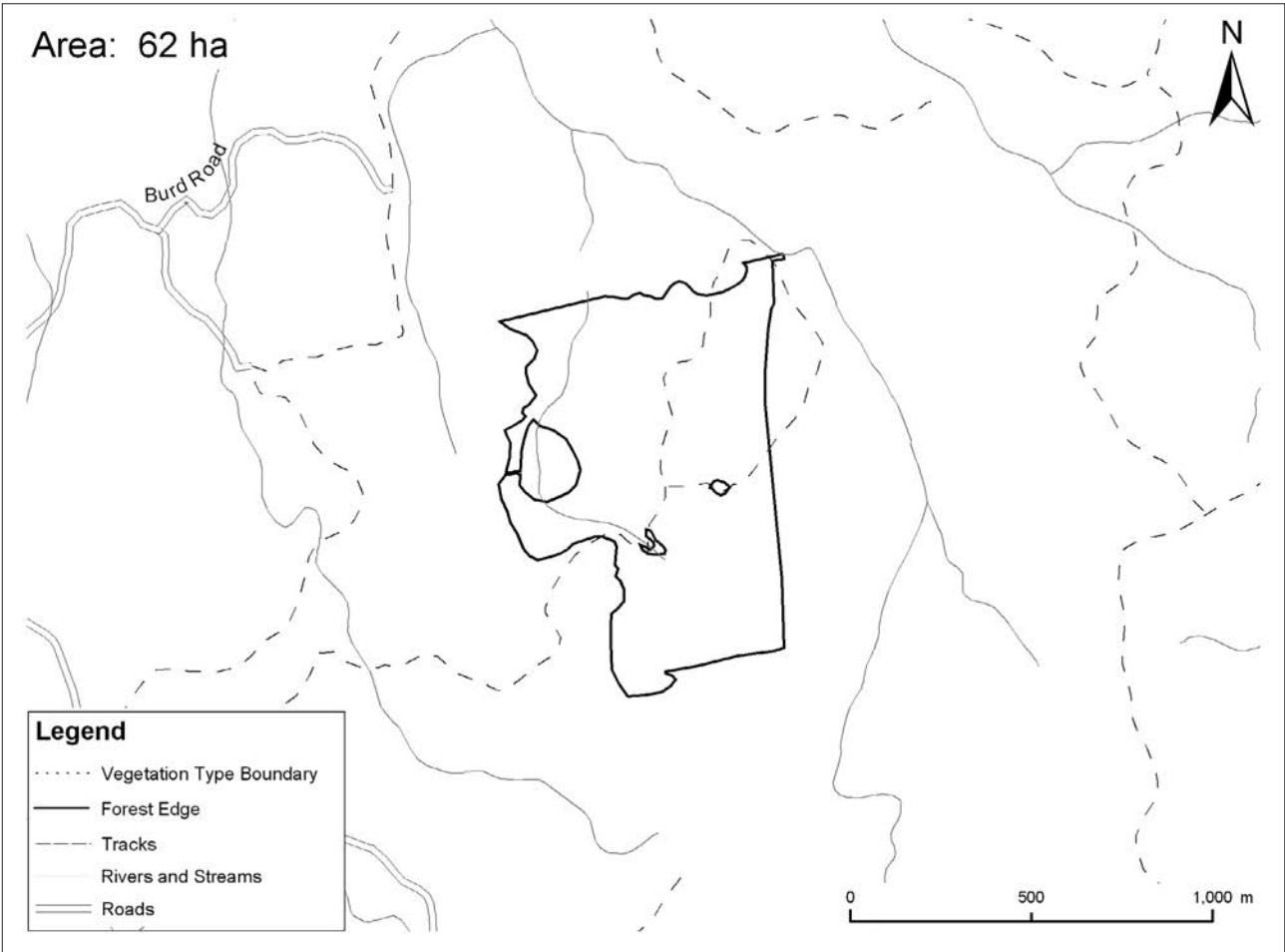
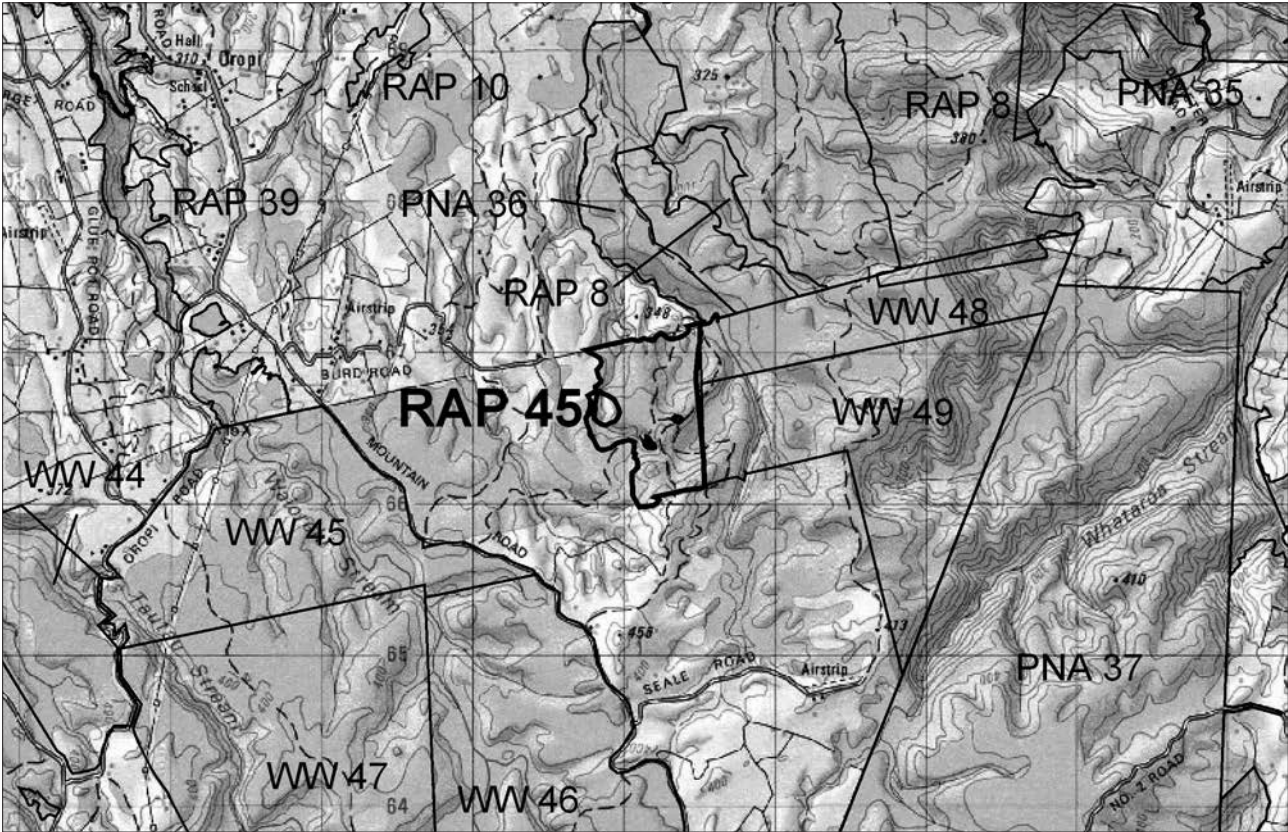
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | L |
| Diversity          | M | Buffering    | M |
| Naturalness        | M | Size & Shape | L |
| Special Features   | L | Threats      | H |

### Discussion

Oropi Forest is one of the few remaining examples of wetland vegetation in this part of the ecological district. It is in relatively good condition and provides habitat for the North Island fernbird.



# RAP 45 OTAWA-OTANEWAINUKU EXTENSION





|                   |                         |
|-------------------|-------------------------|
| Area              | 61.7 ha                 |
| Altitudinal Range | 320–460 m               |
| Grid Reference    | NZMS 260 U15 912665     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | 49                      |
| Status            | Unprotected             |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                 | LANDFORM  |
|------------------|-------------------------------------------------|-----------|
| Lowland          | Rewarewa-tawa-pukatea-mangeao-hinau-rimu forest | Hillslope |

### Landform

Gently undulating ignimbrite plateau in the headwaters of the Waipapa Stream.

### Vegetation

The current vegetation reflects the block's history of logging and grazing by domestic stock. The forest canopy comprises rewarewa, tawa, pukatea, mangeao, hinau and rimu. *Metrosideros fulgens* is common. Bracken and introduced grasses and herbs are common along old logging tracks and on clearings.

### Fauna

Common forest bird species occur in this RAP. It is part of an area ranked as outstanding in Saunders (1983) because of its large size and diversity of bird species (see discussion below).

### Threat / modification

This land has been retired from domestic grazing for ten years.

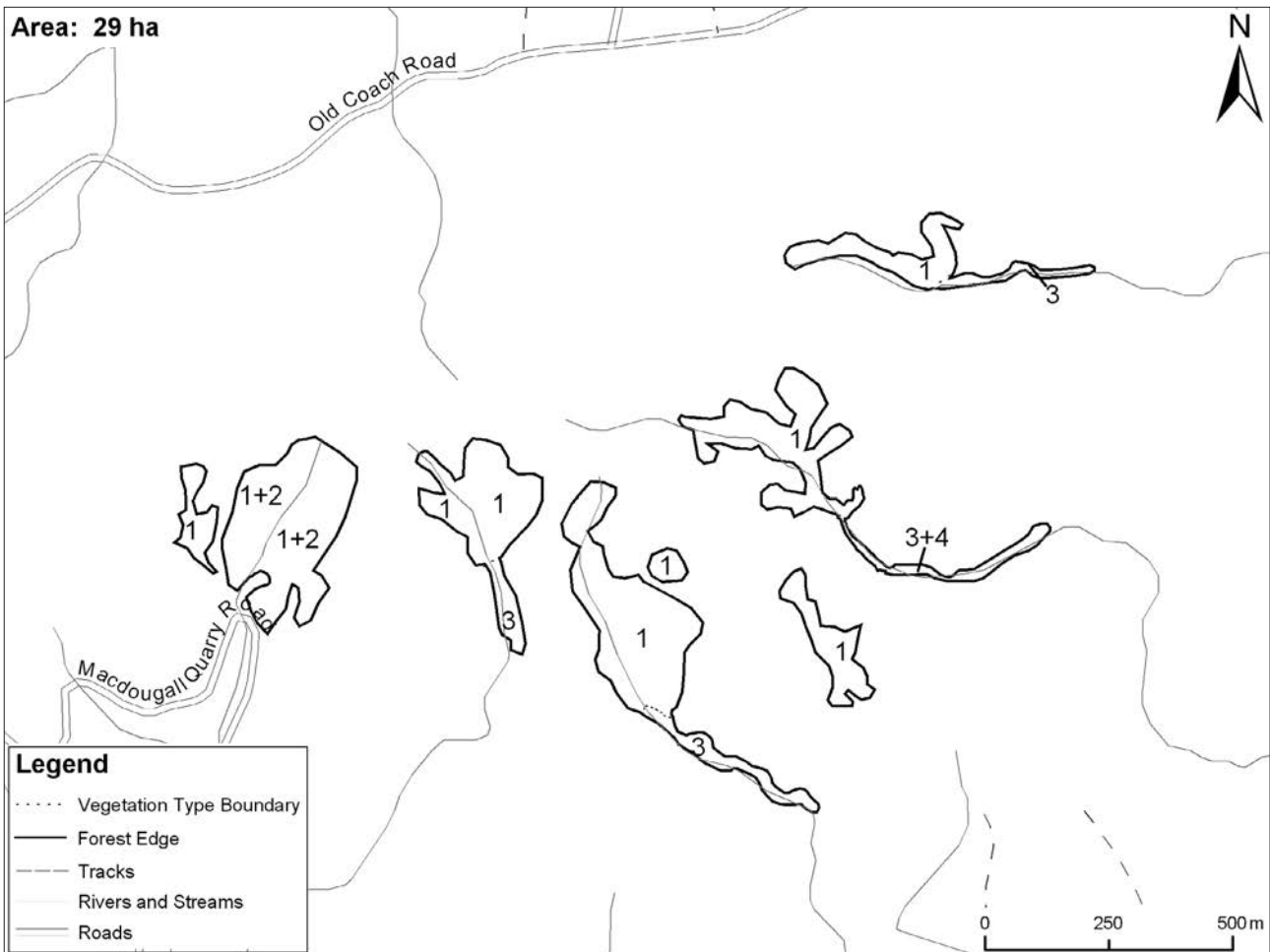
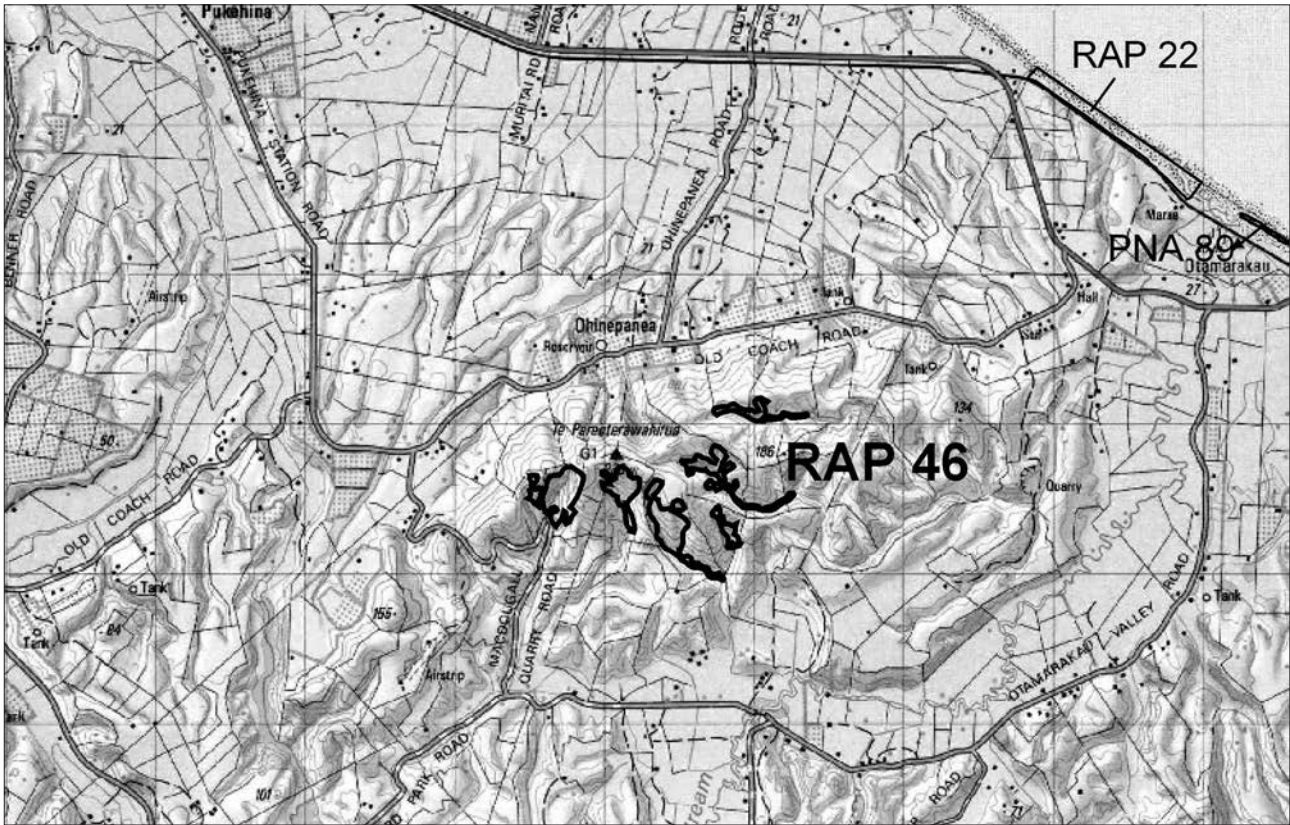
### Evaluation

|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | L | Viability    | M |
| Diversity          | L | Buffering    | M |
| Naturalness        | L | Size & Shape | M |
| Special Features   | L | Threats      | L |

### Discussion

This RAP is contiguous with the large representative Otawa-OtaneWainuku forests (Beadel 1985a) and is part of a large area ranked as outstanding for wildlife habitat value (Saunders 1983). However, from 1982 parts of Oropi forest to the north have been converted to pines, isolating this RAP from the Otawa-OtaneWainuku Forest. This is reflected by the Category 3 rank.

# RAP 46 TE PAREOTERAWAHIRUA



## RAP 46 TE PAREOTERAWAHIRUA

|                   |                     |
|-------------------|---------------------|
| Area              | 28.6 ha             |
| Altitudinal Range | 60–200 m            |
| Grid Reference    | NZMS 260 V15 235664 |
| Land System       | Otamarakau Hills    |
| Study Area No.    | 18                  |
| Status            | Unprotected         |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                | LANDFORM      |
|------------------|------------------------------------------------|---------------|
| Semi-coastal     | 1. Mangeao forest                              | Hillslope     |
| Semi-coastal     | 2. Rewarewa/manuka-mangeao-whauwhaupaku forest | Hillslope     |
| Semi-coastal     | 3. Raupo reedland                              | Sloping gully |
| Semi-coastal     | 4. Grey willow forest                          | Sloping gully |

### Landform

This RAP consists of several small disjunct flushed gullies along the southern side of Te Pareoterawahirua, a greywacke outcrop.

### Vegetation

Several small forest remnants and adjoining wetlands support the vegetation.

Mangeao forest occurs at three of the sites in association with scattered mahoe, kamahi and kohekohe and a few emergent rewarewa. Raupo reedland and grey willow forest occur in the gullies below the forest. Rewarewa/manuka-mangeao-whauwhaupaku occurs in the western most block.

### Flora

New Zealand ngaio occurs here. Ngaio is relatively uncommon in the ecological district.

### Fauna

No species of significance were recorded.

### Threat / modification

This RAP is heavily grazed by domestic stock, threatening the long term survival of forest on these sites.

### Evaluation

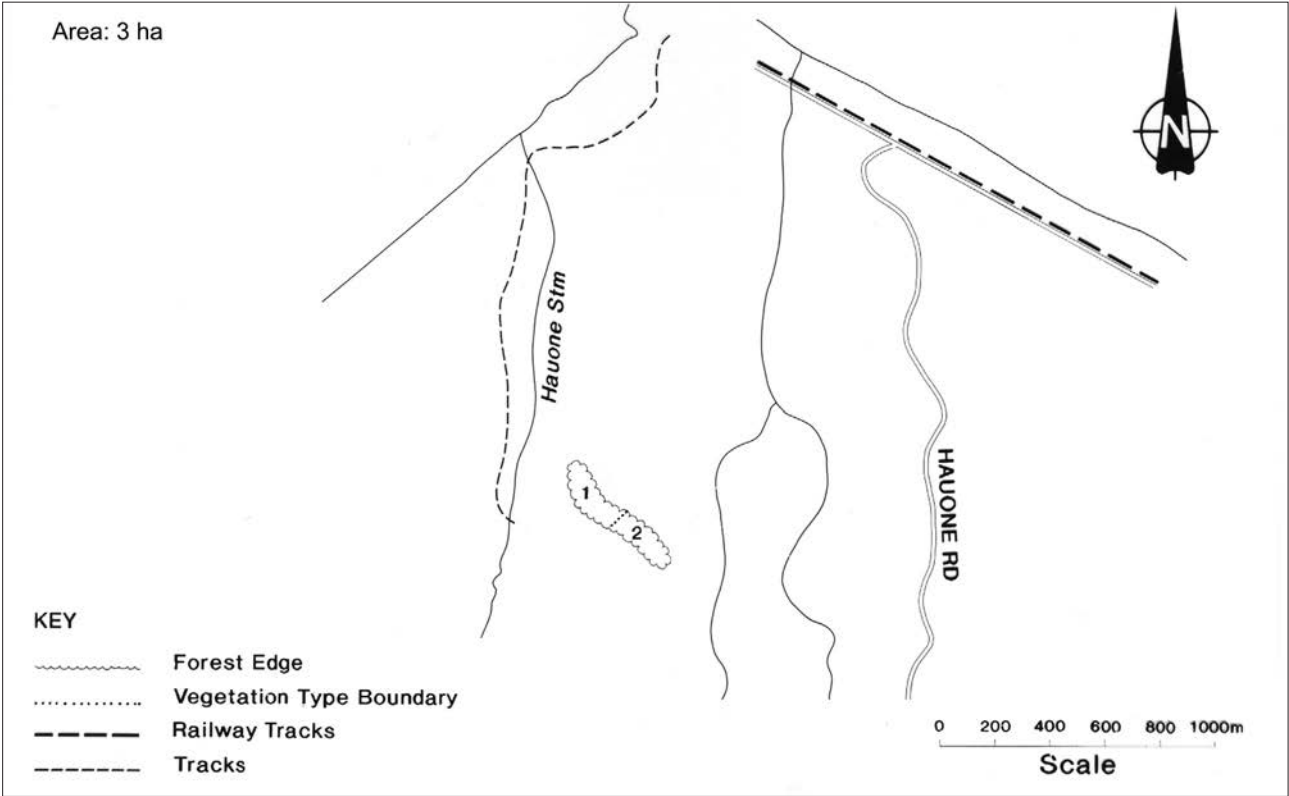
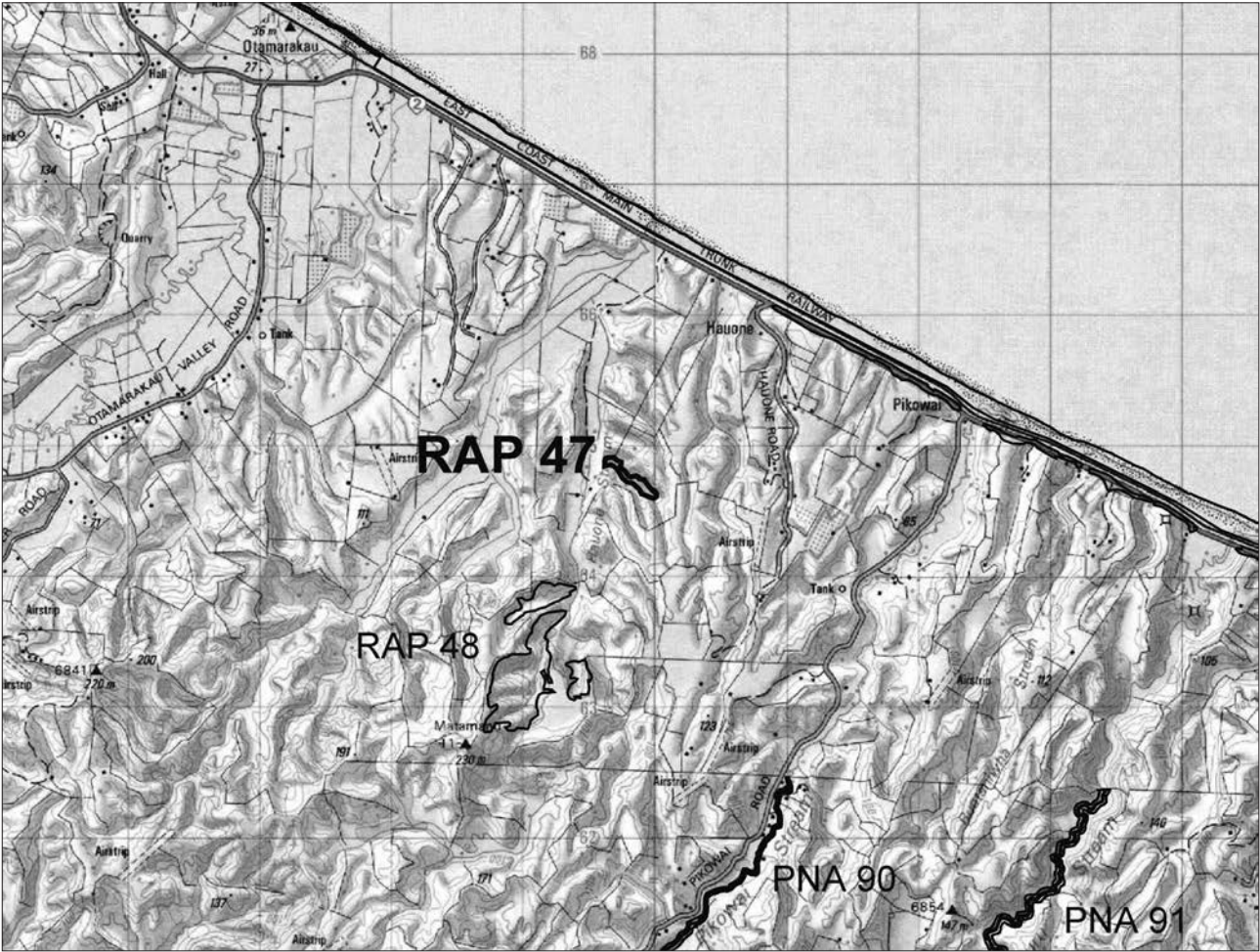
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | L |
| Diversity          | L | Buffering    | L |
| Naturalness        | L | Size & Shape | L |
| Special Features   | M | Threats      | H |

## **Discussion**

Although this RAP consists of several small disjunct areas, it includes the best of the few remaining examples of indigenous forest on the Otamarakau Hills land system. There are no protected areas on this land system, however one other RAP was identified on this land system (RAP 48 Matamanu).



RAP 47    HAUONE STREAM WETLAND



## RAP 47 HAUONE STREAM WETLAND

|                   |                                |
|-------------------|--------------------------------|
| Area              | 2.8 ha                         |
| Altitudinal Range | 20–60 m                        |
| Grid Reference    | NZMS 260 V15 297647            |
| Land System       | Rotoiti Breccia Ignimbrite Fan |
| Study Area No.    | 153                            |
| Status            | Unprotected                    |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                 | LANDFORM    |
|------------------|-----------------------------------------------------------------|-------------|
| Semi-coastal     | 1. Grey willow forest                                           | Gully flush |
| Semi-coastal     | 2. Raupo/ <i>Carex secta</i> -swamp millet-spike sedge reedland | Wetland     |

### Landform

Long narrow gully flush draining into the broad flat Pikowai Valley.

### Vegetation

Small remnant wetland dominated by raupo, purei (*Carex secta* and *C. virgata*), swamp millet and spike sedge with grey willow forest at the upper end. The understorey beneath the grey willow contains mainly indigenous species, including swamp kiokio, wheki and *Carex secta*.

### Flora

Maru (burr reed; *Sparganium subglobosum*) occurs at this site.

### Fauna

Pukeko occur here.

### Threat / modification

This site is currently grazed by domestic stock which should be excluded if possible to maintain the current values of this wetland.

### Evaluation

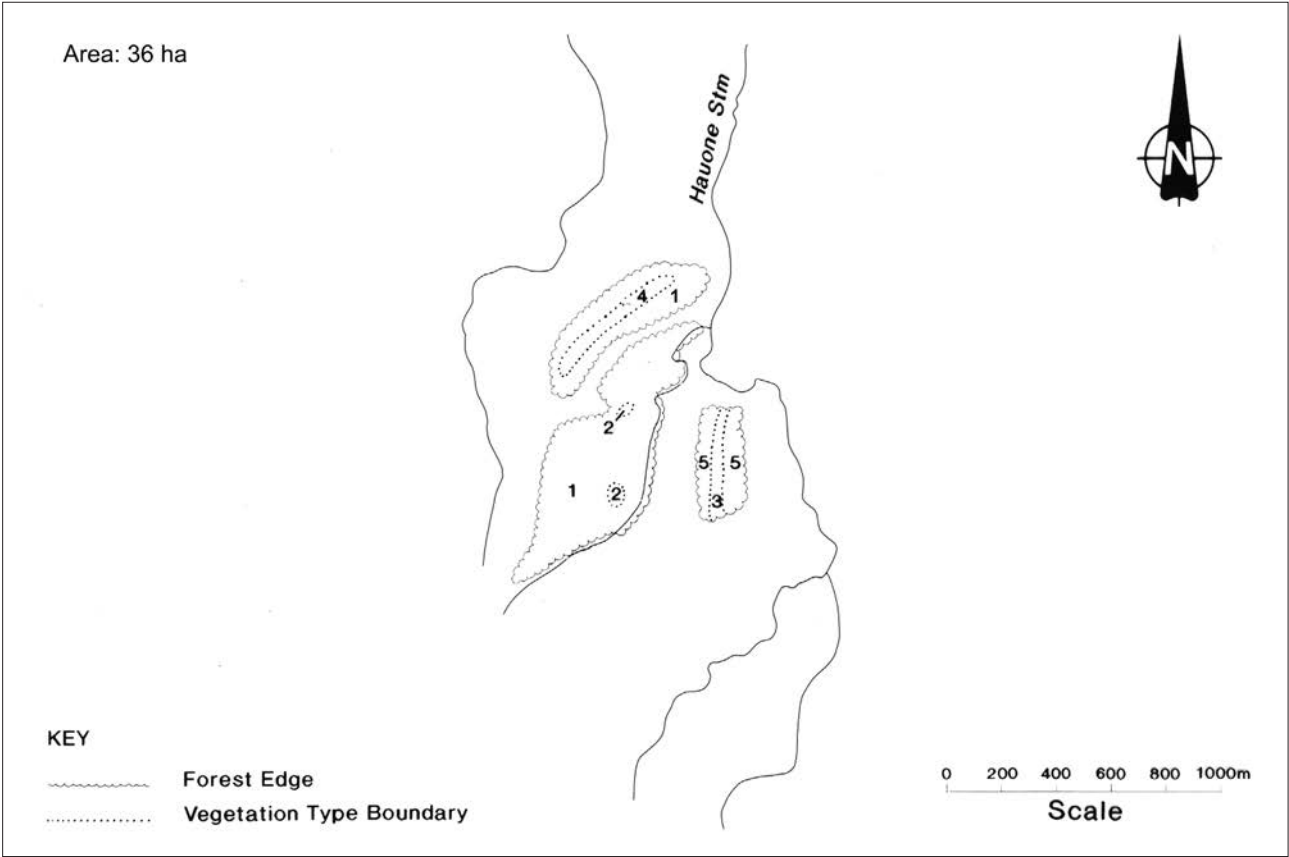
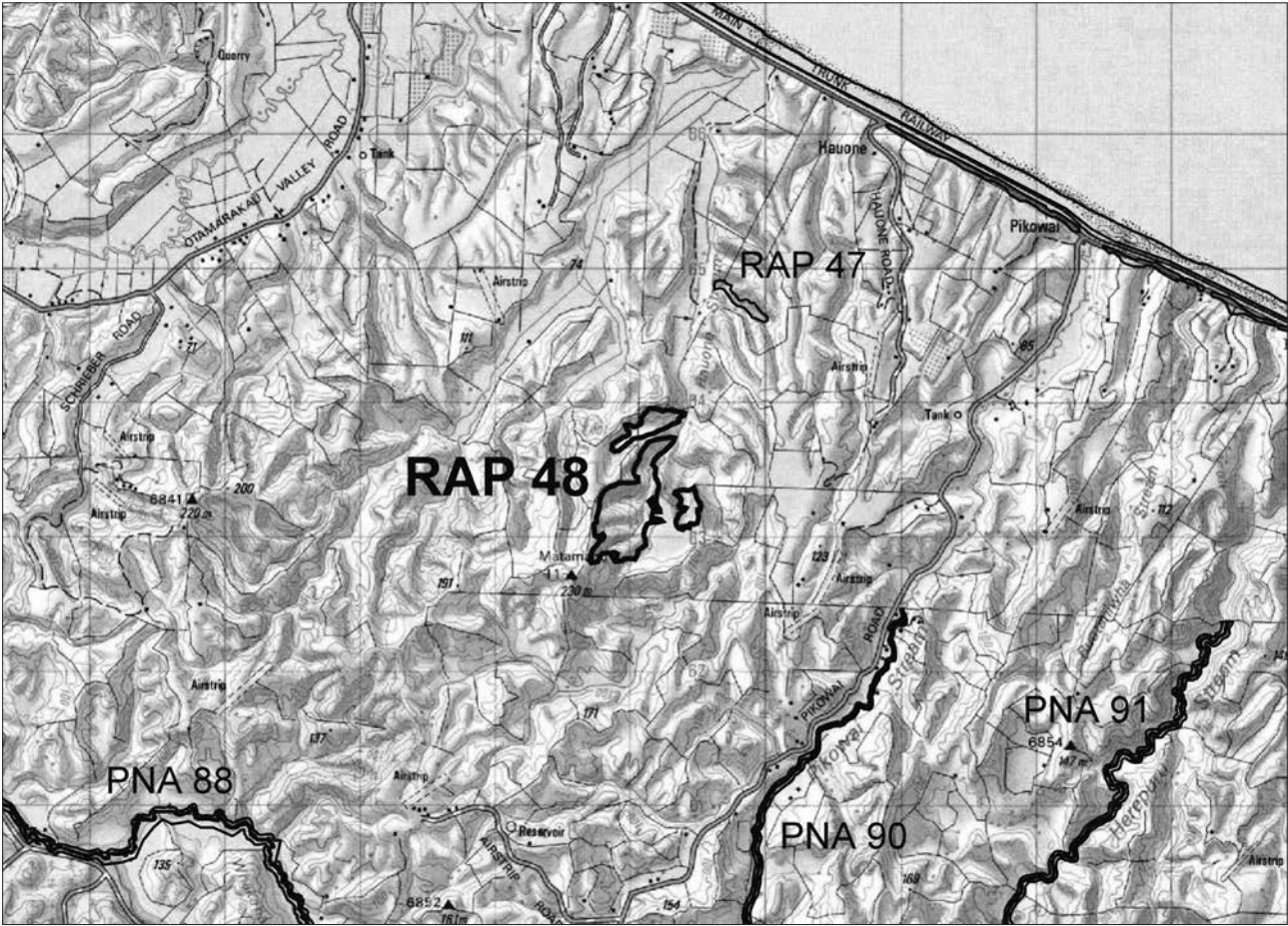
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | M |
| Diversity          | L | Buffering    | L |
| Naturalness        | L | Size & Shape | L |
| Special Features   | L | Threats      | H |

### Discussion

Wetlands were once common in this portion of the district, but few remain. Although small, this RAP is proposed because it is in relatively good condition and is one of the few wetlands remaining in the whole district.



RAP 48 MATAMANU



## RAP 48 MATAMANU

|                   |                     |
|-------------------|---------------------|
| Area              | 35.9 ha             |
| Altitudinal Range | 60–230 m            |
| Grid Reference    | NZMS 260 V15 287629 |
| Land System       | Otamarakau Hills    |
| Study Area No.    | 154                 |
| Status            | Unprotected         |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                                     | LANDFORM               |
|------------------|-------------------------------------------------------------------------------------|------------------------|
| Semi-coastal     | 1. Manuka scrub and mamaku-mahoe treeland                                           | Hillslope, ridge crest |
| Semi-coastal     | 2. Raupo/swamp millet-lotus-spike sedge herb-grass-sedge-reedland                   | Seepage swamp          |
| Semi-coastal     | 3. Manuka/raupo shrubland                                                           | Alluvial flat          |
| Semi-coastal     | 4. Mosaic of grey willow forest, raupo reedland, <i>Cyperus ustulatus</i> sedgeland | Seepage swamp          |
| Semi-coastal     | 5. Mahoe-mamaku-kanuka treeland                                                     | Hillslope              |

### Landform

Greywacke hillslopes with small flushed gullies. Includes a small wetland on an alluvial flat at the head of the Pikowai Valley.

### Vegetation

This RAP comprises secondary scrub and treeland with several small wetlands in gullies.

### Flora and Fauna

No species of note recorded during survey.

### Threat / modification

This site is current grazed by domestic stock which should be excluded.

### Evaluation

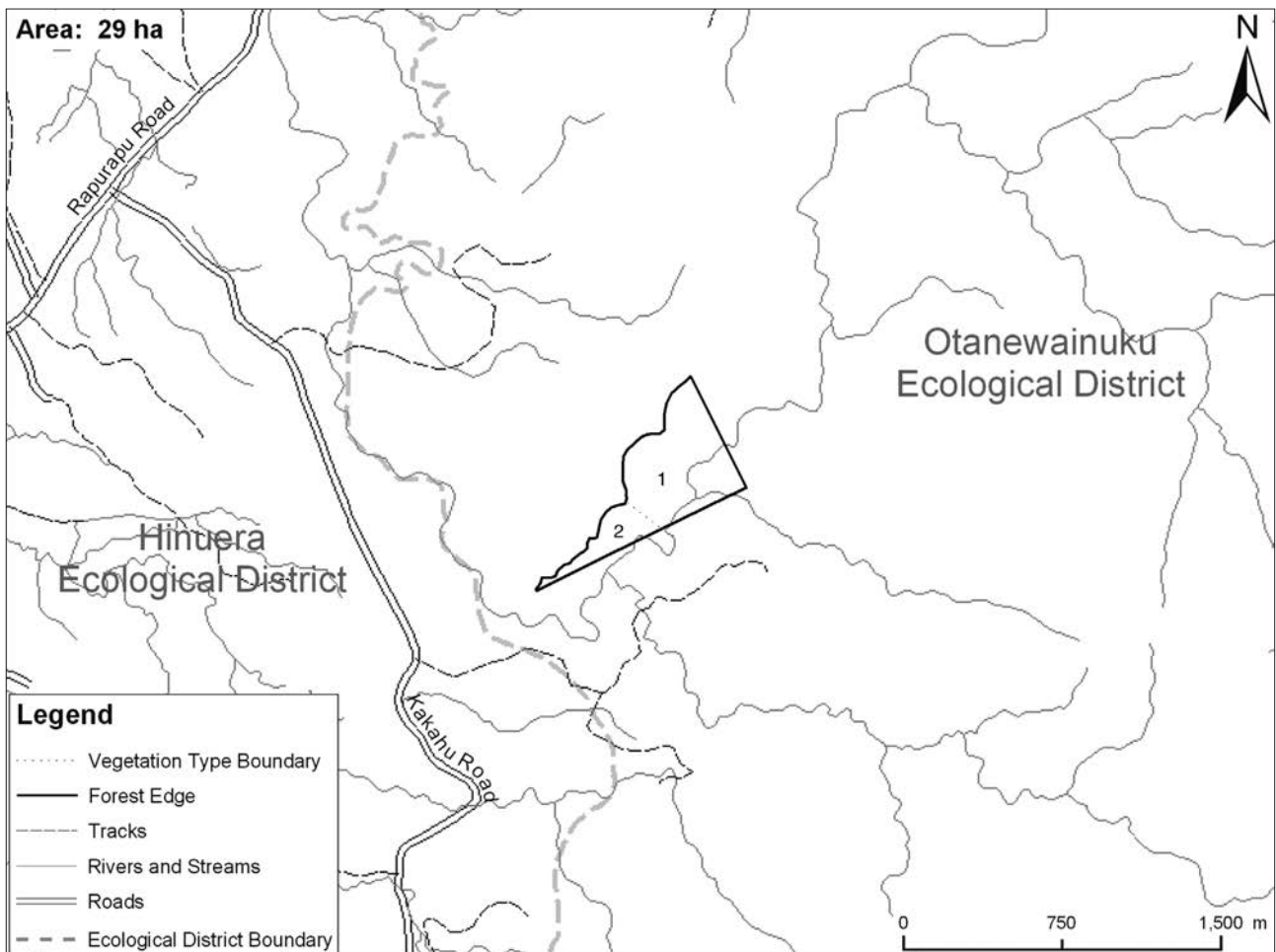
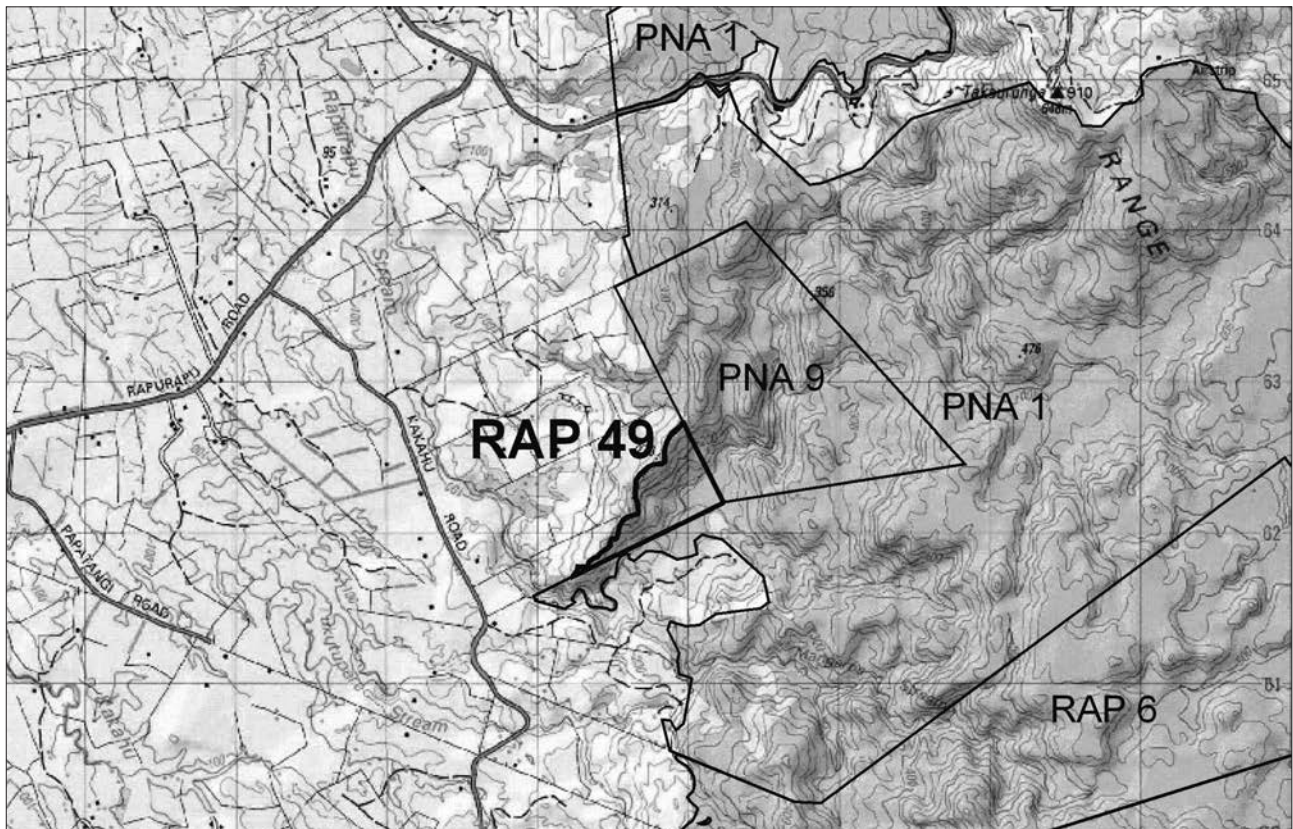
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | L |
| Diversity          | M | Buffering    | L |
| Naturalness        | M | Size & Shape | L |
| Special Features   | L | Threats      | H |

### Discussion

Very little other indigenous vegetation, particularly wetlands, remains in the general Pikowai-Otamarakau locality of the ecological district and there are no protected natural areas in the Otamarakau Hills land system. This is one of only two RAPs identified in this land system (see also RAP 46). This RAP contains one of the best remaining examples of vegetation both in the general Pikowai-Otamarakau locality and on the rare greywacke outcrops in the ecological district.



# RAP 49 KAKAHU ROAD



## RAP 49 KAKAHU ROAD

|                   |                     |
|-------------------|---------------------|
| Area              | 29.3 ha             |
| Altitudinal Range | 200–260 m           |
| Grid Reference    | NZMS 260 T15 659624 |
| Land System       | Whakamarama Plateau |
| Study Area No.    | 81                  |
| Status            | Unprotected         |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                       | LANDFORM  |
|------------------|-------------------------------------------------------|-----------|
| Semi-coastal     | 1. (Rimu)-(northern rata)/tawa-kohekohe-kamahi forest | Hillslope |
| Semi-coastal     | 2. (Northern rata)/tawa-kohekohe-kamahi forest        | Hillslope |

### Landform

A hillslope along the northern side of the Rapurapu Stream on the lower western flank of the Kaimai Range.

### Vegetation and flora

(Rimu)-(northern rata)/tawa-kohekohe-kamahi forest covers much of the RAP. Rimu is absent on the western side following light logging or crown fires.

### Threat / modification

This RAP is fenced to exclude domestic stock.

### Evaluation

|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | H |
| Diversity          | L | Buffering    | H |
| Naturalness        | M | Size & Shape | L |
| Special Features   | M | Threats      | L |

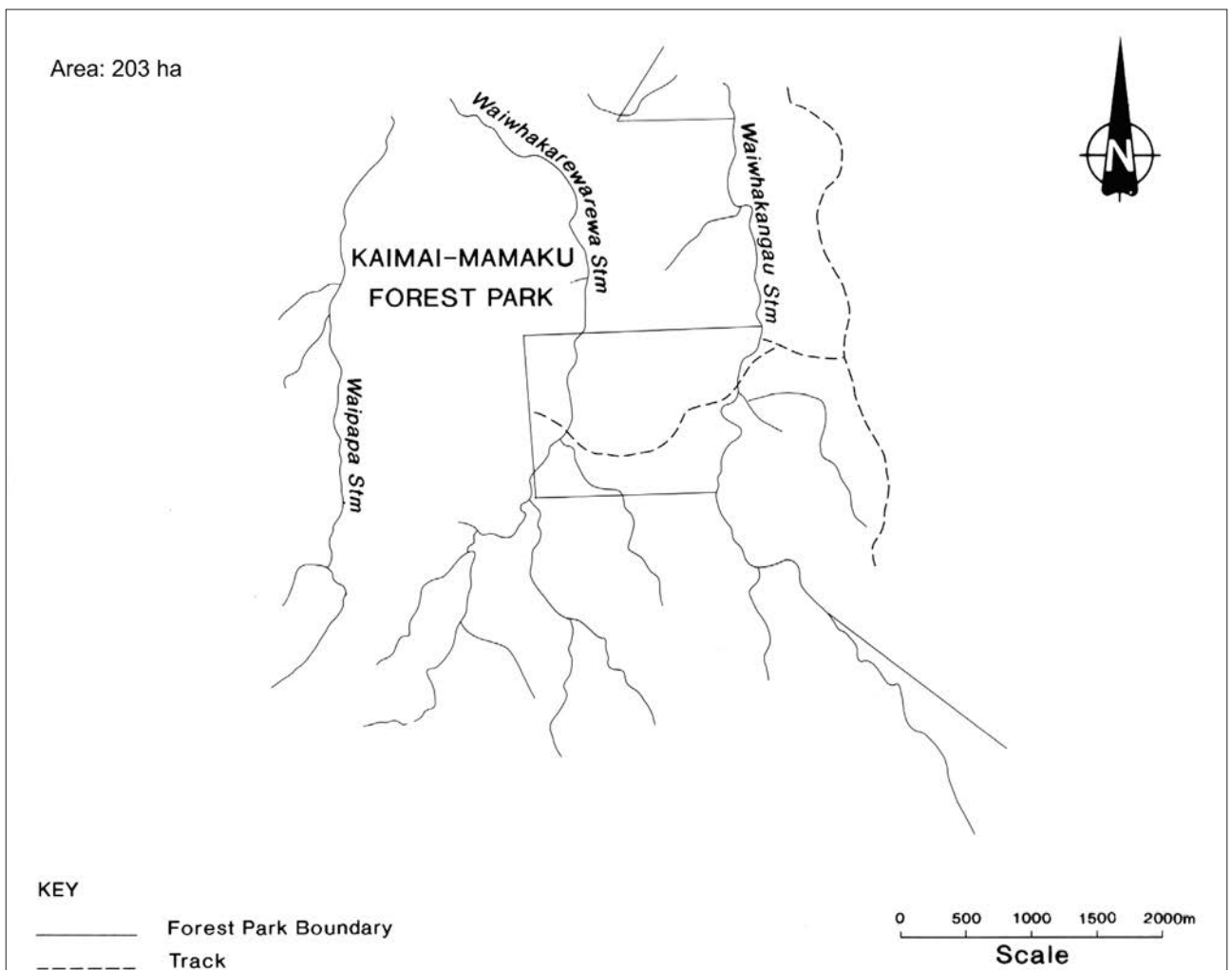
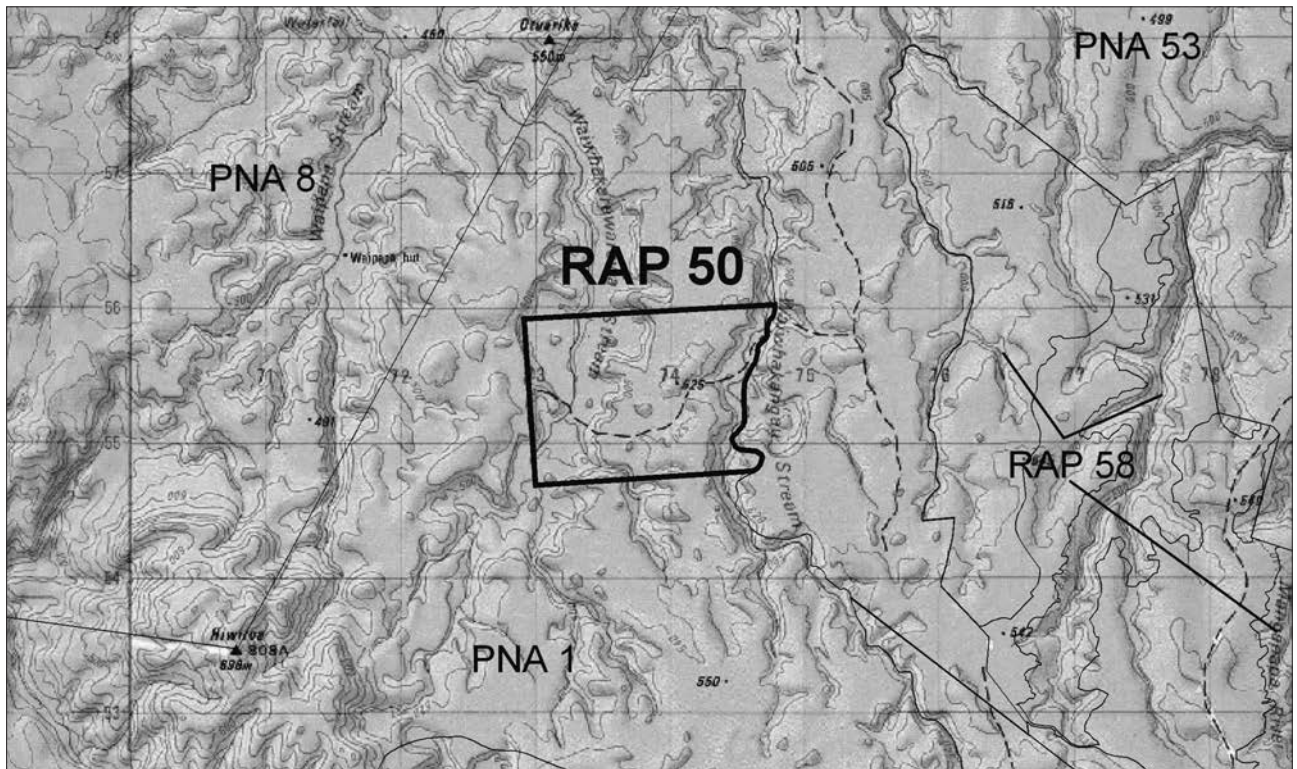
### Discussion

This RAP is contiguous with and complementary to the Rapurapu Ecological Area in Kaimai-Mamaku Forest Park. It contains relatively good examples of semi-coastal vegetation, under-represented in the reserve system of the Otanewainuku ecological district.

### References

Nicholls 1966c.

# RAP 50 WAIWHAKAREWAREWA STREAM





## RAP 50 WAIWHAKAREWAREWA STREAM

|                   |                         |
|-------------------|-------------------------|
| Area              | 203.3 ha                |
| Altitudinal Range | 500–525 m               |
| Grid Reference    | NZMS 260 U15 738554     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | 44a                     |
| Status            | Unprotected             |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                         | LANDFORM           |
|------------------|-------------------------------------------------------------------------|--------------------|
| Lowland          | Toetoe tussockland                                                      | Undulating plateau |
| Lowland          | <i>Coprosma robusta</i> -tawari-kamahi-hinau-kohuhu scrub and shrubland | Undulating plateau |

### Landform

A gently undulating part of Mamaku rhyolite plateau over which flow the Waiwhakarewarewa and Waiwhakangau Streams, tributaries of the Opuia River.

### Vegetation

The vegetation has been heavily modified by tractor-logging and the predominant cover is *Coprosma robusta*-tawari-kamahi-hinau-kohuhu scrub and shrubland, and toetoe tussockland. However there are a few small pockets of tawa dominant forest on the steeper sites (A. Jones pers. comm.).

### Flora and Fauna

No significant species are known to occur in this RAP.

### Threat / modification

This RAP has been so heavily logged that conversion to exotic pine plantations has been considered. However, access to the site is difficult which may preclude that.

### Evaluation

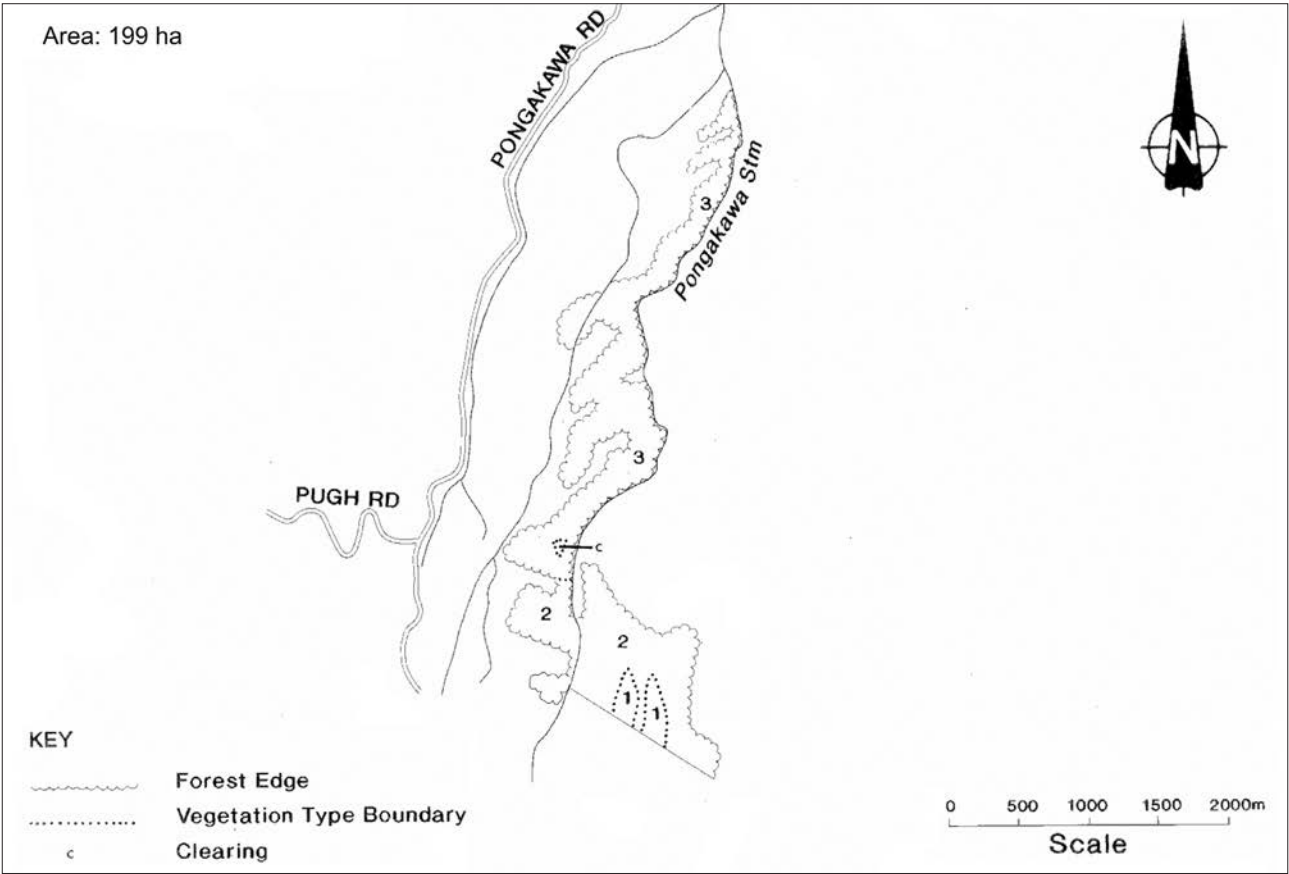
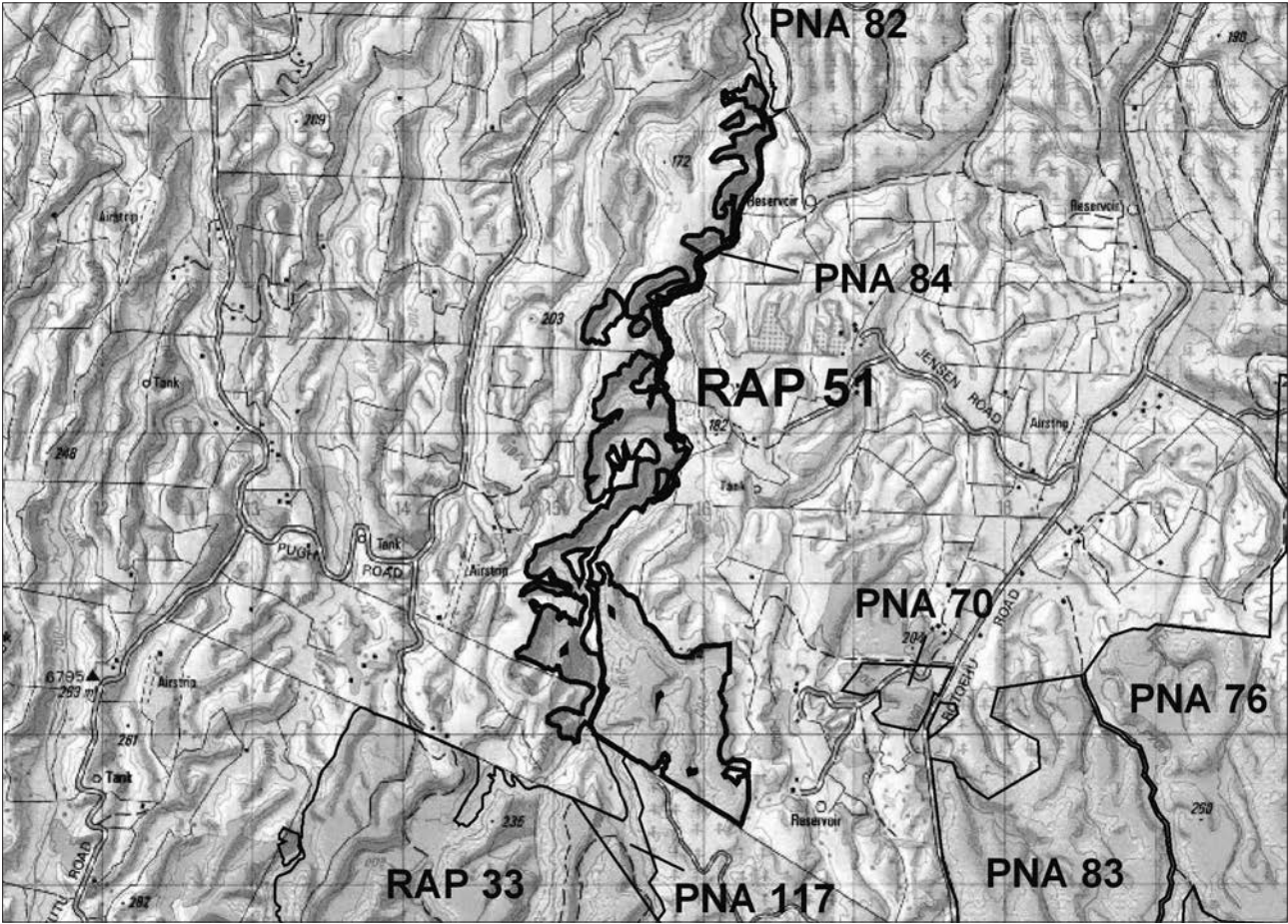
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | M |
| Diversity          | L | Buffering    | L |
| Naturalness        | L | Size & Shape | L |
| Special Features   | H | Threats      | H |

### Discussion

This RAP has been proposed because it is an enclave of unprotected indigenous vegetation surrounded by the Kaimai-Mamaku Forest Park. Protection of this RAP will maintain the forest cover adjacent to the two streams flowing through the RAP, both of which are tributaries of the Opuia River.



# RAP 51 PONGAKAWA STREAM



## RAP 51 PONGAKAWA STREAM

|                   |                                |
|-------------------|--------------------------------|
| Area              | 198.5 ha                       |
| Altitudinal Range | 100–220 m                      |
| Grid Reference    | NZMS 260 V15 157560            |
| Land System       | Rotoiti Breccia Ignimbrite Fan |
| Study Area Nos.   | 16 a and 16b                   |
| Status            | Unprotected                    |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                                                                                                                                        | LANDFORM         |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Semi-coastal     | 1. Rewarewa/kamahi forest                                                                                                                                                              | Ridge, hillslope |
| Semi-coastal     | 2. Tawa-rewarewa-mangeao-kamahi forest                                                                                                                                                 | Hillslope, ridge |
| Semi-coastal     | 3. Mosaic of : Tawa-rewarewa-mahoe-pukatea forest (50%) ⇔ putaputaweta-kanuka-wheki-kohuhu/kiokio-matata-bracken scrub and shrubland (45%) ⇔ pole rimu/kanuka-putaputaweta forest (5%) | Hillslope, ridge |

### Landform

Moderately-sloped valley of the Pongakawa Stream, carved through Rotoiti Breccia. Includes a low hill and gully at the southern end of the site.

### Vegetation

The vegetation of this RAP is relatively highly modified by logging, burning and clearing. Other canopy species present in the tawa-rewarewa-mangeao-kamahi forest include hinau, mamaku, pukatea and a few emergent rimu. Canopy species present adjacent to Pongakawa Stream (vegetation type 3) also include pole miro, mangeao, titoki, rewarewa and tanekaha.

### Flora

No significant species were recorded during the field survey.

### Fauna

In 1994 there were two threatened North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) in this RAP (using the south-eastern portion). These birds colonised the area following the removal of a kokako pair for relocation in the early 1980s. New Zealand falcon (Acutely Threatened, nationally vulnerable in Hitchmough 2002) have been recorded from this locality and probably occasionally use this area (Department of Conservation 1993d). Other forest bird species present include kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002).

## **Threat / modification**

This RAP has been modified by logging, burning and clearing. Except for the south-eastern block it is heavily grazed by domestic stock which threatens the long-term future of the vegetation and should cease.

Feral goats are present in low numbers in the lower reaches of the RAP and should be controlled.

## **Evaluation**

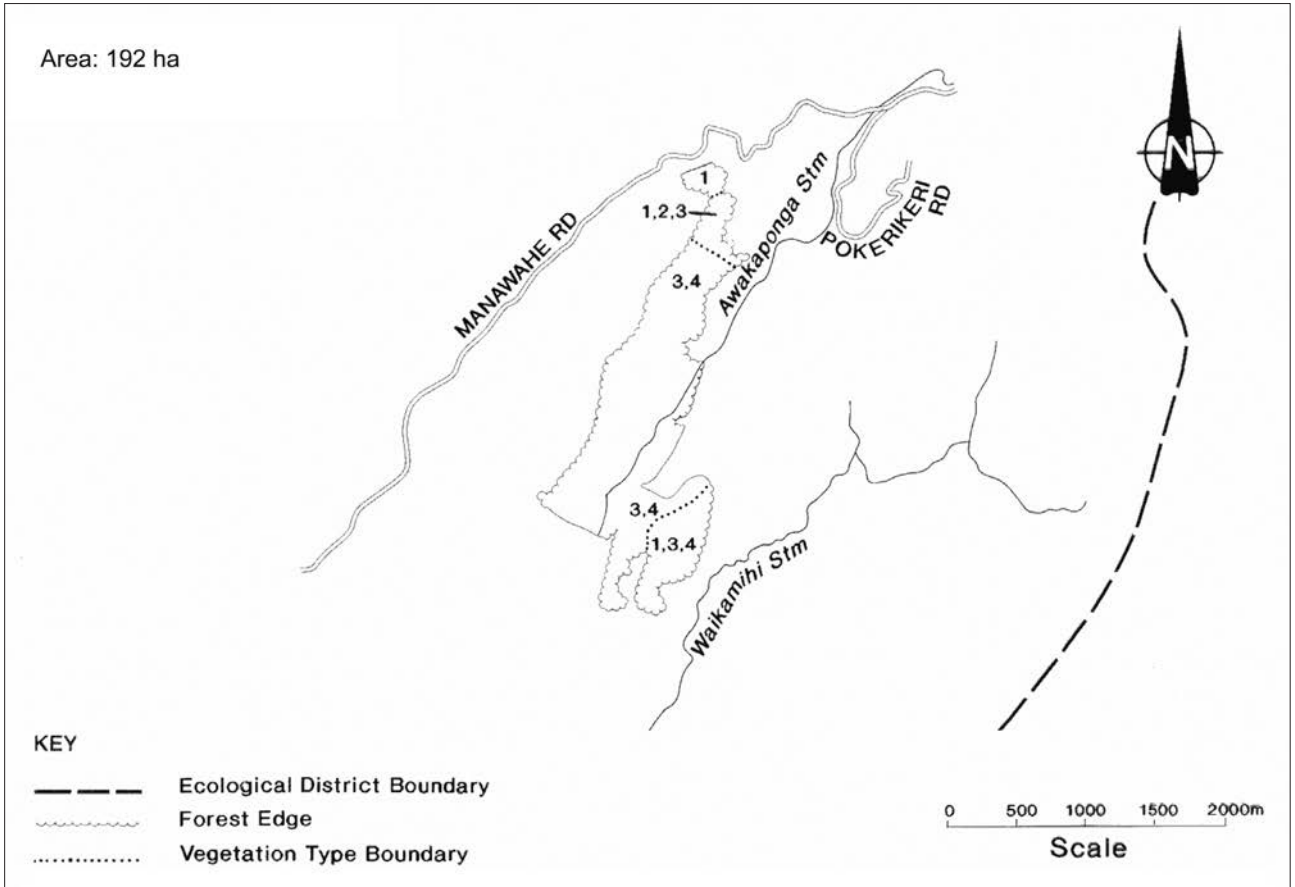
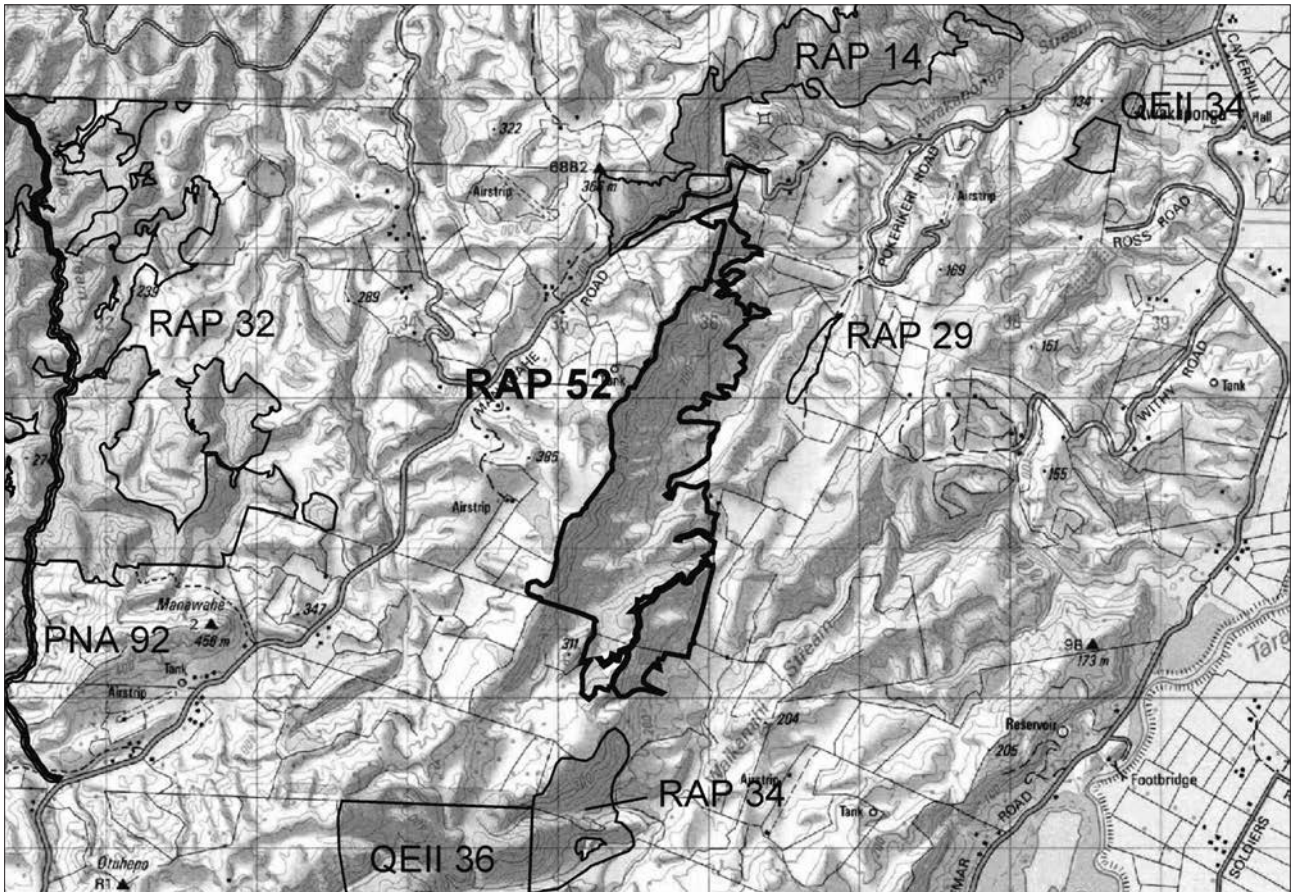
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | M |
| Diversity          | L | Buffering    | L |
| Naturalness        | L | Size & Shape | L |
| Special Features   | H | Threats      | H |

## **Discussion**

This RAP contains relatively good quality examples of the present day semi-coastal vegetation along a stream valley in this part of the district. The south-eastern block of the RAP contains two threatened North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002). Semi-coastal vegetation is under-represented in the existing reserve system of the district.



# RAP 52 MANAWAHE SCARP





## RAP 52 MANAWAHE SCARP

|                   |                                                 |
|-------------------|-------------------------------------------------|
| Area              | 191.7 ha                                        |
| Altitudinal Range | 180–380 m                                       |
| Grid Reference    | NZMS 260 V15 360553                             |
| Land System       | Matata Hills and Rotoiti Breccia Ignimbrite Fan |
| Study Area Nos.   | 5 a&b                                           |
| Status            | Unprotected                                     |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                   | LANDFORM  |
|------------------|-------------------------------------------------------------------|-----------|
| Semi-coastal     | 1. Manuka shrubland                                               | Hillslope |
| Semi-coastal     | 2. Mamaku-manuka-(mangeao)-(rewarewa) shrubland, scrub and forest | Hillslope |
| Semi-coastal     | 3. Tawa-rewarewa forest                                           | Hillslope |
| Semi-coastal     | 4. Rewarewa/mamaku-kamahi forest                                  | Hillslope |

### Landform

Comprises a small section of the broken marine sandstone scarp overlooking the Rangitaiki Plain.

### Vegetation

The tall forest in the southern portion of the RAP has been modified by repeated burning and clearance, inducing secondary forest, scrub and shrubland.

### Flora

No species of note were recorded.

### Fauna

Common forest birds occur in this RAP.

### Threat / modification

This site is threatened by grazing by domestic stock and clearance for firewood and pasture.

### Evaluation

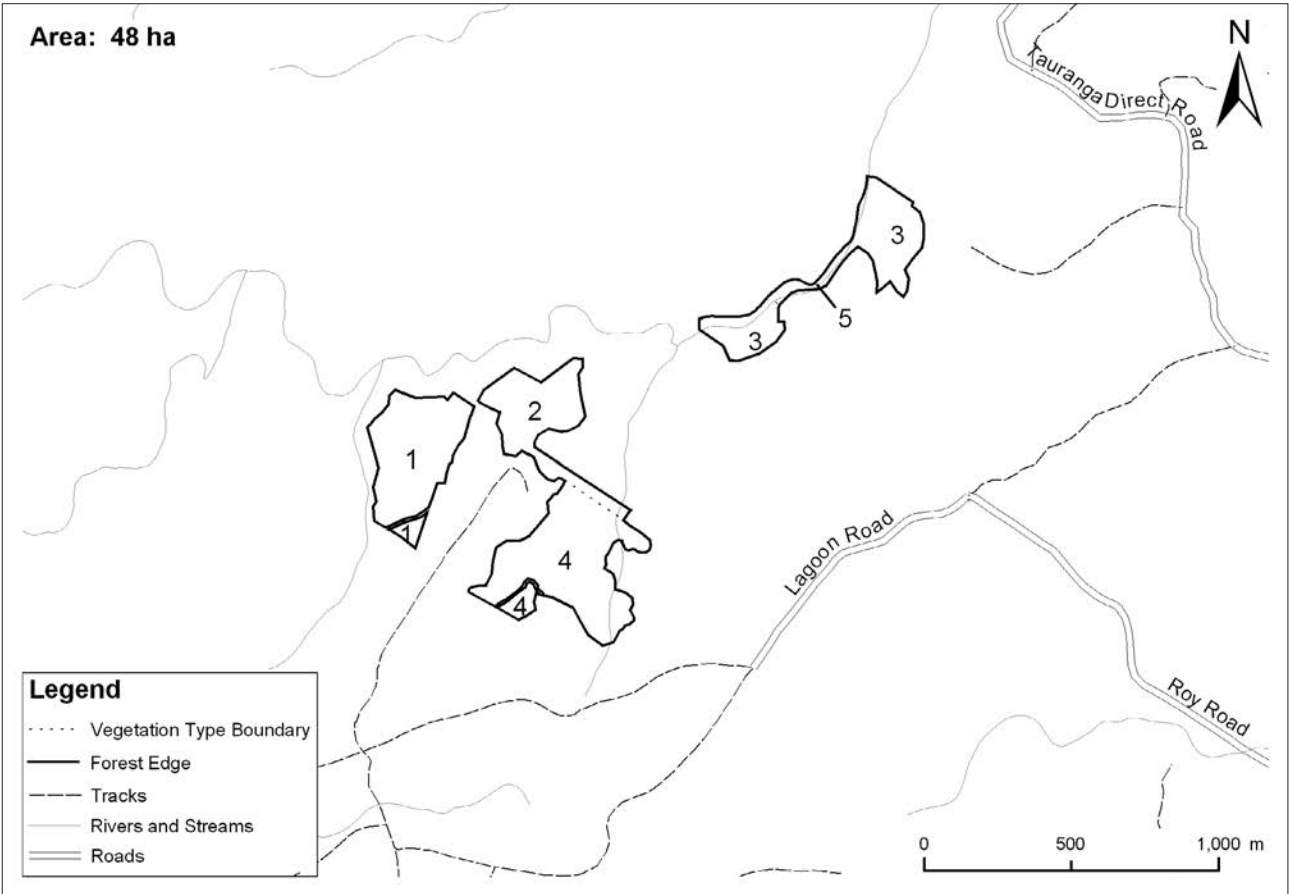
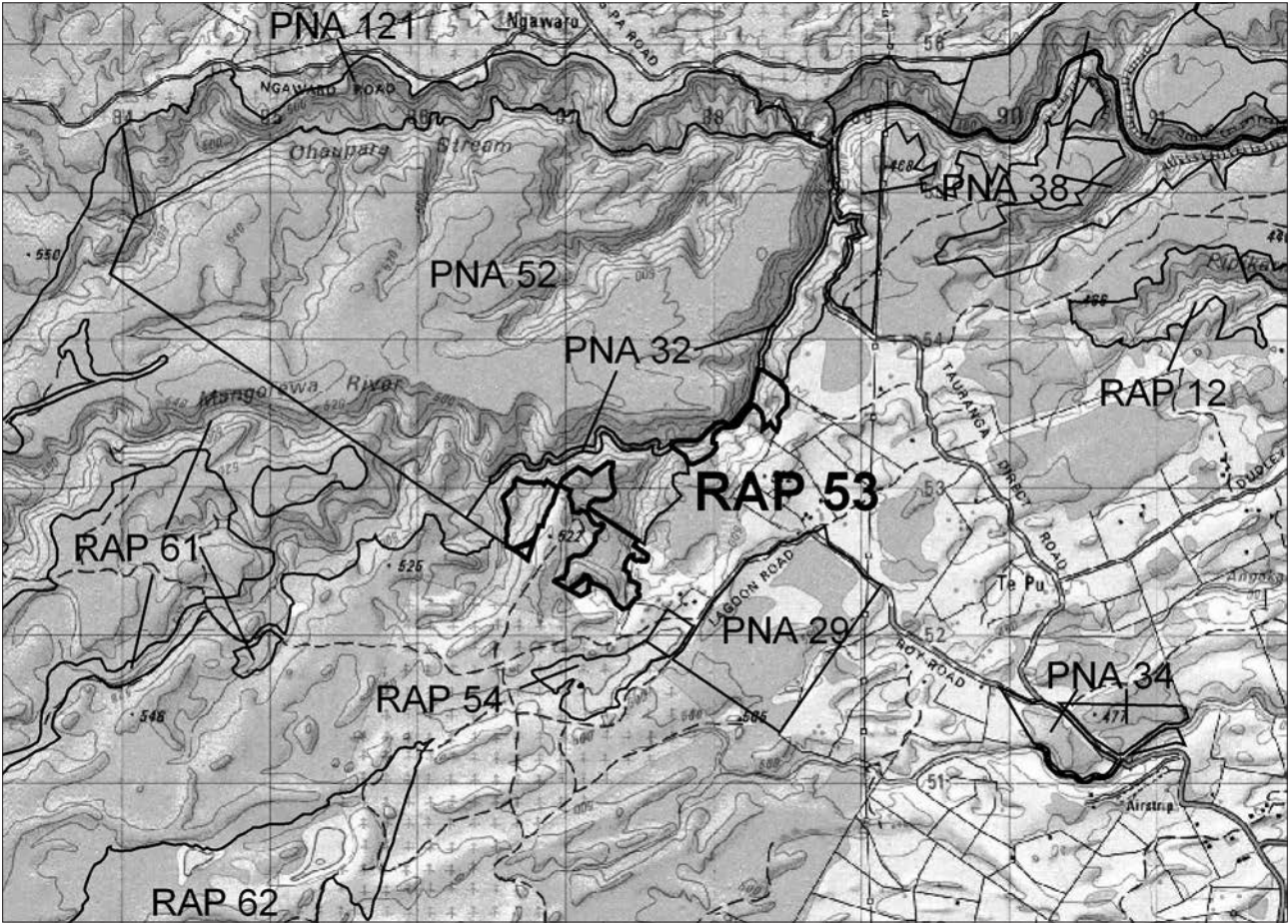
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | H |
| Diversity          | L | Buffering    | M |
| Naturalness        | M | Size & Shape | M |
| Special Features   | L | Threats      | M |

### Discussion

This RAP comprises part of an almost continuous vegetation sequence stretching from the south-eastern inland boundary of the district to the coast, including Matata Scenic Reserve and several QE II covenants. It

is also part of a highly visible and sensitive landscape adjacent to the Rangitaiki Plains, which was identified as a significant natural feature and landscape for the Whakatane District Council (Boffa-Miskell 1993b).

RAP 53 MANGOREWA EXTENSION



## RAP 53 MANGOREWA EXTENSION

|                   |                         |
|-------------------|-------------------------|
| Area              | 48.4 ha                 |
| Altitudinal Range | 420–500 m               |
| Grid Reference    | NZMS 260 U15 873528     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | 23                      |
| Status            | Unprotected             |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                                 | LANDFORM  |
|------------------|---------------------------------------------------------------------------------|-----------|
| Lowland          | 1. (Rimu)/hard beech-red beech-tawa forest                                      | Hillslope |
| Lowland          | 2. (Miro)/hard beech-red beech-tawari forest                                    | Hillslope |
| Lowland          | 3. Tawa-hard beech-tawari forest                                                | Hillslope |
| Lowland          | 4. Tawa-rewarewa forest (with scattered hinau, kamahi, wheki, miro, and tawari) | Hillslope |
| Lowland          | 5. Secondary fern-shrubland                                                     | Hillslope |

### Landform

This RAP comprises gently-sloping hillslopes along the southern boundary of the Mangorewa Ecological Area.

### Vegetation and flora

This area has been logged extensively, however the canopy is relatively intact. *Metrosideros carminea*, *Leptopteris superba* and toatoa were recorded during the survey. A small part of the RAP comprises secondary vegetation.

### Fauna

North Island kaka (Acutely Threatened, Nationally Endangered in Hitchmough 2002) and kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) have been recorded. This RAP is part of a site ranked as outstanding by Saunders (1983) for its large size and diversity of wildlife species.

### Threat / modification

Whilst the eastern blocks have been previously grazed, domestic stock have now been excluded. However, the two western blocks are currently lightly grazed by domestic stock, and this should cease.

### Evaluation

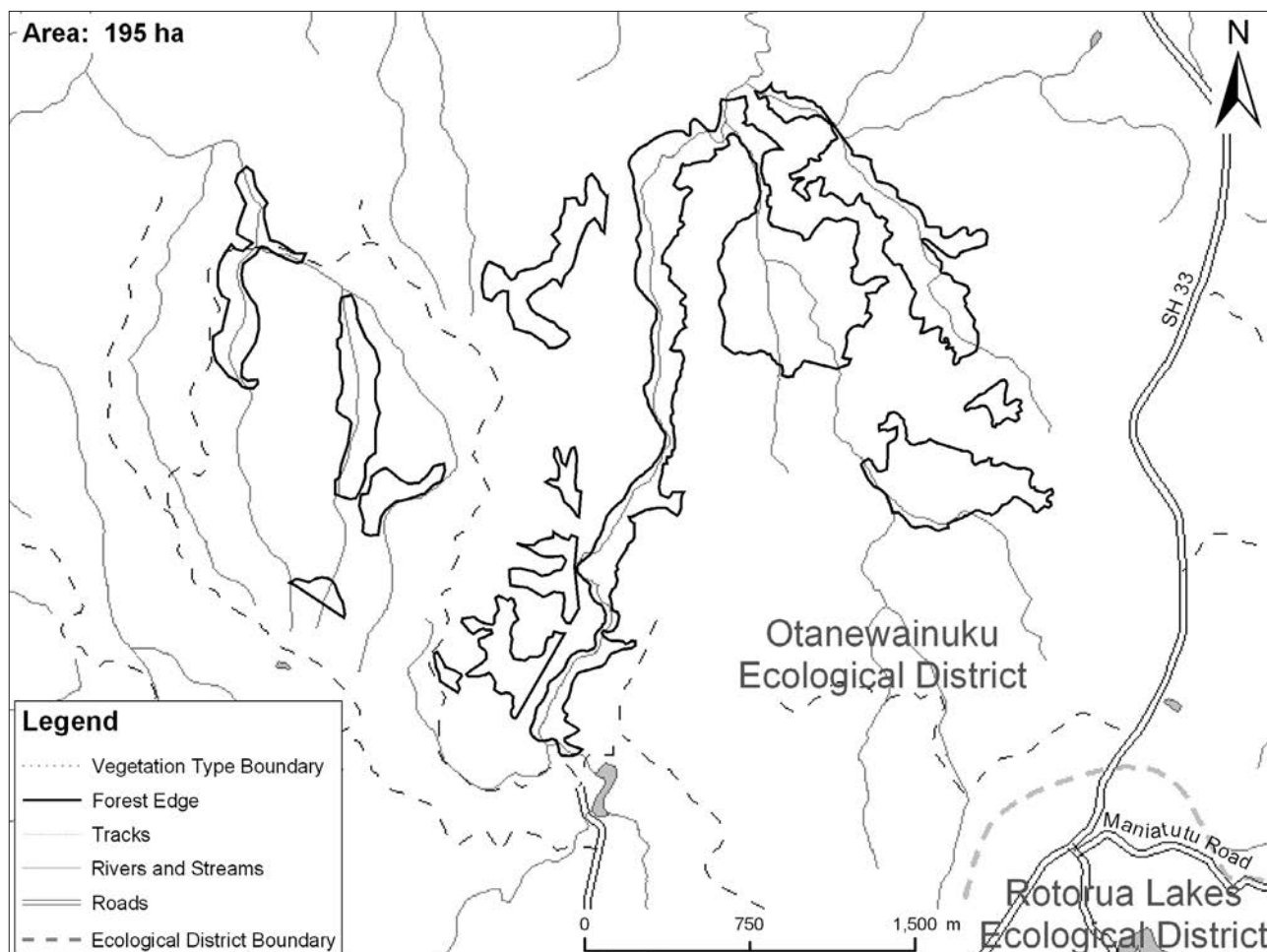
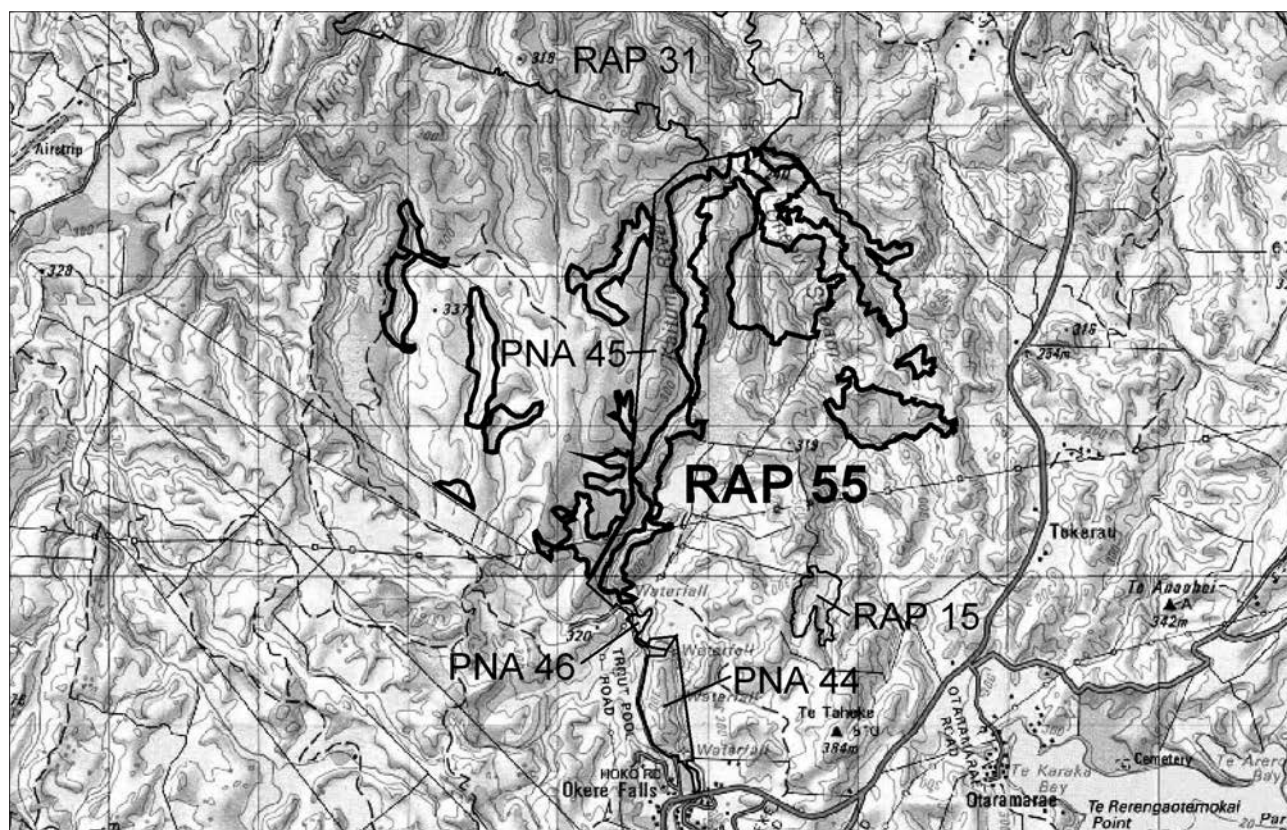
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | H | Viability    | M |
| Diversity          | L | Buffering    | H |
| Naturalness        | M | Size & Shape | M |
| Special Features   | M | Threats      | H |



## **Discussion**

Albeit small, these areas are part of a large tract of indigenous forest (Mangorewa Ecological Area) which is of outstanding wildlife value and exceptional botanical conservation value (cf. Saunders 1983 and Shaw 1994b). They are valuable as a protective buffer to the Mangorewa Ecological Area and headwaters of the Mangorewa gorge.

## RAP 55 UPPER KAITUNA



## RAP 55 UPPER KAITUNA

|                   |                         |
|-------------------|-------------------------|
| Area              | 194.6 ha                |
| Altitudinal Range | 200–340 m               |
| Grid Reference    | NZMS 260 U15 034512     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | N/A                     |
| Status            | Unprotected             |

| BIOCLIMATIC ZONE         | VEGETATION TYPE      | LANDFORM  |
|--------------------------|----------------------|-----------|
| Semi-coastal,<br>lowland | Tawa-rewarewa forest | Hillslope |
|                          | Kamahi forest        | Hillslope |
|                          | Secondary scrub      | Hillslope |

### Landform

Gorge faces on the margins of the Kaituna River, which have cut down through a Rotoiti Breccia veneer to the underlying Mamaku ignimbrite. Also includes several deeply-incised tributary streams to the Kaituna River.

### Vegetation

Examples of tawa-rewarewa dominant forest probably modified by crown fires. Other canopy species present include hinau, mangeao, mamaku and porokaiwhiri. Other vegetation types present are kamahi forest and secondary scrub which has developed following clearance.

### Flora and fauna

Typical species only were noted. Forest bird species present include kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002), tui, and grey warbler.

### Threat / modification

Surrounded by exotic pines. Potential threats include damage during logging of adjacent pines and subsequent preparation of adjacent land for replanting.

### Evaluation

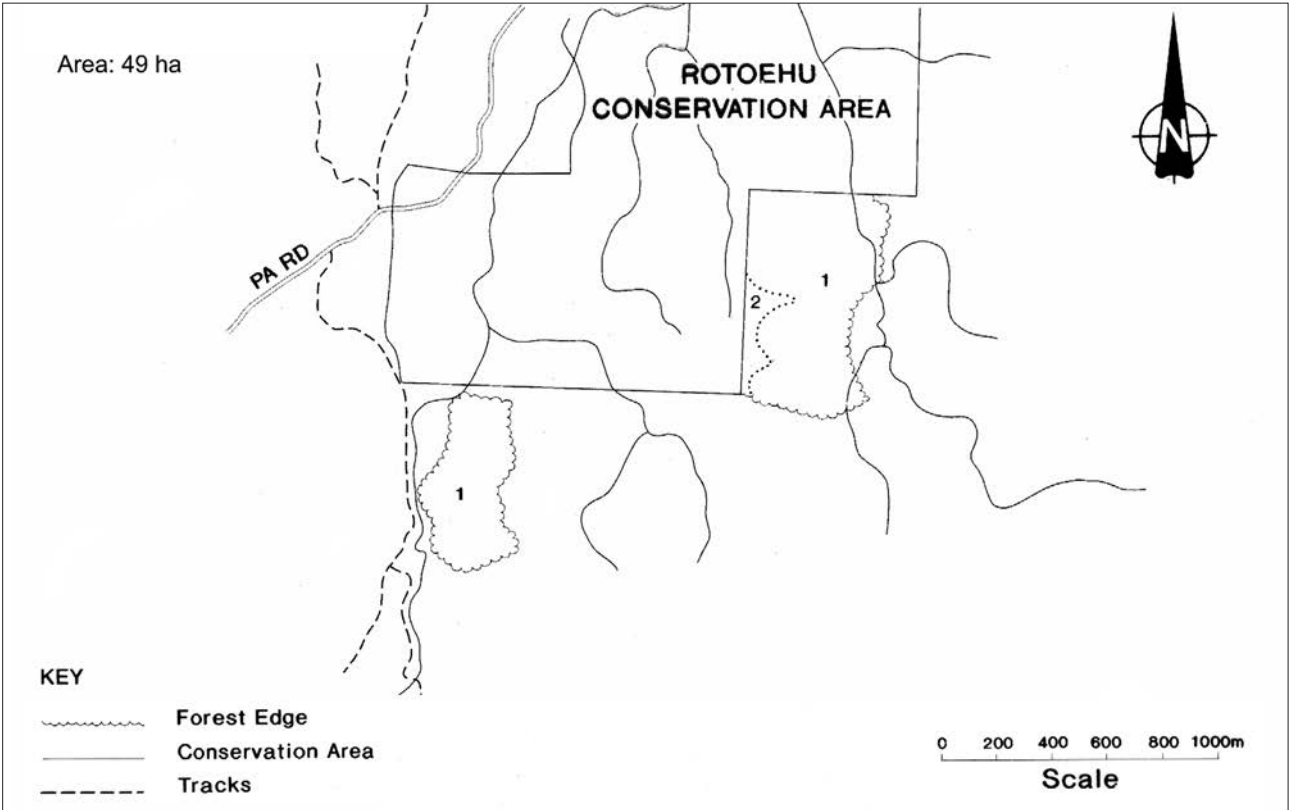
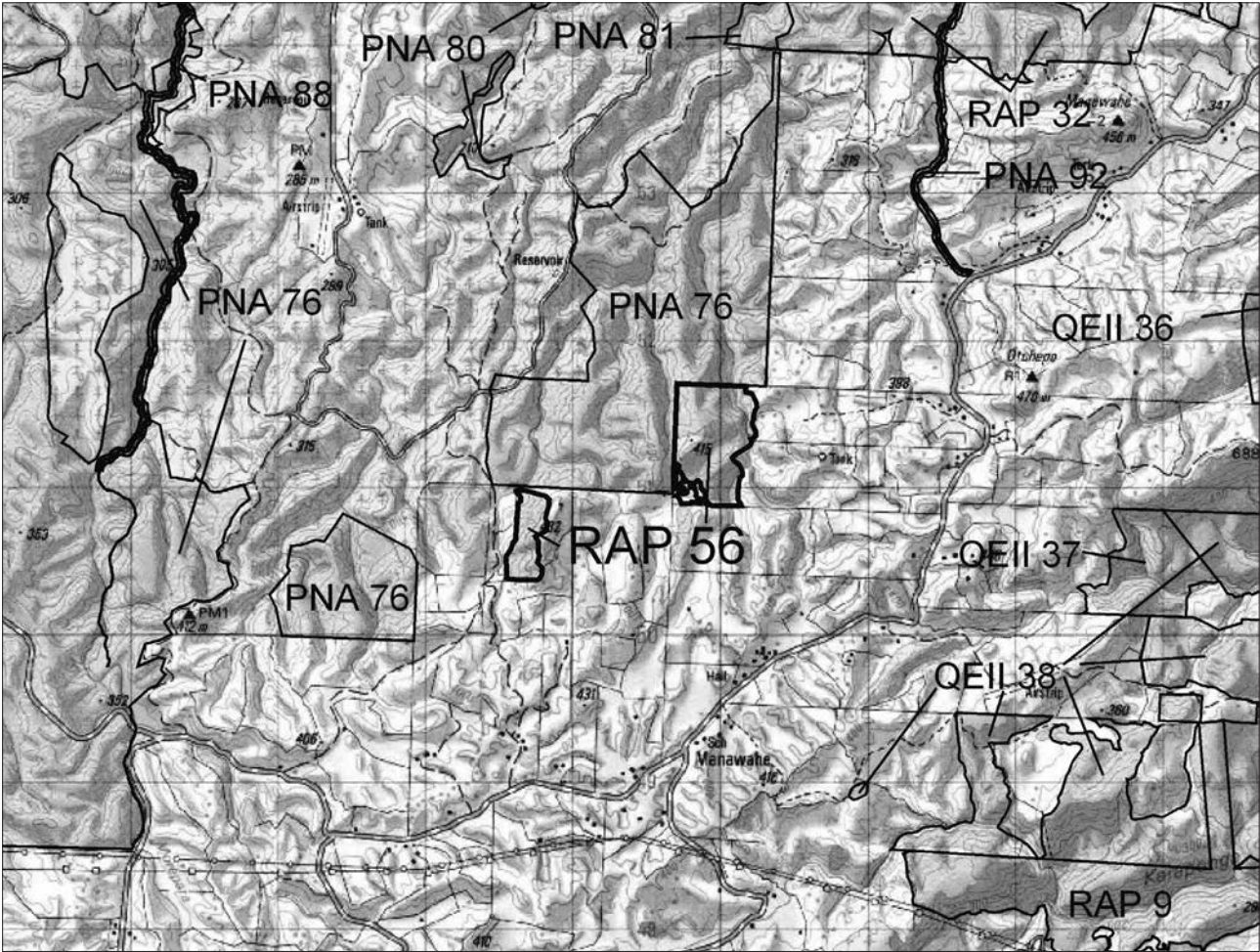
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | H |
| Diversity          | L | Buffering    | M |
| Naturalness        | M | Size & Shape | M |
| Special Features   | M | Threats      | M |

### Discussion

This RAP complements existing protected areas along the Kaituna River Gorge and RAP 44. These areas combine to form a wildlife corridor along the Kaituna, ranked as moderate-high for wildlife values in Rasch (1989).



# RAP 56 ROTOEHU EXTENSION





|                   |                                |
|-------------------|--------------------------------|
| Area              | 49.5 ha                        |
| Altitudinal Range | 280–430 m                      |
| Grid Reference    | NZMS 260 V15 300515            |
| Land System       | Rotoiti Breccia Ignimbrite Fan |
| Study Area No.    | 9a, 9b                         |
| Status            | Unprotected                    |

| BIOCLIMATIC ZONE | VEGETATION TYPE                         | LANDFORM                |
|------------------|-----------------------------------------|-------------------------|
| Semi-coastal     | 1. Tawa-rewarewa-mangeao-pukatea forest | Low ridge and hillslope |
| Semi-coastal     | 2. Bracken fernland and pasture         | Steep face and ridge    |

### Landform

Two low bush-covered ridges and associated hillslopes which form part of the upper catchment of the Herepuru Stream.

### Vegetation

Tawa-rewarewa-mangeao-pukatea forest on Rotoiti breccia with occasional emergent rimu in deep, inaccessible gullies. A small area of rough pasture and bracken fernland occurs on the western boundary of the north-eastern block. Both parts of the RAP have been logged for podocarps.

### Flora

No species of note were recorded during the survey.

### Fauna

North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) have been recorded in the south-west block within the past five years. The north-eastern block is contiguous with the territory of a kokako pair. Kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) were noted during the PNA site inspection. North Island brown kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002) are present in the adjacent Rotoehu Forest (Alan Jones pers. comm.) and may occur in the RAP.

### Threat / modification

Wilding radiata pine have established in both blocks, and both pampas and buddleia are present on the logging tracks. Possum, deer, wallabies and possibly feral goats occur in the adjacent Rotoehu Forest.

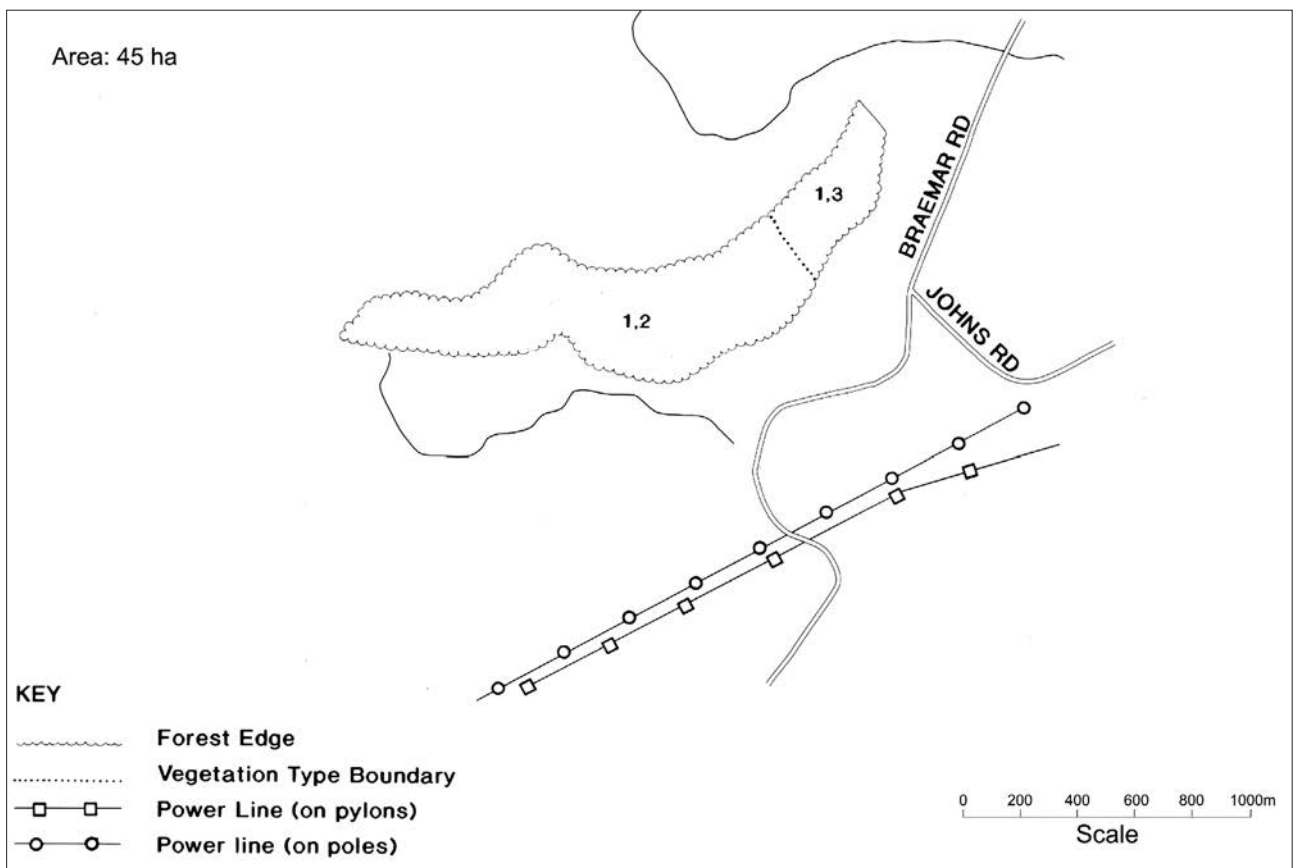
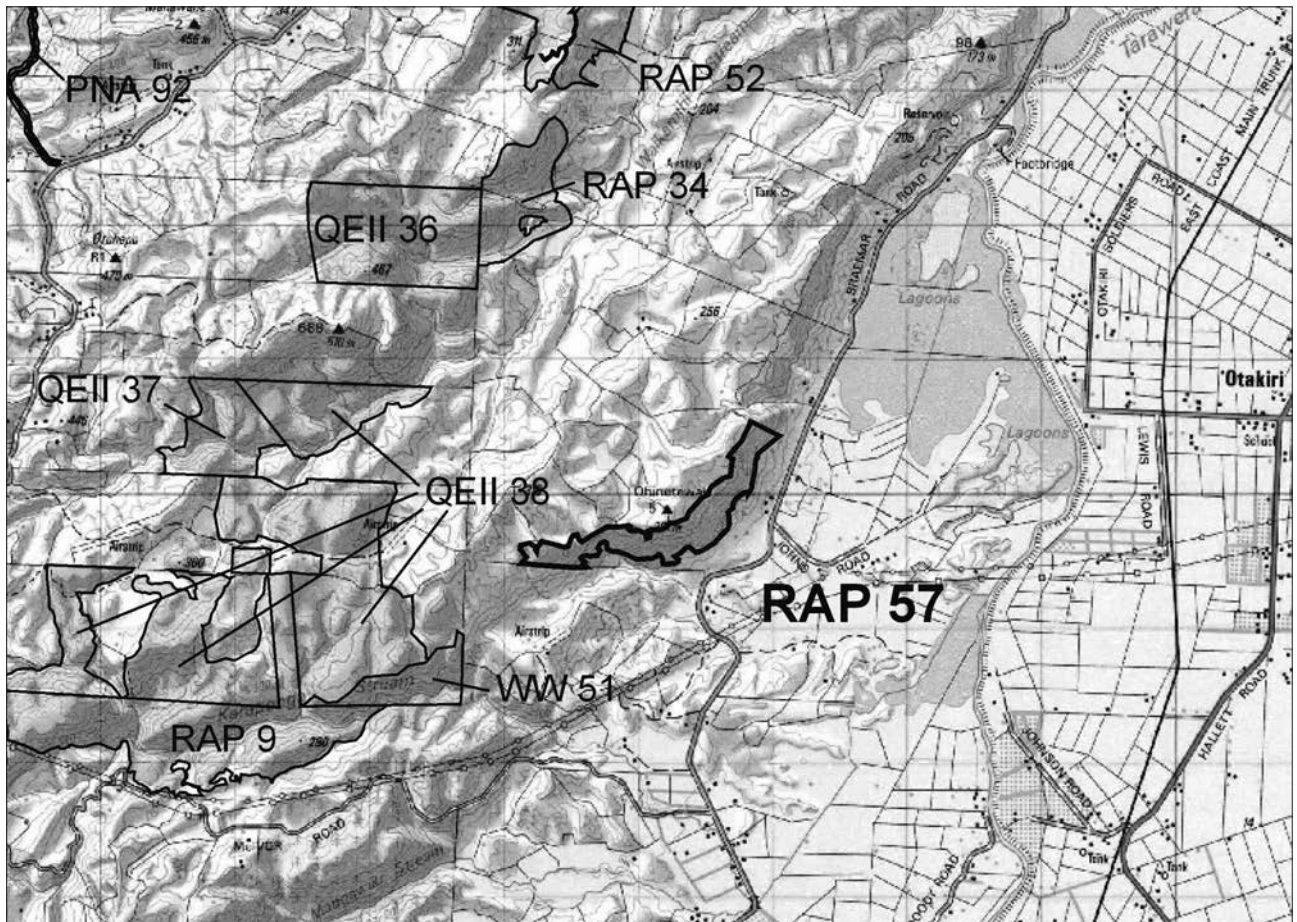
## Evaluation

|                    |   |              |      |
|--------------------|---|--------------|------|
| Representativeness | L | Viability    | M    |
| Diversity          | L | Buffering    | M    |
| Naturalness        | M | Size & Shape | H& L |
| Special Features   | M | Threats      | M    |

## Discussion

This RAP is proposed primarily as an extension of habitat for the endangered North Island kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002). In addition, both blocks are more or less contiguous with the Rotoehu conservation area, a relatively large area of indigenous vegetation. The blocks are currently available as habitat for kokako and possibly, brown kiwi.

# RAP 57 OHINETEWAI



|                   |                     |
|-------------------|---------------------|
| Area              | 44.7 ha             |
| Altitudinal Range | 80–280 m            |
| Grid Reference    | NZMS 260 V15 368496 |
| Land System       | Matata Hills        |
| Study Area No.    | 8                   |
| Status            | Unprotected         |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                        | LANDFORM         |
|------------------|--------------------------------------------------------|------------------|
| Semi-coastal     | 1. Rewarewa/whauwhaupaku-mamaku-mangeao forest         | Steep escarpment |
| Semi-coastal     | 2. Tawa-rewarewa-(mangeao) forest                      | Steep escarpment |
| Semi-coastal     | 3. (Rewarewa)/manuka-mamaku-bracken-whauwhaupaku scrub | Steep escarpment |

### Landform

Comprises a steep scarp overlooking the Rangitaiki Plains.

### Vegetation

The vegetation pattern has resulted from repeated clearing and burning since human settlement of the district. This area was an important access route inland from the Bay of Plenty coast in prehistoric times.

### Flora

Puriri nears its local inland limit of distribution in this RAP.

### Fauna

Common forest bird species occur in this RAP (Fauna Survey Unit, unpublished 1982).

### Threat / modification

Clearance and grazing has occurred at the northern end of this site.

### Evaluation

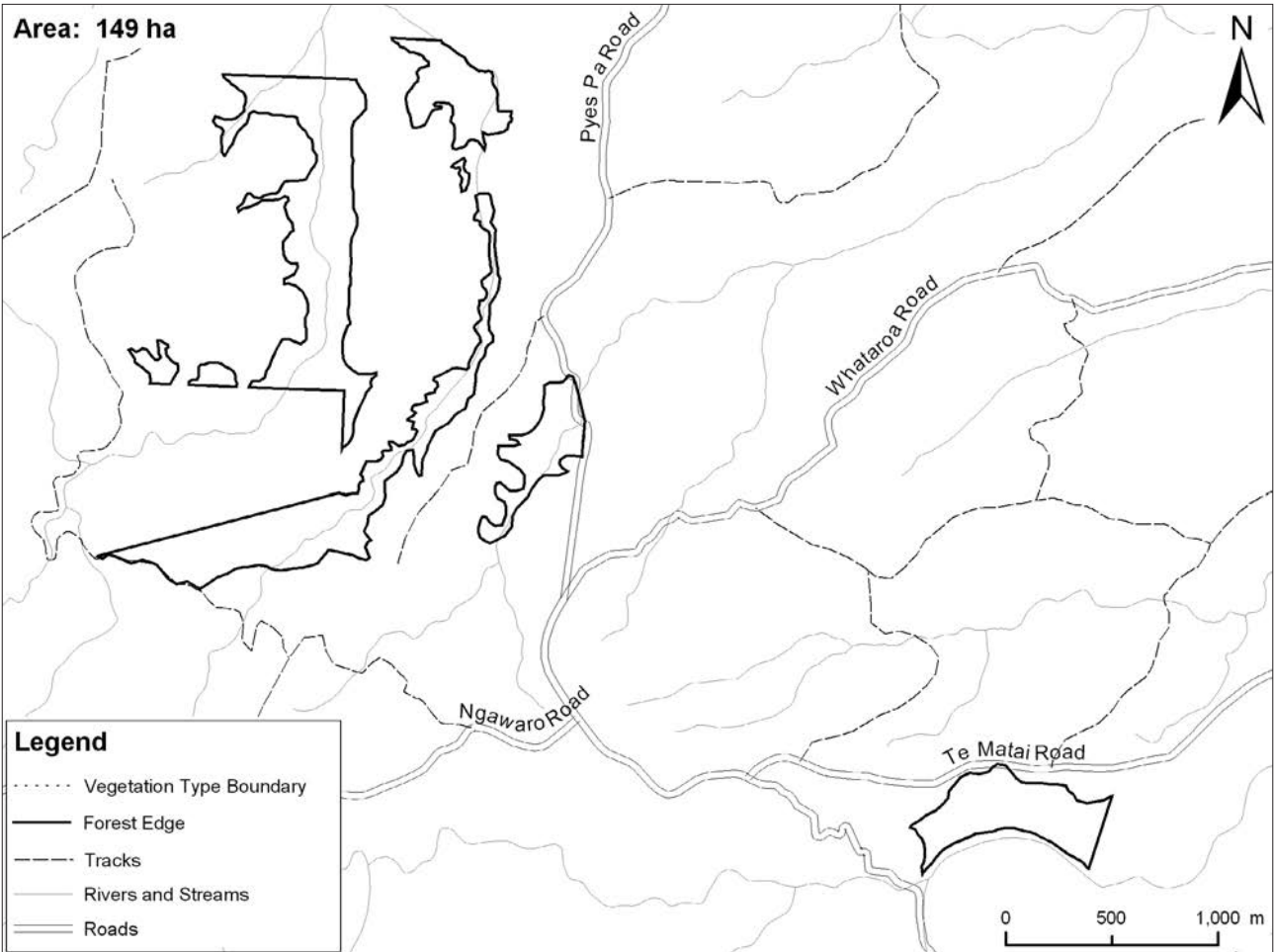
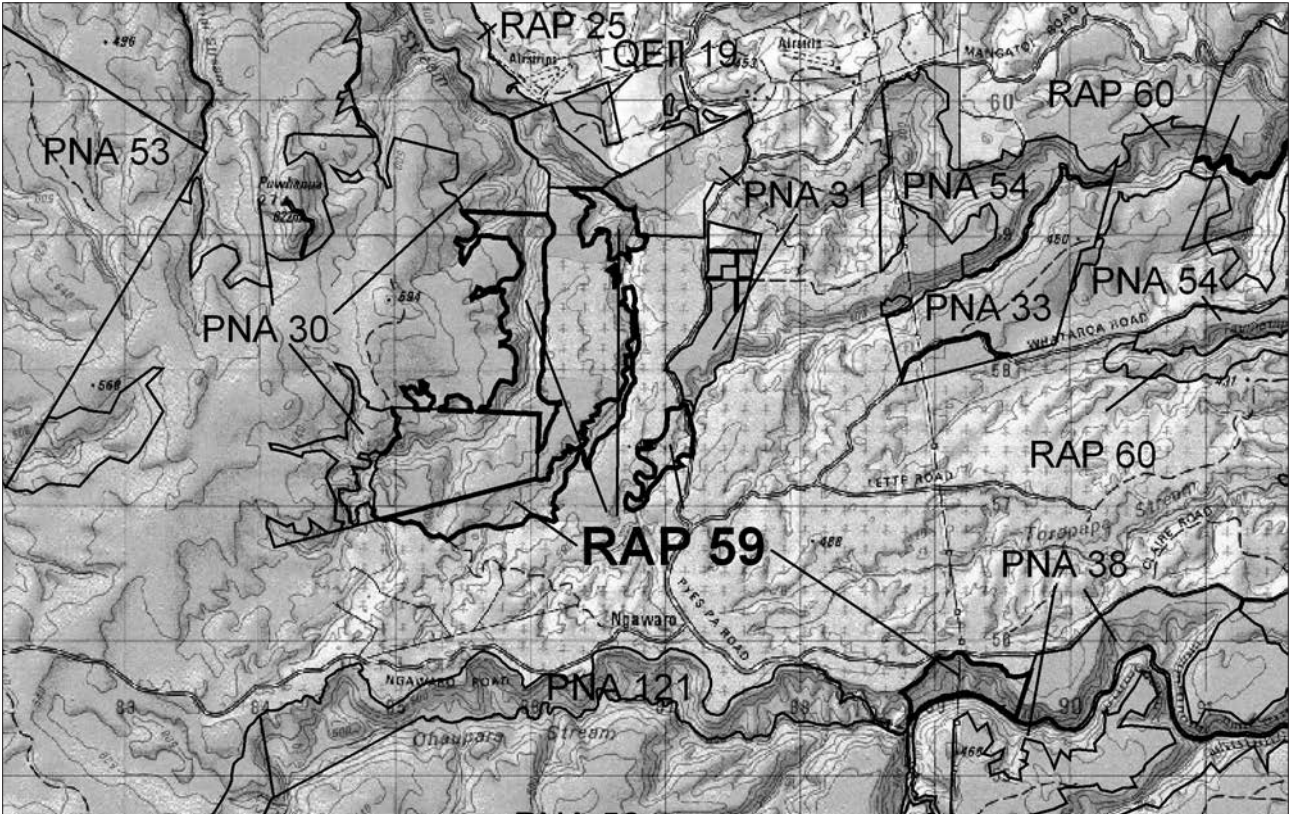
|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | H |
| Diversity          | L | Buffering    | L |
| Naturalness        | M | Size & Shape | L |
| Special Features   | L | Threats      | L |

### Discussion

Although this site has no special features it is a moderate-sized area of vegetation, much of which is in relatively good condition. It contains puriri near its local inland limit. It is part of a highly visible landscape adjacent to the Rangitaiki Plains, which was identified as a significant natural feature and landscape for the Whakatane District Council (Boffa-Miskell 1993b).



RAP 59 TE MATAI



|                   |                         |
|-------------------|-------------------------|
| Area              | 149.4 ha                |
| Altitudinal Range | 380–500 m               |
| Grid Reference    | NZMS 260 U15 868570     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | N/A                     |
| Status            | Unprotected (forest)    |

| BIOCLIMATIC ZONE | VEGETATION TYPE                                                                               | LANDFORM |
|------------------|-----------------------------------------------------------------------------------------------|----------|
| Lowland          | Rimu/miro-tawa-kamahi-tawari forest<br>(Northern rata)-(rimu)-(miro)/tawa-hinau-kamahi forest | Gorges   |

### Landform

Steeply incised gorges

### Vegetation and flora

Indigenous forest dominated by tawa, hinau, and kamahi with occasional emergent northern rata, rimu.

### Fauna

Birds present include tui, North Island robin, tomtit, kereru (Chronically Threatened, Gradual Decline in Hitchmough 2002) and whitehead.

### Threat / modification

Parts of this area had been logged. Some boundaries are contiguous with pine plantations and care needs to be taken during harvesting to ensure these areas are not damaged.

### Evaluation

|                    |   |              |   |
|--------------------|---|--------------|---|
| Representativeness | M | Viability    | H |
| Diversity          | M | Buffering    | H |
| Naturalness        | M | Size & Shape | H |
| Special Features   | M | Threats      | M |

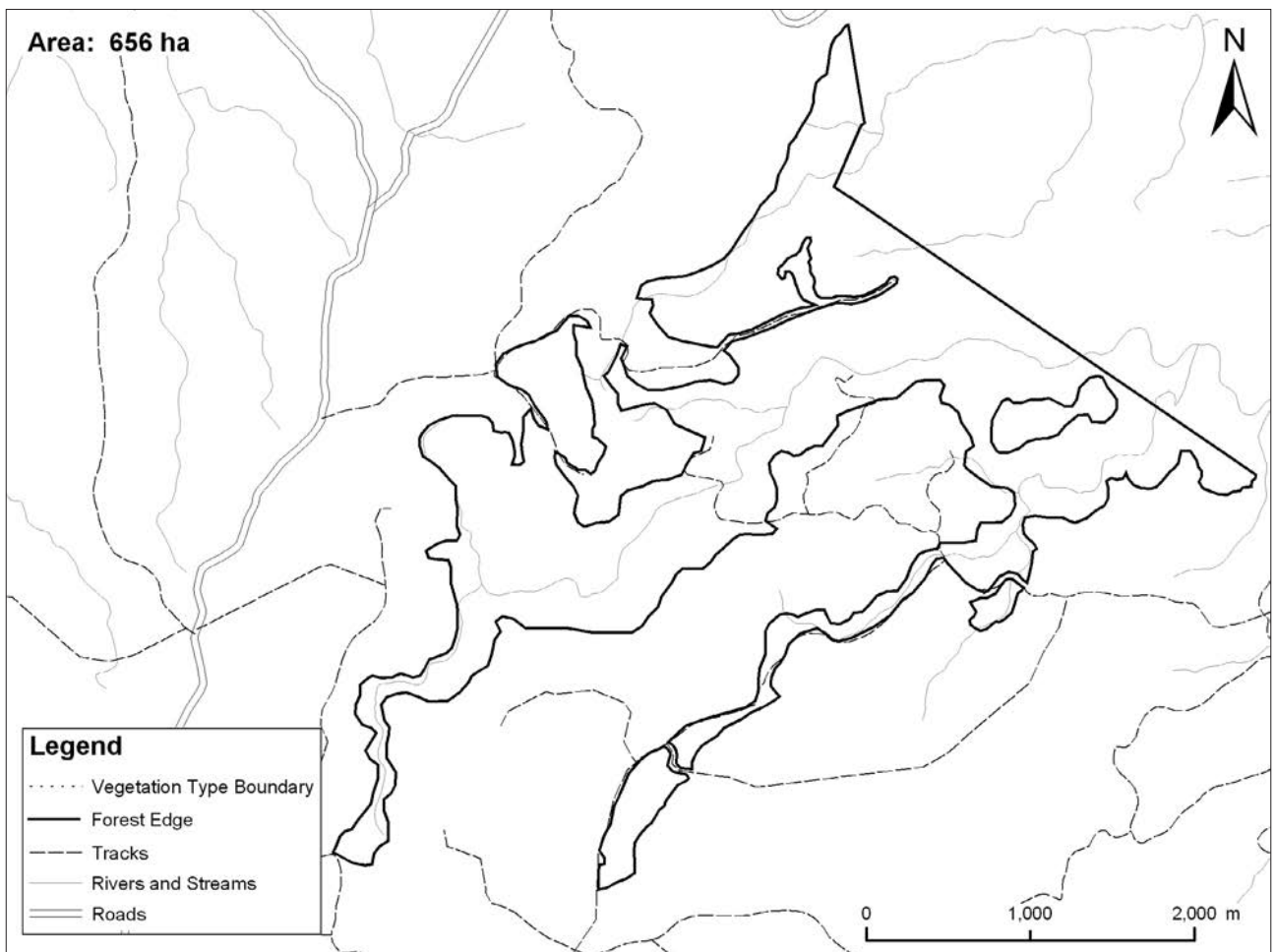
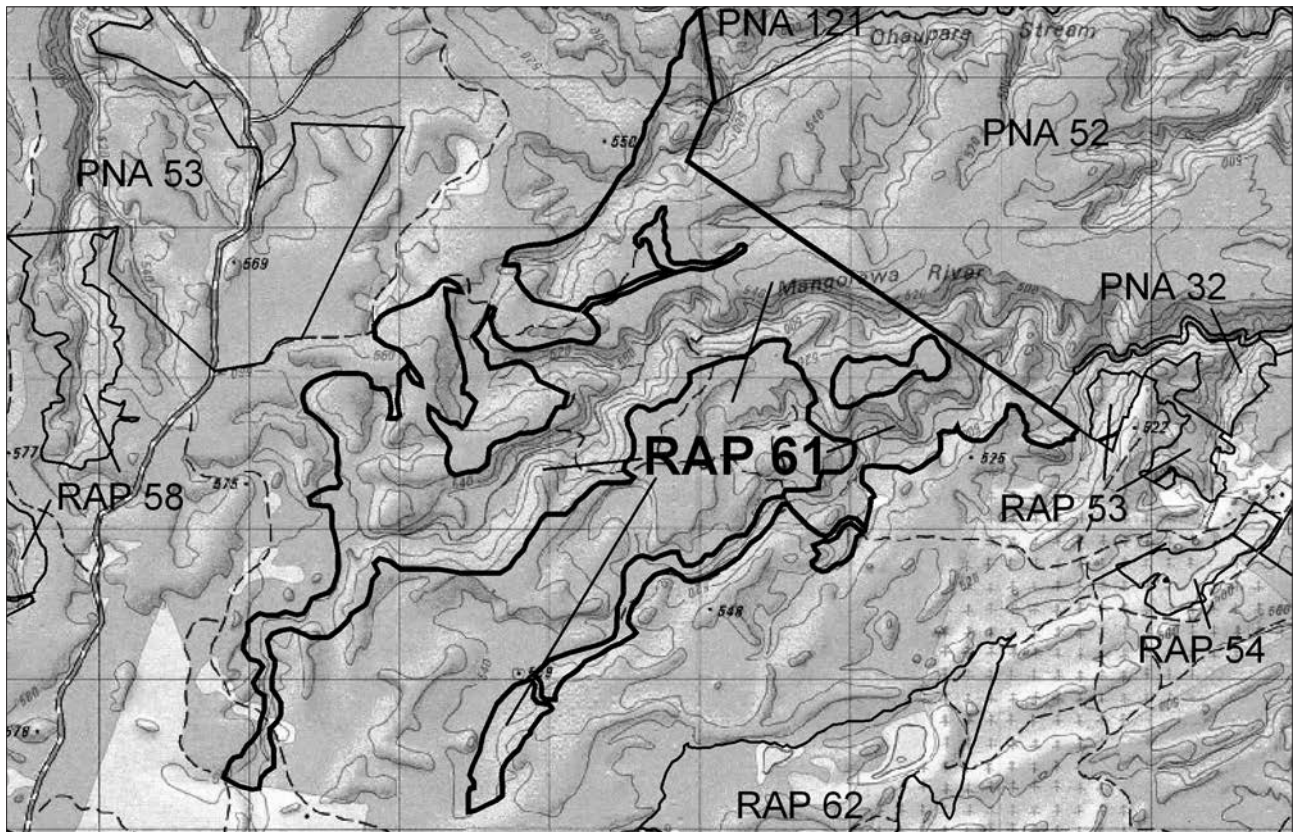
### Discussion

Parts of this area are valuable as a protective buffer to the Mangorewa Ecological Area and the headwaters of the Mangorewa gorge.

These areas are part of a large continuous tract of indigenous vegetation which extends over several ecological districts and includes several protected areas (including Kaimai-Mamaku Forest Park and Mangorewa Ecological Area).



# RAP 61 UPPER MANGOREWA RIVER



|                   |                         |
|-------------------|-------------------------|
| Area              | 656.4 ha                |
| Altitudinal Range | 460–560 m               |
| Grid Reference    | NZMS 260 U15 833529     |
| Land System       | Northern Mamaku Plateau |
| Study Area No.    | N/A                     |
| Status            | Unprotected forest      |

| BIOTIC ZONE | VEGETATION TYPE                                                                                                                        | LANDFORM           |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Lowland     | Tawa-kamahi-tawari-hard beech-silver beech forest; a few emergent rimu (with toatoa and Hall's totara. Heavily logged in most places.) | Hillslope, plateau |
| Lowland     | Tawa-rewarewa/mahoe-porokaiwhiri-pate-makomako-mamaku forest and shrubland ⇔ tawa-rewarewa forest.                                     | Hillslope          |

### Landform

Steeply incised gorges, with smaller areas on the plateau.

### Vegetation

The vegetation cover has been induced through heavy, often repeated, logging of tall podocarp/tawa forest. Though logged rimu/tawa forest often retains a more or less intact canopy of tawa and associated species, some sites which have been very heavily logged have what can be more accurately described as a discontinuous canopy.

### Flora

Typical species only were noted.

### Fauna

Birds recorded from this reserve include kiwi (Chronically Threatened, Serious Decline in Hitchmough 2002), and kokako (Acutely Threatened, Nationally Endangered in Hitchmough 2002) were recorded from here in earlier surveys in 1970 and 1974 (Saunders 1983).

### Threat / modification

This area has been heavily logged. It is within the area managed by the Awahou-Mangorewa Hunting Club for pig hunting.

### Evaluation

|                    |     |              |   |
|--------------------|-----|--------------|---|
| Representativeness | M   | Viability    | M |
| Diversity          | L   | Buffering    | M |
| Naturalness        | L-M | Size & Shape | M |
| Special Features   | M   | Threats      | M |



## **Discussion**

This area is part of a large tract of indigenous forest comprising several extensive reserves (including Kaimai-Mamaku Forest Park). The RAP is part of a tract of indigenous vegetation which forms a continuous ecological sequence across several ecological districts. Part of this area was identified as of outstanding wildlife habitat value by Saunders (1983).

This area is valuable as a protective buffer to the Mangorewa Ecological Area and the headwaters of the Mangorewa gorge.

# Acknowledgements

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# Appendix 1

## CHECKLIST OF ECOLOGICAL UNITS IN OTANEWAINUKU ECOLOGICAL DISTRICT

### **Key**

#### ***Extent***

- \* absent or present due to natural disturbance
- H present due to human intervention
- P Present
- Mn Minor
- C Common
- Mj Major

#### ***Change***

- decrease
- 0 no change
- + increase

#### ***Protection status***

1. Represented in the reserve system.
2. Under-represented in the reserve system.
3. Under-represented in the reserve system and a major part of original landscape, but not greatly reduced in extent.
4. Under-represented in the reserve system, major part of original landscape now greatly reduced in extent.

#### ***Land systems***

1. Whakamarama Plateau
2. Northern Mamaku Plateau
3. Papamoa Hills
4. Rotoiti Breccia Ignimbrite Fan
5. Otamarakau Hills
6. Sand Dunes
7. Matata Hills
8. Otuhepo Hills

| BIOCLIMATIC ZONE           | HYDROLOGICAL ELEMENT  | LAND SYSTEM (PRESENT EXTENT) | VEGETATION TYPE                                                                                                                                                        | LANDFORM           | FORMER EXTENT <sup>1</sup> | PRESENT EXTENT | CHANGE | PROTECTION STATUS |
|----------------------------|-----------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------|----------------|--------|-------------------|
| <b>Dune habitats</b>       |                       |                              |                                                                                                                                                                        |                    |                            |                |        |                   |
| Coastal                    | palustrine, estuarine | 6                            | Dune hollow wetlands                                                                                                                                                   | dune hollow        | C                          | C              | 0      | 1                 |
| Coastal                    | terrestrial           | 6                            | <i>Ficinia nodosa</i> / <i>Muehlenbeckia complexa</i> vineyard and sedgeland                                                                                           | rear dune          | C                          | C              | +      | 1                 |
| Coastal                    | terrestrial           | 6                            | Spinifex sandfield and grassland                                                                                                                                       | fore dune          | C                          | C              | -      | 1                 |
| <b>Freshwater wetlands</b> |                       |                              |                                                                                                                                                                        |                    |                            |                |        |                   |
| Lowland                    | palustrine            | 2                            | <i>Baumea teretifolia</i> sedgeland                                                                                                                                    | lagoon margin      | +                          | P              | 0      | 1                 |
| Lowland                    | palustrine            | 2                            | Lake                                                                                                                                                                   | lake               | Mn                         | P,H            |        |                   |
| Lowland                    | palustrine            | 2                            | Manuka/ <i>Baumea rubiginosa</i> - <i>Gabnia xanthocarpa</i> -toetoe/ <i>Sphagnum</i> shrubland                                                                        | wetland            | Mn                         | P              | 0      | 2                 |
| Semi-coastal               | palustrine            | 4                            | (Manuka)-(grey willow)-(swamp coprosma)/raupo- <i>Gleichenia microphylla</i> - <i>Baumea</i> sp. ( <i>B. teretifolia</i> ?)/ <i>Sphagnum</i> shrub-sedge-fern-reedland | alluvial flat      | Mn                         | P              | -      | 2                 |
| Lowland                    | palustrine            | 2                            | Manuka-harakeke-toetoe-raupo/ <i>Baumea tenax</i> - <i>B. teretifolia</i> - <i>B. arthropophylla</i> -swamp kiokio sedge-shrubland                                     | alluvial flat      | Mn                         | P              | -      | 2                 |
| Lowland                    | palustrine            | 2                            | Manuka-monoao/ <i>Baumea teretifolia</i> - <i>Gleichenia dicarpa</i> - <i>Sphagnum</i> sedge-shrubland                                                                 | wetland            | Mn                         | P              | 0      | 2                 |
| Lowland                    | palustrine            | 2                            | Manuka-monoao/ <i>Gabnia-Astelja grandis</i> - <i>Gleichenia dicarpa</i> / <i>Sphagnum</i> shrubland and scrub                                                         | mire               | Mn                         | Mn             | +      | 2                 |
| Lowland                    | palustrine            | 2                            | Manuka-swamp coprosma scrub and shrubland                                                                                                                              | lagoon margin mire | *                          | P              | 0      | 2                 |

## 1. Pre-Polynesian

| BIOCLIMATIC ZONE           | HYDROLOGICAL ELEMENT | LAND SYSTEM (PRESENT EXTENT) | VEGETATION TYPE                                                          | LANDFORM                              | FORMER EXTENT <sup>1</sup> | PRESENT EXTENT | CHANGE | PROTECTION STATUS |
|----------------------------|----------------------|------------------------------|--------------------------------------------------------------------------|---------------------------------------|----------------------------|----------------|--------|-------------------|
| Coastal                    | palustrine           | 7                            | Manuka scrub and shrubland                                               | swamp                                 | C                          | +              | -      | 4                 |
| Semi-coastal               | palustrine           | 4,2                          |                                                                          | swamp                                 | Mn                         | P              | -      | 2                 |
| Lowland                    | palustrine           | 2,1                          |                                                                          | lagoon margin                         | Mn                         | P              | -      | 2                 |
| Lowland                    | palustrine           | 2                            | <i>Myriophyllum pedunculatum</i> herbfield                               | lagoon margin                         | +                          | P              | 0      | 1                 |
| Coastal                    | palustrine           | 4,5,6,7                      | Raupo reedland                                                           | swamp                                 | Mn                         | P              | -      | 2                 |
| Semi-coastal               | palustrine           | 2,3,4,7                      |                                                                          |                                       | Mn                         | P              | -      | 2                 |
| Lowland                    | palustrine           | 2                            |                                                                          |                                       | Mn                         | P              | -      | 2                 |
| Coastal                    | palustrine           | 4,5,7                        | Sedge-grass-reed wetland associations                                    | swamp                                 | C                          | Mn             | -      | 4                 |
| Semi-coastal               | palustrine           | 2,3,4,5,7                    |                                                                          | swamp                                 | Mn                         | Mn             | -      | 2                 |
| Lowland                    | palustrine           | 2                            |                                                                          | swamp                                 | Mn                         | Mn             | -      | 2                 |
| <b>Scrub and shrubland</b> |                      |                              |                                                                          |                                       |                            |                |        |                   |
| Lowland                    | terrestrial          | 2                            | Kamahitoetoe-kanono-mahoe-wao scrub and shrubland                        | gully                                 | *                          | P              | +      | 1                 |
| Lowland                    | terrestrial          | 2                            | Manuka-toetoe shrubland (other broad-leaved species locally dominant).   | flat                                  | *                          | P              | 0      | 2                 |
| Lowland                    | terrestrial          | 2                            | Mahoe-mahoe-wao-kohuhu-toetoe-bracken-whetiki-pate scrub and shrubland   | bluffs                                | *                          | P              | +      | 1                 |
| Lowland                    | terrestrial          | 2                            | Manuka-bracken-kiokio fernland                                           | gorge, hillslope                      | *                          | P              | +      | 1                 |
| Lowland                    | terrestrial          | 2                            | Mingimingi-kiokio-kamahahi scrub and shrubland                           | steep face                            | *                          | P              | +      | 1                 |
| Lowland                    | palustrine           | 2                            | <i>Myriophyllum pedunculatum</i> subsp. <i>novae-zelandiae</i> herbfield | wetland                               | P                          | P              | 0      | 2                 |
| Semi-coastal               | terrestrial          | 2                            | Rewarewa-kanuka-kamahahi-kiokio-mamaku shrubland                         | steep hillslope and gorge face, ridge | *                          | P              | +      | 1                 |

#### 1. Pre-Polynesian

| BIOCLIMATIC ZONE    | HYDROLOGICAL ELEMENT | LAND SYSTEM (PRESENT EXTENT) | VEGETATION TYPE                                    | LANDFORM                   | FORMER EXTENT <sup>1</sup> | PRESENT EXTENT | CHANGE | PROTECTION STATUS |
|---------------------|----------------------|------------------------------|----------------------------------------------------|----------------------------|----------------------------|----------------|--------|-------------------|
| Coastal             | terrestrial          | 7                            | Secondary scrub, shrubland and fernland            | hillslope                  | *                          | Mn             | +      | 2                 |
| Semi-coastal        | terrestrial          | 2,3,4,5,7                    |                                                    | hillslope                  | *                          | Mn             | +      | 2                 |
| Lowland             | terrestrial          | 1,2                          |                                                    | hillslope                  | *                          | Mn             | +      | 2                 |
| Montane             | terrestrial          | 1                            |                                                    | hillslope                  | *                          | Mj             | +      | 2                 |
| Lowland             | palustrine           | 2                            | Tanekaha/manuka scrub and shrubland                | alluvial terrace           | -                          | P              | -      | 2                 |
| Lowland             | terrestrial          | 2                            | Tanekaha-rewarewa/manuka scrub                     | gorge, hillslope           | *                          | P              | +      | 2                 |
| Lowland             | terrestrial          | 2                            | Tawa-hinai/kamahi-toetoe-kanono-mahoe-wao treeland | gully                      | *                          | P              | +      | 2                 |
| <b>Treefernland</b> |                      |                              |                                                    |                            |                            |                |        |                   |
| Coastal             | terrestrial          | 4,7                          | Mamaku treefernland                                | gully, hillslope           | *                          | Mn             | +      | 1                 |
| Semi-coastal        | terrestrial          | 1,2,3,4,5,7,8                |                                                    | gully, hillslope           | *                          | Mn             | +      | 1                 |
| Lowland             | terrestrial          | 1,2                          |                                                    | gully, hillslope           | *                          | Mn             | +      | 1                 |
| <b>Forest</b>       |                      |                              |                                                    |                            |                            |                |        |                   |
| Semi-coastal        | terrestrial          | 7                            | Hard beech forest                                  | hillslope, gorge           | Mn                         | C              | Mn     | 4                 |
| Lowland             | terrestrial          | 2                            |                                                    | hillslope, gorge           | C                          | C              | Mn     | 4                 |
| Coastal             | terrestrial          | 7                            | Hard beech-pohutukawa forest                       | hillslope                  | C                          | C              | -      | 1                 |
| Lowland             | terrestrial          | 2                            | Hard beech-silver beech forest                     | flat and gentle hillslopes | Mn                         | Mn             | -      | 2                 |
| Lowland             | terrestrial          | 2                            | Hard beech-tanekaha-tawa forest                    | hillslope                  | C                          | Mn             | -      | 4                 |
| Lowland             | terrestrial          | 2                            | Kahikatea-maire tawake forest                      | plateau, alluvial terrace  | C                          | +              | -      | 4                 |
| Semi-coastal        | terrestrial          | 1,2,4                        | Kamahi forest                                      | hillslope                  | *                          | Mn             | +      | 2                 |
| Lowland             | terrestrial          | 1,2                          |                                                    | hillslope                  | *                          | Mn             | +      | 2                 |
| Lowland             | terrestrial          | 2                            | Kamahi-rewarewa/tawheowheo forest                  | hillslope                  | *                          | P              | +      | 2                 |
| Coastal             | terrestrial          | 7                            | Kanuka forest                                      | hillslope                  | *                          | Mn             | +      | 1                 |
| Semi-coastal        | terrestrial          | 1,2,4,5,7                    |                                                    | hillslope                  | *                          | Mn             | +      | 2                 |
| Lowland             | terrestrial          | 2                            |                                                    | hillslope                  | *                          | Mn             | +      | 2                 |
| Semi-coastal        | terrestrial          | 2                            | (Kauri)/podocarps-broadleaved                      | hillslope                  | P                          | P              | -      | 1                 |
| Lowland             | terrestrial          | 2                            | species forest                                     | hillslope                  | P                          | P              | -      | 1                 |

1. Pre-Polynesian



| BIOCLIMATIC ZONE | HYDROLOGICAL ELEMENT | LAND SYSTEM (PRESENT EXTENT) | VEGETATION TYPE                                                | LANDFORM                             | FORMER EXTENT <sup>1</sup> | PRESENT EXTENT | CHANGE | PROTECTION STATUS |
|------------------|----------------------|------------------------------|----------------------------------------------------------------|--------------------------------------|----------------------------|----------------|--------|-------------------|
| Lowland          | terrestrial          | 2                            | Kauri/tanekaha-tawari                                          | hillslope                            | *                          | P              | -      | 1                 |
| Semi-coastal     | terrestrial          | 3                            | Kauri rickers/tawari forest                                    | hillslope                            | *                          | P              | -      | 2                 |
| Semi-coastal     | terrestrial          | 3,4                          | Mangeao forest                                                 | hillslope                            | *                          | Mn             | +      | 2                 |
| Lowland          | terrestrial          | 1,2                          | (Miro)/tawa-kamahi-tawari forest                               | exposed ridge                        | C                          | C              | -      | 1                 |
| Coastal          | terrestrial          | 7                            | (Northern rata)-(rimu)/tawa-kohekohe forest                    | hillslope                            | C                          |                | -      | 4                 |
| Semi-coastal     | terrestrial          | 1,2,3                        |                                                                | hillslope                            | Mj                         | P              | -      | 4                 |
| Lowland          |                      | 2                            | (Northern rata)-(rimu)-(miro)/tawa-hinai-kamahi forest         | gully, gorges                        | *                          | C              | +      | 1                 |
| Semi-coastal     | terrestrial          | 2,4                          | Pole podocarp forest                                           | alluvial terrace                     | *                          | P              | -      | 2                 |
| Lowland          | terrestrial          | 2                            |                                                                | hillslope                            | *                          | P              | -      | 2                 |
| Coastal          | terrestrial          | 4,6,7                        | Pohutukawa forest and treeland                                 | hillslope                            |                            | Mj             | Mn     | 4                 |
| Coastal          | terrestrial          | 7                            | (Northern rata)/tawa-kohekohe forest                           | hillslope                            | *                          | P              | 0      | 2                 |
| Semi-coastal     | terrestrial          | 1,2,3,4,7                    |                                                                | hillslope                            | *                          | C              | +      | 2                 |
| Coastal          | terrestrial          | 7                            | Pohutukawa-kamuka forest                                       | hillslope                            | *                          | Mn             | 0      | 1                 |
| Lowland          | geothermal           | 2                            | Pohutukawa x northern rata-kamahi forest                       | hillslope, stream gully, terrestrial | P                          | P              | -      | 2                 |
| Lowland          | geothermal           | 2                            | Pohutukawa x northern rata/ mingimangi-prostrate kanuka forest | hillslope, terrestrial               | P                          | P              | -      | 2                 |
| Lowland          | terrestrial          | 2                            | Porokaiwhiri-mahoe-mamaku-whetiki kamahi-tawari-(miro) forest  | steep face                           | *                          | P              | +      | 2                 |
| Lowland          | terrestrial          | 2                            | (Pukatea)-(rimu)/tawa-mamaku-rewarewa forest                   | plateau                              | *                          | C              | +      | 2                 |
| Lowland          | terrestrial          | 2                            | Pukatea-(rimu)/tawa-pukatea(hinai) forest                      | plateau                              | *                          | C              | +      | 2                 |
| Coastal          | terrestrial          | 7                            | Rewarewa/broadleaved species-treefern forest                   | hillslope                            | *                          | Mn             | +      | 2                 |
| Semi-coastal     | terrestrial          | 1,2,4,7                      |                                                                | hillslope                            | *                          | Mn             | +      | 2                 |
| Lowland          | terrestrial          | 1,2                          |                                                                | hillslope                            | *                          | Mn             | +      | 2                 |
| Coastal          | terrestrial          | 7                            | Rewarewa/kamahi forest                                         | hillslope                            | *                          | P              | 0      | 2                 |
| Semi-coastal     | terrestrial          | 1,2,3,4                      |                                                                | hillslope                            | *                          | Mn             | +      | 2                 |
| Lowland          | terrestrial          | 1,2                          |                                                                | hillslope                            | *                          | Mn             | +      | 2                 |

#### 1. Pre-Polynesian

| BIOCLIMATIC ZONE                 | HYDROLOGICAL ELEMENT | LAND SYSTEM (PRESENT EXTENT) | VEGETATION TYPE                                                                                  | LANDFORM                           | FORMER EXTENT <sup>1</sup> | PRESENT EXTENT | CHANGE | PROTECTION STATUS |
|----------------------------------|----------------------|------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------|----------------------------|----------------|--------|-------------------|
| Semi-coastal                     | terrestrial          | 3                            | Rewarewa/kamahi-kohekohe-mangao forest                                                           | hillslope                          | *                          | P              | +      | 1                 |
| Coastal                          | terrestrial          | 7                            | Rewarewa/kanuka forest                                                                           | hillslope                          | *                          | P              | +      | 2                 |
| Semi-coastal                     | terrestrial          | 2, 4, 7                      |                                                                                                  | hillslope                          | *                          | P              | Mn     | 2                 |
| Lowland                          | terrestrial          | 2                            |                                                                                                  | hillslope                          | *                          | P              | +      | 2                 |
| Semi-coastal                     | terrestrial          | 2                            | Rewarewa/kanuka-kamahi-(mangao)-(titoki) forest                                                  | steep hillslope, gorge face, ridge | *                          | Mn             | +      | 2                 |
| Semi-coastal                     | terrestrial          | 2                            | Rewarewa-(rimu)/tawa-kamahi forest                                                               | ridges, hillslope                  | *                          | C              | +      | 2                 |
| Lowland                          | terrestrial          | 2                            | Rewarewa/tawa forest                                                                             | hillslope                          | *                          | C              | +      | 2                 |
| Lowland                          | terrestrial          | 2                            | (Rimu)/tawa-rewarewa-hinau forest                                                                | hillslope                          | *                          | C              | +      | 2                 |
| Lowland                          | terrestrial          | 2                            | (Rimu)/tawa-rewarewa-hinau-kamahi forest                                                         | hillslope                          | *                          | C              | +      | 2                 |
| Lowland & Lowland & Semi-coastal | terrestrial          | 2                            | (Rimu)-(miro)/tawa-rewarewa forest (with local hard beech)                                       | gorges                             | *                          | C              | +      | 2                 |
| Lowland                          | terrestrial          | 1, 2                         | Rimu/tawa-kamahi-tawari-forest                                                                   | hillslope                          | Mn                         | Mn             | -      | 1                 |
| Semi-coastal                     | terrestrial          | 1, 2, 3                      | (Rimu)-(miro)-(totara-kotukutuku)-(tanekaha)/tawa-hinau-rewarewa-kamahi-tawari-tawheowheo forest | hillslope                          | Mn                         | Mn             | -      | 1                 |
| Lowland                          | terrestrial          | 1, 2, 3                      | (Rimu)-(northern rata)/tawa-kamahi-rewarewa-mangao forest                                        | hillslopes, plateau                | Mj                         | Mn             | -      | 4                 |
| Lowland                          | terrestrial          | 2                            | Rimu-northern rata/tawa-kamahi-tawari forest                                                     | hillslope                          | *                          | C              | +      | 2                 |
| Lowland                          | terrestrial          | 2                            | Rimu-red beech/tawa-kamahi-tawari-hard beech-silver beech forest                                 | hillslopes, plateau                | C                          | Mn             | -      | 1                 |
| Lowland                          | terrestrial          | 2                            | (Rimu)-(tanekaha)/tawa-kamahi-tawari forest                                                      | hillslope                          | *                          | Mn             | +      | 2                 |
| Lowland                          | terrestrial          | 2                            | Rimu/tawa-rewarewa-kamahi forest                                                                 | hillslope                          | *                          | Mn             | +      | 2                 |
| Lowland                          | terrestrial          | 2                            | Rimu/tawa-kamahi-hard beech forest                                                               | hillslope                          | Mn                         | Mn             | -      | 2                 |

## 1. Pre-Polynesian

| BIOCLIMATIC ZONE     | HYDROLOGICAL ELEMENT   | LAND SYSTEM (PRESENT EXTENT) | VEGETATION TYPE                                                                           | LANDFORM                   | FORMER EXTENT <sup>1</sup> | PRESENT EXTENT | CHANGE | PROTECTION STATUS |
|----------------------|------------------------|------------------------------|-------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------|--------|-------------------|
| Lowland              | palustrine terrestrial | 1                            | Rimu/tawari-kamahi/ <i>Gabnia xanthocarpa</i> forest                                      | plateau                    | *                          | *              | -      | 2                 |
| Lowland              | terrestrial palustrine | 1                            | (Rimu)/tawari-whēki-maire tawake forest                                                   | plateau                    | *                          | *              | 0      | 1                 |
| Lowland              | terrestrial            | 2                            | Silver beech-hard beech-(tawari)-(kamahi) forest                                          | flat                       | *                          | C              | -      | 4                 |
| Semi-coastal Lowland | terrestrial            | 1,2                          | Tanekaha forest                                                                           | hillslope                  | Mn                         | Mn             | -      | 2                 |
|                      | terrestrial            | 1,2                          |                                                                                           | hillslope                  | Mn                         | Mn             | -      | 2                 |
| Semi-coastal         | terrestrial            | 2                            | Tanekaha-rewarewa/kamahi forest                                                           | hillslope                  | *                          | Mn             | -      | 2                 |
| Lowland              | terrestrial            | 2                            | (Tanekaha)-(rimu)/tawari-kamahi-tawari-hard beech forest                                  | hillslope                  | *                          | Mn             | -      | 2                 |
| Lowland              | terrestrial            | 2                            | Tawa-hard beech forest                                                                    | steep face                 | 1                          | Mn             | -      | 2                 |
| Lowland              | terrestrial            | 2                            | Tawa-kamahi-tawari-hard beech-silver beech forest                                         | plateau, hillslope         | *                          | Mn             | +      | 1                 |
| Lowland              | terrestrial            | 2                            | Tawa-kamahi-hard beech-tawari-hinau forest                                                | hillslope, plateau         | *                          | Mn             | +      | 2                 |
| Lowland              | terrestrial            | 2                            | Tawa-kamahi-red beech-hard beech/whēki-whēki ponga-makomako-manuka-mahoe forest and scrub | flat and gentle hillslopes | *                          | Mn             | +      | 2                 |
| Lowland              | terrestrial            | 1,2                          | Tawa-rewarewa forest                                                                      | hillslope                  | *                          | C              | +      | 1                 |
| Lowland              | terrestrial            | 2                            | Tawa-rewarewa/mahoe-porokaiwhiri-pate-makomako-manaku forest and shrubland                | hillslope                  | *                          | Mn             | +      | 2                 |
| Semi-coastal         | terrestrial            | 1,2,3,4,7                    | Tawa-rewarewa-pukatea-kohekohe forest                                                     | hillslope, plateau         | *                          | C              | +      | 2                 |
| Lowland              | terrestrial            | 1,2,3                        | Tawa forest                                                                               | hillslope, plateau         | *                          | C              | +      | 1                 |
| Semi-coastal Lowland | terrestrial            | 3                            | Tawari forest                                                                             | exposed ridges             | *                          | Mn             | +      | 2                 |
|                      | terrestrial            | 1,2                          |                                                                                           |                            | *                          | Mn             | +      | 1                 |
| Montane              | terrestrial            | 1                            | Tawari-tawhewheo forest                                                                   | hillslope                  | P                          | P              | -      | 2                 |

1. Pre-Polynesian

| BIOCLIMATIC ZONE                  | HYDROLOGICAL ELEMENT | LAND SYSTEM (PRESENT EXTENT) | VEGETATION TYPE                                                                                                                           | LANDFORM                                            | FORMER EXTENT <sup>1</sup> | PRESENT EXTENT | CHANGE | PROTECTION STATUS |
|-----------------------------------|----------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------|----------------|--------|-------------------|
| Montane                           | terrestrial          | 1                            | Tawari-tawheowheo-orihou-<br><i>Dracophyllum traversii</i> forest                                                                         | hillslope                                           | P                          | P              | -      | 2                 |
| <b>Geothermal</b>                 |                      |                              |                                                                                                                                           |                                                     |                            |                |        |                   |
| Lowland                           | geothermal           | 2                            | <i>Lycopodiella cernua</i> fernland                                                                                                       | hillslope, terrestrial                              | Mn                         | P              | 0      | 2                 |
| Lowland                           | geothermal           | 2                            | (Dead pohutukawa ⇔ northern rata)/<br>prostrate kanuka-mingimingi scrub                                                                   | hillslope, terrestrial                              | *                          | *              | +      | 2                 |
| Lowland                           | geothermal           | 2                            | (Dead pohutukawa ⇔ northern rata)/<br>prostrate kanuka-mingimingi scrub                                                                   | hillslope, terrestrial                              | *                          | *              | +      | 2                 |
| Lowland                           | geothermal           | 2                            | Mingimingi-prostrate kanuka-manuka<br>scrub ⇔ <i>Histiopteris tncisa</i> fernland<br>⇔ <i>Hypolepis distans</i> fernland ⇔<br>gorse scrub | hillslope, gully, terrestrial                       | P                          | P              | -      | 2                 |
| Lowland                           | geothermal           | 2                            | Prostrate kanuka-manuka-mingimingi<br>scrub                                                                                               | hillslope, terrestrial                              | P                          | P              | -      | 2                 |
| Lowland                           | geothermal           | 2                            | (Dead pohutukawa × northern rata)/<br>wheki- <i>Gabnia setifolia</i> treefernland                                                         | hillslope, terrestrial                              | *                          | *              | +      | 2                 |
| Lowland                           | geothermal           | 2                            | (Dead pohutukawa × northern rata)/<br>wheki-kamahahi treefernland                                                                         | hillslope, terrestrial                              | *                          | *              | +      | 2                 |
| Lowland                           | geothermal           | 2                            | Nonvegetated raw-soilfield                                                                                                                | Flat, hillslope, cliff, stream margins, terrestrial | P                          | P              | 0      | 2                 |
| <b>Bluffs and landslide scars</b> |                      |                              |                                                                                                                                           |                                                     |                            |                |        |                   |
| Coastal                           | terrestrial          | 7                            | Bluffs                                                                                                                                    | rock face                                           | P                          | P              | 0      | 1                 |
| Semi-coastal                      | terrestrial          | 1,2,3,4,7                    |                                                                                                                                           | rock face                                           | P                          | P              | 0      | 2                 |
| Lowland                           | terrestrial          | 1,2,3                        |                                                                                                                                           | rock face                                           | P                          | P              | 0      | 2                 |
| Montane                           | terrestrial          | 1                            |                                                                                                                                           | rock face                                           | P                          | P              | 0      |                   |
| Coastal                           | terrestrial          | 7                            | Landslide scars                                                                                                                           | hillslope                                           | *                          | P              | 0      | 1                 |
| Semi-coastal                      | terrestrial          | 3,7                          |                                                                                                                                           | hillslope                                           | *                          | P              | 0      | 1                 |
| Lowland                           | terrestrial          | 1,3                          |                                                                                                                                           | hillslope                                           | *                          | P              | 0      | 1                 |
| Montane                           | terrestrial          | 1                            |                                                                                                                                           | hillslope                                           | *                          | P              | 0      | 2                 |

1. Pre-Polynesian



# Appendix 2

## VEGETATION TYPE DESCRIPTIONS

These descriptions were compiled from information collected during the current survey and earlier surveys (Beadel 1985a&b, 1987, 1994a, In prep; Nicholls 1964, 1965a-f, 1985a; King 1984a; Clarkson 1981a, 1982, 1983a&b; Wallace 1994; Shaw 1991).

The RAPs which contain each general vegetation type are listed next to the type name.

### **Sand dune vegetation**

#### ***Dune hollow wetlands***

A series of dune hollow wetlands occur along the coast behind the foredune. Other species forming reedlands and sedgeland include harakeke, *Baumea articulata*, pampas, *Schoenoplectus tabernaemontani*, ririwaka (*Bolboschoenus fluviatilis* and *B. medianus*), *Carex virgata* and *Persicaria decipiens*. A common association is raupo reedland (see description below). These wetlands are often associated with small streams.

Searush, *Baumea juncea*, marsh ribbonwood, *Cyperus ustulatus*, oioi, *Schoenoplectus pungens* and spike sedge occur locally. Bachelor's button or arrow grass locally form a low herbfield.

#### ***Spinifex sandfield and grassland*** (RAP 22)

Unmodified foredunes support spinifex sandfield and grassland. Scattered associates include panahi (*Calystegia soldanella*), perehia (*Deyeuxia billardierei*) and pingao. Near Otamarakau was a small colony of hinarepe (sand tussock, *Austrofestuca littoralis*). Modified dunes support marram tussockland.

#### ***Ficinia nodosa* / *Muehlenbeckia complexa* vineland and sedgeland** (RAP 22)

On the rear dunes *Ficinia nodosa* and pohuehue (*Muehlenbeckia complexa*) are common and marram occurs locally. Occasional associates include *Calystegia soldanella*, perehia, *Oxalis rubens*, catsear, pampas, *Zoysia pauciflora*, *Carex pumila*, bracken, lupin and haretail. West of Hauone, scattered emergent shrubs occur, including pohutukawa, taupata, akeake, houpara, *Eucalyptus botryoides* and kawakawa. East of Hauone towards Ohinekoao Stream these species become larger and more common. Near Matata are scattered small kanuka saplings (from Beadel unpublished data).

### **Wetland vegetation**

Wetland vegetation comprises only a small proportion of the vegetation of the district. Nevertheless, it is diverse, almost every wetland being

different. This reflects water table fluctuations and levels, fertility and the origin of the wetland (man-made or natural). However only broad descriptions have been made.

**Myriophyllum pedunculatum** (RAP 54, 62)  
**subsp. novae-zelandiae herbfield**

*Myriophyllum pedunculatum* subsp. *novae-zelandiae* is the predominant species and forms a low herbfield. There is scattered *Lachnagrostis lyalli* with local *Eleocharis gracilis* and manuka seedlings. *Lilaeopsis novae-zelandiae* occurs locally in small hollows.

This type occurs in the lowland zone.

**Raupo reedland** (RAP 27, 29, 46, 47, 48)

Raupo often forms a dense sward with swamp millet locally common. Other associates include *Schoenoplectus tabernaemontani*, *Baumea rubiginosa*, *B. tenax*, *Eleocharis acuta*, *E. gracilis*, *Juncus edgariae*, *J. pallidus* and *J. prismatocarpus*. Emergent grey willow occurs locally.

**Baumea teretifolia sedgeland** (RAP 62)

This type occurs at the Big Lake (lowland zone) and comprises a dense sward of *Baumea teretifolia*.

**Sedge-grass-reed wetland associations** (RAP 7, 29, 48)  
**(Semi-coastal)**

Small wetlands in damp gullies in pasture or secondary scrub occur throughout. These have been induced by clearing, burning and logging and continue to be modified by grazing of domestic stock or feral animals. Composition is variable. In the semi-coastal and coastal zones, common associates include raupo, swamp millet, purei (*Carex virgata* and *C. secta*), spike sedge, lotus, water purslane, Yorkshire fog, grey willow, *Cyperus ustulatus*, harakeke, manuka, *Baumea rubiginosa*, *Carex maorica* with local maru (burr reed; *Sparganium subglobosum*).

On the Whakamarama Plateau, lowland zone common associates include toetoe, *Juncus effusus*, *Juncus edgariae*, *Sphagnum*, Yorkshire fog, lotus, browntop, *Carex dipsacea*, spike sedge, *Juncus acuminatus* and *Juncus microcephalus*, with infrequent *Astelia grandis*.

There are often emergent shrubs, including wheki, tawari and kapuka.

**(Manuka)-(grey willow)-(Coprosma** (RAP 26, 29)  
**tenuicaulis)/raupo-Gleichenia microphylla-**  
**Baumea teretifolia/Sphagnum shrub-**  
**sedge-fern-reedland**

Scattered manuka, grey willow and hukihuki (*Coprosma tenuicaulis*) are emergent over varying amounts of raupo, waewae kaka (*Gleichenia microphylla*) and *Baumea teretifolia*. Occasional associates include purei (*Carex secta* and *C. virgata*), harakeke, *Sphagnum*, swamp millet, karetu (*Hierochloa redolens*) and *Coprosma propinqua* subsp. *propinqua* × *C. robusta*.

***Manuka-harakeke-toetoe-raupo/Baumea tenax-  
B. teretifolia-B. arthrophylla-swamp kiokio  
sedge-shrubland*** (RAP 7)

Manuka, harakeke, toetoe and raupo are scattered over a dense cover of *B. tenax*, *B. teretifolia*, *B. arthrophylla*, and swamp kiokio. Other species present include *Hebe corriganii*, *Carex secta*, grey willow, wheki, *Sphagnum* and waewae kaka.

This type occurs in RAP 7. A few examples of maire tawake occurs in logged tawa forest along the western margin of the wetland.

***Manuka-monoao/Gahnia-Astelia grandis-  
Gleichenia dicarpa/Sphagnum shrubland  
and scrub*** (RAP 26, 62)

Manuka and monoao are scattered or sometimes form an open canopy over varying amounts of *Gabnia* (*G. xanthocarpa* and locally *G. rigida*), *Astelia grandis*, *Gleichenia dicarpa* and waewae kaka. *Baumea rubiginosa* is locally common. *Sphagnum* generally forms a dense ground cover.

Type occurs in the lowland zone.

***Manuka-Coprosma tenuicaulis  
scrub and shrubland*** (RAP 26, 54, 62)

Manuka and hukihuki (*Coprosma tenuicaulis*) are dominant. Associates present at some sites include pole kahikatea and grey willow. The understorey includes *Baumea tenax*, *Baumea rubiginosa* and local tupari maunga (*Gabnia xanthocarpa*), *Astelia grandis*, *Carex virgata* and *Hydrocotyle novae-zeelandiae*.

Type occurs in the lowland zone.

***Tanekaha/manuka scrub and shrubland*** (RAP 7)

Type occurs along stream margins in RAP 7. Scattered tanekaha is emergent over manuka. Occasional associates include harakeke, toetoe and horoeaka.

Understorey components include waewae kaka, *Baumea rubiginosa*, *B. tenax*, swamp kiokio and koromiko.

***Grey willow forest*** (RAP 46, 47, 48)

Type occurs in wetlands in the coastal, semi-coastal and lowland zones.

Grey willow forms the canopy with local scattered manuka. Maire tawake was recorded from one site in McLaren Falls Park. The understorey is often dominated by indigenous species, including swamp kiokio, kiokio, *Baumea tenax*, and purei (*Carex secta* and *C. virgata*).

***Manuka scrub and shrubland*** (RAP 7, 10, 27, 43, 62)

Manuka forms the canopy. Associates present at a few sites include hukihuki (*Coprosma tenuicaulis*), emergent pole kahikatea and grey willow. Local gorse and Spanish heath occur on drier sites.

The understorey is variable and includes waewae kaka, *Baumea tenax*, hukihi ( *Coprosma tenuicaulis*), *Sphagnum cristatum*, *Nertera scapanioides*, swamp kiokio, swamp millet, Yorkshire fog, lotus and spike sedge, *Ranunculus amphitrichus*, and *Pratia angulata* with local waewae kaka, *Coprosma tayloriae*.

Type occurs in the coastal, semi-coastal and lowland zones.

### **Secondary scrub, shrubland and fernland**

**Secondary scrub, shrubland and fernland** (RAP 3, 4, 6, 7, 8, 10, 12, 13, 14, 17, 19, 21, 25, 27, 28, 29, 30, 31, 32, 33, 39, 40, 42, 44, 48, 50, 51, 52, 55, 56, 57, 58, 60, 61, 62)

Secondary scrub, shrubland and fernland occur on regenerating cleared or burnt sites. Manuka or bracken are often common. Common associates which are sometimes dominant include whauwhaupaku, kanuka, karamu (*Coprosma robusta* and *C. lucida*), mapou, hangehange, tutu, koromiko, toetoe, tawiniwini (*Gaultheria antipoda*), kohuhu, kiokio, gorse, kamahi, makomako, mamaku, wheki and horoeka. Emergent rewarewa, pines and kanuka occur locally. In the coastal zone mingimingi, taumingi (*Leptecophylla juniperina*), akepiro, wharariki and pohutukawa are often common in association with manuka and bracken.

Common ground cover species include *Morelotia affinis*, bracken, *Coprosma rhamnoides*, wahu (*Drosera auriculata*), patiti (*Microlaena stipoides*), turutu, kiokio, ground orchids, lichens (*Cladia retipora*, *Cladonia leptoclada*, *Cladonia capitellata*) and mosses (*Hypnum cupressiforme*), puakarimu (*Lycopodium deuterodensum*) and seedlings of the above canopy species. There are local Spanish heath, pampas, willow-leaved hakea and prickly hakea. Exotic grasses and herbs are common where domestic stock are grazed and occur on regenerating cleared or burnt sites in the coastal, semi-coastal and lowland zones.

On Te Weraiti in the sub-montane and upper lowland zones, predominant species are *Raukaua anomalus*, mingimingi, kiokio, tawari and tawheowheo, with scattered emergent rewarewa. Frequent associates include toetoe, kapuka, wheki, kaikawaka, tataramoa (*Rubus cissoides*), wharariki, orihou (*Pseudopanax colensoi*), hupiro (*Coprosma foetidissima*), kanono, *Gabnia* and *Dracophyllum traversii*.

Alongside the Pongakawa Stream in the semi-coastal zone, putaputaweta, kanuka, wheki and kohuhu are emergent over kiokio, ringfern and bracken with local pole rimu and kamahi, mingimingi and rewarewa. Emergent kauri rickers occur at one site in the Rapurapu Ecological Area and on steep scrub faces above a middle reach of the Mangapapa Stream.

**Mamaku treefernland** (RAP 4, 8, 16, 17, 21, 27, 40, 42)

Mamaku is dominant in canopy with occasional kamahi, whauwhaupaku, karamu and emergent rewarewa.

Middle tier is often sparse and includes hangehange and kanono.

Ground tier includes pakau (*Pneumatopteris pennigera*), kiokio, seedlings of mahoe, kanono, rewarewa, porokaiwhiri, pate and leaf litter.



## Forest

### ***Hard beech forest***

**(RAP 7, 12, 14, 25)**

Hard beech dominant in the canopy with local tawa, kamahi, tawari, tanekaha and emergent rewarewa, infrequent emergent rimu and in the semi-coastal zone mamaku, pukatea and nikau.

Middle tier components include kamahi, tawari, tanekaha, maire taiki (*Mida salicifolia*), toru, neinei, ponga, toropapa, mingimingi, piupiu, *Coprosma spathulata* subsp. *spathulata* and *C. lucida* with local pole rimu and miro.

Ground cover includes leaf litter, *Gabnia pauciflora*, puakarimu, seedlings of above, miro, toropapa, *Coprosma lucida*, kiekie, turutu and kiokio.

This type occurs in the lowland and semi-coastal zones.

### ***Hard beech-pohutukawa forest***

Hard beech is dominant with occasional pohutukawa. Pohutukawa becomes increasingly less common further inland. Local associates include kanuka, tawa, rewarewa and mangeao. Kamahi, mida (*Mida salicifolia*), mapou, heketara and pole hard beech often form a subcanopy.

Common middle tier species include hangehange, *Coprosma lucida*, mingimingi, toropapa, taumingi, ti ngahere, bracken, niniao (*Helichrysum lanceolatum*) and ponga.

Leaf litter dominates the ground cover with scattered turutu, kowaowao, *Acianthus sinclairii*, kakaha (*Astelia fragrans*), matau, *Schoenus tendo* and *Gabnia pauciflora*.

This type occurs only in the coastal and semi-coastal zones on the eastern side of the district.

### ***Hard beech-tanekaha-tawa forest***

**(RAP 7, 28)**

Hard beech is common and forms a discontinuous canopy with varying amounts of tanekaha and in gullies tawa. Local emergent rimu. Occasional associates include rewarewa, tawari, kamahi, kanuka, mihimihi and emergent rimu. Tawa associates include rewarewa, pukatea, mahoe and mangeao.

Middle tier components include tawari, rewarewa, mamaku, miro, pole rimu, kamahi, tanekaha, heketara, ponga, *Coprosma rhamnoides*, hukihuki, taumingi, wheki, horoeaka, bracken and mingimingi.

Ground tier species include rata vine (*Metrosideros fulgens*), kiekie and seedlings of above, moss, kiokio, *Blechnum fluviatile* and *Blechnum filiforme*.

Mangemange and kareao are common.

### ***Kahikatea-maire tawake forest***

**(RAP 10)**

Canopy dominated by varying amounts of kahikatea and maire tawake; frequent associates are kamahi, tawa and pukatea.

Common middle tier species include all of the above, mapou, wheki, ponga, kanono, mahoe, horoeaka, rimu and miro.

Ground tier components include *Nertera dichondrifolia*, kahikatea seedlings, kareao, tataramoa (*Rubus australis*), putaputaweta and matau. *Blechnum filiforme* and local *Sphagnum*.

Type now known from only one site in the lowland zone, but was possibly more common in the past. Maire tawake is known from only a handful of sites on the semi-coastal and lowland zones of the district.

### ***Kamahi forest***

**(RAP 1, 17, 18, 54, 55)**

Kamahi dominates the canopy with local associates of rewarewa, pole rimu, pole tawa, hinau, mapou, tanekaha and heketara.

Common middle tier species include rimu, tanekaha, rewarewa, ponga, hangehange, rata vine (*Metrosideros fulgens*), with local kohekohe. Mamangi (*Coprosma arborea*) occurs within RAP 1 Wainui River.

Ground cover is mainly leaf litter with occasional hooked sedges, ponga, kiokio, mangemange, *Oplismenus imbecillis*, seedlings of the above species and local toropapa, *Schoenus tendo* and waewaekoukou (*Lycopodium volubile*).

In the upper lowland zone where kamahi forest has developed on landslide scars the understorey comprises mainly mahoe, kanono, pate and tawari and the groundcover is dense with abundant pate, hangehange and ferns, including pakau, kiokio and katote (*Cyathea smithii*).

Type occurs in semi-coastal and lowland zones, often the result of burning and clearing but also the result of natural disturbance, for example: landslides.

### ***Kanuka forest***

**(RAP 8, 14, 27, 30)**

Kanuka dominant in canopy with local emergent rewarewa. Local canopy associates include mahoe, mangeao, mapou, mamaku, kohuhu and kamahi, and in coastal and semi-coastal zones pohutukawa and puriri.

Common middle tier associates include kawakawa, hangehange, mapou, rewarewa, whauwhaupaku, kamahi, ponga, porokaiwhiri and mahoe. Mingimingi, taumingi, wharariki, akepiro and rangiora are locally common in the coastal zone.

Ground cover components include leaf litter, *Lycopodium deuterodensum*, hangehange, *Poa anceps* subsp. *anceps*, matau, huruhuruwhenua (*Asplenium oblongifolium*), seedlings of middle tier species, *Polystichum richardii*, kiokio, *Adiantum cunninghamii*, rereti (*Blechnum chambersii*) with *Doodia australis* on coastal and semi-coastal sites.

Type induced by burning of hillslopes in the coastal, semi-coastal and lowland zones.

### ***(Kauri)/podocarps-broad leaved species***

A few large kauri occur in forest otherwise characteristic of (rimu)-(miro)-(Hall's totara)-(tanekaha)/tawa-hinau-rewarewa-kamahi tawari-tawheowheo forest, on steep broken country beside the Wairoa River near Lower Kaimai, six miles further south beside its tributary, the Mangapapa, and on the steep faces above Rapurapu and Kakahu streams. In the areas of forest where kauri was burnt many years ago, kauri saplings and rickers occur locally in the consequent low forest and shrubland. Canopy associates include kauri, Hall's totara, tawa, rewarewa and tawari. (Nicholls 1965a, b).

Middle tier species include tanekaha, tawa, totara, miro, tawari, mingimingi, *Coprosma lucida* and toru (*Myrsine salicina*).

Ground cover includes *Astelia trinervia*, kanono, toropapa and *Blechnum fraseri*, kiekie and mangemange are common lianes.

***Kauri (rickers)/tanekaha-tawari forest* (RAP 8)**

Kauri (rickers) are emergent over tanekaha and tawari.

Common middle tier associates include *Astelia trinervia*, kiokio, toropapa, mingimingi, kamahi, tawari, *Schoenus tendo*, bracken and *Coprosma lucida* with scattered juvenile kauri and tanekaha.

Ground cover includes leaf litter, kenehu (*Trichomanes reniforme*), puakarimu and kamahi.

***Kauri rickers/tawari forest* (RAP 8)**

Kauri rickers are emergent over a predominantly tawari canopy with occasional kamahi, Hall's totara and rewarewa.

Common middle tier species include korokio (*Corokia buddleioides*), tawari, rata vine (*Metrosideros fulgens*) and Hall's totara.

Ground cover is dominated by *Astelia trinervia* and *Gabnia pauciflora* with local puakarimu.

***Mangeao forest* (RAP 8, 46)**

Mangeao dominant in canopy with occasional associates of rewarewa, kamahi, kohekohe and scattered mamaku, mahoe, pukatea and titoki. Large kohekohe often form a dense subcanopy tier. Ngaio occurs in RAP 18.

Common middle tier species include kohekohe, kawakawa, ponga and mahoe.

Ground cover is mainly leaf litter with scattered seedlings of the above species especially kawakawa and ferns such as rereti, *Blechnum filiforme* and mouku (*Asplenium bulbiferum*).

This forest type has developed following logging and small pockets of mangeao forest are common on farmland on the higher part of the Rotoiti Breccia Fan. These are generally heavily grazed and the understorey virtually non-existent.

***(Miro)/tawa-kamahi-tawari forest* (RAP 2, 3, 4, 6)**

Type occurs on exposed ridges in lowland zone. Local infrequent emergent miro occurs over a canopy dominated by varying amounts of tawa, kamahi and tawari. Tawari is locally mono-dominant. Infrequent associates include Hall's totara, rimu, rewarewa, hinau, tanekaha, totara, porokaiwhiri and tawheowheo.

Common middle tier species include kamahi, tawari, kanono, porokaiwhiri, miro, tawa, ponga, mahoe, mangemange, kareao, wheki, tawheowheo, toro, toropapa with local neinei, horopito and kareao.

Common ground cover species are *Hymenophyllum demissum*, hangehange, kanono, mouku, bush rice grass, piupiu, *Leptopteris bymenophylloides*, kiwikiwi (*Blechnum fluviatile*) and seedlings and saplings of the canopy and understorey species.

**(Northern rata)-(rimu)/tawa-kohekohe forest** (RAP 1, 2, 4, 8, 12, 17, 24, 27, 36, 44, 49)

Scattered to common emergent rimu, local northern rata and infrequent kahikatea and miro are emergent over a canopy with varying dominance of tawa, kohekohe, rewarewa, pukatea and kamahi. Common associates include hinau, mangeao, mamaku. Puriri occurs locally throughout, often forming small groves, sometimes in gullies, sometimes on the flat plateau, with local tanekaha and hard beech in gorges.

Kohekohe often form a subcanopy. Kamahi and tawari occur very locally, and maire tawake locally on the western side of the Papamoa Range.

Common middle tier species include pole tawa and kohekohe, kawakawa, kanono, ponga, wheki, kareao, mahoe, mamaku, kiekie, mapou, porokaiwhiri and nikau, with local toropapa. Pole hinau, rewarewa, pukatea and mangeao are fairly common.

Ground cover is often dense and includes crown fern, *Blechnum filiforme*, *B. fraseri*, mouku, bush rice grass, seedlings of the above species and *Hymenophyllum demissum*.

Common lianes are kiekie, kareao and mangemange.

This forest type was probably the dominant forest cover in the semi-coastal zone before human settlement.

**(Northern rata)/tawa-kohekohe forest** (RAP 1, 2, 5, 6, 8, 11, 14, 17, 27, 49)

Tawa is the dominant canopy species, overtopped infrequently by northern rata and rimu. Kohekohe is common in the canopy. Large pukatea are often common in gullies and there is local tanekaha and hard beech in gorges. Other canopy associates include mangeao, rewarewa and kamahi. Kohekohe often forms the subcanopy tier.

Common middle tier species are porokaiwhiri, ponga, kawakawa, mangeao, tawa, kohekohe, kareao, kiekie, mangemange, rata vine (*Metrosideros fulgens*) and nikau.

Common ground cover species include *Hymenophyllum demissum*, crown fern, *Lastreopsis bispida*, *L. glabella*, mouku, bush rice grass and seedlings of the above.

This forest type has been lightly logged or modified by crown fires. It occurs in the coastal and semi-coastal zones.

**Pohutukawa forest and treeland** (RAP 27)

Pohutukawa is the dominant canopy species. Locally, the pohutukawa are widely spaced and mahoe, mamaku and houpara with local brush wattle form a subcanopy.



Kawakawa is common in the middle tier. Other species include *Coprosma robusta*, koromiko, rangiora, hangehange, taupata, mahoe, mamaku, houpara, brush wattle and pampas.

Ground cover is mainly leaf litter. Plants include *Doodia australis*, *Pteris macilenta*, matau, kiokio, *Ficinia nodosa*, *Poa anceps* subsp. *anceps*, *Machaerina sinclairii* and buffalo grass.

### ***Pohutukawa-kanuka forest***

**(RAP 27)**

Pohutukawa and kanuka form the canopy with occasional puriri, mapou, mahoe, kamahi and local houpara. There is local emergent rewarewa. In gullies mamaku is common with scattered whau.

Common middle tier species include mapou, hangehange, whauwhaupaku, ponga, mamaku and kawakawa. On steep ridge crests *Coprosma lucida* is common in association with hukihuki, mingimingi, mapou and koromiko.

Common ground cover species include *Adiantum bispidulum*, *Pteris macilenta*, kiokio, matau and seedlings of mahoe, hangehange and porokaiwhiri.

### ***Pole podocarp forest***

**(RAP 10, 33)**

The canopy composition varies, but kahikatea alone or with tanekaha are two chief species. Rimu is common with local miro and totara, and infrequent matai. Domestic stock were grazed at most of the sites which were inspected and the understorey was generally sparse.

Species present in the middle tier include saplings of canopy species, horoeka, wheki, kamahi, mapou and local swamp maire and tawa.

Ground cover includes leaf litter and scattered rereti and kiwkiwi (*Blechnum fluviatile*), tataramoa, seedlings of above, *Blechnum filiforme* and local *Sphagnum* and *Pratia angulata*. Lianes include *Rubus schmidelioides*.

### ***Rewarewa/broadleaved species-treefern forest***

**(RAP 3, 5, 8, 9, 23, 24, 25, 27, 31, 36, 39, 40, 52, 57)**

Secondary forest developed following repeated burning and clearing. Rewarewa is common in the canopy or emergent over varying canopy associates including a selection of kamahi, mamaku, kanuka, mangeao, porokaiwhiri, mahoe and local makomako, pate, kanono, tanekaha, whauwhaupaku, hinau, mapou, heketara, horoeka, pole rimu, totara, mihimihi, pukatea and kohekohe.

Rewarewa is locally dominant. Some sites contain good rimu regeneration.

Common middle tier species include hangehange, mamaku, ponga, mangeao, kanono, mahoe, porokaiwhiri, rangiora, kareao, mapou, *Coprosma rhamnoides*, *Coprosma lucida* and rewarewa.

Ground cover includes rereti, pakau, kiokio, ponga, leaf litter, seedlings of above species, matau and turutu.

**Rewarewa/kamahi forest****(RAP 1, 4, 7, 8, 9, 10, 12, 19, 25, 27, 28, 30, 31, 33, 42, 51)**

Rewarewa is commonly emergent over kamahi. Occasional canopy associates include kanuka, mamaku, mahoe, mangeao, kohuhu, putaputaweta, hinau, porokaiwhiri and tawa. There is local pole rimu and tanekaha. At some sites scattered emergent radiata pine occurs with maritime pine around margins.

The middle tier is often diverse and includes kawakawa, kohekohe, porokaiwhiri, ponga, mapou, heketara, rewarewa, miro, mahoe, kanono, tanekaha, horoeka, wheki, hangehange, mangemange and rangiora. Hall's totara, kahikatea, rimu and *Coprosma spathulata* occur locally.

Leaf litter is often abundant. Ground cover species include seedlings of the above species, matau, *Oplismenus imbecillis*, *Pteris macilenta*, *Lastreopsis* species, *Doodia australis*, kareao, piupiu and *Metrosideros diffusa*.

Type occurs in semi-coastal and lowland zones, and has arisen following burning or clearing.

**Rewarewa/kamahi-kohokohe-mangeao forest****(RAP 8, 40)**

Scattered rewarewa are emergent over a kamahi-dominant canopy with kohekohe and mangeao commonly present. Occasional associates include kanuka, hinau, porokaiwhiri, tawa and mamaku along with rare emergent rimu. Large puriri occur in some gullies in association with nikau, gully tree fern and kareao.

Common middle tier species include kohekohe, mangeao, heketara, kawakawa and hangehange.

Ground cover comprises leaf litter, with occasional matau, bush rice grass, *Lastreopsis hispida*, *L. glabella*, *Asplenium bulbiferum*, *A. bookerianum* and seedlings.

**Rewarewa/kanuka forest****(RAP 13, 14, 27, 32, 36, 44)**

Rewarewa is commonly emergent over a canopy of kanuka with varying amounts of kamahi.

Other local canopy associates include mamaku, mahoe, heketara, kohuhu, mihimihi, infrequent mangeao and, in the coastal zone, pohutukawa.

Common middle tier species include kaponga, mingimingi, *Coprosma lucida*, taumingi, hangehange and whauwhaupaku. Tanekaha, heketara and kohekohe occur locally.

Ground cover components include hooked sedges (*Uncinia uncinata*), turutu, waewaekoukou, *Oplismenus imbecillis*, *Hymenophyllum sanguinolentum*, kiokio with local concentrations of puakarimu on ridge crests.

Type has arisen following burning or clearing in the coastal, semi-coastal and lowland zones.

***(Rimu)-(miro)-tawa-kamahi-tawari forest*** **(RAP 4, 6, 7, 8, 25, 41, 59)**

Local emergents of rimu and miro over a canopy with varying dominance of tawa, kamahi and tawari. Occasional associates of Hall's totara, rewarewa, hinau and emergent tanekaha and northern rata.

Middle tier species commonly include kamahi, tawari, tawa, ponga and kareao, hinau, toropapa, mahoe, horoeka and mangemange, porokaiwhiri, wheki and kanono, with local horopito.

Ground tier includes occasional aspleniums, piupiu, *Leptopteris bymenophylloides*, mauku (filmy ferns), matau and seedlings of the above.

Mangemange, kiekie and kareao are common lianes.

Type occurs mainly in the upper lowland zone. Where this type has been logged, emergent podocarps are rare.

***(Rimu)-(miro)-(tanekaha)/tawa-hinau-rewarewa-kamahi-tawari-tawheowheo forest*** **(RAP 3, 7)**

Type occurs along gorges and on very steep ridges and faces in the lowland and semi-coastal zones.

Occasional rimu, miro, Hall's totara, tanekaha emergent over locally frequent to abundant tawa, kamahi and tawari with occasional hinau, rewarewa and tawheowheo. Emergent northern rata occur very occasionally throughout, with local pukatea and kohekohe in deep gullies.

Middle tiers include frequent to abundant kamahi and tawari. Occasional poles of all the other hardwood tree species and the podocarps; heketara, horoeka, ponga, wheki, hangehange, kanono, lancewood, mapou, mingimingi, horopito, porokaiwhiri. Kotukutuku and punui (*Cyathea cunninghamii*) occur locally in gullies.

Ground tier often comprises piupiu, waekura (*Sticherus cunninghamii*), astelias, gahnias and seedlings and saplings of all the hardwoods and podocarps. Common lianes are kiekie, mangemange, kareao.

***(Rimu)-(northern rata)/tawa-kamahi-rewarewa-mangeao forest*** **(RAP 2, 4, 5, 6, 14, 28, 60)**

Tawa in canopy often co-dominant with kamahi overtopped by scattered emergent rimu. Common associates include rewarewa, mangeao, hinau, mamaku, kamahi, scattered tawari and, particularly on flatter sites, pukatea. Emergent northern rata (dead or alive), miro and kahikatea may be present with local tanekaha and hard beech in gorges.

Middle tiers are often dense and diverse and include kamahi, tawari, pole tawa, kanono, ponga, mahoe, hangehange, kawakawa, pate, porokaiwhiri, punui, wheki, mamaku, ponga, rata vine (*Metrosideros fulgens*), kiekie and supplejack. Pole rewarewa, hinau and mangeao are fairly common.

Ground tier is also thick and includes kanono, kawakawa, mouku, *Blechnum filiforme*, piupiu, *Hymenophyllum demissum*, *Leptopteris*

*bymenophylloides*, bush rice grass, astelias, matau, young treeferns and seedlings. Kiekie, kareao and mangemange are common lianes.

Epiphytes kowharawhara (*Astelia solandri*) and kahakaha (*Collospermum bastatum*) are common.

Type occurs in the lowland zone.

***Rimu-red beech/tawa-kamahi-tawari-hard beech-silver beech forest*** (RAP 53, 62)

This type is confined to broken country and apparently poorly drained minor basins in the upper Mangorewa catchment, on the north-eastern fall of the Mamaku plateau. It comprises a fine mosaic of “sub-types”. In general, red beech occurs on the more fertile sites, hard beech on impoverished soils, silver beech in cold gullies and along streams. Tawa, kamahi and scattered emergent rimu occur throughout. Occasional associates include tawari, pokaka, toatoa and Hall’s totara.

Common middle tier species include *Astelia fragrans*, *Gabnia pauciflora*, kamahi, tawa, hangehange, kanono, tawheowheo with infrequent miro, rimu, totara kotukutuku and horopito (*Pseudowintera axillaris*), mahoe and juvenile *Nothofagus* spp.

Ground cover includes leaf litter, piupiu and *Lindsaea trichomanoides*, and seedlings of tawari, toatoa and rimu.

***Rimu/tawari-kamahi/Gahnia xanthocarpa forest***

A few small stands of rimu occur in the unlogged forests on the highest southern part of the Whakamarama Plateau. The largest stand covers about 5 ha of flat ground (500 m a.s.l.) at the head of a tributary of the Ngamuwahine Stream (Nicholls 1985a). Abundant rimu are emergent over tawari, kamahi and pole rimu, with scattered associates of porokaiwhiri, broadleaf, wheki, pokaka, toropapa, kanono and horopito (*Pseudowintera axillaris*).

Waewaekaka locally abundant in the ground tier with scattered bush rice grass, wheki, *Libertia micrantha* and *Sphagnum*.

***(Rimu)/tawari-wheki-maire tawake forest***

Scattered emergent rimu over a canopy comprising tawari, wheki and maire tawake. Occasional associates include miro, kamahi, tawa, pukatea. (Maire tawake may not be present at all sites.)

Common middle tier species include wheki-ponga, wheki, kamahi, tawa, tawari, mapou and maire tawake.

Common ground tier species are bush rice grass, matau, kiwikiwi, piupiu and *Blechnum procerum*.

Type occurs on poorly drained swampy ground on the top of the Whakamarama Plateau.

***Tanekaha forest*** (RAP 1, 4, 7, 10, 12, 21, 44)

Tanekaha forest generally occurs in gorges, on steep spurs, ridges and on hillslopes above rivers and streams. Tanekaha forms the canopy with local associates of rimu, totara, kamahi, hinau and tawari.



Common middle tier species include kamahi, heketara, mihimihi, tawari, horoeka, rimu, Hall's totara, miro, mingimingi, taumingi, rewarewa, *Coprosma lucida* with toropapa, mapou and hangehange.

Common ground cover includes *Astelia trinervia*, mosses, *Lycopodium deuterodensum*, kiokio, turututu, *Gabnia pauciflora*, *Astelia trinervia*, *Schoenus tendo* and *Sticherus cunninghamii*.

Mairehau reaches its southern limit of distribution in this type near the confluence of the Opuaki River and Mangaonui Stream. *Corunastylis pumila* was also recorded from this site.

Type occurs in the semi-coastal and lowland zones.

### ***Tawa forest* (RAP 1, 5, 7, 12, 25, 41, 42, 51, 58)**

Infrequent rimu, miro, Hall's totara and dead northern rata are sometimes emergent over tawa dominant canopy with scattered associates of tawari, rewarewa, hinau, kamahi, mangeao and pukatea. Tanekaha and hard beech often occur in gorges, and kotukutuku occurs locally in gullies.

Common middle tier species include ponga, kiekie, porokaiwhiri, mahoe, rata vine (*Metrosideros fulgens*), rewarewa and mangemange, kanono, hangehange, wheki and pate.

Ground tier includes leaf litter, kiekie, piupiu, bush rice grass, *Hymenophyllum demissum*, pakau, hooked sedges and *Blechnum filiforme*.

Type is result of logging or crown fires in the lowland zone.

### ***Tawa-kamahi-tawari-hard beech-silver beech forest* (RAP 12, 26, 61)**

This type is the result of logging in rimu-red beech/tawa-kamahi-tawari-hard beech-silver beech forest for podocarps in the 1920s and for red beech 1945-55 (Nicholls 1965b).

Canopy comprises various admixtures, often comprising hard beech and silver beech, tawa and kamahi, and tawari. There are infrequent rimu and toatoa.

Middle tier components include tawari, kanono, kamahi, whauwhaupaku, tawa, toropapa, *Raukaua anomalus* with local miro and toatoa.

Ground cover components include crown fern, toropapa, kanono, astelias, kowaowao, tawari, hooked sedges and seedlings of above.

Type occurs in the lowland zone.

### ***Tawa-rewarewa forest* (RAP 3, 5, 6, 7, 8, 10, 39)**

Tawa and rewarewa common in the canopy with varying amounts of pukatea, hinau and other canopy associates include kamahi, ponga and local tawari and mangeao, and local tanekaha and hard beech in gorges. There is the odd emergent rimu and northern rata. Varying combinations of mamaku, mahoe, porokaiwhiri and ponga often form a subcanopy.

Common middle tier associates include ponga, kanono, mahoe, porokaiwhiri, mamaku, rewarewa, tawa and hangehange.

In the semi-coastal zone, taurepo and nikau occur locally.

Common ground cover comprises rereti, pakau, *Hymenophyllum demissum*, *Blechnum filiforme*, seedlings of the above species, mouku and *Lastreopsis hispida*. Scrambling lianes are locally abundant and include mangemange, kiekie and kareao.

This type occurs in the lowland, and locally in the semi-coastal zone. It has generally been logged or modified by crown fires.

***Tawa-rewarewa-pukatea-kohekohe forest*** (RAP 1, 3, 5, 8, 9, 12, 13, 14, 16, 18, 19, 20, 21, 23, 30, 31, 32, 33, 34, 35, 36, 37, 52, 55, 56, 57)

The canopy is dominated by varying amounts of tawa, rewarewa, pukatea and kohekohe. This type is the result of logging or crown fires in (northern rata)-(rimu)/tawa-rewarewa-pukatea-kohekohe. Other canopy associates include hinau, mangeao, mamaku, kamahi, pole rimu with local puriri, titoki and aka. Tanekaha, Hall's totara and hard beech often occur on steep sites. A few emergent rimu remain at several sites with local epiphytic puka (*Griselina lucida*). Local small stands of podocarp regenerations occur on ridges. Kotukutuku is local in gullies, particularly on the eastern side of the district. Puriri occurs locally.

Common middle tier species are mahoe, ponga, mamaku, porokaiwhiri, rangiora, hangehange, kawakawa, rewarewa, kanono, kohekohe, tawa in association with local nikau, wheki, pukatea.

Common ground cover species include pakau, rereti, mouku, *Blechnum filiforme*, *Leptopteris hymenophylloides* and seedlings of the above species. Kiekie, kareao and rata vine (*Metrosideros fulgens*) are locally common. *Asplenium lamprophyllum* occurs locally on the western side of the Kaimai Ranges.

Type occurs in the coastal and semi-coastal zones.

***Tawari forest*** (RAP 8)

Tawari dominant in canopy with occasional associates of kamahi, tanekaha and toatoa.

Middle tier species include porokaiwhiri, ponga, Hall's totara, mapou, rewarewa, miro, horopito, tawheowheo and tanekaha with local neinei and *Corokia buddleioides*.

Leaf litter is common on the ground. Species present include ponga, *Sticherus cunninghamii*, rewarewa, matau, rata vine (*Metrosideros fulgens*), puakarimu, mapere (*Gabnia setifolia*), seedlings of rewarewa and tawari with local *Coprosma spathulata* subsp. *spathulata*.

Type occurs in lowland and semi-coastal zones.

***Tawari-tawheowheo forest*** (RAP 2, 3)

Occurs in the sub-montane zone and upper lowland zone.

Tawari and tawheowheo forms the canopy with local *Myrsine salicina*.

Middle tier species include tawari, tawheowheo, hupiro, kakaha (*Astelia fragrans*), wheki, mingimingi, puka and kamahi with local horopito (*P. axillaris* and *P. colorata*).

Ground cover includes leaf litter, mosses, kahaka, *Gabnia pauciflora*, *Blechnum procerum*, *Hymenophyllum demissum*.

Epiphytes are common and include *Rumobra adiantiformis*, kenehu (*Trichomanes cardiomanes*) and *Hymenophyllum demissum*.

**Heavily logged rimu/  
tawa forest** (RAP 1, 4, 7, 17, 18, 24, 25,  
33, 34, 38, 40, 42, 45, 51, 61)

This forest type has been induced through heavy, often repeated, logging of tall podocarp/tawa forest. Though logged rimu/tawa forest often retains a more or less intact canopy of tawa and associates, some sites which have been very heavily logged have what can be more accurately described as a discontinuous canopy.

It mainly comprises scattered emergent tawa, rewarewa and pukatea over a lower canopy of mamaku, mahoe, porokaiwhiri, pate, other broadleaved species and rata vine (*Metrosideros fulgens*).

Common mid-tier species include porokaiwhiri, kaponga and wheki.

Common ground cover species include piupiu with local *Blechnum fraseri* and *Hymenophyllum demissum*. Kiekie is locally abundant on the ground and scrambling up trees and there are also local thickets of mangemange and kareao.

On logging tracks there is often a cover of mixed exotic grasses and herbs, toetoe, matata, bracken, gorse, Spanish heath. Secondary shrubs beside logging tracks include makomako, kotukutuku, wheki, wheki ponga, mahoe, tataramoa (*Rubus cissoides*), with local mahoe-wao (*Melicytus lanceolatus*), tawa and mangeao.

Nevertheless, local pockets of more intact tawa forest (similar to (rimu)-(northern rata)/tawa-kamahi-rewarewa-mangeao forest) occur on some less accessible sites.

## **Geothermal**

**Pohutukawa × northern rata dominant forest** (RAP 15)

This forest type is variable and occurs in the Taheke Geothermal Area. In places pohutukawa × northern rata (to c.20 m) and kamahi form the canopy with occasional wheki and karamu. *Gabnia setifolia* and *Histiopteris incisa*, mingimingi, wheki, and manuka are common in the understorey. Patches of bracken, turutu, *Hypolepis distans*, *Paesia scaberula* and *Gleichenia microphylla* are present.

Elsewhere pohutukawa forms an open canopy over an understorey dominated with mingimingi, prostrate kanuka and *Histiopteris incisa*. Kamahi and *Gabnia setifolia* are also present.

In other places emergent pohutukawa × northern rata to 20 m are emergent over prostrate kanuka and mingimingi. Wheki, *Histiopteris incisa*, *Gabnia setifolia*, and *Hypolepis distans* are also present.

***Prostrate kanuka-manuka-mingimingi scrub* (RAP 15)**

This type occurs in the Taheke Geothermal Area. Prostrate kanuka to 2 m tall, and manuka and mingimingi are dominant. Occasional *Histiopteris incisa*, *Lycopodiella cernua* and pohutukawa × northern rata seedlings. Gorse and kanuka become common on cooler margins.

Elsewhere dead trees of pohutukawa × northern rata are emergent over prostrate kanuka to 2 m and mingimingi are dominant. Occasional *Histiopteris incisa*, *Lycopodiella cernua* and pohutukawa × northern rata seedlings.

In one place, several dead pohutukawa × northern rata trees occur over a canopy of manuka, mingimingi, gorse, tawiniwini, turutu and *Gabnia setifolia*. Occasional wheki, *Histiopteris incisa* and *Paesia scaberula* present. This area has been geothermally active in the recent past.

***Mingimingi-prostrate kanuka-manuka scrub* ⇔ (RAP 15)  
*Histiopteris incisa fernland* ⇔ *Hypolepis distans fernland***

This type occurs in the Taheke Geothermal Area. A varied vegetation type where mingimingi is dominant with smaller areas dominated by prostrate kanuka, manuka, *Histiopteris incisa*, and gorse. Wilding radiata pine and pohutukawa × northern rata are occasional emergents, with gorse becoming more abundant on cooler soils. Scattered dead pohutukawa × northern rata are also present. In open steep areas *Gabnia setifolia*, *Histiopteris incisa*, *Hypolepis distans*, and bracken become common. Blackberry, turutu, wheki, *Lycopodiella cernua*, kamahi, hangehange, kohuhu and mamaku are also present. Towards the boundary with pine plantation, mingimingi is still the dominant species with increasing amounts of gorse, hangehange, mamaku, *Histiopteris incisa*, and wheki.

***Manuka-prostrate kanuka-Lycopodiella cernua shrubland* (RAP 15)**

This type occurs in the Taheke Geothermal Area. Manuka and prostrate kanuka are dominant with *Lycopodiella cernua* common in the understorey. Raw-soilfield forms a cover for about 30% of this unit. Gorse becomes common on cooler soils. Other species present include *Paesia scaberula*, kiokio, *Juncus edgariae*, *Gleichenia microphylla*, *Schizaea bifida* (at least eight plants), tawiniwini, pohutukawa × northern rata seedlings.

***Histiopteris incisa-mingimingi fernland* (RAP 15)**

This type occurs in the Taheke Geothermal Area. *Histiopteris incisa* and mingimingi are dominant with wheki also present. Occasional *Gabnia setifolia*, kamahi, gorse and manuka present.

***Lycopodiella cernua fernland* (RAP 15)**

*Lycopodiella cernua* dominates these areas.

***(Dead pohutukawa × northern rata)/wheki-kamahi-Gabnia setifolia treefernland* (RAP 15)**

This type occurs in the Taheke Geothermal Area. Several dead pohutukawa × northern rata trees occur over wheki and *Gabnia setifolia*. Occasional



pohutukawa × northern rata to 10m tall with manuka, mingimingi, hangehange, kohuhu also present. *Lycopodiella cernua* is present in the understorey. In places wheki and kamahi are dominant.

### ***Non-vegetated raw soilfield***

**(RAP 15)**

This type occurs in the Taheke Geothermal Area. Heated bare ground, mudpools, steaming ground, fumaroles, hot springs and sulphur deposits. Occasional small patches of mingimingi and manuka are present.

### **Other**

#### ***Lake***

**(RAP 7, 62)**

#### ***Bluffs***

**(RAP 3, 12, 14)**

Bluffs occur throughout the ecological district (for example: Matata Scenic Reserve, Te Weraiti, Papamoa Range and Mangorewa Gorge) and support distinct plant associations. Coastal bluff vegetation comprises a sparse cover of wharariki, *Morelotia affinis*, kama (*Gaultheria oppositifolia*), totorowhiti (*Dracophyllum strictum*), akepiro, taumingi, mingimingi, *Schoenus tendo*, puakarimu, manuka and locally ground orchids (including *Thelymitra carnea*). There is sometimes a luxuriant cover of tuhara (*Machaerina sinclairii*) and kiokio, often associated with seepages.

On semi-coastal bluffs in RAP 14, species present include kiokio, wharariki, *Schoenus tendo*, tuhara, totorowhiti, toetoe, mingimingi, manuka with mihimihi locally along the edges.

In the lowland zone, bluffs exposed to the sun often support a low cover of rewarewa, kamahi, *Coprosma lucida*, mingimingi, koromiko and *Schoenus tendo*. Towards the base of the bluffs where surrounding vegetation supplies shade, rata vines (*Metrosideros fulgens*, *M. perforata*), *Lindsaea viridis*, *Trichomanes elongatum*, *T. endlicherianum*, *Hymenophyllum demissum*, *H. ferrugineum*, kiokio, rereti, *Blechnum nigrum*, *Epilobium* species and *Adiantum cunninghamii* are common.

In the sub-montane zone, species present on rock faces include kiokio, mingimingi, kaikawaka, kamahi, kapuka, rata vine (*Metrosideros fulgens*), *Nertera depressa*, waekura and waewaekoukou.

### ***Landslide scars***

**(RAP 3)**

Landslide scars occur along several of the steeper ridge systems in the district. Early colonising species of these sites include *Gabnia setifolia*, matata, kiokio, toetoe, crown fern and seedlings of kamahi, rewarewa, makomako and kotukutuku. Along forest margins, common species include pate, rangiora, hangehange, nikau, ponga and kiekie.

Species present in the sub-montane zone include *Lycopodium scariosum*, *Leucopogon fraseri*, bracken, kiokio, *Deyeuxia avenoides*, and orchids (including *Thelymitra longifolium*, *Orthoceras novae-zeelandiae* and *Corunastylis nuda*) and *Dracophyllum traversii*.



# Appendix 3

## CHECKLIST OF NATIVE VASCULAR PLANTS IN OTANEWAINUKU ECOLOGICAL DISTRICT

The following list is compiled from the Otanewainuku Ecological District P.N.A. survey, previous vegetation surveys by the author, and computerised Christchurch herbarium (NZCHR) database.

Nomenclature follows Allan (1961), Moore and Edgar (1970), Healy and Edgar (1980), Brownsey, Given and Lovis (1985), Connor and Edgar (1987), and Webb, Sykes and Garnock-Jones (1988).

### Abbreviations used

|        |   |                                              |
|--------|---|----------------------------------------------|
| aff.   | : | affinities with                              |
| agg.   | : | aggregate, comprising more than one species. |
| cf.    | : | compare with                                 |
| incl.  | : | including                                    |
| s.l.   | : | sensu lato, in the broad sense               |
| sp.    | : | species (singular)                           |
| spp.   | : | species (plural)                             |
| s.s.   | : | sensu stricto, in the narrow sense           |
| subsp. | : | subspecies                                   |
| ×      | : | hybrid                                       |
| var.   | : | variety                                      |
| *      | : | possibly adventive                           |

### Gymnosperms

|                                             |               |
|---------------------------------------------|---------------|
| <i>Agathis australis</i>                    | kauri         |
| <i>Dacrycarpus dacrydioides</i>             | kahikatea     |
| <i>Dacrydium cupressinum</i>                | rimu          |
| <i>Libocedrus bidwillii</i>                 | kaikawaka     |
| <i>Phyllocladus toatoa</i>                  | toatoa        |
| <i>Phyllocladus trichomanoides</i>          | tanekaha      |
| <i>Podocarpus hallii</i>                    | Hall's totara |
| <i>Podocarpus totara</i> var. <i>totara</i> | totara        |
| <i>Prumnopitys taxifolia</i>                | matai         |
| <i>Prumnopitys ferruginea</i>               | miro          |

**Monocot. trees and shrubs**

|                                                |                                 |
|------------------------------------------------|---------------------------------|
| <i>Cordyline australis</i>                     | ti kouka                        |
| <i>Cordyline banksii</i>                       | ti ngahere, forest cabbage tree |
| <i>Cordyline australis</i> × <i>C. banksii</i> |                                 |
| <i>Phormium cookianum</i>                      | wharariki, mountain flax        |
| <i>Phormium tenax</i>                          | harakeke, flax                  |
| <i>Rhopalostylis sapida</i>                    | nikau                           |

**Dicot. trees and shrubs**

|                                                                        |                     |
|------------------------------------------------------------------------|---------------------|
| <i>Alectryon excelsus</i> subsp. <i>excelsus</i>                       | titoki              |
| <i>Alseuosmia macrophylla</i>                                          | toropapa            |
| <i>Alseuosmia pusilla</i>                                              |                     |
| <i>Aristotelia fruticosa</i>                                           |                     |
| <i>Aristotelia serrata</i>                                             | makomako, wineberry |
| <i>Beilschmiedia tawa</i>                                              | tawa                |
| <i>Brachyglottis kirkii</i> var. <i>kirkii</i>                         | kohurangi           |
| <i>Brachyglottis repanda</i>                                           | rangiora            |
| <i>Carmichaelia australis</i>                                          | makaka, maukoro     |
| <i>Carpodetus serratus</i>                                             | putaputaweta        |
| <i>Coprosma arborea</i>                                                | tree coprosma       |
| <i>Coprosma foetidissima</i>                                           | hupiro              |
| <i>Coprosma grandifolia</i>                                            | kanono              |
| <i>Coprosma lucida</i>                                                 | karamu              |
| <i>Coprosma propinqua</i> var. <i>propinqua</i>                        | mingimingi          |
| <i>Coprosma propinqua</i> var. <i>propinqua</i> ×<br><i>C. robusta</i> |                     |
| <i>Coprosma rhamnoides</i>                                             |                     |
| <i>Coprosma robusta</i>                                                | karamu              |
| <i>Coprosma rotundifolia</i>                                           |                     |
| <i>Coprosma spathulata</i> subsp. <i>spathulata</i>                    |                     |
| <i>Coprosma tayloriae</i>                                              |                     |
| <i>Coprosma tenuicaulis</i>                                            | hukihuki            |
| <i>Coprosma tenuifolia</i>                                             |                     |
| <i>Coriaria arborea</i> var. <i>arborea</i>                            | tutu                |
| <i>Corokia buddleioides</i> (incl. <i>C. b.</i> var. <i>linearis</i> ) | korokio             |
| <i>Corynocarpus laevigatus</i>                                         | karaka              |
| <i>Dactylanthus taylorii</i>                                           | pua o te reinga     |
| <i>Dodonaea viscosa</i>                                                | akeake              |
| <i>Dracophyllum latifolium</i>                                         | neinei              |
| <i>Dracophyllum strictum</i>                                           | totorowhiti         |



|                                                                       |                         |
|-----------------------------------------------------------------------|-------------------------|
| <i>Dracophyllum subulatum</i>                                         | monoao                  |
| <i>Dracophyllum traversii</i>                                         |                         |
| <i>Dysoxylum spectabile</i>                                           | kohekohe                |
| <i>Elaeocarpus dentatus</i>                                           | hinau                   |
| <i>Elaeocarpus bookerianus</i>                                        | pokaka                  |
| <i>Fuchsia excorticata</i>                                            | kotukutuku              |
| <i>Gaultheria antipoda</i>                                            | tawiniwini              |
| <i>Gaultheria antipoda</i> × <i>G. oppositifolia</i>                  | koropuka                |
| <i>Gaultheria antipoda</i> × <i>G. paniculata</i>                     | koropuka                |
| <i>Gaultheria oppositifolia</i>                                       | kama                    |
| <i>Gaultheria paniculata</i>                                          | koropuka                |
| <i>Geniostoma ligustrifolium</i> var. <i>ligustrifolium</i>           | hangehange              |
| <i>Griselinia littoralis</i>                                          | kapuka                  |
| <i>Griselinia lucida</i>                                              | puka                    |
| <i>Hebe corriganii</i>                                                |                         |
| <i>Hebe stricta</i> var. <i>stricta</i>                               | koromiko                |
| <i>Hedycarya arborea</i>                                              | porokaiwhiri            |
| <i>Helicbrysum lanceolatum</i>                                        | niniaio                 |
| <i>Ileostylus micranthus</i>                                          | pirita, green mistletoe |
| <i>Ixerba brexioides</i>                                              | tawari                  |
| <i>Knightia excelsa</i>                                               | rewarewa                |
| <i>Kunzea ericoides</i> var. <i>ericoides</i>                         | kanuka                  |
| <i>Kunzea ericoides</i> var. <i>microflora</i>                        | prostrate kanuka        |
| <i>Laurelia novae-zelandiae</i>                                       | pukatea                 |
| <i>Leionema nudum</i>                                                 | mairehau                |
| <i>Leptecophylla juniperina</i>                                       | prickly mingimingi      |
| <i>Leptospermum scoparium</i>                                         | manuka                  |
| <i>Leucopogon fasciculatus</i>                                        | mingimingi              |
| <i>Leucopogon fraseri</i> s.s.                                        | patotara                |
| <i>Litsea calicaris</i>                                               | mangeao                 |
| <i>Lophomyrtus bullata</i>                                            | ramarama                |
| <i>Lophomyrtus bullata</i> × <i>L. obcordata</i>                      |                         |
| <i>Lophomyrtus obcordata</i>                                          | rohutu                  |
| <i>Macropiper excelsum</i> subsp. <i>excelsum</i>                     | kawakawa                |
| <i>Melicope simplex</i>                                               | poataniwha              |
| <i>Melicope simplex</i> × <i>M. ternata</i>                           |                         |
| <i>Melicope ternata</i>                                               | wharangi                |
| <i>Melicytus lanceolatus</i> (incl. <i>M. l.</i> var. <i>latior</i> ) | mahoe-wao               |
| <i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>                  | mahoe                   |
| <i>Metrosideros excelsa</i>                                           | pohutukawa              |

|                                                                          |                           |
|--------------------------------------------------------------------------|---------------------------|
| <i>Metrosideros excelsa</i> × <i>M. robusta</i>                          |                           |
| <i>Metrosideros robusta</i>                                              | northern rata             |
| <i>Mida salicifolia</i> (incl. <i>M. s.</i> var. <i>myrtifolia</i> )     | mida                      |
| <i>Myoporum laetum</i>                                                   | ngaio                     |
| <i>Myrsine australis</i>                                                 | mapou                     |
| <i>Myrsine salicina</i>                                                  | toro                      |
| <i>Neomrytus pedunculata</i>                                             | rohutu                    |
| <i>Nestegis lanceolata</i>                                               | white maire               |
| <i>Nestegis montana</i>                                                  | rororo                    |
| <i>Nothofagus fusca</i>                                                  | red beech, tawhai raunui  |
| <i>Nothofagus fusca</i> × <i>N. solandri</i> (WAIK 11323; Nicholls 1989) | tawhai                    |
| <i>Nothofagus fusca</i> × <i>N. truncata</i>                             | tawhai                    |
| <i>Nothofagus menziesii</i>                                              | silver beech, tawhai      |
| <i>Nothofagus truncata</i>                                               | hard beech, tawhai raunui |
| <i>Olearia cheesemanii</i>                                               |                           |
| <i>Olearia furfuracea</i>                                                | akepiro                   |
| <i>Olearia pachyphylla</i> <sup>1</sup>                                  |                           |
| <i>Olearia rani</i> var. <i>colorata</i>                                 | heketara                  |
| <i>Ozothamnus leptophyllus</i>                                           | tauhinu                   |
| <i>Pennantia corymbosa</i>                                               | kaikomako                 |
| <i>Peraxilla tetrapetala</i>                                             |                           |
| <i>Pimelea longifolia</i>                                                | taranga                   |
| <i>Pimelea prostrata</i>                                                 | pinatoro                  |
| <i>Pimelea tomentosa</i>                                                 |                           |
| <i>Pittosporum cornifolium</i>                                           | tawhirikao                |
| <i>Pittosporum crassifolium</i>                                          | karo                      |
| <i>Pittosporum eugenioides</i>                                           | tarata                    |
| <i>Pittosporum kirkii</i>                                                |                           |
| <i>Pittosporum tenuifolium</i> subsp. <i>colensoi</i>                    | rautawhiri                |
| <i>Pittosporum tenuifolium</i> subsp. <i>tenuifolium</i>                 | kohuhu                    |
| <i>Plagianthus divaricatus</i>                                           | marsh ribbonwood, makaka  |
| <i>Pomaderris</i> aff. <i>phyllicifolia</i>                              |                           |
| <i>Pseudopanax arboreus</i>                                              | whauwhaupaku, five finger |
| <i>Pseudopanax colensoi</i> var. <i>colensoi</i>                         | orihou                    |
| <i>Pseudopanax crassifolius</i>                                          | horoeka, lancewood        |
| <i>Pseudopanax crassifolius</i> × <i>P. lessonii</i>                     |                           |

1. Doubtful record. There are old records of *O. pachyphylla* from the ecological district (P. de Lange pers. comm.)

|                                                                                |                           |
|--------------------------------------------------------------------------------|---------------------------|
| <i>Pseudopanax lessonii</i>                                                    | houpara                   |
| <i>Pseudowintera axillaris</i>                                                 | horopito                  |
| <i>Pseudowintera colorata</i>                                                  | horopito                  |
| <i>Quintinia serrata</i> (incl. <i>Q. acutifolia</i> and <i>Q. elliptica</i> ) | tawheowheo                |
| <i>Raukaua anomalus</i>                                                        |                           |
| <i>Raukaua edgerleyi</i>                                                       | raukawa                   |
| <i>Rhabdothamnus solandri</i>                                                  | taurepo                   |
| <i>Schefflera digitata</i>                                                     | pate                      |
| <i>Solanum aviculare</i> f. <i>aviculare</i>                                   |                           |
| <i>Streblus heterophyllus</i>                                                  | turepo                    |
| <i>Syzygium maire</i>                                                          | maire tawake, swamp maire |
| <i>Toronia toru</i>                                                            | toru                      |
| <i>Tupeia antarctica</i>                                                       | pirita                    |
| <i>Urtica ferox</i> (NZFRI 20875; J.F.F. Hobbs 1964)                           | ongaonga                  |
| <i>Weinmannia racemosa</i>                                                     | kamahi, tawhero           |
| <b>Monocot. Lianes</b>                                                         |                           |
| <i>Freycinetia banksii</i>                                                     | kiekie                    |
| <i>Ripogonum scandens</i>                                                      | kareao, supplejack        |
| <b>Dicot. Lianes</b>                                                           |                           |
| <i>Calystegia sepium</i> subsp. <i>roseata</i>                                 | pohue                     |
| <i>Calystegia soldanella</i>                                                   | panahi                    |
| <i>Clematis cunninghamii</i>                                                   | ngakau-kiore              |
| <i>Clematis foetida</i>                                                        | akakaiku                  |
| <i>Clematis forsteri</i>                                                       | poananga                  |
| <i>Clematis paniculata</i>                                                     | puawananga                |
| <i>Metrosideros carminea</i>                                                   | akakura                   |
| <i>Metrosideros colensoi</i>                                                   | rata                      |
| <i>Metrosideros diffusa</i>                                                    | rata                      |
| <i>Metrosideros fulgens</i>                                                    | rata                      |
| <i>Metrosideros perforata</i>                                                  | aka                       |
| <i>Muehlenbeckia australis</i>                                                 | puka                      |
| <i>Muehlenbeckia complexa</i>                                                  | pohuehue                  |
| <i>Parsonsia capsularis</i>                                                    | akakiore                  |
| <i>Parsonsia heterophylla</i>                                                  | akakaikiore               |
| <i>Passiflora tetrandra</i>                                                    | kohia                     |
| <i>Rubus australis</i>                                                         | tataramoa                 |
| <i>Rubus australis</i> × <i>R. cissoides</i>                                   |                           |
| <i>Rubus cissoides</i>                                                         | tataramoa                 |

|                                                        |                      |
|--------------------------------------------------------|----------------------|
| <i>Rubus schmidelioides</i> var. <i>schmidelioides</i> | akatataramoa         |
| <i>Tetragonia tetragonioides</i>                       | kokihi               |
| <b>Lycopods and psilopsids</b>                         |                      |
| <i>Huperzia varia</i>                                  | Whiri-o-Raukatauri   |
| <i>Lycopodiella cernua</i>                             | maatukutuku          |
| <i>Lycopodium deuterodensum</i>                        | puakarimu            |
| <i>Lycopodium scariosum</i>                            | matukutuku           |
| <i>Lycopodium volubile</i>                             | waewaekoukou         |
| <i>Tmesipteris elongata</i>                            |                      |
| <i>Tmesipteris lanceolata</i>                          |                      |
| <i>Tmesipteris tannensis</i>                           |                      |
| <b>Ferns</b>                                           |                      |
| <i>Adiantum cunninghamii</i>                           | huruhuru tapairu     |
| <i>Adiantum diaphanum</i>                              | huruhuru tapairu     |
| <i>Adiantum fulvum</i>                                 | huruhuru tapairu     |
| <i>Adiantum viridescens</i>                            | huruhuru tapairu     |
| <i>Anarthropteris lanceolata</i>                       |                      |
| <i>Arthropteris tenella</i>                            |                      |
| <i>Asplenium bulbiferum</i>                            | mouku                |
| <i>Asplenium bulbiferum</i> × <i>A. flaccidum</i>      | petako-paraharaha    |
| <i>Asplenium bulbiferum</i> × <i>A. lamprophyllum</i>  | petako-paraharaha    |
| <i>Asplenium flaccidum</i>                             |                      |
| <i>Asplenium gracillimum</i>                           | petako-paraharaha    |
| <i>Asplenium hookerianum</i>                           | petako-paraharaha    |
| <i>Asplenium lamprophyllum</i>                         | petako-paraharaha    |
| <i>Asplenium oblongifolium</i>                         | huruhuruwhenua       |
| <i>Asplenium polyodon</i>                              | petako               |
| <i>Azolla filiculoides</i>                             | retoretore           |
| <i>Blechnum chambersii</i>                             | rereti               |
| <i>Blechnum colensoi</i>                               | peretao              |
| <i>Blechnum discolor</i>                               | petipeti, crown fern |
| <i>Blechnum filiforme</i>                              | panako               |
| <i>Blechnum fluviatile</i>                             | kiwikiwi             |
| <i>Blechnum fraseri</i>                                |                      |
| <i>Blechnum membranaceum</i>                           |                      |
| <i>Blechnum minus</i>                                  | swamp kiokio         |
| <i>Blechnum minus</i> × <i>B. novae-zelandiae</i>      |                      |
| <i>Blechnum nigrum</i>                                 |                      |



|                                                                       |                         |
|-----------------------------------------------------------------------|-------------------------|
| <i>Blechnum novae-zelandiae</i>                                       | kiokio                  |
| <i>Blechnum penna-marina</i> subsp. <i>alpina</i>                     |                         |
| <i>Blechnum procerum</i>                                              |                         |
| <i>Blechnum vulcanicum</i>                                            | korokio                 |
| <i>Botrychium biforme</i>                                             |                         |
| <i>Ctenopteris heterophylla</i>                                       |                         |
| <i>Cyathea cunninghamii</i>                                           | punui, gully tree fern  |
| <i>Cyathea dealbata</i>                                               | ponga, silver fern      |
| <i>Cyathea medullaris</i>                                             | mamaku, black tree fern |
| <i>Cyathea smithii</i>                                                | katote (soft tree fern) |
| <i>Deparia petersenii</i>                                             |                         |
| <i>Dicksonia fibrosa</i>                                              | wheki-ponga, skirt fern |
| <i>Dicksonia lanata</i>                                               | tuakura                 |
| <i>Dicksonia squarrosa</i>                                            | wheki, rough tree fern  |
| <i>Diplazium australe</i>                                             |                         |
| <i>Doodia australis</i>                                               | pukupuku                |
| <i>Gleichenia dicarpa</i>                                             | tangle fern             |
| <i>Gleichenia microphylla</i>                                         | waewaekaka              |
| <i>Grammitis billardierei</i>                                         |                         |
| <i>Grammitis magellanica</i> subsp. <i>notbofageti</i>                |                         |
| <i>Grammitis pseudociliata</i> (Bellingham 1985)                      |                         |
| <i>Histiopteris incisa</i>                                            | matata, water fern      |
| <i>Hymenophyllum armstrongii</i>                                      | mauku                   |
| <i>Hymenophyllum atrovirens</i>                                       | mauku                   |
| <i>Hymenophyllum bivalve</i>                                          | mauku                   |
| <i>Hymenophyllum demissum</i>                                         | irirangi                |
| <i>Hymenophyllum dilatatum</i>                                        | matua mauku             |
| <i>Hymenophyllum ferrugineum</i>                                      | mauku                   |
| <i>Hymenophyllum flabellatum</i>                                      | mauku                   |
| <i>Hymenophyllum flexuosum</i>                                        | mauku                   |
| <i>Hymenophyllum lyalli</i>                                           | mauku                   |
| <i>Hymenophyllum malingii</i>                                         | mauku                   |
| <i>Hymenophyllum minimum</i> (de Lange 1988)                          | mauku                   |
| <i>Hymenophyllum multifidum</i>                                       | mauku                   |
| <i>Hymenophyllum rarum</i>                                            | mauku                   |
| <i>Hymenophyllum revolutum</i>                                        | mauku                   |
| <i>Hymenophyllum sanguinolentum</i>                                   | piripiri                |
| <i>Hymenophyllum scabrum</i>                                          | mauku                   |
| <i>Hymenophyllum</i> aff. <i>flexuosum</i> (AK 177370;<br>Mt Burnett) |                         |

|                                                              |                               |
|--------------------------------------------------------------|-------------------------------|
| <i>Hypolepis ambigua</i>                                     |                               |
| <i>Hypolepis distans</i>                                     |                               |
| <i>Hypolepis lactea</i>                                      |                               |
| <i>Hypolepis rufobarbata</i>                                 |                               |
| <i>Lastreopsis glabella</i>                                  |                               |
| <i>Lastreopsis hispida</i>                                   |                               |
| <i>Lastreopsis microsora</i> subsp. <i>petangularis</i>      |                               |
| <i>Lastreopsis velutina</i>                                  |                               |
| <i>Leptolepia novae-zelandiae</i>                            |                               |
| <i>Leptopteris hymenophylloides</i>                          | heruheru                      |
| <i>Leptopteris hymenophylloides</i> × <i>L. superba</i>      | heruheru                      |
| <i>Leptopteris superba</i>                                   | heruheru                      |
| <i>Lindsaea linearis</i>                                     |                               |
| <i>Lindsaea trichomanoides</i>                               |                               |
| <i>Lindsaea viridis</i>                                      |                               |
| <i>Lygodium articulatum</i>                                  | mangemange                    |
| <i>Marattia salicina</i>                                     | para, kingfern                |
| <i>Microsorium novae-zelandiae</i>                           |                               |
| <i>Microsorium pustulatum</i>                                | kowaowao (hounds tongue fern) |
| <i>Microsorium scandens</i>                                  | mokimoki                      |
| <i>Ophioglossum coriaceum</i>                                |                               |
| <i>Paesia scaberula</i>                                      | matata                        |
| <i>Pellaea rotundifolia</i>                                  | tarawera (button fern)        |
| <i>Pneumatopteris pennigera</i>                              | pakau                         |
| <i>Polystichum neozelandicum</i> subsp. <i>neozelandicum</i> | pikopiko, shield fern         |
| <i>Polystichum silvaticum</i>                                |                               |
| <i>Polystichum vestitum</i>                                  | puniu (prickly shield fern)   |
| <i>Polystichum wawranum</i>                                  | pikopiko, shield fern         |
| <i>Pteridium esculentum</i>                                  | bracken (bracken)             |
| <i>Pteris macilenta</i>                                      | sweet fern                    |
| <i>Pteris tremula</i>                                        | turawera (shaking brake)      |
| <i>Pyrrosia eleagnifolia</i>                                 | leather-leaf fern             |
| <i>Rumohra adiantiformis</i>                                 |                               |
| <i>Schizaea bifida</i>                                       |                               |
| <i>Schizaea dichotoma</i> (Shaw 1991)                        |                               |
| <i>Sticherus cunninghamii</i>                                | wackura                       |
| <i>Trichomanes elongatum</i>                                 |                               |
| <i>Trichomanes endlicherianum</i>                            |                               |

*Trichomanes reniforme*  
*Trichomanes strictum*  
*Trichomanes venosum*

### Orchids

*Acianthus sinclairii*  
*Aporostylis bifolia*  
*Caladenia* sp. (aff. *C. catenata*)  
*Corunastylis nuda*  
*Corunastylis pumila*  
*Corybas* sp. (*C. rivularis* agg.)  
*Diplodinium alobulum*  
*Diplodinium trullifolium*  
*Drymoanthus adversus*  
*Earina autumnalis* raupeka  
*Earina mucronata* peka-a-waka  
*Gastrodia cunninghamii* huperei  
*Icthyostomum pygmaeum* piripiri  
*Microtis oligantha* (Smale 1985a)  
*Microtis unifolia* maikaika  
*Nematoceras acuminatus*  
*Nematoceras macranthus*  
*Nematoceras trilobus*  
*Orthoceras novae-zeelandiae* maikaika  
*Prasophyllum colensoi*  
*Pterostylis* “aff. montana”  
*Pterostylis banksii* tutukiwi  
*Pterostylis cardiostigma* (Irwin J.B. pers. comm.)  
*Pterostylis graminea*  
*Pterostylis paludosa* (NZFRI 15753)  
*Simpliglottis cornuta*  
*Singularybas oblongus*  
*Thelymitra carnea*  
*Thelymitra cyanea*  
*Thelymitra hatchii*  
*Thelymitra ixioides* (Shaw 1991; Gudex 1963)  
*Thelymitra longifolia* maikuku  
*Thelymitra pauciflora*  
*Winika cunninghamii*

### Grasses

|                                                           |                 |
|-----------------------------------------------------------|-----------------|
| <i>Cortaderia fulvida</i>                                 | toetoe          |
| <i>Cortaderia toetoe</i>                                  | toetoe          |
| <i>Deyeuxia</i> aff. <i>quadriseta</i> “Volcanic Plateau” |                 |
| <i>Deyeuxia avenoides</i>                                 |                 |
| <i>Dichelachne crinita</i>                                | patiti          |
| <i>Echinopogon ovatus</i>                                 |                 |
| <i>Hierochloe redolens</i>                                | karetu          |
| <i>Isachne globosa</i>                                    | swamp millet    |
| <i>Lachnagrostis billardierei</i>                         | perehia         |
| <i>Lachnagrostis filiformis</i>                           |                 |
| <i>Lachnagrostis lyallii</i>                              |                 |
| <i>Microlaena avenacea</i>                                | bush rice grass |
| <i>Microlaena stipoides</i>                               | patiti          |
| <i>Oplismenus birtellus</i> subsp. <i>imbecillis</i>      |                 |
| <i>Poa anceps</i> subsp. <i>anceps</i>                    |                 |
| <i>Poa breviglumis</i>                                    |                 |
| <i>Rytidosperma clavatum</i>                              |                 |
| <i>Rytidosperma gracile</i>                               |                 |
| <i>Rytidosperma unarede</i>                               |                 |
| <i>Spinifex sericeus</i>                                  | kowhangatara    |
| <i>Stenostachys gracilis</i>                              |                 |
| <i>Zoysia pauciflora</i>                                  |                 |

### Sedges

|                                  |          |
|----------------------------------|----------|
| <i>Baumea arthrophylla</i>       |          |
| <i>Baumea articulata</i>         |          |
| <i>Baumea juncea</i>             |          |
| <i>Baumea rubiginosa</i>         |          |
| <i>Baumea tenax</i>              |          |
| <i>Baumea teretifolia</i>        |          |
| <i>Bolboschoenus fluviatilis</i> | ririwaka |
| <i>Bolboschoenus medianus</i>    | ririwaka |
| <i>Carex breviculmis</i>         |          |
| <i>Carex dipsacea</i>            |          |
| <i>Carex dissita</i>             |          |
| <i>Carex echinata</i>            |          |
| <i>Carex flagellifera</i>        | manaia   |
| <i>Carex forsteri</i>            |          |
| <i>Carex inversa</i>             |          |



|                                              |                     |
|----------------------------------------------|---------------------|
| <i>Carex lambertiana</i>                     |                     |
| <i>Carex maorica</i>                         |                     |
| <i>Carex pumila</i>                          |                     |
| <i>Carex secta</i>                           | purei               |
| <i>Carex sinclairii</i>                      |                     |
| <i>Carex solandri</i>                        |                     |
| <i>Carex spinirostris</i>                    |                     |
| <i>Carex subdola</i>                         |                     |
| <i>Carex testacea</i>                        |                     |
| <i>Carex virgata</i>                         | purei               |
| <i>Carex</i> sp. ( <i>C. geminata</i> agg.)  | rautahi             |
| <i>Cyperus ustulatus</i> f. <i>ustulatus</i> | toetoe upokotangata |
| <i>Desmoschoenus spiralis</i>                | pingao              |
| <i>Eleocharis acuta</i>                      |                     |
| <i>Eleocharis gracilis</i>                   |                     |
| <i>Eleocharis sphacelata</i>                 |                     |
| <i>Ficinia nodosa</i>                        | wiwi                |
| <i>Gabnia lacera</i>                         | tarangarara         |
| <i>Gabnia pauciflora</i>                     | takahikahi          |
| <i>Gabnia rigida</i>                         | takahikahi          |
| <i>Gabnia setifolia</i>                      | mapere              |
| <i>Gabnia xanthocarpa</i>                    | tupari-maunga       |
| <i>Isolepis cernua</i>                       |                     |
| <i>Isolepis distigmatica</i>                 |                     |
| <i>Isolepis habra</i>                        |                     |
| <i>Isolepis inundata</i>                     |                     |
| <i>Isolepis pottsii</i>                      |                     |
| <i>Isolepis prolifer</i>                     |                     |
| <i>Isolepis reticularis</i>                  |                     |
| <i>Lepidosperma australe</i>                 |                     |
| <i>Lepidosperma laterale</i>                 |                     |
| <i>Machaerina sinclairii</i>                 | tuhara              |
| <i>Morelotia affinis</i>                     |                     |
| <i>Schoenoplectus pungens</i>                |                     |
| <i>Schoenoplectus tabernaemontani</i>        | kapungawha          |
| <i>Schoenus maschalinus</i>                  |                     |
| <i>Schoenus tendo</i>                        | wiwi                |
| <i>Uncinia banksii</i>                       | matau               |
| <i>Uncinia distans</i>                       | matau               |
| <i>Uncinia ferruginea</i>                    | matau               |

|                                                          |                    |
|----------------------------------------------------------|--------------------|
| <i>Uncinia filiformis</i>                                | matau              |
| <i>Uncinia gracilentia</i>                               | matau              |
| <i>Uncinia rupestris</i> (incl. <i>U. angustifolia</i> ) | matau              |
| <i>Uncinia scabra</i>                                    | matau              |
| <i>Uncinia uncinata</i>                                  | kamu, matau a Maui |
| <i>Uncinia zotovii</i>                                   | matau              |

### **Rushes**

|                                                          |               |
|----------------------------------------------------------|---------------|
| <i>Juncus australis</i>                                  | wi            |
| <i>Juncus edgariae</i>                                   | wi            |
| <i>Juncus kraussii</i> subsp. <i>australiensis</i>       | wi (sea rush) |
| <i>Juncus pallidus</i>                                   | wi            |
| <i>Juncus planifolius</i>                                |               |
| <i>Juncus prismatocarpus</i>                             |               |
| <i>Juncus sarophorus</i>                                 | wi            |
| <i>Luzula picta</i> var. <i>limosa</i> (Bellingham 1985) |               |
| <i>Luzula picta</i> var. <i>picta</i>                    |               |

### **Monocot. herbs (other than orchids, grasses, sedges and rushes)**

|                                                       |                 |
|-------------------------------------------------------|-----------------|
| <i>Apodasmia similis</i>                              | oioi            |
| <i>Astelia fragrans</i>                               | kakaha          |
| <i>Astelia grandis</i>                                | mauri           |
| <i>Astelia solandri</i>                               | kowharawhara    |
| <i>Astelia</i> sp. (unnamed; aff. <i>A. nervosa</i> ) | mauri           |
| <i>Astelia trinervia</i>                              | mauri           |
| <i>Collospermum bastatum</i>                          | kahakaha        |
| <i>Collospermum microspermum</i>                      |                 |
| <i>Cordyline pumilio</i>                              | ti rauriki      |
| <i>Cordyline banksii</i> × <i>C. pumilio</i>          |                 |
| <i>Dianella nigra</i>                                 | turutu          |
| <i>Lemna minor</i>                                    | karearea        |
| <i>Libertia grandiflora</i>                           | mikoikoi        |
| <i>Libertia ixioides</i>                              | mikoikoi        |
| <i>Libertia micrantha</i>                             |                 |
| <i>Potamogeton cheesemanii</i>                        | manihi          |
| <i>Potamogeton suboblongus</i>                        | rerewai         |
| <i>Sparganium subglobosum</i>                         | maru, burr reed |
| <i>Triglochin striata</i>                             | arrow grass     |
| <i>Typha orientalis</i>                               | raupo           |

**Composite herbs**

|                                         |                   |
|-----------------------------------------|-------------------|
| <i>Anaphalioides trinervis</i>          | puatea            |
| <i>Celmisia gracilentia</i>             |                   |
| <i>Cotula coronopifolia</i>             | bachelor's button |
| <i>Euchiton audax</i>                   |                   |
| <i>Euchiton collinus</i>                |                   |
| <i>Euchiton delicatus</i>               |                   |
| <i>Euchiton involucratus</i>            |                   |
| <i>Euchiton limosus</i>                 |                   |
| <i>Euchiton sphaericus</i>              |                   |
| <i>Lagenifera pumila</i>                | papataniwhaniwha  |
| <i>Pseudognaphalium luteoalbum</i> agg. | pukatea           |
| <i>Raoulia glabra</i>                   |                   |
| <i>Senecio minimus</i>                  |                   |

**Dicot. herbs (other than composites)**

|                                                                               |                  |
|-------------------------------------------------------------------------------|------------------|
| <i>Acaena anserinifolia</i>                                                   | piripiri         |
| <i>Callitriche muelleri</i>                                                   |                  |
| <i>Cardamine</i> sp. ( <i>C. debilis</i> agg. "Long Style" of Pritchard 1957) | panapana         |
| <i>Centella uniflora</i>                                                      |                  |
| <i>Dichondra</i> "large flower" (unnamed; aff. <i>D. brevifolia</i> )         |                  |
| <i>Dichondra repens</i>                                                       | Mercury Bay weed |
| <i>Disphyma australe</i> subsp. <i>australe</i>                               | horokaka         |
| <i>Drosera auriculata</i>                                                     |                  |
| <i>Drosera binata</i>                                                         |                  |
| <i>Drosera spatulata</i>                                                      |                  |
| <i>Elatostema rugosum</i>                                                     | parataniwha      |
| <i>Epilobium alsinoides</i> s.s.                                              |                  |
| <i>Epilobium atriplicifolium</i>                                              |                  |
| <i>Epilobium billardioreanum</i> s.s.                                         |                  |
| <i>Epilobium brunnescens</i> subsp. <i>minutiflorum</i>                       |                  |
| <i>Epilobium insulare</i>                                                     |                  |
| <i>Epilobium komaravianum</i>                                                 |                  |
| <i>Epilobium nerteroides</i>                                                  |                  |
| <i>Epilobium nummulariifolium</i>                                             |                  |
| <i>Epilobium pallidiflorum</i>                                                | tawarewa         |
| <i>Epilobium pedunculare</i>                                                  |                  |
| <i>Epilobium pubens</i>                                                       |                  |

|                                                                    |          |
|--------------------------------------------------------------------|----------|
| <i>Epilobium rotundifolium</i>                                     |          |
| <i>Epilobium tenuipes</i> s.s.                                     |          |
| <i>Galium perpusillum</i>                                          |          |
| <i>Galium propinquum</i>                                           | mawe     |
| <i>Geranium potentilloides</i> var. <i>potentilloides</i>          |          |
| <i>Glossostigma elatinoides</i>                                    |          |
| <i>Gonocarpus aggregatus</i>                                       |          |
| <i>Gonocarpus incanus</i>                                          | piripiri |
| <i>Gonocarpus micranthus</i> subsp. <i>micranthus</i>              |          |
| <i>Gratiola nana</i> (de Lange 1988)                               |          |
| <i>Gratiola sexdentata</i>                                         |          |
| <i>Gunnera monoica</i>                                             |          |
| <i>Gunnera prorepens</i>                                           |          |
| <i>Haloragis erecta</i> subsp. <i>erecta</i>                       | toatoa   |
| <i>Hydrocotyle dissecta</i>                                        |          |
| <i>Hydrocotyle elongata</i>                                        |          |
| <i>Hydrocotyle heteromeria</i>                                     |          |
| <i>Hydrocotyle microphylla</i>                                     |          |
| <i>Hydrocotyle moschata</i>                                        |          |
| <i>Hydrocotyle novae-zeelandiae</i>                                |          |
| <i>Hydrocotyle pterocarpa</i>                                      |          |
| <i>Hypericum japonicum</i>                                         |          |
| <i>Hypericum</i> sp. (aff. <i>H. japonicum</i> )                   |          |
| <i>Hypsela rivalis</i>                                             |          |
| <i>Lilaeopsis novae-zeelandiae</i>                                 |          |
| <i>Lobelia anceps</i>                                              | punakuru |
| <i>Montia fontana</i>                                              |          |
| <i>Myosotis forsteri</i>                                           |          |
| <i>Myriophyllum pedunculatum</i><br>subsp. <i>novae-zeelandiae</i> |          |
| <i>Myriophyllum propinquum</i>                                     |          |
| <i>Nertera ciliata</i>                                             |          |
| <i>Nertera depressa</i>                                            |          |
| <i>Nertera dichondrifolia</i>                                      |          |
| <i>Nertera scapanioides</i>                                        |          |
| <i>Nertera villosa</i>                                             |          |
| <i>Oxalis magellanica</i>                                          |          |
| <i>Oxalis rubens</i>                                               |          |
| <i>Parahebe catarractae</i> (de Lange 1988)                        |          |
| <i>Pelargonium inodorum</i>                                        | kopata   |



|                                                   |                         |
|---------------------------------------------------|-------------------------|
| <i>Peperomia tetraphylla</i>                      |                         |
| <i>Peperomia urvilleana</i>                       |                         |
| <i>Persicaria decipiens</i>                       | tutunawai               |
| <i>Plantago raoulii</i>                           | kopakopa                |
| <i>Plantago triandra</i> var. <i>triandra</i>     |                         |
| <i>Potentilla anserinoides</i>                    | kowai                   |
| <i>Pratia angulata</i>                            | panakenake              |
| <i>Pratia perpusilla</i>                          |                         |
| <i>Ranunculus amphitrichus</i>                    | kawariki                |
| <i>Ranunculus glabrifolius</i>                    | kawariki                |
| <i>Ranunculus limosella</i>                       |                         |
| <i>Ranunculus reflexus</i>                        | maruru                  |
| <i>Rorippa divaricata</i>                         |                         |
| <i>Rorippa palustris</i>                          |                         |
| <i>Samolus repens</i>                             | makaokao                |
| <i>Selliera microphylla</i>                       |                         |
| <i>Selliera radicans</i>                          | remuremu                |
| <i>Sicyos australis</i>                           |                         |
| <i>Solanum americanum</i>                         | small-leaved nightshade |
| <i>Stellaria decipiens</i>                        | kohukohu                |
| <i>Urtica incisa</i>                              |                         |
| <i>Viola cunninghamii</i>                         |                         |
| <i>Viola filicaulis</i>                           |                         |
| <i>Viola lyalli</i>                               |                         |
| <i>Wahlenbergia pygmaea</i> subsp. <i>pygmaea</i> |                         |
| <i>Wahlenbergia</i> sp.                           |                         |



# Appendix 4

## CHECKLIST OF ADVENTIVE VASCULAR PLANTS IN OTANEWAINUKU ECOLOGICAL DISTRICT

(From current survey and Beadel 1991, 1993b, 1994a&b unless otherwise quoted.)

### Gymnosperms

|                       |               |
|-----------------------|---------------|
| <i>Pinus patula</i>   | patula pine   |
| <i>Pinus pinaster</i> | maritime pine |
| <i>Pinus radiata</i>  | radiata pine  |

### Dicot. trees and shrubs

|                                  |                       |
|----------------------------------|-----------------------|
| <i>Acacia dealbata</i>           | silver wattle         |
| <i>Acacia mearnsii</i>           | black wattle          |
| <i>Acacia melanoxylon</i>        | Tasmanian blackwood   |
| <i>Acacia verticillatum</i>      | prickly Moses         |
| <i>Berberis glaucocarpa</i>      | barberry              |
| <i>Buddleja davidii</i>          | buddleia              |
| <i>Chamaecytisus palmensis</i>   | tree lucerne          |
| <i>Cotoneaster glaucophyllus</i> | cotoneaster           |
| <i>Crataegus monogyna</i>        | hawthorn              |
| <i>Cytisus scoparius</i>         | broom                 |
| <i>Erica lusitanica</i>          | Spanish heath         |
| <i>Erythrina × sykesii</i>       | coral tree            |
| <i>Eucalyptus botryoides</i>     | eucalyptus            |
| <i>Hakea salicifolia</i>         | willow-leaved hakea   |
| <i>Hakea sericea</i>             | prickly hakea         |
| <i>Hydrangea macrophylla</i>     | hydrangea             |
| <i>Leycesteria formosa</i>       | Himalayan honeysuckle |
| <i>Ligustrum sinense</i>         | Chinese privet        |
| <i>Lupinus arboreus</i>          | lupin                 |
| <i>Lycium ferocissimum</i>       | African boxthorn      |
| <i>Malus × domestica</i>         | apple tree            |
| <i>Myoporum insulare</i>         | Australian ngaio      |
| <i>Paraserianthes lophantha</i>  | brush wattle          |
| <i>Paulownia tomentosa</i>       | paulownia             |

|                                               |                            |
|-----------------------------------------------|----------------------------|
| <i>Populus alba</i> cv. "Nivea"               | silver poplar              |
| <i>Prunus persica</i>                         | peach tree, nectarine      |
| <i>Rubus phoenicolasius</i>                   | Japanese wineberry         |
| <i>Rubus</i> sp. ( <i>R. fruticosus</i> agg.) | blackberry                 |
| <i>Salix cinerea</i>                          | grey willow                |
| <i>Salix fragilis</i>                         | crack willow               |
| <i>Senna multiglandulosa</i>                  | buttercup bush             |
| <i>Solanum mauritianum</i>                    | woolly nightshade          |
| <i>Tecomaria capensis</i>                     | Cape honeysuckle           |
| <i>Teline monspessulana</i>                   | Montpellier broom          |
| <i>Ulex europaeus</i>                         | gorse                      |
| <b>Dicot. Lianes</b>                          |                            |
| <i>Actinidia chinensis</i>                    | kiwifruit                  |
| <i>Celastrus orbiculatus</i>                  | climbing spindle berry     |
| <i>Cobaea scandens</i>                        | cathedral bells            |
| <i>Elaeagnus x reflexa</i>                    | elaeanthus                 |
| <i>Hedera helix</i>                           | ivy                        |
| <i>Lonicera japonica</i>                      | Japanese honeysuckle       |
| <i>Senecio mikanioides</i>                    | German ivy                 |
| <b>Lycopods</b>                               |                            |
| <i>Sellaginella kraussiana</i>                | creeping clubmoss          |
| <b>Grasses</b>                                |                            |
| <i>Agrostis capillaris</i>                    | browntop                   |
| <i>Agrostis stolonifera</i>                   | creeping bent              |
| <i>Aira caryophylla</i>                       | silvery hairy grass        |
| <i>Ammophila arenaria</i>                     | marram                     |
| <i>Anthoxanthum odoratum</i>                  | sweet vernal               |
| <i>Axonopus fissifolius</i>                   | narrow-leaved carpet grass |
| <i>Bromus diandrus</i>                        | ripgut brome               |
| <i>Bromus hordeaceus</i>                      | soft brome                 |
| <i>Cortaderia jubata</i>                      | pampas                     |
| <i>Cortaderia selloana</i>                    | pampas                     |
| <i>Dactylis glomerata</i>                     | cocksfoot                  |
| <i>Digitaria sanguinalis</i>                  | summer grass               |
| <i>Elytrigia pycnantha</i>                    | sea couch                  |
| <i>Eragrostis brownii</i>                     | bay grass                  |
| <i>Festuca rubra</i> subsp. <i>rubra</i>      | red fescue                 |



|                                                                    |                      |
|--------------------------------------------------------------------|----------------------|
| <i>Glyceria fluitans</i>                                           | floating sweetgrass  |
| <i>Holcus lanatus</i>                                              | Yorkshire fog        |
| <i>Lagurus ovatus</i>                                              | haretail             |
| <i>Lolium perenne</i>                                              | rye grass            |
| <i>Miscanthus nepalensis</i>                                       | Himalaya fairy grass |
| <i>Paspalum dilatatum</i>                                          | paspalum             |
| <i>Paspalum distichum</i>                                          | Mercer grass         |
| <i>Pennisetum clandestinum</i>                                     | kikuyu grass         |
| <i>Poa annua</i>                                                   | annual poa           |
| <i>Poa pratensis</i>                                               | Kentucky bluegrass   |
| <i>Pseudosasa japonica</i>                                         | bamboo               |
| <i>Rytidosperma racemosum</i>                                      | danthonia            |
| <i>Schedonorus phoenix</i>                                         | tall fescue          |
| <i>Sporobolus africanus</i>                                        | ratstail             |
| <i>Stenotaphrum secundatum</i>                                     | buffalo grass        |
| <i>Vulpia bromoides</i>                                            | vulpia hair grass    |
| <b>Sedges</b>                                                      |                      |
| <i>Carex demissa</i>                                               |                      |
| <i>Carex divulsa</i>                                               | grey sedge           |
| <i>Carex lurida</i>                                                | sallow sedge         |
| <i>Carex ovalis</i>                                                | oval sedge           |
| <i>Cyperus brevifolius</i>                                         | globe sedge          |
| <i>Cyperus eragrostis</i>                                          | umbrella sedge       |
| <i>Isolepis marginata</i>                                          |                      |
| <i>Isolepis sepulcralis</i>                                        |                      |
| <i>Rhynchospora capitellata</i> (NZFRI 21536,<br>E.M. Miller 1995) |                      |
| <b>Rushes</b>                                                      |                      |
| <i>Juncus acuminatus</i>                                           | sharp-fruited rush   |
| <i>Juncus articulatus</i>                                          | jointed rush         |
| <i>Juncus bufonius</i>                                             | toad rush            |
| <i>Juncus bulbosus</i>                                             |                      |
| <i>Juncus canadensis</i> (NZFRI 13307, M.C. Smale<br>1984)         |                      |
| <i>Juncus conglomerata</i>                                         | soft rush            |
| <i>Juncus effusus</i>                                              | soft rush            |
| <i>Juncus microcephalus</i>                                        | South American rush  |
| <i>Juncus tenuis</i>                                               | track rush           |

**Monocot. herbs (other than orchids, grasses, sedges and rushes)**

|                                   |                            |
|-----------------------------------|----------------------------|
| <i>Allium triquetrum</i>          | three-cornered garlic      |
| <i>Asparagus scandens</i>         | climbing asparagus         |
| <i>Crocosmia x crocosmiiflora</i> | montbretia                 |
| <i>Hedychium flavescens</i>       | wild ginger                |
| <i>Hedychium gardnerianum</i>     | kahili ginger; wild ginger |
| <i>Tradescantia fluminensis</i>   | tradescantia               |
| <i>Zantedeschia aethiopica</i>    | arum lily                  |

**Composite herbs**

|                                |                                   |
|--------------------------------|-----------------------------------|
| <i>Achillea millefolium</i>    | yarrow                            |
| <i>Aster subulatus</i>         | sea aster                         |
| <i>Bellis perennis</i>         | daisy                             |
| <i>Bidens frondosa</i>         | beggars' ticks                    |
| <i>Carduus nutans</i>          | nodding thistle                   |
| <i>Carduus tenuiflorus</i>     | winged thistle                    |
| <i>Cirsium arvense</i>         | California thistle                |
| <i>Cirsium vulgare</i>         | Scotch thistle                    |
| <i>Conyza albida</i>           | fleabane                          |
| <i>Crepis capillaris</i>       | hawksbeard, hawksear              |
| <i>Erigeron karvinskianus</i>  | Mexican daisy                     |
| <i>Gamochaeta spicata</i>      | cudweed                           |
| <i>Hypochoeris radicata</i>    | catsear                           |
| <i>Leontodon taraxacoides</i>  | hawkbit                           |
| <i>Leucanthemum vulgare</i>    | oxeye daisy                       |
| <i>Mycelis muralis</i>         | wall lettuce                      |
| <i>Senecio bipinnatisectus</i> | Australian fireweed               |
| <i>Senecio elegans</i>         | purple groundsel                  |
| <i>Senecio jacobaea</i>        | ragwort                           |
| <i>Sonchus asper</i>           | prickly puha, prickly sow thistle |
| <i>Sonchus oleraceus</i>       | puha                              |
| <i>Taraxacum officinale</i>    | dandelion                         |

**Dicot. herbs (other than composites)**

|                               |                                 |
|-------------------------------|---------------------------------|
| <i>Acaena agnipila</i>        | Australian sheep's burr, yarrow |
| <i>Acaena novae-zelandiae</i> | piripiri                        |
| <i>Acetosa acetosella</i>     | sheep's sorrel                  |
| <i>Alternanthera sessilis</i> |                                 |

|                                                     |                            |
|-----------------------------------------------------|----------------------------|
| <i>Anagallis arvensis</i>                           | scarlet pimpernel          |
| <i>Cakile maritima</i>                              | sea rocket                 |
| <i>Callitriche stagnalis</i>                        | starwort                   |
| <i>Cannabis sativa</i>                              | hemp, cannabis             |
| <i>Carpobrotus edulis</i>                           | ice plant                  |
| <i>Centaureum erythraea</i>                         | centaury                   |
| <i>Cerastium arvense</i>                            |                            |
| <i>Cerastium fontanum</i> subsp. <i>triviale</i>    | mouse-ear chickweed        |
| <i>Cerastium glomeratum</i>                         | annual mouse-ear chickweed |
| <i>Cerastium holosteoides</i>                       | mouse-ear chickweed        |
| <i>Cichorium intybus</i>                            | chicory                    |
| <i>Clinopodium vulgare</i>                          |                            |
| <i>Daucus carota</i>                                | wild carrot                |
| <i>Digitalis purpurea</i>                           | foxglove                   |
| <i>Epilobium ciliatum</i>                           | tall willow herb           |
| <i>Epilobium ciliatum</i> × <i>E. pallidiflorum</i> |                            |
| <i>Epilobium obscurum</i>                           | tall willow herb           |
| <i>Euphorbia peplus</i>                             | milkweed                   |
| <i>Foeniculum vulgare</i>                           | fennel                     |
| <i>Fragaria vesca</i>                               | wild strawberry            |
| <i>Fumaria muralis</i>                              | scrambling fumitory        |
| <i>Galium aparine</i>                               | cleavers, bedstraw         |
| <i>Galium palustre</i>                              | marsh bedstraw             |
| <i>Geranium molle</i>                               | dove's foot                |
| <i>Geranium robertianum</i>                         | herb Robert                |
| <i>Linum bienne</i>                                 |                            |
| <i>Lotus pedunculatus</i>                           | lotus                      |
| <i>Ludwigia palustris</i>                           | water purslane             |
| <i>Lycopus europeus</i>                             | gypsy wort                 |
| <i>Lythrum hyssopifolia</i>                         | hyssop loosestrife         |
| <i>Lythrum portula</i>                              |                            |
| <i>Madia sativa</i> (Irving & Skinner 1985)         | Chilean tarweed            |
| <i>Malva neglecta</i>                               | dwarf mallow               |
| <i>Malva parviflora</i>                             | mallow                     |
| <i>Mentha pulegium</i>                              | penny royal                |
| <i>Myosotis arvensis</i>                            | forget-me-not              |
| <i>Myosotis laxa</i> var. <i>caespitosa</i>         | forget-me-not              |

|                                                         |                        |
|---------------------------------------------------------|------------------------|
| <i>Orobanche minor</i>                                  | broomrape              |
| <i>Oxalis pes-caprae</i>                                | Bermuda buttercup      |
| <i>Parentucellia viscosa</i>                            | tarweed                |
| <i>Persicaria hydropiper</i>                            | water pepper           |
| <i>Persicaria persicaria</i>                            | willow weed            |
| <i>Physalis peruviana</i>                               | cape gooseberry        |
| <i>Phytolacca octandra</i>                              | inkweed                |
| <i>Plantago australis</i>                               | swamp plantain         |
| <i>Plantago lanceolata</i>                              | narrow-leaved plantain |
| <i>Potentilla anglica</i>                               | trailing cinquefoil    |
| <i>Prunella vulgaris</i>                                | selfheal               |
| <i>Ranunculus flammula</i>                              | spearwort              |
| <i>Ranunculus repens</i>                                | creeping buttercup     |
| <i>Raphanus raphanistrum</i> subsp. <i>raphanistrum</i> | wild raddish           |
| <i>Raphanus sativa</i>                                  |                        |
| <i>Rorippa nasturtium-aquaticum</i>                     | watercress             |
| <i>Rumex obtusifolius</i>                               | dock                   |
| <i>Sagina procumbens</i>                                | pearlwort              |
| <i>Scrophularia auriculata</i>                          | water betony           |
| <i>Sigesbeckia orientalis</i> (Creswell 1975)           |                        |
| <i>Silene gallica</i>                                   | catchfly               |
| <i>Solanum nigrum</i>                                   | black nightshade       |
| <i>Solanum pseudocapsicum</i>                           | Jerusalem cherry       |
| <i>Stellaria media</i>                                  | chickweed              |
| <i>Trifolium dubium</i>                                 | suckling clover        |
| <i>Trifolium pratense</i>                               | red clover             |
| <i>Trifolium repens</i>                                 | white clover           |
| <i>Tropaeolum majus</i>                                 | garden nasturtium      |
| <i>Verbascum thapsus</i>                                | woolly mullein         |
| <i>Verbena bonariensis</i>                              | purple-top             |
| <i>Veronica arvensis</i>                                | field speedwell        |
| <i>Veronica serpyllifolia</i>                           | turf speedwell         |



# Appendix 5

## CHECKLIST OF WILDLIFE SPECIES IN OTANEWAINUKU ECOLOGICAL DISTRICT

Information from Fauna Survey Unit unpublished; Department of Conservation 1993a; Beadel 1994b, Mayhill 1994; Bull *et al.* 1985; Pickard and Towns 1988; Department of Conservation Biosite Database; Department of Conservation unpubl. records; K. Owen and A. Garrick pers. comm.

---

### (i) Mammals

#### *Native*

*Chalinolobus tuberculatus* North Island long-tailed bat

*Mystacina tuberculata rhyacobia* Central short-tailed bat

#### *Introduced (feral)*

*Bos taurus* feral cattle

*Capra hircus* feral goat

*Cervus elaphus scoticus* red deer

*Dama dama dama* fallow deer

*Erinaceus europaeus occidentalis* European hedgehog

*Felis catus* house cat

*Lepus europaeus occidentalis* brown hare

*Macropus eugenii* dama wallaby

*Mus musculus* house mouse

*Mustela erminea* stoat

*Mustela nivalis vulgaris* weasel

*Mustela putorius furo* ferret

*Oryctolagus cuniculus cuniculus* European rabbit

*Rattus norvegicus* Norway rat

*Rattus rattus* ship rat

*Sus scrofa* feral pig

*Trichosurus vulpecula* brushtail possum

### (ii) Birds

#### *Native*

*Acanthisitta chloris granti* North Island rifleman; titipounamu

*Anas gracilis*<sup>1</sup> grey teal; tete

---

1. Species which may occur in the district but whose presence has not been confirmed.

|                                                      |                                               |
|------------------------------------------------------|-----------------------------------------------|
| <i>Anas rybnichotus variegata</i>                    | New Zealand shoveler;<br>kuruwhengi           |
| <i>Anas superciliosa superciliosa</i>                | grey duck; parera                             |
| <i>Anthornis melanura melanura</i>                   | bellbird; korimako; makomako                  |
| <i>Anthus novaeseelandiae novaeseelandiae</i>        | New Zealand pipit; pihoihoi                   |
| <i>Apteryx australis mantelli</i>                    | North Island brown kiwi                       |
| <i>Ardea novaehollandiae novaehollandiae</i>         | white-faced heron                             |
| <i>Aythya novaeseelandiae</i>                        | New Zealand scaup; papango                    |
| <i>Botaurus stellaris poiciloptilus</i> <sup>2</sup> | Australasian bittern; matuku                  |
| <i>Bowdleria punctata vealeae</i>                    | North Island fernbird; matata                 |
| <i>Callaeas cinerea wilsoni</i>                      | North Island kokako                           |
| <i>Charadrius bicinctus bicinctus</i>                | banded dotterel; tuturiwhatu                  |
| <i>Charadrius obscurus aquilonius</i>                | northern New Zealand dotterel;<br>tuturiwhatu |
| <i>Chrysococcyx lucidus lucidus</i>                  | shining cuckoo; pipiwharaua                   |
| <i>Circus approximans</i>                            | Australasian harrier; kahu                    |
| <i>Cyanoramphus auriceps auriceps</i> <sup>1</sup>   | yellow-crowned parakeet; kakariki             |
| <i>Eudynamys taitensis</i>                           | long-tailed cuckoo; koekoea                   |
| <i>Falco novaeseelandiae</i>                         | New Zealand falcon; karearea                  |
| <i>Gerygone igata</i>                                | grey warbler; riroriro                        |
| <i>Haematopus unicolor</i>                           | variable oystercatcher; torea;<br>toreapango  |
| <i>Halcyon sancta vagans</i>                         | New Zealand kingfisher; kotare                |
| <i>Himantopus himantopus leucocephalus</i>           | Australasian pied stilt; poaka                |
| <i>Hemiphaga novaeseelandiae<br/>novaeseelandiae</i> | New Zealand pigeon; Kereru                    |
| <i>Hirundo tabitica neoxena</i>                      | welcome swallow                               |
| <i>Hymenolaimus malacorhynchos</i>                   | blue duck; whio                               |
| <i>Larus dominicanus dominicanus</i>                 | southern black-backed gull; karoro            |
| <i>Larus novaehollandiae scopulinus</i>              | red-billed gull; tarapunga                    |
| <i>Moboua albigilla</i>                              | whitehead; popokatea                          |
| <i>Nestor meridionalis septentrionalis</i>           | North Island kaka                             |
| <i>Ninox novaeseelandiae novaeseelandiae</i>         | morepork; ruru                                |
| <i>Petroica australis longipes</i>                   | North Island robin; toutouwai                 |
| <i>Petroica macrocephala toitoi</i>                  | North Island tomtit; miromiro                 |
| <i>Phalacrocorax melanoleucos brevirostris</i>       | little shag; kawaupaka                        |

1. Species which may occur in the district but whose presence has not been confirmed.

2. Species likely to have occurred in the district in the past and which may still occur locally but whose presence has not been confirmed.

|                                                                |                                  |
|----------------------------------------------------------------|----------------------------------|
| <i>Phalacrocorax carbo novaehollandiae</i>                     | black shag; kawau                |
| <i>Phalacrocorax sulcirostris</i>                              | little black shag                |
| <i>Phalacrocorax varius varius</i>                             | pied shag; karuhiruhi            |
| <i>Poliocephalis rufopectus</i>                                | New Zealand dabchick; weweia     |
| <i>Porphyrio porphyrio melanotus</i>                           | pukeko                           |
| <i>Porzana tabuensis plumbea</i> <sup>1</sup>                  | spotless crake; paweto           |
| <i>Prosthemadera novaeseelandiae</i><br><i>novaeseelandiae</i> | tui                              |
| <i>Rallus philippensis</i> <sup>1</sup>                        | banded rail; moho- pereru        |
| <i>Rhipidura fuliginosa placabilis</i>                         | North Island fantail; piwakawaka |
| <i>Sterna caspia</i> <sup>1</sup>                              | Caspian tern; taranui            |
| <i>Sterna striata</i>                                          | white-fronted tern; tara         |
| <i>Tadorna variegata</i>                                       | paradise shelduck; putangitangi  |
| <i>Vanellus miles novaehollandiae</i>                          | spur-winged plover               |
| <i>Zosterops lateralis lateralis</i>                           | silveryeye; tauhou               |
| <b>Introduced</b>                                              |                                  |
| <i>Acridotheres tristis</i>                                    | common myna                      |
| <i>Alauda arvensis</i>                                         | skylark                          |
| <i>Anas platyrhynchos platyrhynchos</i>                        | mallard                          |
| <i>Branta canadensis maxima</i>                                | Canada goose                     |
| <i>Callipepla californica brunnescens</i>                      | California quail                 |
| <i>Carduelis carduelis</i>                                     | goldfinch                        |
| <i>Carduelis chloris</i>                                       | greenfinch                       |
| <i>Carduelis flammea</i>                                       | redpoll                          |
| <i>Cygnus atratus</i>                                          | black swan                       |
| <i>Emberiza citrinella</i>                                     | yellowhammer                     |
| <i>Fringilla coelebs</i>                                       | chaffinch                        |
| <i>Gymnorhina tibicen hypoleuca</i>                            | white-backed magpie              |
| <i>Meleagris gallopavo</i>                                     | wild turkey                      |
| <i>Passer domesticus</i>                                       | house sparrow                    |
| <i>Phasianus colchicus</i>                                     | ring-necked pheasant             |
| <i>Platycercus eximius</i>                                     | eastern rosella                  |
| <i>Prunella modularis</i>                                      | hedge sparrow (dunnock)          |
| <i>Sturnus vulgaris</i>                                        | starling                         |
| <i>Synoicus ypsilophorus</i>                                   | brown quail                      |
| <i>Turdus merula</i>                                           | blackbird                        |
| <i>Turdus philomelos</i>                                       | song thrush                      |

1. Species which may occur in the district but whose presence has not been confirmed.

### (iii) Reptiles

#### **Native**

|                                  |               |
|----------------------------------|---------------|
| <i>Cyclodina aenea</i>           | copper skink  |
| <i>Hoplodactylus granulatus</i>  | forest gecko  |
| <i>Hoplodactylus maculatus</i>   | common gecko  |
| <i>Oligosoma striatum</i>        | striped skink |
| <i>Naultinus elegans elegans</i> | green gecko   |

#### **Introduced**

|                              |               |
|------------------------------|---------------|
| <i>Lampropholis delicata</i> | rainbow skink |
|------------------------------|---------------|

### (iv) Amphibians

#### **Native**

|                               |                    |
|-------------------------------|--------------------|
| <i>Leiopelma hochstetteri</i> | Hochstetter's frog |
|-------------------------------|--------------------|

#### **Introduced**

|                           |                    |
|---------------------------|--------------------|
| <i>Litoria aurea</i>      | golden bell frog   |
| <i>Litoria raniformis</i> | southern bell frog |

### (v) Fish (Gavin Williamson, Department of Conservation pers. comm.)

#### **Native**

|                                |                  |
|--------------------------------|------------------|
| <i>Anguilla australis</i>      | shortfinned eel  |
| <i>Anguilla dieffenbachii</i>  | longfinned eel   |
| <i>Cheimarrichthys fosteri</i> | torrentfish      |
| <i>Galaxias argenteus</i>      | giant kokopu     |
| <i>Galaxias brevipinnis</i>    | koaro            |
| <i>Galaxias fasciatus</i>      | banded kokopu    |
| <i>Galaxias maculatus</i>      | inanga           |
| <i>Galaxias postvectis</i>     | shortjaw kokopu  |
| <i>Geotria australis</i>       | lamprey          |
| <i>Gobiomorphus basalis</i>    | crans bully      |
| <i>Gobiomorphus cotidianus</i> | common bully     |
| <i>Gobiomorphus gobioides</i>  | giant bully      |
| <i>Gobiomorphus hubbsi</i>     | bluegilled bully |
| <i>Gobiomorphus buttoni</i>    | redfinned bully  |
| <i>Retropinna retropinna</i>   | common smelt     |

#### **Introduced**

|                            |               |
|----------------------------|---------------|
| <i>Carassius auratus</i>   | goldfish      |
| <i>Gambusia affinis</i>    | mosquitofish  |
| <i>Oncorhynchus mykiss</i> | rainbow trout |
| <i>Salmo trutta</i>        | brown trout   |



|                                    |       |
|------------------------------------|-------|
| <i>Scardinius erythrophthalmus</i> | rudd  |
| <i>Tinca tinca</i>                 | tench |

**(vi) Snails (P. Mayhill pers. comm.)**

*Allodiscus dimorphus*  
*Allodiscus granum*  
*Allodiscus miranda*  
*Allodiscus planulatus*  
*Allodiscus tessellatus*  
*Allodiscus tullia*  
*Allodiscus urquharti*  
*Archiobanella* sp.  
*Austroiotula* sp.<sup>1</sup>  
*Cavellia anguicula*  
*Cavellia buccinella*  
*Cavellia colensoi*  
*Cavellia irregularis*  
*Cavellia reeftonensis*  
*Cavellia roseveari*  
*Charopa coma*  
*Chaureopa depressa*  
*Chaureopa subdepressa*  
*Cionella lubrica*  
*Cytora cytora*  
*Cytora fasciata*  
*Cytora hedleyi*  
*Cytora torquilla*  
*Delos coresia*  
*Delos* sp.<sup>1</sup>  
*Delos jeffreysiana*  
*Dorilaoma ariel*  
*Fectola infecta*  
*Fectola mira*  
*Flammulina chiron*  
*Flammocharopa costulata*  
*Flammulina* sp.<sup>1</sup>  
*Flammulina crebriflammis*  
*Flammocharopa feredayi*

---

1. Recognised as separate entities but given informal names only in Mayhill (1994).

*Flammulina perdita*  
*Flammulina zebra*  
*Geminoropa cookianum*  
*Geminoropa buttoni*  
*Geminoropa moussoni*  
*Geminoropa subantialba*  
*Haurakora* sp.<sup>1</sup>  
*Huonodon bectori*  
*Huonodon pseudoleioda*  
*Hydrocena purchasi*  
*Iotula* sp.<sup>1</sup>  
*Iotula allochroida*  
*Iotula sericata*  
*Iotula* sp.<sup>1</sup>  
*Kokopapa* sp.<sup>1</sup>  
*Laoma conicula*  
*Laoma domus*  
*Laoma mariae*  
*Laoma marina*  
*Liarea egea*  
*Liarea hochstetteri*  
*Litopunctum* sp.  
*Mocella eta*  
*Mocella* cf *manawatawhia*  
*Mocella northern maculata*  
*Mocella prestoni*  
*Mocella segregata*  
*Otoconcha dimidiata*  
*Oxychilus cellarius*  
*Paracharopa bianca*  
*Paracharopa chrysaugeia*  
*Paracharopa fuscosa*  
*Paracharopa titirangiensis*  
*Paryphanta busbyi*  
*Pasmaditta miserabilis*  
*Phenacharopa pseudanguicula*  
*Phenacobelix giveni*

---

1. Recognised as separate entities but given informal names only in Mayhill (1994).

*Phenacobelix* sp.<sup>1</sup>  
*Phenacobelix ponsonbyi*  
*Pbrixgnathus brunneus*  
*Pbrixgnathus erigone*  
*Pseudegestula goulstonei*  
*Pseudegestula montivaga*  
*Punctum caputspinulae*  
*Punctum conella*  
*Punctum elaiodes*  
*Punctum lateumbilicata*  
*Punctum minuta*  
*Punctum* sp.<sup>1</sup>  
*Punctum pirongiaensis*  
*Punctum serratocostata*  
*Rengakora* sp.<sup>1</sup>  
*Rengakora rimutaka*  
*Rhytida greenwoodi*  
*Robapapa* sp.<sup>1</sup>  
*Roscoeia* sp.<sup>1</sup>  
*Schizoglossa novoseelandica*  
*Serpbo kivi*  
*Sinploia parva*  
*Sinploia pilsbryi*  
*Suteria ide*  
*Taguabelix campbellica*  
*Taguabelix pseudelaiodes*  
*Taguabelix viridula*  
*Thalassobelix ziczag*  
*Therasia traversi*  
*Therasia zelandiae*  
*Therasiella celinde*  
*Therasiella neozelanica*  
*Therasiella* sp.  
*Therasiella serrata*  
*Therasiella tamora*  
*Tornatellides novoseelandica*  
*Tubuaia novoseelandica*

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1. Recognised as separate entities but given informal names only in Mayhill (1994).



# Appendix 6

## CONSERVATION STATUS OF TAXA IN OTANEWAINUKU ECOLOGICAL DISTRICT

### WILDLIFE

#### Mammals (status from Hitchmough 2002)

Acutely Threatened, Nationally Vulnerable

*Chalinolobus tuberculatus* North Island long-tailed bat

At Risk, Range Restricted

*Mystacina tuberculata rhyacobia* Central short-tailed bat

#### Birds (status from Hitchmough 2002)

Acutely Threatened, Nationally Endangered

*Botaurus stellaris poiciloptilus*<sup>1</sup> Australasian bittern

*Callaeas cinerea wilsoni* North Island kokako

*Hymenolaimus malacorhynchus* whio, blue duck

*Nestor meridionalis septentrionalis* North Island kaka

Acutely Threatened, Nationally Vulnerable

*Falco novaeseelandiae* New Zealand falcon

*Sterna caspia*<sup>1</sup> Caspian tern

Chronically Threatened, Serious Decline

*Apteryx australis mantelli* North Island brown kiwi

Chronically Threatened, Gradual Decline

*Cyanoramphus auriceps auriceps* yellow-crowned kakariki

*Hemiphaga novaeseelandiae* kereru; New Zealand pigeon

*Eudynamys taitensis* long-tailed cuckoo

*Charadrius bicinctus bicinctus* banded dotterel

At Risk, Sparse

*Bowdleria punctata vealeae* North Island fernbird

*Charadrius obscurus aquilonius* northern New Zealand dotterel

*Phalacrocorax sulcirostris* little black shag

*Poliocephalus rufopectus* New Zealand dabchick

1. Species likely to have occurred in the district in the past and which may still occur locally but whose presence has not been confirmed.



|                                                         |                |
|---------------------------------------------------------|----------------|
| <i>Porzana pusilla</i> ssp. <i>affinis</i> <sup>1</sup> | marsh crake    |
| <i>Porzana tabuensis</i> ssp. <i>plumbea</i>            | spotless crake |
| <i>Rallus philippensis</i> <sup>1</sup>                 | banded rail    |

#### **Reptiles (status from Hitchmough 2002)**

Data Deficient

|                           |               |
|---------------------------|---------------|
| <i>Oligosoma striatum</i> | striped skink |
|---------------------------|---------------|

#### **Amphibians (status from Hitchmough 2002)**

At Risk, Sparse

|                               |                    |
|-------------------------------|--------------------|
| <i>Leiopelma hochstetteri</i> | Hochstetter's frog |
|-------------------------------|--------------------|

#### **Fish (status from Hitchmough 2002)**

Chronically Threatened, Gradual Decline

|                            |                 |
|----------------------------|-----------------|
| <i>Galaxias argenteus</i>  | giant kokopu    |
| <i>Galaxias postvectis</i> | shortjaw kokopu |

At Risk, Sparse

|                          |         |
|--------------------------|---------|
| <i>Geotria australis</i> | lamprey |
|--------------------------|---------|

#### **PLANTS (status from de Lange *et al.* 2004)**

Acutely Threatened, Nationally Critical

|                         |                         |
|-------------------------|-------------------------|
| <i>Sicyos australis</i> | mawhai, native cucumber |
|-------------------------|-------------------------|

Acutely Threatened, Nationally Endangered

|                                         |                             |
|-----------------------------------------|-----------------------------|
| <i>Olearia pachyphylla</i> <sup>2</sup> |                             |
| <i>Rorippa divaricata</i>               | matangoa, New Zealand cress |

Chronically Threatened, Serious Decline

|                                                |                         |
|------------------------------------------------|-------------------------|
| <i>Brachyglottis kirkii</i> var. <i>kirkii</i> | Kirk's daisy, kohurangi |
| <i>Dactylanthus taylorii</i>                   | pua o te reinga         |
| <i>Marattia salicina</i>                       | para, kingfern          |
| <i>Pimelea tomentosa</i>                       |                         |
| <i>Pittosporum kirkii</i>                      | thick-leaved kohuhu     |
| <i>Pterostylis paludosa</i>                    | green hooded orchid     |

---

1. Species likely to have occurred in the district in the past and which may still occur locally but whose presence has not been confirmed.

2. Doubtful record. There are old records of this species from the ecological district (P. de Lange pers. comm.).

Chronically Threatened, Gradual Decline

|                                 |                          |
|---------------------------------|--------------------------|
| <i>Austrofestuca littoralis</i> | hinarepe, sand tussock   |
| <i>Desmoschoenus spiralis</i>   | pingao                   |
| <i>Mida salicifolia</i>         | mida                     |
| <i>Olearia cheesemanii</i>      |                          |
| <i>Peraxilla tetrapetala</i>    | pirirangi, red mistletoe |
| <i>Raukawa edgerleyi</i>        | raukawa                  |
| <i>Tupeia antarctica</i>        | pirita, green mistletoe  |

At Risk, Sparse

|                                                                     |                   |
|---------------------------------------------------------------------|-------------------|
| <i>Corunastylis pumila</i>                                          | leek orchid       |
| <i>Corunastylis nuda</i>                                            | leek orchid       |
| <i>Hymenophyllum</i> aff. <i>flexuosum</i><br>(AK17730; Mt Burnett) | mauku, filmy fern |
| <i>Hymenophyllum atrovirens</i>                                     | mauku, filmy fern |
| <i>Lindsaea viridis</i>                                             | fern              |
| <i>Microsorium novae-zelandiae</i>                                  | fragrant fern     |
| <i>Peperomia tetraphylla</i>                                        |                   |
| <i>Schizaea dichotoma</i>                                           |                   |
| <i>Tetragonia tetragonioides</i>                                    |                   |

At Risk, Range Restricted

|                                                |                  |
|------------------------------------------------|------------------|
| <i>Kunzea ericoides</i> var. <i>microflora</i> | prostrate kanuka |
|------------------------------------------------|------------------|



# Appendix 7

## COMMON PLANT NAMES USED IN THE TEXT

|                   |                                                       |
|-------------------|-------------------------------------------------------|
| akeake            | <i>Dodonea viscosa</i>                                |
| akepiro           | <i>Olearia furfuracea</i>                             |
| arrow grass       | <i>Triglochin striata</i>                             |
| bachelor's button | <i>Cotula coronopifolia</i>                           |
| black beech       | <i>Nothofagus solandri</i> var. <i>solandri</i>       |
| bracken           | <i>Pteridium esculentum</i>                           |
| buddleia          | <i>Buddleja davidii</i>                               |
| burr reed         | <i>Sparganium subglobosum</i>                         |
| catsear           | <i>Hypochoeris radicata</i>                           |
| eucalyptus        | <i>Eucalyptus botryoides</i>                          |
| gorse             | <i>Ulex europaeus</i>                                 |
| grey willow       | <i>Salix cinerea</i>                                  |
| Hall's totara     | <i>Podocarpus hallii</i>                              |
| hangehange        | <i>Geniostoma rupestre</i> var. <i>ligustrifolium</i> |
| harakeke          | <i>Phormium tenax</i>                                 |
| hard beech        | <i>Nothofagus truncata</i>                            |
| haretail          | <i>Lagarus ovatus</i>                                 |
| heketara          | <i>Olearia rani</i>                                   |
| hinarepe          | sand tussock; <i>Austrofestuca littoralis</i>         |
| hinau             | <i>Elaeocarpus dentatus</i>                           |
| horoeke           | lancewood; <i>Pseudopanax crassifolius</i>            |
| houpara           | <i>Pseudopanax lessonii</i>                           |
| hukihuki          | <i>Coprosma tenuicaulis</i>                           |
| hupiro            | <i>Coprosma foetidissima</i>                          |
| kahikatea         | <i>Dacrycarpus dacrydioides</i>                       |
| kaikawaka         | <i>Libocedrus bidwillii</i>                           |
| kamahi            | <i>Weinmannia racemosa</i>                            |
| kamu              | <i>Uncinia uncinata</i>                               |
| kanono            | <i>Coprosma grandifolia</i>                           |
| kanuka            | <i>Kunzea ericoides</i> var. <i>ericoides</i>         |
| karaka            | <i>Corynocarpus laevigatus</i>                        |
| karamu            | <i>Coprosma robusta</i>                               |

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| kareao             | <i>Ripogonum scandens</i>                                          |
| karetu             | <i>Hierochloa redolens</i>                                         |
| kauri              | <i>Agathis australis</i>                                           |
| kawakawa           | <i>Macropiper excelsum</i> var. <i>excelsum</i>                    |
| kiekie             | <i>Freycinetia baueriana</i> subsp. <i>banksii</i>                 |
| kiokio             | <i>Blechnum novae-zelandiae</i>                                    |
| kiwikiwi           | <i>Blechnum fluviatile</i>                                         |
| kohekohe           | <i>Dysoxylum spectabile</i>                                        |
| kohuhu             | <i>Pittosporum tenuifolium</i> subsp. <i>tenuifolium</i>           |
| koromiko           | <i>Hebe stricta</i> var. <i>stricta</i> and <i>Hebe corriganii</i> |
| kotukutuku         | <i>Fuchsia excorticata</i>                                         |
| kowaowao           | <i>Microsorium pustulatum</i>                                      |
| lotus              | <i>Lotus pedunculatus</i>                                          |
| lowland ribbonwood | <i>Plagianthus regius</i>                                          |
| lupin              | <i>Lupinus arboreus</i>                                            |
| mahoe              | <i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i>               |
| mahoe wao          | <i>Melicytus lanceolatus</i>                                       |
| maire tawake       | swamp maire; <i>Syzygium maire</i>                                 |
| maire taiki        | mida; <i>Mida salicifolia</i>                                      |
| mairehau           | <i>Leionema nudum</i>                                              |
| makomako           | <i>Aristotelia serrata</i>                                         |
| mamaku             | <i>Cyathea medullaris</i>                                          |
| mangeao            | <i>Litsea calicaris</i>                                            |
| mangemange         | <i>Lygodium articulatum</i>                                        |
| manuka             | <i>Leptospermum scoparium</i>                                      |
| mapou              | <i>Myrsine australis</i>                                           |
| maritime pine      | <i>Pinus pinaster</i>                                              |
| marram             | <i>Ammophila arenaria</i>                                          |
| marsh ribbonwood   | <i>Plagianthus divaricatus</i>                                     |
| matai              | <i>Prumnopitys taxifolia</i>                                       |
| matau              | hooked sedges; <i>Uncinia</i> spp.                                 |
| mida               | <i>Mida salicifolia</i>                                            |
| mihimihi           | toro; <i>Toronia toru</i>                                          |
| mingimingi         | <i>Leucopogon fasciculatus</i>                                     |
| miro               | <i>Prumnopitys ferruginea</i>                                      |
| monoao             | <i>Dracophyllum subulatum</i>                                      |
| mouku              | <i>Asplenium bulbiferum</i> s.s.                                   |



|                    |                                                          |
|--------------------|----------------------------------------------------------|
| neinei             | <i>Dracophyllum latifolium</i>                           |
| ngaio              | <i>Myoporum laetum</i>                                   |
| nikau              | <i>Rhopalostylis sapida</i>                              |
| northern rata      | <i>Metrosideros robusta</i>                              |
| oioi               | <i>Apodasmia similis</i>                                 |
| pakau              | <i>Pneumatopteris pennigera</i>                          |
| pampas             | <i>Cortaderia selloana</i>                               |
| pate               | <i>Schefflera digitata</i>                               |
| pinus              | <i>Pinus radiata</i> , <i>P. pinaster</i>                |
| pingao             | <i>Desmoschoenus spiralis</i>                            |
| piupiu             | crown fern; <i>Blechnum discolor</i>                     |
| pohutukawa         | <i>Metrosideros excelsa</i>                              |
| ponga              | silver fern; <i>Cyathea dealbata</i>                     |
| prickly hakea      | <i>Hakea sericea</i>                                     |
| prickly mingimingi | <i>Leptecophylla juniperina</i> subsp. <i>juniperina</i> |
| prostrate kanuka   | <i>Kunzea ericoides</i> var. <i>microflora</i>           |
| puakarimu          | <i>Lycopodium deuterodensum</i>                          |
| puka               | broadleaf; <i>Griselinia littoralis</i>                  |
| pukatea            | <i>Laurelia novae-zelandiae</i>                          |
| punui              | <i>Cyathea cunninghamii</i>                              |
| puriri             | <i>Vitex lucens</i>                                      |
| putaputaweta       | <i>Carpodetus serratus</i>                               |
| rangiora           | <i>Brachyglottis repanda</i>                             |
| bracken            | bracken; <i>Pteridium esculentum</i>                     |
| raupo              | <i>Typha orientalis</i>                                  |
| red beech          | <i>Nothofagus fusca</i>                                  |
| rereti             | <i>Blechnum chambersii</i>                               |
| rewarewa           | <i>Knightia excelsa</i>                                  |
| rimu               | <i>Dacrydium cupressinum</i>                             |
| sea couch          | <i>Elytrigia pycnantha</i>                               |
| searush            | <i>Juncus kraussii</i> subsp. <i>australiensis</i>       |
| silver beech       | <i>Nothofagus menziesii</i>                              |
| Spanish heath      | <i>Erica lusitanica</i>                                  |
| sphagnum           | <i>Sphagnum cristatum</i>                                |
| spike sedge        | <i>Eleocharis acuta</i>                                  |
| spinifex           | <i>Spinifex sericeus</i>                                 |
| swamp coprosma     | <i>Coprosma tenuicaulis</i>                              |

|                     |                                                                                |
|---------------------|--------------------------------------------------------------------------------|
| swamp kiokio        | <i>Blechnum minus</i>                                                          |
| swamp millet        | <i>Isachne globosa</i>                                                         |
| tanekaha            | <i>Phyllocladus trichomanoides</i>                                             |
| taumingi            | <i>Leptecophylla juniperina</i> subsp. <i>juniperina</i>                       |
| taupata             | <i>Coprosma repens</i>                                                         |
| taurepo             | <i>Rhabdotheramnus solandri</i>                                                |
| tawa                | <i>Beilschmiedia tawa</i>                                                      |
| tawari              | <i>Ixerba brexioides</i>                                                       |
| tawheowheo          | <i>Quintinia serrata</i> (incl. <i>Q. acutifolia</i> and <i>Q. elliptica</i> ) |
| ti kouka            | <i>Cordyline australis</i>                                                     |
| titoki              | <i>Alectryon excelsus</i>                                                      |
| ti ngahere          | <i>Cordyline banksii</i>                                                       |
| toatoa              | <i>Phyllocladus toatoa</i>                                                     |
| toetoe              | <i>Cortaderia fulvida</i>                                                      |
| toro                | <i>Myrsine salicina</i>                                                        |
| toropapa            | <i>Alseuosmia macrophylla</i>                                                  |
| toru                | <i>Toronia toru</i>                                                            |
| totara              | <i>Podocarpus totara</i>                                                       |
| totorowhiti         | <i>Dracophyllum strictum</i>                                                   |
| tuhara              | <i>Machaerina sinclairii</i>                                                   |
| turutu              | <i>Dianella nigra</i>                                                          |
| tutu                | <i>Coriaria arborea</i>                                                        |
| waewae kaka         | <i>Gleichenia microphylla</i>                                                  |
| tupari maunga       | <i>Gabnia xanthocarpa</i>                                                      |
| water purslane      | <i>Ludwigia palustris</i>                                                      |
| wharariki           | <i>Phormium cookianum</i>                                                      |
| whau                | <i>Entelea arborescens</i>                                                     |
| whauwhaupaku        | <i>Pseudopanax arboreus</i>                                                    |
| wheki ponga         | <i>Dicksonia fibrosa</i>                                                       |
| wheki               | <i>Dicksonia squarrosa</i>                                                     |
| wild strawberry     | <i>Fragaria vesca</i>                                                          |
| willow-leaved hakea | <i>Hakea salicifolia</i>                                                       |
| Yorkshire fog       | <i>Holcus lanatus</i>                                                          |

# Appendix 8

## GLOSSARY OF TECHNICAL TERMS

**Adventive:** Arriving from outside; in contrast to native.

**Alluvial Flat:** Refer to Landform.

**Alluvial Terrace:** Refer to Landform.

**Basin:** Refer to Landform.

**Bioclimatic Zone:** The broad distribution of vegetational zones along altitudinal gradients, where, a particular climatic regime dictates the character of the natural ecosystem. See section on bioclimatic zones in text.

For example: Coastal zone, semi-coastal zone, lowland zone, submontane zone.

**Buffer:** A zone surrounding a natural area, which reduces the effect of external influences upon the features within the natural area, for example: vegetation such as modified forest/scrub or a stream.

**Buffering:** Refer to Recommended Area for Protection Selection Criteria.

**Canopy:** The layer or layers formed by the uppermost crowns or their parts. The concept is applicable to any kind of vegetation. In forests it includes lianes and epiphytes.

**Cliff:** Refer to Landform.

**Coastal Zone:** Refer to Bioclimatic Zone.

**Communities:** A collection of populations of animals, and plants, that occur naturally together in a common environment of any size.

**Conservation Value:** The relative merit of a natural feature within a regional or national context (for example: within an ecological region or ecological district).

**Crown fires:** Crown fires are fires, which have swept across the canopy and killed previous emergent trees and some canopy trees, resulting in a mosaic effect.

**Diversity:** The range of the natural physical and biotic components in the landscape, including species, communities, ecosystems, landforms, soil sequences, and dynamic systems and processes.

**Dune Hollow:** Depression or low area between dunes, may have groundwater at surface (refer to Landform section).

**Ecological Character:** The distinguishing features of a particular place, definable in terms of biotic composition, climatic, edaphic and topographical factors.

**Ecological Class:** A category which describes the broad ecological patterns within an ecological district in terms of bioclimatic zone, hydrological class, vegetation structural class, and land system. For example: a coastal palustrine reedland on uplifted marine terrace.

**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. New Zealand has been subdivided into 268 such districts, setting 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 closely related ecological characteristics, or, in some cases, a single very distinctive ecological district. New Zealand has been subdivided into 85 such regions.

**Ecological Unit:** The ecological unit is the linking, in tandem, of a natural community type (usually a vegetation type) and a physical environment type (usually a landform type) (Myers *et al.* 1987). For example, mountain beech forest on colluvial mountain sideslopes or red tussockland on moraine.

**Endangered:** Refer to rarity.

**Endemic:** Occurring naturally in, and restricted to, a particular country, region or locality. Refer to Indigenous.

**Estuarine:** Refer to Hydrological Class.

**Exotic:** Introduced from abroad.

**Fernland:** Refer to Vegetation Structural Class.

**Foredune:** Refer to Landform.

**Forest:** Refer to Vegetation Structural Class.

**Gorge:** Refer to Landform.

**Grass/Sedge/Rushland:** Refer to Vegetation Structural Class.

**Gully:** Refer to Landform.

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

**Herbfield:** Refer to Vegetation Structural Class.

**Hillslope:** Refer to Landform.

**Hydrologic Class:** One of five descriptive categories used in classifying the influence of water on the character of the biotic elements. If water is not a significant influence, a site is considered terrestrial. On sites where water is a major

feature, the characteristics of the soils and biota will be strongly influenced by the nature of the water body (for example: palustrine, lacustrine, estuarine) and its nutrient content.

*Terrestrial:* Free water has an insignificant role in the ecological character of these areas.

*Estuarine:* Tidal and non-tidal saline wetlands associated with a coastal body of water with a free connection to the open sea, and where fresh water, derived from land drainage (usually rivers) is mixed with sea water.

*Palustrine:* A wetland community/environment characterised by emergent vegetation, which may, or may not, have freestanding water present.

*Lacustrine:* A lake community /environment lacking persistent emergent vegetation.

*Riverine:* A system of flowing freshwater.

**Indigenous:** Native to, occurring naturally in, and characteristic of a particular country, region or locality. All the indigenous features of New Zealand give it its own distinctive character.

**Induced:** Native vegetation established after destruction or disturbance of the previous cover, and which may dominate for many decades, but is essentially different from the original vegetation, for example: raupo reedland, manuka scrub.

**Lacustrine:** See Hydrologic Class.

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

Landform Definitions-after Soons and Selby (1982), Bayfield and Benson (1986) and interpretation by the author.

*Alluvial Flat:* Flat area associated with river, over which the river course is unconfined; wetlands frequent.

*Alluvial Terrace:* Flat to gently sloping area of alluvium of variable height above river level. May be periodically flooded.

*Basin:* Concave to almost flat area on hillside; may be the site of water accumulation.

*Cliff:* Very steeply sloping to vertical rock face at inland locations.

*Dune Hollow:* Low concave area or depression between dunes, may have groundwater at surface.

*Foredune:* A coastal dune parallel to the shoreline at the landward margin of the beach.

*Gorge:* A steep-sided narrow drainage-way cut into bedrock.

*Gully:* Deep incision into hillslope due to fluvial action.

*Hillslope:* Slope unit on which drainage lines are predominantly parallel.

*Rear Dune:* A coastal dune parallel to the shoreline landward of the foredune.



*Ridge*: The top (often acute angled) of a divide between two drainage ways.

*Seepage Swamp*: Swamp zone on hillside.

**Land System**: An area throughout which there is a general coherence and unity of physical and biological attributes.

**Local**: Refer to rarity.

**Lowland Zone**: See Bioclimatic Zone.

**Native**: Not known to have been introduced by human agency.

**Natural Area**: A place characterised by indigenous species or ecosystems, or a place or landform not or scarcely modified from an indigenous condition.

Some natural areas will be identified as suitable for evaluation of ecological quality and representativeness, and hence also be study areas. Some of these may be of sufficient quality to become Recommended Areas for Protection. In some instances one natural area may embrace more than one study area.

or:

A tract of land which supports vegetation and landforms considered to be in a predominantly natural state; identified as a suitable unit for evaluation of ecological quality and representativeness and has potential to be recommended for protection.

**Natural Diversity**: Refer to Recommended Area for Protection Selection Criteria.

**Naturalness**: Degree to which, ecological units/communities/ ecosystems retain their original character. Refer to Original Natural Ecosystem.

Also refer to Recommended Area for Protection Selection Criteria.

**Nature Conservation Value**: A relative value assessment for nature conservation purposes based on scientific criteria derived from ecological, and biogeographical theory (diversity, naturalness, rarity etc) and on the social value placed on those criteria.

**Original Natural Ecosystem**: Original natural landscape—the original state of an ecosystem and the landscape is that which prevailed before the arrival of humans in New Zealand with their domesticated and commensal animals and plants. A major objective of most nature conservation strategies in New Zealand is to protect indigenous ecosystems and landscapes that most closely approximate this state. In Otanewainuku Ecological District it applies to areas where the landscape has remained in, returned to, or is returning to its probable original state (i.e. mature or steady-state forest) of the pre-Polynesian period.

**Palustrine**: See Hydrologic Class.

**Pattern**: Refer to Recommended Area for Protection Selection Criteria.

**Primary:** Native vegetation which has never been logged or cleared.

**Protected Natural Area (PNA):** A legally protected area, characterised by indigenous species or ecosystems, in which the principal purpose of management is retention of the indigenous state.

**Rare:** Refer to Recommended Area for Protection Selection Criteria.

**Rarity:** Refer to Recommended Area for Protection Selection Criteria.

**Rear Dune:** Refer to Landform.

**Recommended Area for Protection (RAP):** An area identified as priority for protection because it is one of the best remaining natural areas in an ecological district. A RAP is intended to be the basis of a proposal for a new protected natural area.

**Recommended Area for Protection Selection Criteria:** Seven selection criteria are used for identifying Recommended Areas for Protection in the PNA Programme: representativeness; diversity and pattern; rarity and special features; naturalness; long-term ecological viability; size and shape; buffering and surrounding landscape.

*Representative:* The extent to which an area represents or exemplifies the components of the natural diversity of a larger reference area, for example: 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 the PNA Programme.

*Natural Diversity:* Natural diversity refers to 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 (for example: species, communities).

*Naturalness:* Involves the assessment of the degree which an area (for example: 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 cases 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.

*Size and Shape:* Larger areas with "compact shape" are generally inherently more viable and better for the protection of the features present.

*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 cases, fences or other artificial structures.

*Surrounding Landscape*: The land which surrounds and influences a particular natural area.

*Site*: An area of land surface for which a specific statement can be made of aspect, slope, exposure, ground water, underlying geological material and vegetation. The size of a site may vary quite widely depending on the degree of uniformity required for sampling.

**Reedland**: Refer to Vegetation Structural Class.

**Representative**: Refer to Recommended Area for Protection Selection Criteria.

**Ridge**: Refer to Landform.

**Riverine**: Refer to Hydrologic Class.

**Sandfield**: Refer to Vegetation Structural Class.

**Scrub**: Refer to Vegetation Structural Class.

**Secondary**: Secondary native vegetation, seral regrowth after destruction or disturbance.

**Seepage Swamp**: Refer to Landform.

**Semi-coastal Zone**: Refer to Bioclimatic Zone.

**Site**: Refer to Recommended Area for Protection Selection Criteria.

**Size and Shape**: Refer to Recommended Area for Protection Selection Criteria.

**Shrubland**: Refer to Vegetation Structural Class.

**Study Area**: A tract of land with indigenous vegetation delineated as suitable for rapid field survey in order to identify the ecological patterns and the natural diversity of an ecological district.

A study area is an arbitrary unit, defined, appropriate to circumstances - it may be defined by the boundary of a remnant forest stand; a catchment; a legal title; or in largely undifferentiated environments by grid squares or other manageable, arbitrarily bound areas.

**Submontane Zone**: See Bioclimatic Zone.

**Succession**: The process of change in the appearance, composition and structure of a community. This usually occurs over a number of years. Change may be due to biotic factors, site factors, or both.

**Surrounding Landscape**: Refer to Recommended Area for Protection Selection Criteria.

**Terrestrial**: See Hydrologic Class.

**Threatened species:** Definitions from de Lange *et al.* (2004).

***Acutely Threatened***

Acutely Threatened taxa are those which meet the criteria specified by Molloy *et al.* (2002) for the categories 1.

Nationally Critical, 2. Nationally Endangered, and 3. Nationally Vulnerable.

**1. Nationally Critical**

Taxa which qualify as Nationally Critical because of their small population size ( $\leq 250$  mature individuals), or the number of sub-populations known ( $\leq 2$ , with  $\leq 200$  mature individuals in the largest of these), or their area of occupancy ( $0.01 \text{ km}^2$ ), or their predicted decline rate ( $\geq 80\%$  in the next 10 years). Fuller definitions are provided by Molloy *et al.* (2002).

**2. Nationally Endangered**

Taxa characterised by their small population size (250–1,000 mature individuals),  $\leq 5$  sub-populations known (with either  $\leq 300$  mature individuals in the largest population or the total area of occupancy  $\leq 0.1 \text{ km}^2$ ), and a moderate to high recent predicted decline ( $\geq 30\%$  of the total population or habitat area over the last 100 years, or predicted to occur within the next 10 years); or those taxa typified by small to moderate population sizes (1,000–5,000 mature individuals),  $\leq 15$  sub-populations (with  $\leq 200$ –500 mature individuals in the largest or the total area of occupancy is  $0.1$ – $1 \text{ km}^2$ ), and a high recent or predicted decline ( $\geq 60\%$  of the total population or habitat area over the last 100 years, or this is predicted to occur within the next 10 years). Fuller definitions are provided by Molloy *et al.* (2002).

**3. Nationally Vulnerable**

Taxa characterised by their small to moderate population size (1,000–5,000 mature individuals),  $\leq 15$  sub-populations (either with 300–500 mature individuals in the largest sub-population or occupying a total area of  $0.1$ – $1 \text{ km}^2$ ), and with either an initially historic but continuing decline rate of 30–60% in total population size or habitat area over the last 100 years, or a predicted decline of 30–60% in the total population likely in the next 10 years. Fuller definitions are provided by Molloy *et al.* (2002).

***Chronically Threatened***

Chronically Threatened taxa are those which meet the criteria specified by Molloy *et al.* (2002) for the categories 1. Serious Decline, and 2. Gradual Decline.

**1. Serious Decline**

Taxa qualify if they occur as moderate to large populations where there is a moderate to large predicted decline (with total population size  $> 5,000$  mature individuals,  $> 15$  sub-populations, and either  $> 500$  mature individuals in the largest sub-population or the total area of occupancy  $> 1 \text{ km}^2$ , with a predicted decline rate of  $> 30\%$  in total population over the next 10 years), or taxa exist as small to moderate sized

populations with a small to moderate predicted decline (with total population <5,000 mature individuals,  $\leq 500$  mature individuals in the largest sub-population, or total area of occupancy  $\leq 1 \text{ km}^2$ , with a predicted decline rate of 5-30% in the total population over the next 10 years). Fuller definitions are provided by Molloy *et al.* (2002).

## **2. Gradual Decline**

Taxa qualify if they occur as moderate to large populations with small to moderate predicted declines (total population size >5,000 mature individuals, >15 sub-populations, and either >500 mature individuals in the largest sub-population or the total area of occupancy >1 km<sup>2</sup>, with a decline rate of 5-30% in total population over the next 10 years, which is predicted to continue beyond 10 years). Fuller definitions are provided by Molloy *et al.* (2002).

## ***At Risk***

These are taxa which do not qualify as Acutely or Chronically Threatened but which exist as widely scattered, small sub-populations or have restricted ranges. Although such taxa are not currently considered threatened, their small population size and aspects of their biology and ecology place them at potential risk, which is why they are listed here as either 1. Sparse, or 2. Range Restricted.

### **1. Sparse**

Taxa that, for largely undetermined reasons, occur within typically small and widely scattered populations. This distribution appears wholly natural, and is not considered the result of past or recent anthropogenic disturbance. However, as the candidate taxa usually occur in small numbers at any given site, they are naturally susceptible to extirpation within parts of their range.

### **2. Range Restricted**

Taxa whose distribution is naturally confined to specific substrates (e.g. ultramafic rock), habitats (e.g. high alpine fell field), or geographic areas (e.g. subantarctic islands). Range Restricted taxa occupy an area of <100 km<sup>2</sup> and within that area they are under no obvious or immediate threat. However, because of their distribution they are naturally susceptible to extirpation.

## ***Non-Resident Native***

Taxa whose natural presence in New Zealand is either sporadic or temporary (1. Vagrant), or they have succeeded in recent ( $\leq 50$  years) establishing themselves beyond their point of introduction (2. Coloniser).

### **1. Vagrant**

Taxa whose occurrences, though natural, are sporadic and typically transitory. Most (if not all) fail to establish themselves beyond their point of arrival because of reproductive failure or for specific ecological reasons. Also includes those vagrants which are currently known in the



New Zealand Botanical Region only from historic herbarium specimens but which remain extant in their country of origin, and so retain the potential to re-establish themselves.

## **2. Coloniser**

Taxa which have arrived without direct or indirect human assistance and which have been successfully reproducing in the wild for <50 years.

### ***Data Deficient***

Taxa that are suspected but not definitely known to belong to any of the above categories due to a lack of current information about their present-day distribution and abundance. It is hoped that listing such taxa will stimulate research to find out the true category or threat. For a fuller definition see Molloy *et al.* (2002).

**Treefernland:** Refer to Vegetation Structural Class.

**Treeland:** Refer to Vegetation Structural Class.

**Tussockland:** Refer to Vegetation Structural Class.

**Vegetation Structural Class:** Vegetation classification based on the type of plant, which is dominant in the canopy, for example: forest, reedland. These are based on Atkinson (1985), with the following abbreviated definitions:

*Forest:* more than 80% trees in the canopy.

*Treeland:* less than or equal to 80% trees in the canopy.

*Scrub:* More than 80% shrubs in the canopy.

*Sbrubland:* Less than or equal to 80% shrubs in the canopy.

*Tussockland:* Herbaceous plants, including grasses, land sedges and rushes, with leaves densely bunched at the base. This includes flax and toetoe.

*Grass/Sedge/Rusbland:* Herbaceous monocotyledons with narrow linear leaves not densely bunched at the base.

*Reedland:* Tall herbaceous monocotyledons with linear leaves containing spongy mesophyll tissue.

*Fernland:* dominated by ferns.

*Sandfield:* Bare sand exceeds the area covered by any one class of plant growth form.

*Treefernland:* Dominated by treeferns.

*Vineland:* Dominated by vines.

*Herbfield:* dominated by small herbaceous plants not included in the above categories.

**Vegetation Type:** A term, which includes the dominant canopy species and structural class of an area of vegetation, for example: rimu/tawa-kamahi forest, *Ficinia nodosa*/*Muehlenbeckia complexa* sedge-vineland.

In addition, cover values and tiers are included, i.e:

(tawa): less than 5% cover of the bracketed species.

(rimu)/tawa: indicates less than 5% cover of rimu emergent over a canopy of tawa.

tawa-hinau: indicates tawa and hinau occur in the same tier.

⇔: mosaic of vegetation types

**Viability:** Refer to Recommended Area for Protection Selection Criteria.

**Vineland:** Refer to Vegetation Structural Class.

**Vulnerable:** Refer to Recommended Area for Protection Criteria.

# Appendix 9

## LIST OF STUDY AREAS FOR WHICH FIELD SURVEYS WERE UNDERTAKEN

| STUDY AREA | NAME (RAP NO.)                     | GRID REFERENCE      |
|------------|------------------------------------|---------------------|
| 1a         | Ohinekoao (RAP 27)                 | NZMS 260 V15 375613 |
| 1b         | Awakaponga (RAP 14; part)          | NZMS 260 V15 365572 |
| 1c         | Awakaponga (RAP 14; part)          | NZMS 260 V15 380584 |
| 4          | Tuhua Wetland (RAP 29; part)       | NZMS 260 V15 366552 |
| 4a         | Tuhua Wetland (RAP 29; part)       | NZMS 260 V15 365548 |
| 5a         | Manawahe Scarp (RAP 52; part)      | NZMS 260 V15 360553 |
| 5b         | Manawahe Scarp (RAP 52; part)      | NZMS 260 V15 362562 |
| 6          | Otuhepo (RAP 34)                   | NZMS 260 V15 350524 |
| 7          | McIvor Road (RAP 9)                | NZMS 260 V15 335484 |
| 8          | Ohinetewai (RAP 57)                | NZMS 260 V15 368496 |
| 9a         | Rotoehu Extension (RAP 56; part)   | NZMS 260 V15 300515 |
| 9b         | Rotoehu Extension (RAP 56; part)   | NZMS 260 V15 288506 |
| 11         | Waipapa Stream (RAP 32)            | NZMS 260 V15 315555 |
| 12         | Tokerau (RAP 33)                   | NZMS 260 V15 140525 |
| 14         | McPhail Road (RAP 10; part)        | NZMS 260 U14 890705 |
| 16a        | Pongakawa Stream (RAP 51; part)    | NZMS 260 V15 157556 |
| 16b        | Pongakawa Stream (RAP 51; part)    | NZMS 260 V15 157560 |
| 18         | Te Pareoterawahirua (RAP 46)       | NZMS 260 V15 235664 |
| 19         | Mangorewa                          | NZMS 260 U15 823518 |
| 23         | Mangorewa Extension (RAP 53)       | NZMS 260 U15 873528 |
| 24         | Lagoon Rd (RAP 54)                 | NZMS 260 U15 875518 |
| 25         | Upokokotio Stream Extension        | NZMS 260 U15 855605 |
| 26         | Mid Mangorewa Gorge (RAP 12; part) | NZMS 260 U15 926543 |
| 27         | Rataroa Stream - Te Ahuru (RAP 38) | NZMS 260 U14 717710 |
| 28         | Mid Mangorewa Gorge (RAP 12; part) | NZMS 260 U15 955555 |
| 31         | Onaia Stream                       | NZMS 260 U15 985540 |
| 32         | Te Iringa (RAP 31)                 | NZMS 260 U15 030540 |
| 33         | Upper Kaituna (RAP 55)             | NZMS 260 U15 038510 |
| 33a        | Onepu Stream                       | NZMS 260 U15 043518 |
| 34         | Taheke Geothermal (RAP 15)         | NZMS 260 U15 046498 |
| 35         | Pokopoko (RAP 30)                  | NZMS 260 U15 082567 |
| 36         | Maniatutu Road Bush                | NZMS 260 U15 400505 |
| 37         | Kaituna River (RAP 44)             | NZMS 260 U15 058597 |
| 38         | Ohineangaanga Stream (RAP 23)      | NZMS 260 U15 997683 |
| 39         | Waiari Stream (RAP 24)             | NZMS 260 U15 012682 |

| STUDY AREA | NAME (RAP NO.)                                 | GRID REFERENCE      |
|------------|------------------------------------------------|---------------------|
| 40a        | Lower Mangorewa Gorge (RAP 13; part)           | NZMS 260 U15 057665 |
| 40b        | Mid Mangorewa Gorge (RAP 12; part)             | NZMS 260 U15 001588 |
| 40c        | Mid Mangorewa Gorge (RAP 12; part)             | NZMS 260 U15 968572 |
| 40d        | Lower Mangorewa Gorge (RAP 13; part)           | NZMS 260 U15 045645 |
| 41         | Otawa-Otanewainuku (RAP 8; part)               | NZMS 260 U15 955660 |
| 42         | Mangatoi Stream (RAP 11)                       | NZMS 260 U15 965626 |
| 43a        | Whataroa Gorge (RAP 28)                        | NZMS 260 U15 950604 |
| 44         | Opuiaiki River (RAP 7)                         | NZMS 260 U15 763685 |
| 44a        | Waiwhakarewarewa stream (RAP 50)               | NZMS 260 U15 738554 |
| 45         | Tautau Stream - Kopurererua Stm (RAP 42; part) | NZMS 260 U15 845660 |
| 46a        | Otawa-Otanewainuku (RAP 8; part)               | NZMS 260 U15 912615 |
| 46         | Unnamed                                        | NZMS 260 U15 914604 |
| 47         | Unnamed                                        | NZMS 260 U14 906690 |
| 48         | Unnamed                                        | NZMS 260 U14 906690 |
| 49         | Otawa-Otanewainuku Extension (RAP 45)          | NZMS 260 U15 912665 |
| 50         | Omanawa East Extension (RAP 25)                | NZMS 260 U15 825671 |
| 51         | Waipapa (RAP 17)                               | NZMS 260 U14 705820 |
| 52         | Whakamarama B                                  | NZMS 260 U14 713810 |
| 53         | Whakamarama C                                  | NZMS 260 U14 713797 |
| 55         | Whakamarama (RAP 4; 6C2B, 6C2C, 6C2D, 5D2)     | NZMS 260 U14 738762 |
| 56a        | Tautau Stm - Kopurererua Stm (RAP 42; part)    | NZMS 260 U14 826735 |
| 56b        | Omanawa Extension - West                       | NZMS 260 U14 818735 |
| 59         | Wainui River (RAP 1; part)                     | NZMS 260 U14 701845 |
| 60a        | Kaukaumoutiti Stream (RAP 21)                  | NZMS 260 U15 723675 |
| 60b        | Kaukaumoutiti Stream                           | NZMS 260 U14 745705 |
| 63a        | Wainui River (RAP 1; part)                     | NZMS 260 U14 719868 |
| 63b        | Wainui River (RAP 1; part)                     | NZMS 260 T14 697865 |
| 64         | Wainui River (RAP 1; part)                     | NZMS 260 T14 690854 |
| 65         | Whatakao Stream (RAP 36; part)                 | NZMS 260 T14 681882 |
| 66         | Whatakao Stream (RAP 36; part)                 | NZMS 260 T14 691880 |
| 67         | Wainui River (RAP 1; part)                     | NZMS 260 T14 698856 |
| 68         | Unnamed                                        | NZMS 260 V15 374542 |
| 69         | Henderson Western Tram (RAP 41)                | NZMS 260 T15 690690 |
| 76         | Raparapahoe Stream (RAP 40)                    | NZMS 260 U14 995705 |
| 81         | Kakahu Road (RAP 49)                           | NZMS 260 T15 659624 |
| 82         | Putangi Stream (RAP 2)                         | NZMS 260 T14 636733 |
| 84         | Te Weraiti (RAP 3)                             | NZMS 260 T14 660720 |
| 86         | Omahine Stream A (RAP 5)                       | NZMS 260 T15 663670 |
| 87         | Western Whaiti Kuranui (6C1) (RAP 6; part)     | NZMS 260 T15 688608 |
| 90         | Mangakurukuru stream (RAP 37)                  | NZMS 260 U14 764820 |

| STUDY AREA                     | NAME (RAP NO.)                                 | GRID REFERENCE      |
|--------------------------------|------------------------------------------------|---------------------|
| 93                             | Tautau Stm - Kopurererua Stream (RAP 42; part) | NZMS 260 U14 840705 |
| 94                             | Waiorahi Stream (RAP 39)                       | NZMS 260 U14 860719 |
| 95                             | Unnamed                                        | NZMS 260 T14 615853 |
| 96                             | Graveson Road (RAP 16)                         | NZMS 260 T14 638805 |
| 98                             | Omahine Stream B (RAP 20)                      | NZMS 260 T15 656667 |
| 106                            | McPhail Road (RAP 10; part)                    | NZMS 260 U15 896694 |
| 107                            | Oropi Forest (RAP 43)                          | NZMS 260 U15 912695 |
| 125                            | Mangapouri Gorge                               | NZMS 260 U15 877505 |
| 127                            | Blaymires Wetland                              | NZMS 260 V15 126595 |
| 129                            | Otawa West (RAP 18)                            | NZMS 260 U14 925716 |
| 130                            | Pukunui (RAP 19)                               | NZMS 260 U14 925753 |
| 137                            | Mid Mangorewa Gorge (RAP 12; part)             | NZMS 260 U15 994567 |
| 138                            | Onaia Extension Winston Fleming                | NZMS 260 U15 004547 |
| 152a                           | Mangaone Extension (RAP 35; part)              | NZMS 260 V15 305467 |
| 152b                           | Mangaone Extension (RAP 35; part)              | NZMS 260 V15 296455 |
| 153                            | Hauone Stream Wetland (RAP 47)                 | NZMS 260 V15 297647 |
| 154                            | Matamanu (RAP 48)                              | NZMS 260 V15 287629 |
| 159                            | Fletchers Road Bush                            | NZMS 260 V15 167558 |
| - (Beadel 1994a <sup>1</sup> ) | Otamarakau (RAP 22)                            | NZMS 260 V15 262691 |
| - (Beadel 1985a <sup>1</sup> ) | Otawa-Otanewainuku (RAP 8; part)               | NZMS 260 U14 950730 |

1. Not field surveyed.





# Appendix 10

## LIST OF SITES NOT SURVEYED OR EVALUATED

| STUDY AREA  | NAME                      | GRID REFERENCE      |
|-------------|---------------------------|---------------------|
| 36          | Maniatutu Rd Bush         | NZMS 260 U15 100505 |
| 88          | Unnamed                   | NZMS 260 T15 672558 |
| 89          | Kakahu Stream             | NZMS 260 T15 644558 |
| 96          | Joyce Road - Pyes Pa Road | NZMS 260 U14 850754 |
| 119         | Te Puna Stream            | NZMS 260 U14 752822 |
| 144         | Mangakarengorengo River   | NZMS 260 U14 791744 |
| 160         | Rocky Cutting Road        | NZMS 260 U14 960790 |
| 204         | Upper Herepuru Road       | NZMS 260 V15 343568 |
| (No number) | Parawhenuamea Stream      | NZMS 260 U15 032670 |



# Appendix 11

## OTANEWAINUKU ECOLOGICAL DISTRICT PNAP SURVEY FORM

## OTANEWAINUKU ECOLOGICAL DISTRICT PNAP SURVEY FORM

STUDY AREA NAME  DATE

STUDY AREA NO.  RECORDER  RAP NO.  AREA

|                           |                              |
|---------------------------|------------------------------|
| OWNERSHIP (address/phone) | LAND OWNER ATTITUDE/COMMENTS |
|---------------------------|------------------------------|

NZMS 260  GRID REF.  AERIAL PHOTO  ALTITUDE

LAND SYSTEM  BIOC. ZONE  MEAN SLOPE

SLOPE RANGE  PREDOM. ASPECTS  ASPECT RANGE

Vegetation Dynamics ☐ Primary ☐ Secondary ☐ Modified ☐ Don't Know

|                                   |                          |      |                          |        |                          |     |                          |            |       |
|-----------------------------------|--------------------------|------|--------------------------|--------|--------------------------|-----|--------------------------|------------|-------|
| Representativeness                | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know | Notes |
| Diversity and pattern             | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know |       |
| Rarity, special features          | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know |       |
| Naturalness                       | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know |       |
| Long-term viability               | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know |       |
| Size and shape                    | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know |       |
| Fragility and threat              | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know |       |
| Buffering & surrounding landscape | <input type="checkbox"/> | High | <input type="checkbox"/> | Medium | <input type="checkbox"/> | Low | <input type="checkbox"/> | Don't Know |       |

| Threats      | Degree (NLMH) | Comments (weed species, wild animal species) |
|--------------|---------------|----------------------------------------------|
| Grazing      |               |                                              |
| Weeds        |               |                                              |
| Wild Animals |               |                                              |
| Drainage     |               |                                              |
| Erosion      |               |                                              |
| Fire         |               |                                              |
| Clearance    |               |                                              |
| Topdressing  |               |                                              |

| Requirements | Degree (NLMH) | Comments (weed species, wild animal species) |
|--------------|---------------|----------------------------------------------|
| Fencing      |               |                                              |
| Protection   |               |                                              |

|                                                                                                            |        |
|------------------------------------------------------------------------------------------------------------|--------|
| BIRDS                                                                                                      | PLANTS |
| OTHER VALUES: (Landscape, cultural, recreational, educational, economic, historical, spiritual etc.) (LMH) |        |



**ECOLOGICAL UNITS WITHIN THE NATURAL AREA**

| Vegetation Type | % Cover | Canopy Height | Landform Type |
|-----------------|---------|---------------|---------------|
|                 |         |               |               |

**ECOL. PATTERN**

Notes, vegetation type descriptions, species lists, references, sketch map or map cutout.