

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

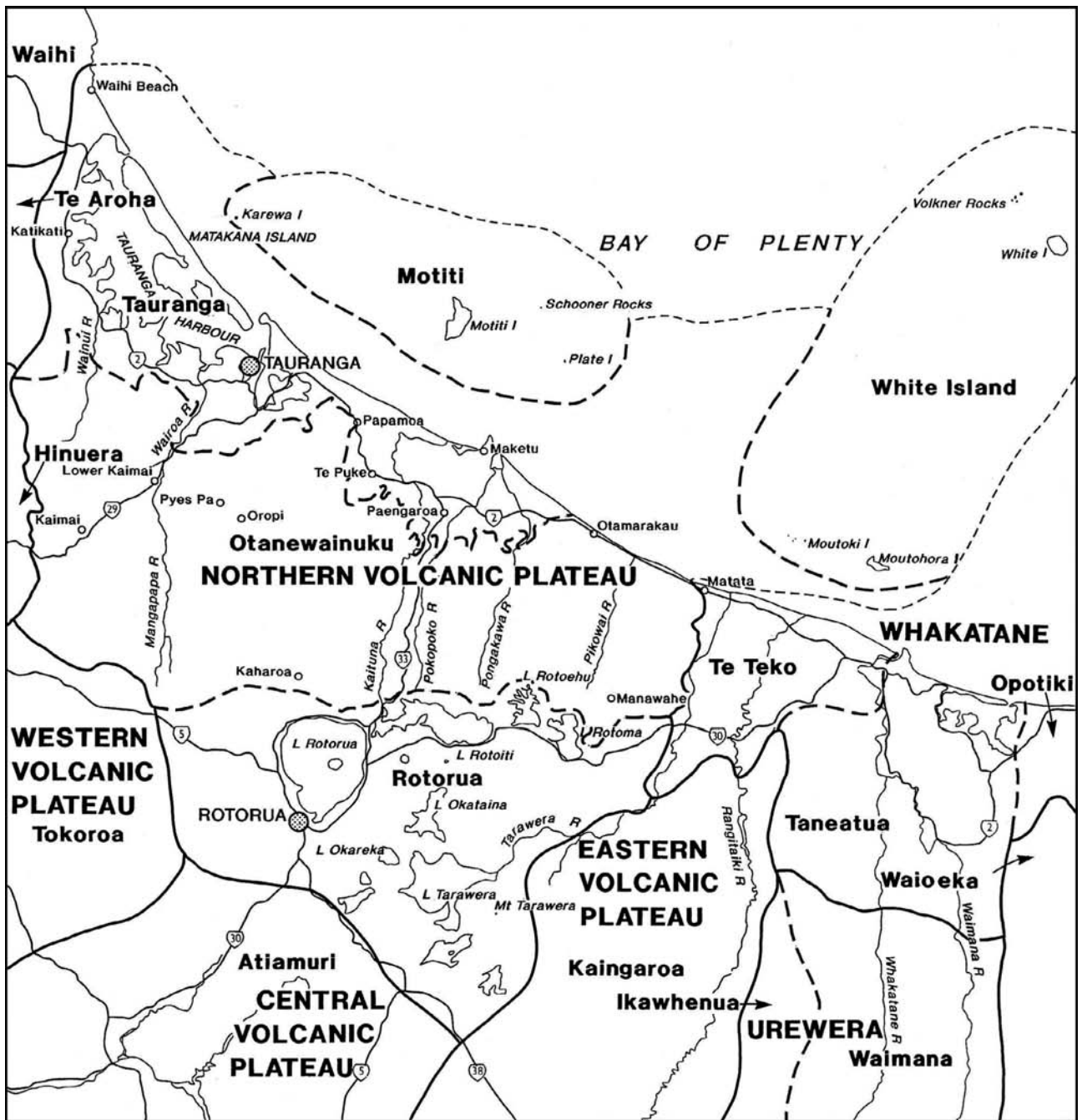
LOCATION AND SETTING

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 Papamoia 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.



KEY

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| | River/Coastline |
| | Town/City |
| | Ecological District |
| | Ecological Region |

Figure 1. Location of Otanewainuku Ecological District.

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 (thornblende 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 470 m 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 3152mm and 3940mm and can be as high as 4728mm. 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 lenticulitic 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 platy 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; Fluvialite 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 (enticulite)). 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. Otuhupo 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.