

WAIAPU ECOLOGICAL DISTRICT

Survey report for the
Protected Natural Areas Programme

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Waiapu Ecological District

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Protected Natural Areas Programme

J. R. Leathwick, B. D. Clarkson, B. R. Burns,
J. G. Innes, M. C. Smale

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Cover photograph: A Waiapu Ecological District landscape, ridges between Tolaga Bay and Hikurangi Maunga.

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Foreword

Early pastoralists cleared the indigenous forests of the Waiapu Ecological District - the hill country north of Gisborne - with single-minded enthusiasm. Not all this land proved to be sustainable in pasture. The district is well known for its erosion problem, and secondary forests are now more extensive than the small remnants of the original indigenous forests.

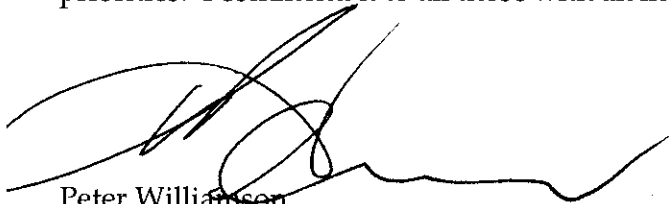
These two factors together bring a focus on the district's special character. On the one hand, successive Governments have recognised a need to assist today's landowners in dealing with catastrophic erosion. On the other, the distinctive indigenous elements of the landscape are under threat and need active protection.

This report of a survey of the district for the Protected Natural Areas Programme is one response to these needs. It has been prepared by Manaaki Whenua - Landcare Research New Zealand Ltd, working on contract to the East Coast Conservancy of the Department of Conservation.

The report presents a set of Recommended Areas for Protection (RAPs). Collectively the RAPs represent the best of the range of natural ecological diversity that has survived outside the district's few existing protected natural areas. Protection of these areas is important for a sustainable future. Without them the Waiapu Ecological District will lose what indigenous character it has been able to retain.

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

This report contains much information on the ecological character of the Waiapu Ecological District. As such it is a significant reference work as well as a guide to conservation priorities. I commend it to all those with an interest in the land and its biodiversity.



Peter Williamson
Regional Conservator
Department of Conservation
East Coast

Abstract

The Waiapu Ecological District and parts of the Motu Ecological District - totalling some 390 000 ha - were surveyed for the Protected Natural Areas Programme to assess the representativeness of existing Protected Natural Areas and to recommend additional areas for protection. A total of 555 sites containing approximately 65 000 ha were visited, and their ecological character was described. Large areas of primary forest survive only in montane areas, with generally small, isolated fragments of primary forest remaining in the lowlands. Conversely, secondary vegetation is more common at low altitudes.

Existing protected natural areas comprise only approx. 8400 ha or 2% of the study area. They are concentrated mostly in the west, and are strongly biased towards high-altitude sites. Protected areas at lower altitudes contain either small fragments of primary forest or more extensive areas of advanced secondary vegetation on reverted farmland.

A total of 152 sites, comprising 31 000 ha or 8% of the Ecological District, have been identified as Recommended Areas for Protection. They encompass a much wider range of ecosystems than the existing protected areas, and include freshwater wetlands, estuaries, and dunelands in addition to forest and scrub. The selection process has been guided by the principle of attempting to represent the full range of indigenous ecosystems on different land types throughout the study area.

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1. Introduction

The goal of the Protected Natural Areas Programme (PNAP) is to establish a network of reserves which is representative of the full range of New Zealand's natural diversity as embodied in the Reserves Act 1977 (Section 3(1) (b)). This identifies the need for:

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

The PNAP works in a two-stage process. First, it involves the identification of the best remaining examples of natural ecosystems and landscapes which, if protected, would improve the representativeness of the current reserves network. Second, it initiates moves to protect identified areas of high conservation value, sometimes through acquisition of land, but more generally through making owners aware of the conservation value of their land, and encouraging formal protection by mechanisms such as conservation covenants through the Department of Conservation or the Queen Elizabeth the Second National Trust. Rather than being carried out on a piecemeal basis, the assessment of the conservation value of particular sites use a subdivision of New Zealand into Ecological Regions and Districts (Simpson 1982) as a framework.

PNAP surveys of a number of Ecological Districts in East Coast Conservancy were carried out between 1983 and 1990 (Motu - Clarkson *et al.* 1986; Pukeamaru - Regnier *et al.* 1988; Turanga - Clarkson and Clarkson 1991 - Fig. 1). The need to carry out a similar survey of the Waiapu Ecological District became apparent with the setting up of the East Coast Forestry Project, designed to facilitate the establishment of plantation forest on erosion-prone land through the provision of Government subsidies (Ministry of Forestry 1993). As a result of this scheme it became necessary for the Department of Conservation to have a rational basis on which to assess the conservation value of land proposed for planting with exotic species. Landcare Research New Zealand was therefore commissioned to carry out a PNAP survey of the Ecological District, not only to fulfil this immediate need but also to provide information needed for planning future conservation management in the district.

The study area (Fig. 1) consisted of the Waiapu Ecological District as shown on the third edition maps of Ecological Districts and Regions of New Zealand (McEwen 1987), and two smaller additional areas: the middle parts of the Tapuaeroa catchment in the north, and parts of the Motu catchment in the southwest. Although both additional areas are nominally part of the Motu Ecological District, the 1983 survey of that district concentrated on the more westerly coastal forests, and these areas were not surveyed then. Formal adjustments to Ecological District boundaries are proposed as a result of the Waiapu survey.

The PNAP survey was structured into four main phases:

- (i) a description of the ecological character of the District was built up from a review of existing published and unpublished information - see Chapter 2;
- (ii) remnants of natural vegetation were identified, visited and described - methods for this phase are described in Chapter 3, and results in Chapter 4;
- (iii) information from the first two phases was then used to assess the adequacy with which existing Protected Natural Areas (PNAs) encapsulate the character of the Ecological District - reported on in Chapter 5; and

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

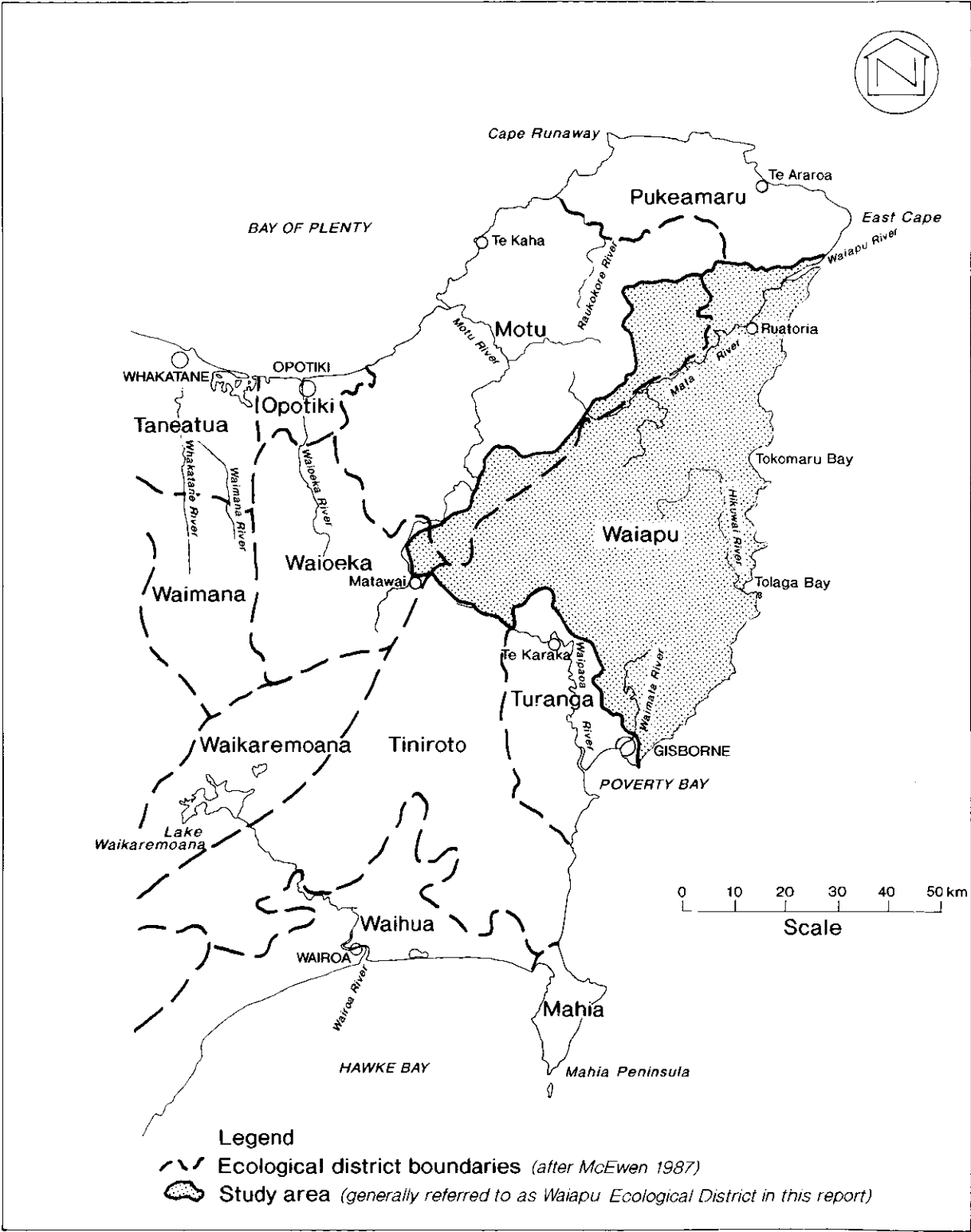


Fig. 1 - Location of the Waiapu Ecological District.

2. Ecological Character of Waiapu Ecological District

2.1 Location and setting

The study area boundary encompasses nearly 390 000 ha, with the Waiapu Ecological District as defined by McEwen (1987) containing 340 000 ha, and the additions (Fig. 1) containing a further 50 000 ha. It is roughly triangular, with the corners defined by Gisborne City in the south, the Waiapu River mouth in the northeast, and Maungahaumi in the west.

The topography is typically dissected hill country, mostly less than 600 m altitude (Fig. 2), but with higher hills and some plateaux in the west towards the Raukumara Range. Major river systems of the study area include the Waipaoa, which drains from the southwest to the southeast of the study area, and reaches the coast south of Gisborne City; the smaller Waimata, Pakarae, and Uawa Rivers which drain the eastern coastal hill country north of Gisborne; and the Waiapu River, which flows into the sea in the far northeast of the study area, but whose headwaters stretch back southwest and inland for around 70 km, draining a large part of the eastern side of the main divide. The coastline consists of alternating bays and rugged promontories, often fringed with cliffs.

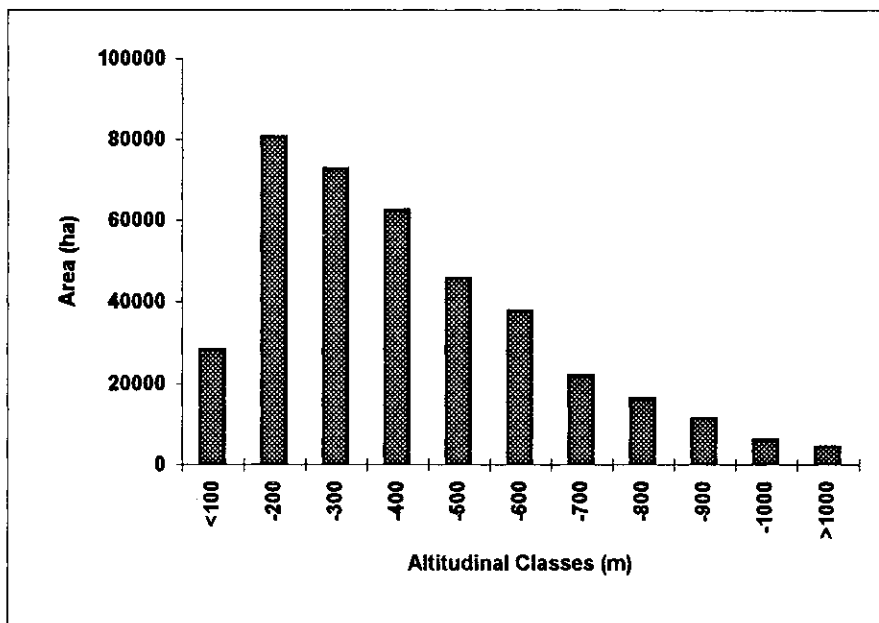


Fig. 2 - Altitudinal distribution of land in the study area

2.2 Geology and landforms

Recent studies have identified three broad geological zones in the study area (Moore and Mazengarb 1992). In the northwest, and to the west of the Hikurangi Fault, indurated sandstones and mudstones of the Motu Block form the main divide of the Raukumara Range, including the peak of Hikurangi at 1752 m, the highest point on the North Island axial ranges.

North of Te Puia, and to the west in the headwaters of the Waipaoa River, lies a series of sandstone and mudstone sheets, with some limestone. These have been displaced a large distance from their place of deposition, resulting in a very complex internal structure, with

the layers often tightly folded, fractured, and intensely sheared. This material is locally very erosion-prone, as typified by the Tapuaeroa Valley, where the often severely eroded lower slopes are dominated by the commanding peaks of Aorangi, Wharekia, and Taitai, all formed from harder sandstone. Similarly, in the headwaters of the Waipaoa River extensive deep slumping and earthflows led to the planting of Mangatu Forest.

Similar rock units occur in the rest of the Ecological District, i.e., to the east, but only locally at the ground surface - they are generally overlain by a thick sequence of more recent (Miocene-Pliocene) mudstone, alternating sandstone and mudstone, sandstone, and minor limestone. This zone is typified by steep to gently rolling hills, with a number of high plateaux formed on thick sandstone along the coast, e.g., Waipare Highlands between Tolaga Bay and Tokomaru Bay.

2.3 Climate

The climate of the Waiapu Ecological District is mild, equable, and well known for its hot, dry, sunny summers. Mean annual temperatures range from 14°C near the coast to 10°C or less on the high peaks (New Zealand Meteorological Service 1985a). The amount of rainfall varies with both altitude and exposure to prevailing winds. Along the eastern coast, where most rain falls with winds from the south to southeast, it ranges from less than 1200 mm in the south around Gisborne to over 1600 mm in the north around Ruatoria (New Zealand Meteorological Service 1985b). It gradually increases with progression inland and to higher altitudes, where more rain falls with winds from the westerly quarter, approaching or exceeding 2000 mm over large areas, and probably reaching a maximum of over 4000 mm on the highest peaks. Rainfall generally has a winter maximum and a summer minimum, except on the coast, where spring, with its frequent prolonged periods of westerly winds, is generally the driest season (New Zealand Meteorological Service 1986). Year to year variation in rainfall is also more marked than in most of the North Island (New Zealand Meteorological Service 1985b), with both prolonged dry periods and periods of very intense rainfall common.

2.4 Soils

Soils of the study area are related to regional-scale variation in rainfall and the depth and nature of volcanic ash (tephra) deposits, and more local variation in landform (M. McLeod, pers. comm.). In hill country, volcanic ash deposits generally survive only on broad stable ridge crests or pockets of rolling land; these sites have Brown or Tephric Recent soils¹ (Yellow-brown loams) under 1200-1800 mm of annual rainfall. As rainfall increases, the soils tend to develop higher P-retention to form Allophanic Brown soils or Allophanic soils (Yellow-brown loams); where rainfall exceeds approximately 2000 mm Podzols (Podzols) become dominant. On steep slopes the volcanic ash has generally been eroded away, and these sites have Recent soils (Yellow-brown and Yellow-grey earths).

Superimposed on this pattern is a trend for both the depth and coarseness of Taupo Pumice and Waimihia lapilli to increase towards the southwest, i.e., closer to Lake Taupo, the source of these tephra. When the sand content increases to over 40% the soils are classified as Pumice soils, with Orthic Pumice soils (Yellow-brown pumice soils) in moderately well and well drained positions, and Perch-gley Pumice soils (Gley soils) in poorly drained locations. Pumice soils may become podsolised under slightly lower rainfall than their counterparts on finer parent materials.

¹ Soil types follow the New Zealand Soil Classification (Hewitt 1992) - equivalent soil types of the New Zealand Genetic Soil Classification (Taylor and Pohlen 1962) are shown in parentheses.

Variation in alluvial soils is linked to topographic position. Low, flood-prone alluvial terraces have well drained Fluvial Recent soils (Recent soils) in levee positions, and poorly drained Recent Gley soils (Gley soils) in back swamp positions; imperfectly drained Mottled Fluvial Recent soils occur in transitional positions. Higher, non-flooding terraces have Brown soils (Yellow-brown loams) or Gley soils (Gley soils) developed in volcanic ash. Soils of the estuaries cover only minor areas, and are Sulphuric Gley soils or Gley Raw soils (Gley soils), depending on the amount of soil development. Similarly, the minor areas of sand dunes have soils classified as Sandy Brown soils (Yellow-brown sands), Sandy Recent soils (Recent soils), or Raw soils (unclassified) depending on the age and soil profile development.

2.5 Historical vegetation cover

The vegetation of the East Coast district is notable as much for its place in early European botanical exploration as for its composition. In October 1769, Joseph Banks and Daniel Solander, scientists travelling with Cook on the *Endeavour*, made extensive collections from Anaura Bay and Tolaga Bay. Other notable early botanists who visited the area include William Colenso and Thomas Kirk. The latter was greatly impressed by the forests of the district, commenting "The extensive forest districts exhibit great variety and luxuriance, differing but little from the best forest of the North Auckland district, except in the total absence of kauri (*Agathis australis*, Salisb.)" (Kirk 1896). Although much of the coastal forest had been cleared by Maori at the time of European settlement (McGlone 1983), and large-scale clearing for pastoral farming commenced in the 1880s, at the time of Kirk's writing the district was still largely forested. But from this time onwards, the pace of development of land for agriculture increased, resulting in a progressive and almost complete removal of the original forest cover. However, despite the extent of this deforestation, reconstruction of the general nature of the original forest cover is possible from the remnants that survive.

Variation in forest composition at a regional level was most marked along the gradient from coastal sites, with their drier and warm, relatively frost-free climates, to higher-altitude and inland sites with their wetter, cooler climates. The primary forests of the coastal lowlands were generally dominated by broadleaved trees such as kohekohe², puriri, titoki, and tawa, with karaka and pohutukawa locally common, particularly along the coastal fringe. Away from the coast and with increasing altitude first puriri and then kohekohe gradually diminished in importance, and tawa assumed dominance, generally accompanied by pukatea, rewarewa, and scattered northern rata and hinau, and all overtopped by emergent conifers including kahikatea, rimu, matai, totara, tanekaha, and/or miro.

Above about 600 m a gradual transition to beech forest began, with tawa joined by red and silver beech, along with kamahi and tawari, and with rimu, miro, and Hall's totara the more common emergent conifers. Above about 750 m tawa generally dropped out, and the number of emergent conifers gradually declined, so that by about 850 m red and silver beech were almost entirely dominant, with only scattered miro and Hall's totara, and with broadleaf, tawari, kamahi, *Dracophyllum* spp., and toro in the understorey. Red beech gradually diminished above this altitude, disappearing by about 1050 m, and leaving almost pure silver beech forests to form the treeline on the highest peaks, sometimes with mountain toatoa, pink pine, or kaikawaka, particularly on harsh sites.

Superimposed on this broad regional pattern was the more local variation associated with change in topography, particularly in the lowlands. Here, for example, the more fertile but

² Common names and their scientific equivalents are listed in Appendix II.

often gleyed soils of the lowland alluvial terraces - such as the Uawa River flats behind Tolaga Bay - were dominated not by broadleaved species but by kahikatea, accompanied by various mixtures of pukatea, totara, matai, puriri, titoki, white maire, lacebark, and/or ribbonwood depending on local site conditions (Photo 1). At higher altitudes, e.g., on terraces along the upper Mata River, kahikatea grew in association with rimu, matai, totara, and tanekaha.



Photo 1. A secondary podocarp stand dominated by kahikatea with occasional matai, totara, pukatea, and tawa growing on deep alluvial soils in the lower reaches of the Uawa River (Paroa Station Y17 694058).

Similar topographically controlled variation also occurred on the hill slopes, where broadleaved species such as tawa, titoki, and kohekohe were generally dominant on Recent soils of average to good fertility on steeper sites, but black beech often formed small enclaves on more drought-prone sites such as rocky ridges or plateau edges (Photo 2). Podocarp forest dominated by matai and totara and with little broadleaved component occurred locally on some high-fertility sites, such as lower toe-slopes with deep accumulations of colluvium.

Similarly, red and silver beech descended to lower altitudes on the older, more stable but less fertile Brown soils common in flat to rolling country than on the more fertile Recent soils occurring on steeper hill country. Consequently, in places like the Mata Plateau, contrasting beech-dominant and broadleaved-dominant communities formed complex, topographically controlled mosaics, with beech-dominant forests on the plateau surfaces but broadleaved forests along gully sides.

Along the coast, sand dunes would have been clothed in indigenous sand-binding species such as spinifex, along with species such as *Austrofestuca*, *Deyeuxia billardieri*, and *Zoysia pauciflora*. In the absence of fire, succession to woody species would have occurred on stable dunes, with early dominance probably by kanuka, and then pohutukawa and other broadleaved species.

Wetlands were never extensive, and many of those present would have supported forest dominated by tree species tolerant of wet soils such as kahikatea and pukatea. The wettest areas would have been covered in harakeke and raupo on more fertile sites, and sphagnum and *Baumea* spp. on less fertile sites, perhaps accompanied by woody species such as

manuka. Disturbance first by Maori, and later by Europeans, has probably resulted in an expansion in the relative abundance of raupo, because of increases in sedimentation and nutrient input.

A variety of vegetation would have occurred on disturbed areas. Where erosion exposed bare mineral soils, early successional vegetation would have been dominated by pioneer woody species such as tutu and kowhai, along with small tree species such as kohuhu and *Pittosporum ralphii*. Successions following fire would probably have been dominated in the initial stages by kanuka and/or manuka, the first on more fertile soils and the second on less fertile, eroded, or poorly drained soils, often accompanied by tauhinu. Bracken may have been locally dominant in some early successions under higher rainfall.

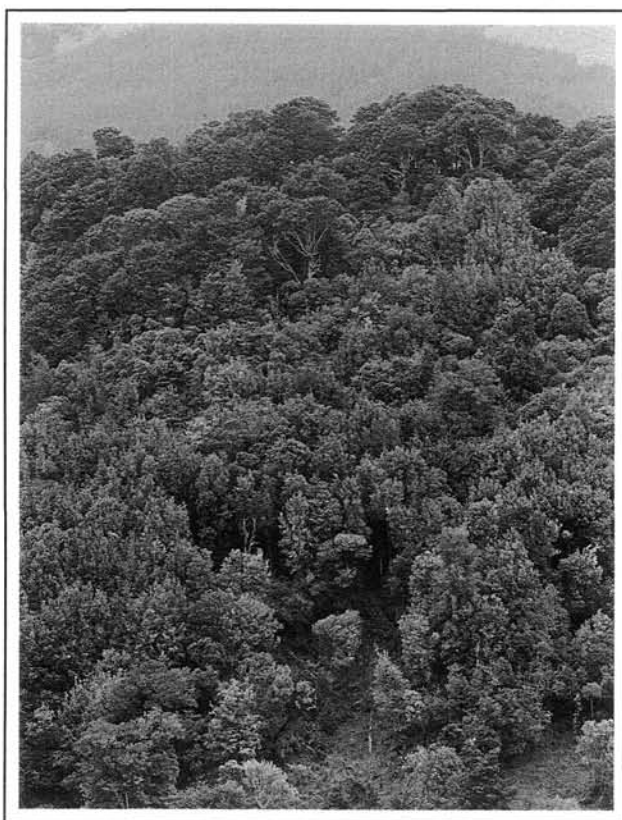


Photo 2. A typical primary forest remnant in lowland hillcountry on Bexhaven Station (Y16 560338) showing typical relationships between species composition and local variation in soil conditions. Tawa is dominant on the sideslopes and black beech on the drier ridgecrests - scattered matai, kahikatea, and rimu would have once formed an emergent tier above the canopy but have been selectively removed probably for their timber.

2.6 Flora

General

A list of 161 species collected from Anaura Bay and Tolaga Bay by Banks and Solander in 1769 (Anon. undated) provides the first botanical record of the district. Approximately 90% of these species are still present, although many are now much reduced in numbers or extent, e.g., tawapou, kowhai ngutukaka, and raukumara (*Brachyglottis perdicoides*). Of the remainder, species such as nau (*Lepidium oleraceum*), mawhai (*Sicyos angulata*), sand daphne (*Pimelea arenaria*), and native dock (*Rumex flexuosus*) have almost certainly become extinct here, as elsewhere. A few, e.g., *Gratiola sexdentata* and *Rorippa gigantea*, may still be present but were not recorded by the present 'rapid survey'.

At least 619 native vascular taxa are known from the district (Appendix I). The flora of higher altitude zones is comparatively well known, owing mainly to the systematic effort of A. P. Druce in surveying the main peaks above tree-line. The lower altitudinal zones have not been as comprehensively surveyed. However, the vascular flora is unlikely to exceed 700 taxa.

Threatened plants

As many as five species included in the latest threatened plant list (Cameron *et al.* 1993) may have already been lost from the District's flora (see above). Eight threatened species are currently known from the District (Appendix I). All are found in other districts, but three (raukumara, *Coriaria pottsiana*, and *Hebe* sp. unnamed) have their strongholds here. Kowhai ngutukaka (*Clianthus puniceus* - kakabeak), a leguminous shrub classified as 'endangered', was recorded by Creswell (1966) in the Mangatokerau River catchment and still occurs there (RAP 25). It was also recorded in the Waipare Highlands in 1985 (Daniel 1985), and although searches in 1991 failed to relocate any plants (Shaw 1993), a single plant has been found subsequently (C. Ward, pers. comm.). The 'endangered' herb *Plantago spathulata* subsp. *picta* occurs on Whangara Island and the adjacent coastal cliffs. At least 100 plants of the 'rare' grass *Austrofestuca littoralis* grow on the Waiomoko River sand dunes (Beadel 1990). The largest known population in New Zealand of the 'local' unnamed *Hebe* (*Hebe* sp. n of Eagle 1982) occurs in Makarori Beach Recreation Reserve; a smaller but still significant population was noted at Knob No. 2 (RAP 145). *Coriaria pottsiana*, a summer-green herb, has its stronghold on the subalpine scree slopes of Mt Hikurangi. It is classified as 'insufficiently known' by Cameron *et al.* (1993) but probably warrants the category 'rare' (B. D. Clarkson, pers. obs.). The 'local' herb *Myosotis saxosa* (incl. *M. amabilis*) occurs in the alpine herbfields of Mts Hikurangi and Whanokao. The largest known population in New Zealand of the 'local' shrub daisy raukumara is at Waimahuru Bay Scenic Reserve, soon to be gazetted (Clarkson *et al.* 1992). Other recent records in the District for this species are Anaura Bay Scenic Reserve and Makarori Point Recreation Reserve. The 'vulnerable' parasitic plant *Dactylanthus taylorii* was found in forest at two sites, the first near Tolaga Bay (RAP 27) and the second inland from Ruatoria (RAP 131).

The 'local' sedge *Desmoschoenus spiralis* (pingao) may have once occurred extensively on dunes, e.g., at the Waiomoko and Pouawa river mouths, and at Whangara, but we are unaware of any confirmed records, either old or recent, of naturally occurring populations. An unnamed *Asplenium* recorded on Maungahaumi, and characteristically found on limestone outcrops in several New Zealand locations, may be considered for inclusion on the threatened plant list once more information on its status is available.

Distributional limits

More than 40 species - mainly alpine and subalpine shrubs, herbs, and grasses - reach their northern limits on Mts Hikurangi, Whanokao, and Raukumara (see Clarkson *et al.* 1986). *Hebe* sp. n of Eagle (1982) reaches its northern limit in the coastal zone at Waihou Bay Road, but further inland occurs on the banks of the Mata River (RAP 140). Tawapou reaches its southern limit at Tolaga Bay. *Coprosma spathulata* ssp. *spathulata* reaches its southern limit in Town Hill Bush (RAP 64).

2.7 Fauna

As elsewhere in New Zealand, there has been a profound reduction in both the number of native bird species present and the abundance of many of those species which have survived - a change which started with the arrival of Maori and continued after the arrival of Europeans (King 1984). This change reflects not only the clearance of forest habitats, but

also the introduction of mammalian predators and competitors such as kiore, ship rat, stoat, and Australian brush-tail possum. The impacts on wildlife in the study area are likely to have been extremely severe, particularly in the lowlands, given the extent of clearance of the original forest cover.

A survey of the East Cape Region to identify Sites of Special Wildlife Interest (SSWI) was carried out by staff of the former Wildlife Service during 1983-85 (Rasch 1989). Confirmed sightings of long-tailed bat have been reported for the study area, but none for the rarer short-tailed bat.

Twelve endangered or threatened bird species occur in the study area, and these are listed in Appendix II along with more widespread species. Many of them are of wetland species. For example, New Zealand dabchick occur on a number of small freshwater ponds and lakes, some of which are in highly modified landscapes. Australasian bittern occur in wetlands with dense vegetation, and their current scarcity reflects the widespread loss of suitable habitat. Banded rail occur at only one or two sites in the East Cape region; Rasch (1989) recorded them at one wetland site within the study area. Spotless crane are more widespread, occurring especially in wetlands dominated by raupo. White heron or kotuku occasionally visit the study area outside their breeding season.

Threatened bird species occurring mainly in shoreline habitats include New Zealand dotterel, banded dotterel, reef heron, and Caspian tern, all of which are threatened by coastal development and human disturbance during breeding.

The remaining threatened species occur in forest or sometimes in scrub and open country. North Island brown kiwi are now largely restricted to the extensive forests of the main divide. Although Rasch (1989) records them as present in the sizeable tract of secondary forest which makes up the Waipare and Nuhiti scenic reserves between Tolaga Bay and Tokomaru Bay, there are no recent records. Parakeet, probably yellow-crowned, have been reported from forests in the west of the study area. North Island kaka have a similar pattern of distribution, with most records from the main forest tract of the Raukumara Range, and only isolated records from forest fragments in lowland areas now largely deforested. In contrast, New Zealand falcon are better adapted to the modified habitats which now prevail in the lowlands, occurring in low numbers throughout the study area, mostly in less developed hill country. The Gisborne hinterland, including the southern part of the Waiapu Ecological District, is now the only mainland area where North Island weka are still found, this species having vanished from most of North Island between the 1890s and 1925. However, even here they are subject to marked population fluctuations, with a sizeable reduction in numbers and range reported just before the production of Rasch's report in 1989.

A range of introduced mammal species occur in the study area. Apart from domestic stock, goats are probably the most widespread and destructive of habitat, having been present in the region since the 1840s (Rasch 1989). Red deer are much less abundant, their numbers having been reduced in early years by government hunters, and more recently by recreational and commercial hunting and live capture. They now occur mainly in forested areas in the west of the study area. Other widespread species include the Australian brush-tail possum, feral pig, ship rat, mouse, ferret, stoat, feral cat, and hedgehog.

Information on the distribution of indigenous fish species is also summarised by Rasch (1989). Numbers of fish species in East Coast rivers, with their predominantly non-forested catchments, are much lower than in rivers west of the main divide, most of which still have forested catchments.

2.8 Land use

Extensive pastoral farming has traditionally been the predominant land use within the study area, with more intensive agriculture and horticulture on the alluvial flats near the mouths of the Waiapu and Uawa rivers. However, extensive erosion over the last three decades, caused especially by intense rainstorms of tropical origin (see e.g., Singleton *et al.* 1989), has led to a recognition of the desirability of transferring extensive areas of erosion-prone land from pastoral farming to forestry (Photo 3). The extent of erosion-prone land within the study area is reflected in the mix of land use capability classes, over 90% of the total land area falling within classes 6-8, in which there are increasing limitations to pastoral use.

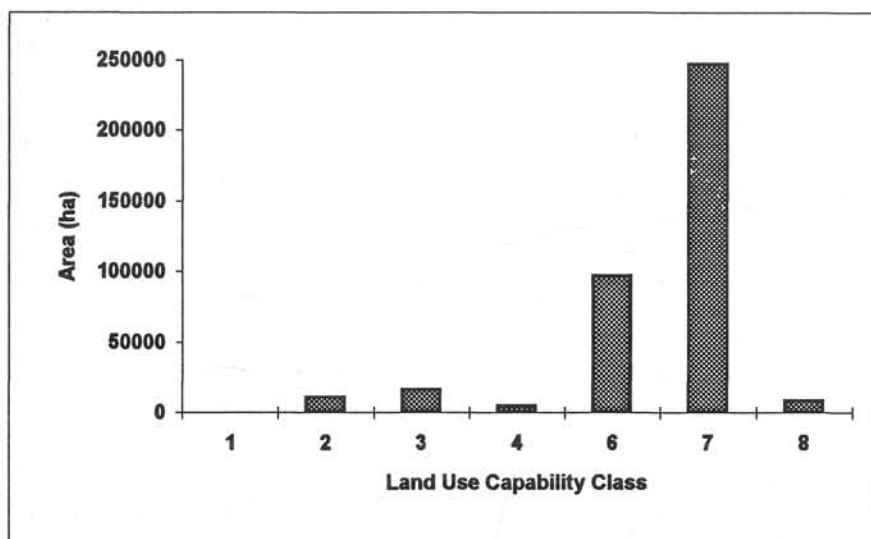


Fig. 3 - Distribution of Land Use Capability Classes in the study area.

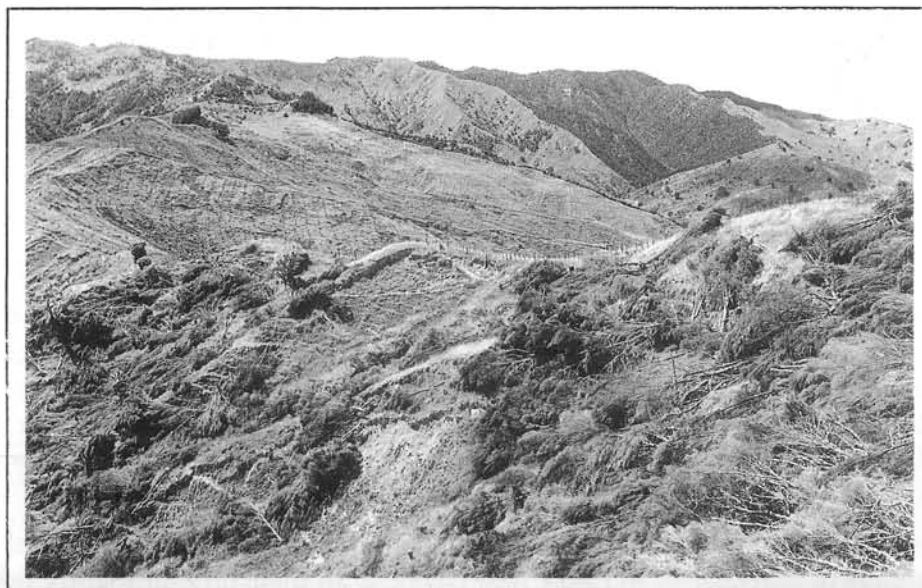


Photo 3. The changing face of land use in the Waiapu Ecological District - recently felled kanuka (foreground) being replaced by *Pinus radiata* plantation. Mangaruaki catchment, looking southeast from Y15 435930.

2.9 Relation to adjoining districts

Five other ecological districts about the Waiapu Ecological District (McEwen 1987), as follows.

Pukeamaru in the northeast encompasses an area of diverse topography centred on the Pukeamaru Range, with a mix of Tertiary sandstone, mudstone, conglomerate, and breccia interspersed with areas of basic volcanic rocks. It has generally higher and more reliable rainfall than Waiapu, a consequence of its greater exposure to rain-bearing westerly and northerly winds. The vegetation is a mix of pasture, scrub, and indigenous forest. Primary forest is much more extensive than in Waiapu, with tawa dominant at lower altitudes, along with black and hard beech; red and silver beech dominate with kamahi and tawari at higher altitudes. In contrast to Waiapu, manuka is locally extensive in secondary communities.

Motu in the west and northwest contains very steep and rugged country centred on the Raukumara Range, and extending out to the Bay of Plenty coast. Geological substrates are mainly hard Cretaceous greywacke and argillite, in contrast to the weaker Tertiary substrates which predominate in Waiapu. The climate varies widely with topography, high-rainfall but mild climates prevailing in the mountains, and drier sunny climates along the coast. Hill-country soils tend to be skeletal and of lower fertility, and this, combined with the climate, has discouraged forest clearance for pastoral farming. In striking contrast to Waiapu, most of the area is forested, with a sequence from podocarp-tawa-hard beech forest at lower altitudes, through podocarp-red beech-silver beech forest and red beech-silver beech forest at middle altitudes, to silver beech forest with kaikawaka general towards the treeline.

Waioeka in the west is similar in geology, topography, and vegetation to Motu but lacks extensive hard beech forests and coastal areas.

Turanga in the southwest is a small district of alluvial plains and low hills surrounding the lower to middle reaches of the Waipaoa River. Although coastal and lowland forests were once extensive, they have now been largely cleared and only small remnants of natural vegetation remain.

Tiniroto in the southwest encompasses an area of hillcountry on Tertiary sandstone, siltstone, and limestone substrates tending to be more stable than in Waiapu, and with a climate which is generally wetter. Although now largely cleared and in semi-extensive pastoral use, it contains scattered remnants of forest whose composition is broadly similar to that found in Waiapu but of greater floristic richness.

2.10 Proposed boundary revisions

As a result of this survey we propose the following formal modifications to the boundary between the Waiapu and Motu ecological districts (Fig. 1).

(1) Move that part of the boundary which currently lies across the lower reaches of the Tapuaeroa River inland so as to include the middle parts of the Tapuaeroa catchment in Waiapu Ecological District.

(2) Move that part of the boundary which lies along the middle reaches of the Waitahaia River by about 3 km to the northwest.

The basis of revision (1) in the Tapuaeroa catchment is as follows. The area features moderate slopes prone to various forms of mass-flow and local gullying. Most of it is deforested and lies in the relatively warm rain shadow of the Raukumara Range. Very

steep rocky peaks standing above lower-gradient 'pedestals' - Taitai, Aorangi, Wharekia, and Hikurangi itself - are very distinctive. These previously were used to judge the unity of this area and to see it as a promontory of Motu District projecting somewhat into Waiapu. While the alpine and forested slopes of Hikurangi clearly have significant similarity to the ecological character of Motu, especially that on Whanokao, the Tapuaeroa area as a whole is more closely allied in its landform, climate, and ecological patterns to Waiapu. Powerful landscape and cultural links between Hikurangi, its associated maunga, and the Waiapu River are additional factors supporting the boundary revision.

Revision (2) in the Waitahaia catchment is less substantial. It is judged more appropriate to include the largely deforested irregular lower slopes of moderate gradient northwest of the Waitahaia River in the Waiapu district, in contrast to the consistently steeper, higher-altitude, mainly forested slopes in the Motu district. The redefined boundary more closely conforms to the essentially ecological judgements of early surveyors and farmers on the suitability or otherwise of the forested land for clearance, rather than using the Waitahaia River as a boundary for mapping convenience.

Some refinement of current ecological district boundaries could also be made in the southwest, where the Waiapu Ecological District abuts the Motu, Waioeka, and Tiniroto ecological districts. The additional areas we have surveyed here probably lie more suitably with Waiapu, or could perhaps form the core of a 'new' ecological district. Final decisions on this are probably best left until a PNAP survey has been completed for the Tiniroto District.

3. Outline of Survey Methods

3.1 Definition of subdistricts

Because of its extent and ecological diversity, the study area was subdivided at the outset of the survey process by Dr C. Ward of the Department of Conservation, Gisborne, into nineteen units or subdistricts of more uniform ecological character (Fig. 4). This subdivision was made mainly on the basis of variation in climate, geology, and landforms, factors which have a powerful influence on the character of a landscape and its vegetation cover. Boundaries were reviewed during the field survey and were refined where necessary. The final subdistricts, detailed below, form a framework for much of the subsequent analysis in this report, on the basis that the ecological character of the District is so highly variable that subdivision into more homogeneous units was required to facilitate the PNAP survey process.

The first seven subdistricts occur in a sweep down the eastern coastline. Because of the generally low altitudes and coastal influences temperatures are warm, with annual means around 13.5°C. Annual rainfall gradually declines from around 1650 mm in the north to around 1250 mm in the south.

1. **Mangaoporo** is characterised by alluvial flats and terraces of the Waiapu River and major tributaries, plus hill country on a jumble of weak argillite and Tertiary rocks. It generally has moderate relief and slopes, with some flows and gullying.
2. **Waipiro** is mainly argillite country of moderate relief, with broad, rounded ridges and gentle or moderate slopes, prone to earth-flow and slumping. There is little volcanic ash in the soils, which are mainly of rather low fertility.
3. **Tokomaru** is characterised by Tokomaru Sandstone which forms steep-sided massifs and bluffs with thin, infertile soils. Because of the base of softer mudstones and alternating beds of sandstones and mudstones, landforms are generally moderately steep and dissected, with soil-slip dominant and minor slumping and earth-flow.
4. **Tolaga** is clustered around the broad alluvial plain of the Uawa River. Its hillcountry landforms are similar to the Tokomaru subdistrict, but without the bold sandstone massifs. The topography is irregular, with some areas of higher relief due to sandstones. Soils are generally of higher fertility than in the Tokomaru subdistrict.
5. **Pakarae**, which has less coastal influence than the previous subdistricts, encompasses an area of irregular topography on Miocene rocks at low altitude. The terrain varies from gentle to steep, and large slumps and earth-flows are common even on moderate slopes.
6. **Whangara** is characterised by broad rolling topography with smooth, rounded ridges and gentle slopes formed on a variety of weak rocks, mainly Miocene mudstone and alternating sandstone and mudstone. Some localised steeper topography occurs near the coast. Soils have high natural fertility, due in part to deposits of tephra.



Fig. 4 - Subdistricts used in this study.

7. **Waimata** is composed of younger and harder rock substrates, and is characterised by moderately steep, dissected hill country, with only minor coastal influence.

The next six subdistricts, although still predominantly at low to intermediate altitudes, are situated more inland, and as a consequence mean annual temperatures (mostly around 12.0-12.5°C) are generally lower than in the more coastal subdistricts to the east. Annual rainfall is also higher, reaching 1700-1800 mm in the north but only about 1400 mm in the south.

8. **Ihungia** is mainly on Miocene rocks, but with some argillite in the north. It has rolling terrain of moderate relief, with broad ridges, and mainly moderate or gentle slopes, subject to considerable earth-flow and slumping, and localised severe gully erosion.
9. **Waiau** has a rather regular pattern of moderately steep-sided valleys and ridges, formed on Miocene mudstone, siltstone, and alternating sandstone and mudstone. There is some soil slip, slumping, and minor earth-flow. Much of the area is covered in plantation forest.
10. **Hokoroa** is similar to Waimata but of higher relief, with strong, younger Pliocene sandstone and siltstone forming a regular pattern of steep finely dissected hill country centred on a prominent high ridge. Steep slopes are very prone to soil-slipping, but scarcely at all to slumping, earth-flow, or gulying. Soils are generally shallow and of low fertility, with ash present only on the generally narrow ridge crests.
11. **Mata Plateau** consists of a somewhat warped and dissected plateau with very broad, flat ridges dipping gently to the northeast, and with deeply incised valleys. Headwater valleys are mainly in weakish Miocene sandstone, steep and irregular, and with soils of low fertility. The lower valleys are mainly in mudstone, prone to flowing, and have more fertile soils. A higher sandstone plateau (Tutamoe) stands above the main plateau in the southwest.
12. **Waingaromia** is characterised by irregular hill country mainly on Miocene mudstone, with rather high relief and variable, mainly moderate slopes prone to slumping, earth-flow, soil slip, and minor gulying. Soils have moderate to high natural fertility.
13. **Waipaoa** is similar in landform to Waingaromia, but of lower relief, with irregular, fine-scale topography and a wide range of slopes. Substrates are mainly Miocene mudstone, but the flow-prone Mangatu formation is also present.

The remaining six subdistricts occur from north to south along the eastern margins of the Raukumara Range, in the west of the study area. Because of their greater altitude and more westerly position relative to the main divide they have both lower mean temperatures (10.0-11.5°C) and higher annual rainfall (1800-2500 mm+) than subdistricts further to the east.

14. **Tapuaeroa** includes a wide altitudinal range from Hikurangi (1752 m) to the lower Tapuaeroa River. It has a distinctive topographic character, with the bold greywacke peaks of Hikurangi, Aorangi, Wharekia, and Taitai standing abruptly on pedestals of weaker greywacke-argillites forming long, gentle ridges and moderate slopes. These slopes are prone to mass earth-flow and gulying.

15. **Waitahaia** is an area of high relief with generally moderate to locally steep slopes flanking the Waitahaia and Mata rivers. Slopes formed mainly on weak greywacke and argillite rocks are prone to slumping and earth-flow.
16. **Mangatu** is similar to Waitahaia but more regular, with high relief and long, moderate slopes developed on argillites. Earth-flows, with localised gullying, are widespread. The subdistrict is mostly in plantation forest.
17. **Mangaotane** lies across the divide into the Motu catchment, and although nominally in the Motu Ecological District is similar in both geology and landform to Mangatu.
18. **Maungahaumi** consists of several subparallel, steep-sided, knobbly ridges of mid-Tertiary limestone, trending NW perpendicular to the main ridge, which culminates at Maungahaumi (1213 m). Limestone faces emerge above weaker early Tertiary rocks on which slopes are moderate, though prone to earth-flows and slumps.
19. **Waitangirua** is an irregular subdistrict having similarities to both Mangaotane and Maungahaumi, with argillite and soft Tertiary rocks of moderate slope, capped by solid sandstone and the limestone edge of Maungahaumi. As for Mangaotane, it lies nominally in Motu Ecological District.

3.2 Collection of field data

Methods used for the field survey component of this study were based largely on the standardised method of Myers *et al.* (1987), but with amendments - Appendix IV should be consulted for a more detailed account. Potential survey targets (study sites) were identified using topographic and cadastral maps and large-scale aerial photographs. Study sites³ generally consisted of a discrete remnant of vegetation, often demarcated by change in cover (e.g., change from forest or scrub to pasture), but sometimes also taking into account changes in land tenure, (e.g., from Crown to freehold tenure). Lower area limits for inclusion varied according to the type of vegetation, with primary forest remnants down to approx. 5 ha, secondary scrub down to approx. 10 ha, and wetlands down to as little as 1 ha included. Existing Protected Natural Areas were also targeted if available descriptions of them were considered inadequate.

Survey targets were then systematically visited on the ground, subject to grant of access by landowners, and data were collected on physical location, site factors, and vegetation composition and condition. The boundaries of major vegetation communities for each study site were drawn in the field, either onto aerial photographs or directly onto topographic maps. Collected data were entered into a Geographic Information System to facilitate subsequent analysis.

³ Definitions for technical terms used in the text are given in Appendix VI.

4. What Natural Vegetation Remains?

In total, 555 study sites were identified and described during the field survey, covering around 65 000 ha or 17% of the total study area, and accounting for the vast majority of the remaining natural vegetation. The majority of study sites were small, often isolated remnants of less than 25 ha in extent; fewer than 10% exceeded 300 ha.

Primary forest accounted by area for 40% of the study sites (Table 1), or 7% of the total study area. Much of this is composed of the extensive montane, beech-dominant forests which occur at higher altitude along the fringes of the Raukumara Range in the west of the study area, i.e., in the Tapuaeroa, Mangaotane, Maungahaumi, and Waitangirua subdistricts (Fig. 5, Table 2). The mainly tawa-dominant forests of the lowland bioclimatic zone (< 750 m) are much less extensive in area, and even less common when considered as a proportion of the total land area at lower altitudes (cf. percentage annotations on Fig. 5). In each of the other 15 subdistricts primary forest accounted for only 1-3% of the total area, and remnants were generally small and scattered. Perhaps not surprisingly primary forests survive predominantly on land of Land Use Capability classes 7 or 8, reflecting past patterns of clearance for agricultural purposes (Fig. 6).

Table 1 Areas and percentages of major vegetation/landform classes across all study sites.

Vegetation/landform class	Total area (ha)	% of total study site area	% of total study area
Primary forest	26278	40	7
Advanced secondary forest	5401	8	1
Secondary forest and scrub	32712	50	8
Freshwater wetland	100	<1	<1
Duneland	57	<1	<1
Estuarine	32	<1	<1
Above treeline	462	1	<1
Exotic pasture/plantation	322	<1	<1
Totals:	65364	100	17

Advanced secondary forest accounts for a much smaller percentage of both the study sites (Table 1) and the total study area, occurring predominantly at low to middle altitudes, and mostly in the Tokomaru subdistrict (Table 2, Fig. 5). It comprises two contrasting types of forest: kanuka-led successions in which forest species such as rewarewa are now abundant, and which occur on steep hillslopes and plateaux predominantly on Tokomaru Sandstone (Photo 4); and much smaller areas of podocarp-dominant secondary forest on alluvial terraces, much of it on the Uawa flats behind Tolaga Bay township (Photo 1).

Secondary scrub and forest which is less successional advanced accounts for most of the remainder, occupying 50% of the area of study sites or 8% of the total study area (Table 1). Again the altitudinal and regional distribution is uneven, with much more at lower than higher altitudes (Fig. 5). Substantial areas occur in the northern and eastern subdistricts, e.g., Tapuaeroa, Mangaoporo, Waipiro, and Tokomaru, and in one western subdistrict, Mangaotane (Table 2). As with the primary forest, little of the secondary scrub and forest occurs on highly productive land (classes 1-6 - Fig. 6), reflected in its comparative absence in the more fertile country of the southern subdistricts, e.g., Pakarae, Whangara, and Waimata. The balance of the area surveyed is composed mostly of vegetation above treeline, estuaries, freshwater wetlands, or dunelands, but none of these exceed 1% of the total area of study sites (Table 1).

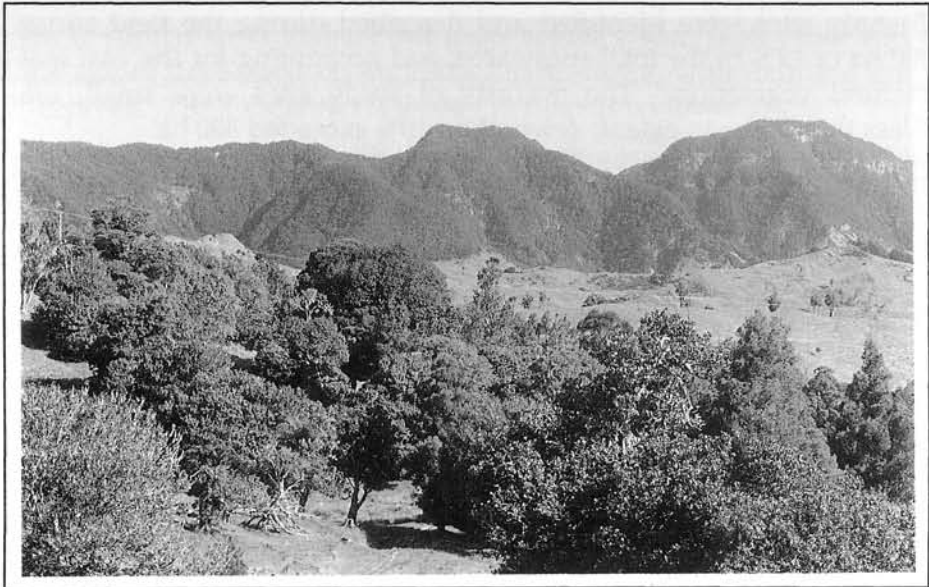


Photo 4. A small fragmented remnant of primary forest in the foreground is overshadowed by the large kanuka-clad massif of the Waipare and Nuhiti Scenic reserves in the background (looking southeast from Z16 720262).

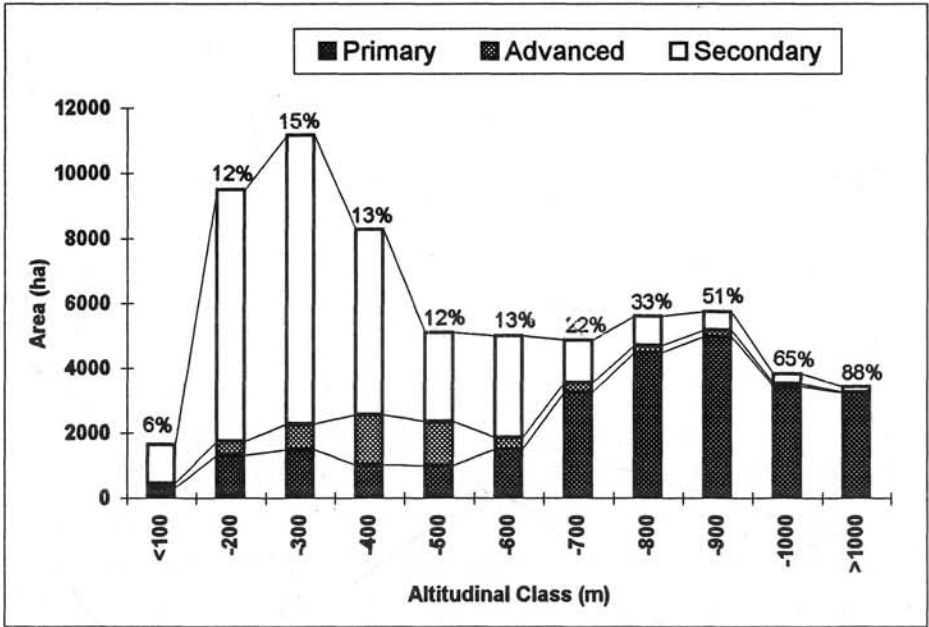


Fig. 5 Distribution of primary forest, advanced secondary forest, and secondary scrub and forest by altitude. Figures above each bar indicate the percentage of the total land area in the altitudinal class that is occupied by indigenous vegetation.

Table 2 Areas of primary forest, advanced secondary forest, and secondary scrub and forest in the 19 subdistricts.

No.	Subdistrict name	Total area	Study areas		Primary		Advanced		Secondary	
			(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
1	Mangaoporo	22805	3231	14.2	535	2.3	14	0.1	2655	11.6
2	Waipiro	27630	8154	29.5	738	2.7	107	0.4	7251	26.2
3	Tokomaru	22671	7431	32.8	272	1.2	3101	13.7	4006	17.7
4	Tolaga	14973	890	5.9	150	1.0	122	0.8	563	3.8
5	Pakarae	14527	460	3.2	228	1.6	50	0.3	182	1.3
6	Whangara	26135	472	1.8	293	1.1	1	<0.1	83	0.3
7	Waimata	15696	531	3.4	193	1.2	0	0	338	2.2
8	Ihungia	13778	1097	8.0	91	0.7	62	0.4	887	6.4
9	Waiau	19268	3085	16.0	174	0.9	261	1.4	2650	13.8
10	Hokoroa	29201	3025	10.4	384	1.3	363	1.2	2278	7.8
11	Mata Plateau	28056	4330	15.4	697	2.5	221	0.8	3243	11.6
12	Waingaromia	24306	954	3.9	400	1.6	207	0.9	344	1.4
13	Waipaoa	18127	954	5.3	311	1.7	49	0.3	594	3.3
14	Tapuaeroa	25748	10992	42.7	5607	21.8	257	1.0	4722	18.3
15	Waitahaia	25256	925	3.7	667	2.6	63	0.2	146	0.6
16	Mangatu	16843	747	4.4	361	2.1	238	1.4	147	0.9
17	Mangaotane	11067	7668	69.3	6321	57.1	4	0.0	1343	12.1
18	Maungahaumi	19704	4547	23.1	3163	16.1	281	1.4	1102	5.6
19	Waitangirua	11784	5871	49.8	5693	48.3	0	0	178	1.5
Totals:		387575	65364	16.9	26278	6.8	5401	1.4	32712	8.4

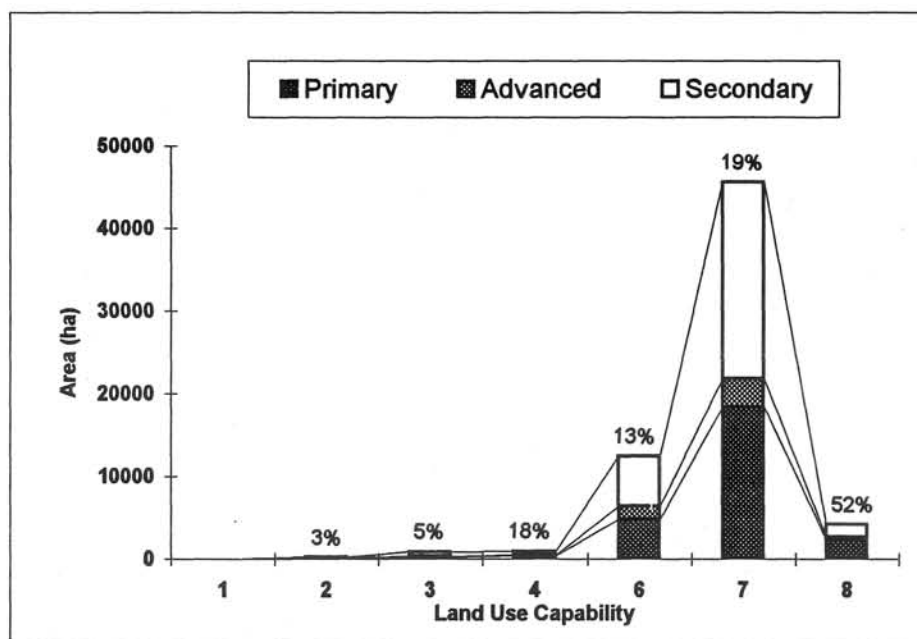


Fig. 6 - Distribution of primary forest, advanced secondary forest, and secondary forest and scrub by Land Use Capability Class. Figures above each bar indicate the percentage of the total land area in the Class that is occupied by indigenous vegetation.

5. What values are currently protected?

Existing Protected Natural Areas (PNAs) total just over 8600 ha in area, or just over 2% of the total study area. Most of these are owned, or in one instance, leased, by the Crown and administered as either Scenic Reserve, Forest Park, Conservation Area, or Recreation Reserve. The remainder are either owned by, or subject to Open Space Covenants with, the Queen Elizabeth the Second National Trust, or under covenants designed to protect former State Forest assets of high conservation value.

Proportion of the various vegetation/landform classes contained within PNAs vary markedly (Table 3), with primary forest, advanced secondary forest, and vegetation above treeline all having much higher representation than secondary forest and scrub, wetlands, dunelands, or estuaries. In part this probably reflects past attitudes to conservation, which have emphasised forest and alpine habitats at the expense of other ecosystems regarded as less worthy of protection.

Table 3 Areas and percentages of major vegetation/landform classes across all study sites, and in Protected Natural Areas (PNAs).

Vegetation/landform class	Total area (ha)	PNA (ha)	(%)
Primary forest	26278	4800	18
Advanced secondary forest	5401	1918	37
Secondary forest and scrub	32712	1600	5
Freshwater wetland	100	3	3
Duneland	57	0	0
Estuarine	32	0	0
Above treeline	462	306	66
Exotic pasture/plantation	322	4	na
Total study sites:	65364	8631	13

Although existing PNAs are reasonably evenly spread across the range of altitudes occurring in the study area (Fig. 8), in proportionate terms (cf. percentage annotations on Fig. 8) much more land has been granted protection at high altitudes than low. The distribution of PNAs across the subdistricts is also very uneven⁴, with nearly 7500 ha or 87% of the total area of PNAs contained within only two subdistricts (Table 4). Tapuaeroa contains extensive lowland-montane forests and alpine scrub, tussockland, and herbfield in the Raukumara Forest Park, and Tokomaru contains several PNAs, most of which protect advanced secondary forest on land abandoned for agriculture. All the rest of the subdistricts have 1% or less of their area set aside in PNAs; seven subdistricts have no PNAs at all. Most PNAs occupy land of low productive potential (Fig. 9), reflecting the distribution of natural vegetation across these classes.

⁴ The geographic locations of all Protected Natural Areas (as numbered in the following descriptions) are shown, along with those of Recommended Areas for Protection in Fig. 11, Chapter 6.

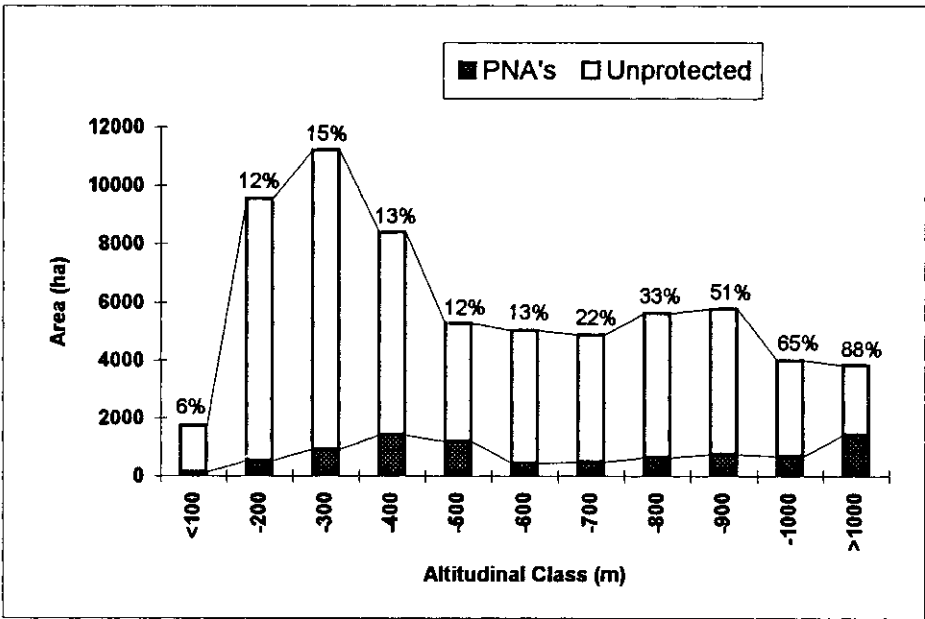


Fig. 8 - Distribution of Protected Natural Areas (PNAs) and unprotected indigenous vegetation in relation to altitude. Figures above each bar indicate the percentage of the total land area in the altitudinal class that is occupied by indigenous vegetation.

Table 4 Extent of Protected Natural Areas (PNAs) in the 19 subdistricts.

No.	Subdistrict name	Total area	PNA (ha)	(%)
1	Mangaoporo	22805	84	0.3
2	Waipiro	27630	83	0.3
3	Tokomaru	22671	3027	13.4
4	Tolaga	14973	88	0.6
5	Pakarae	14527	41	0.3
6	Whangara	26135	23	0.1
7	Waimata	15696	10	0.1
8	Ihungia	13778	0	0
9	Waiau	19268	0	0
10	Hokoroa	29201	397	1.4
11	Mata Plateau	28056	31	0.1
12	Waingaromia	24306	207	0.9
13	Waipaoa	18127	0	0
14	Tapuaeroa	25748	4379	17.0
15	Waitahaia	25256	12	<0.1
16	Mangatu	16843	0	0
17	Mangaotane	11067	0	0
18	Mangahaumi	19704	3	<0.1
19	Waitangirua	11784	0	0
Totals:		387575	8385	2.2

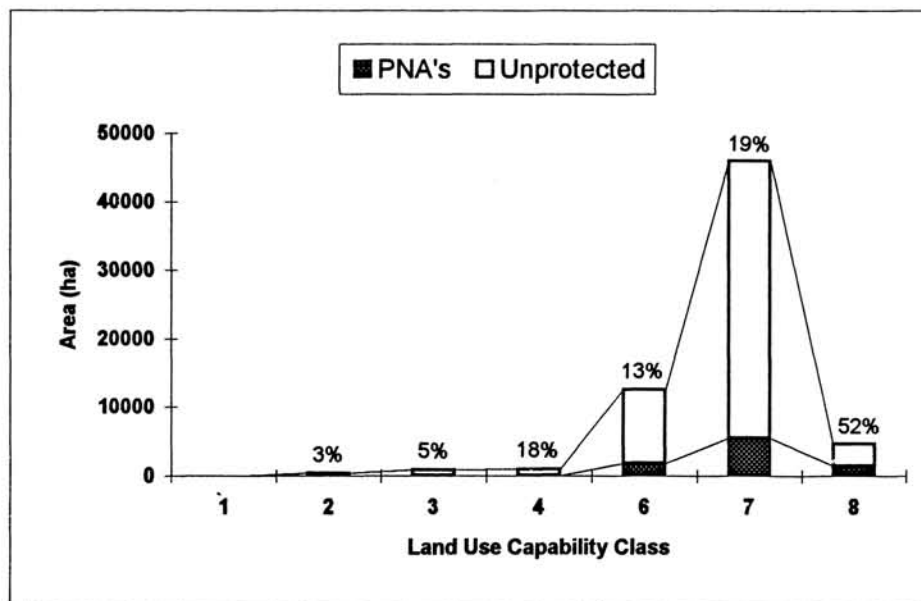


Fig. 9 Distribution of Protected Natural Areas (PNAs) and unprotected natural vegetation in relation to Land Use Capability Classes. Figures above each bar indicate the percentage of the total land area in the LUCC that is occupied by indigenous vegetation.

In the following brief descriptions of features protected by the various existing PNAs, sites are ordered according to the subdistricts described above.

5.1 Mangaoporo

(1) **Poroporo Road Crown Forest Assets covenant** (≈90 ha) lies on the northern boundary of the Ecological District. It consists of a diverse stand of primary hill slope forest in which rimu and occasional northern rata are emergent over a canopy of tawa, hinau, and kohekohe. Other species include miro, tanekaha, rewarewa, pukatea, titoki, nikau, and black beech. The area is currently grazed by cattle.

5.2 Waipiro

(2) **Kuratau Conservation Area** (≈63 ha) is located on the coast northeast of Ruatoria. It contains both a small remnant of coastal forest dominated by tawa, kohekohe, and puriri, and areas of secondary vegetation dominated by kanuka on more intact soils, and by manuka, tauhinu, and toetoe on eroded sites with more skeletal soils. One small patch of pohutukawa grows at the eastern or coastal end of the Conservation Area. Much of the reserve has been badly affected by erosion, and this, together with browsing by feral goats and domestic stock, has allowed invasion by numerous weeds including gorse, sweet briar, privet, and blackberry.

(3) **Herenga Scenic Reserve** (6 ha) is situated near the coast northeast of Ruatoria. This primary forest remnant consists of scattered kahikatea emergent over a canopy of tawa, puriri, kohekohe, and titoki with occasional pohutukawa, karaka, lancewood, pukatea, pigeonwood, rewarewa, mamaku, and lacebark.

(4) **Te Puia Springs Reserve** (14 ha) contains several hot springs. Although most of the secondary scrub surrounding the geothermal areas is dominated by introduced weeds and

planted exotic species, the vegetation immediately adjacent to some of the hot springs is entirely dominated by indigenous, normally coastal species. Arrow grass and *Isolepis cernua* are dominant in the geothermal mires, with sea primrose and batchelor's button growing on mounds and around the margins.

5.3 Tokomaru

(5) **Waimahuru Bay Scenic Reserve** (≈290 ha) is soon to be gazetted. It consists of a small conservation area located in the north of this subdistrict, augmented by an area recently purchased by the Department of Conservation. It contains an area of predominantly secondary coastal vegetation on steep coastal hill slopes, with kanuka the most widespread and dominant tree species. Growing in association with the kanuka are rewarewa and five finger in the canopy and *Helichrysum aggregatum*, raukumara, and/or prickly mingimingi in the understorey. Remnants of primary forest survive in gullies, generally containing tawa, kohekohe, rewarewa, tree ferns, and occasional large puriri. An extensive area of pohutukawa treeland occurs on the steep slopes along the coastal fringe.

Further south are a group of three contiguous reserves occupying a sequence from the coast up onto a high plateau of Tokomaru Sandstone. (6) **Anaura Bay Scenic Reserve** (225 ha) extends from the coast at Anaura Bay 2 km inland on the northern side of the Anaura Stream. Approximately one-third of this area supports diverse primary mixed broadleaved forest on gently sloping terrain, dominated by tawa with puriri, kohekohe, and some kowhai, rewarewa, titoki, cabbage tree, kahikatea, and pohutukawa. The remainder of the area is secondary forest, much of it on dry, exposed hill slopes, dominated by kanuka along with rangiora, bracken, rewarewa, lancewood, mahoe, kohuhu, and tree ferns. Some large puriri, kohekohe, tawa, and kahikatea occur in the gullies. (7) **Waipare and Nuhiti scenic reserves** (≈2137 ha combined) occupy the high plateau and its steep flanks to the north-west of the Anaura Bay reserve. They consist of secondary forest and scrub, with small primary forest remnants dominated by species such as kohekohe, tawa, pukatea, and nikau remaining in some of the deeper gullies. Kanuka, rewarewa, and kamahi are dominant over large areas, but black beech is locally dominant on dry ridges. Important features include cliff sites on which kowhai ngutukaka has been found, relatively unmodified wetlands on the plateau top, and the presence of a wide range of fauna including brown kiwi. Cliff sites are dominated by wharariki, karamu, *Gahnia pauciflora*, and kowhai. The wetlands are dominated by manuka, harakeke, toetoe, raupo, *Hebe stricta*, and species of *Carex*, *Baumea*, and *Eleocharis*.

(8) **Pakaturi Conservation Area** (≈328 ha) lies directly inland from Anaura Bay, and west of the Hikuwai River. It contains a mosaic of secondary kanuka-dominant forest and scrub of varying ages on steep country with many bluffs, but with small elements of the original primary forest left in some of the more protected gullies. Other widespread species include rewarewa, lacebark, cabbage tree, mamaku, and kowhai. Primary forest remnants contain tawa, pukatea, titoki, a few large rimu and kahikatea, and one small patch of black beech. Goats have had a serious impact on the reserve, particularly in the understorey. (9) **S. King Spencer Reserve** (31 ha) is located 10 km north of Tolaga Bay on the banks of the Hikuwai River. Owned by the Queen Elizabeth the Second National Trust, it was set aside to protect an old homestead site surrounded by mature plantings of introduced trees. It also contains small areas of secondary kanuka forest and primary tawa-rewarewa-kohekohe forest, with other species present including kahikatea, kowhai, pukatea, and puriri.

5.4 Tolaga

(10) **Henri Loisel Scenic Reserve** (41 ha) is located in a steep gorge on State Highway 35 just south of Tolaga Bay. It consists largely of secondary forest and scrub dominated by manuka, kanuka, kohuhu, lacebark, five finger, lancewood, cabbage tree, mahoe, rangiora, and mamaku. One small area of primary forest is dominated by tawa, puriri, and rewarewa, with some black beech, tanekaha, and miro. (11) **Norma Leonie Shelton Scenic Reserve** (17 ha) contains a small remnant of primary mixed broadleaved forest surrounded by a fringe of secondary kanuka forest, located on rolling country just south of Tolaga Bay. Tawa, titoki, and rewarewa dominate the primary forest, with lesser amounts of kohekohe, hinau, mahoe, cabbage tree, lancewood, puriri, karaka, lacebark, and pukatea.

Several Open Space Covenants are located in the subdistrict. Four of these are clustered together on the coast, protecting an elongated area of 27 ha of coastal cliff of southerly aspect known as the **Tatarahake Cliffs** (12). These are located along the northern perimeter of Tolaga Bay stretching from Te Karaka Point in the northeast almost to State Highway 35 in the southwest, and are covered with scattered scrub and low forest interspersed with erosion scars. Two larger areas are currently having covenants placed over them. The first of these contains an area of approximately 30 ha of steep, east-facing hillcountry on the high point **Whareopaia** (13) at the north end of the Henry Loisel Scenic Reserve. The vegetation it contains is very similar to that in the Scenic Reserve, with kanuka and scattered rewarewa, black beech, and kohekohe. The second contains an area of approximately 20 ha of secondary kahikatea-dominant forest on **Broadlands Station** (14) on the Uawa River flats behind Tolaga Bay, which has been designated as an RAP (No. 29) in this study.

5.5 Pakarae

This subdistrict contains several small PNAs. (15) **Makaramaea Scenic Reserve** (7 ha) contains a small area of primary forest consisting of scattered kahikatea, totara, and rimu emergent over a canopy of tawa and titoki with scattered rewarewa, hinau, puriri, and kohekohe. Other species include tarata, kowhai, mahoe, and cabbage tree. This is contiguous with an area of 0.7 ha on the adjacent **Kiore Station** (16), over which there is an Open Space Covenant to protect mixed podocarp/broadleaved forest. Further south a 26 ha Open Space Covenant area on **Arataha** (17) contains primary hillslope forest dominated by tawa, titoki, and kohekohe with emergent matai and totara. Two smaller areas on the adjacent **Panikau Station** (18), together totalling just over 8 ha, are also under Open Space Covenants, and contain diverse lowland forest on hillslopes dominated by tawa, puriri, kohekohe, karaka, rewarewa, and titoki, with scattered totara.

5.6 Whangara

Two small coastal reserves lie adjacent to the coast road from Gisborne to Tolaga Bay. (19) **Okitu Scenic Reserve** (≈2.6 ha) consists largely of planted coastal forest, supplementing a small area of natural puriri-kohekohe-karaka forest. Other species include mahoe, cabbage tree, five finger, totara, tanekaha, kohuhu, titoki, and lacebark. Planted species include pohutukawa, with ngaio, karo, akeake, tarata, taupata, and a range of *Hebe* and *Pseudopanax* cultivars. (20) **Makarori Point Recreation Reserve** (≈7 ha) to the north contains a small area of modified coastal forest and secondary vegetation on a steep southeast-facing slope. Wharariki, tutu, and tauhinu are dominant in open vegetation on steep eroded faces and cliffs at the eastern end. At the western end more intact vegetation is dominated by *Hebe stricta* var. *macroura*, kohekohe, ngaio, and karaka, with populations of raukumara and *Hebe*

sp. unnamed (*Hebe* sp. n of Eagle 1982). Given the presence of these latter two species, the suitability of its current designation as Recreation Reserve should perhaps be reviewed.

Three Open Space Covenants all contain small remnants of primary forest dominated by broadleaved tree species. A 4 ha area on **Mangaone Station** (21) contains a forest of puriri, tawa, karaka, pukatea, and rewarewa. A smaller block of 2.2 ha on **Emirau Station** (22) contains forest dominated by puriri, along with karaka, nikau, titoki, and rewarewa. The largest of the three is a 7.3 ha remnant of forest containing puriri, titoki, tawa, lacebark, rewarewa, and nikau on **Makorori Station** (23) in the south of the subdistrict.

5.7 Waimata

The only PNA is a 10 ha block under an Open Space Covenant on **Linburn Station** (24), in the lower Waimata Valley. The forest it contains is dominated by tawa and kohekohe with one large emergent rimu, over an understorey of titoki and *Coprosma* spp. It is planned to restore podocarps to the area through artificial establishment of seedlings.

5.8 Ihungia

An Open Space Covenant is currently being registered over an area of about 14 ha on **Ihungia Station** (25), part of which falls within the northern block described in RAP 65. It contains forest on an alluvial terrace in which kahikatea is dominant, but with scattered matai and totara also present.

5.9 Waiau

No Protected Natural Areas occur within this subdistrict.

5.10 Hokoroa

(26) **Whakaroa Scenic Reserve** (138 ha) is situated on steep hill country inland on the Waimata-Hokoroa road about 35 km north of Gisborne. It contains a complex mosaic of secondary forest and scrub of varying ages, with small remnants of primary and/or well advanced secondary forest. Kanuka and rewarewa are dominant over most of the area, with kohuhu, lacebark, kamahi, and lancewood also widespread; *Pinus radiata* are scattered throughout. Tawa, pukatea, hinau, and rewarewa are common in older stands, particularly in deeper gullies. Black beech forms scattered enclaves on dry ridge crests. (27) **Paraheka Scenic Reserve** (239 ha) is situated further north on the Waimata-Hokoroa road, and consists largely of rewarewa-dominant secondary forest growing on upper steep hillslopes and kanuka forest on the lower, more moderate slopes. Rewarewa is most abundant on the ridges, with other species more abundant on the lower slopes, including putaputaweta, five finger, lacebark, mahoe, pate, hinau, lancewood, tarata, mapou, and cabbage tree. Small remnants of primary tawa-pukatea forest occur in the gully bottoms, with some large kahikatea and rimu surviving locally.

Three Open Space Covenants have been placed over forest blocks located close to the Hokoroa road. The northernmost, on **Ngawhitu Station** (28), contains an area of 11.2 ha of forest approximately half of which consists of rimu and matai emergent over a canopy of tawa, pukatea, mahoe, and rangiora. The other half consists of advanced secondary forest dominated by rewarewa. An area of 4.5 ha on **Ahititi Station** (29) contains occasional rimu and northern rata emergent over a canopy of tawa, rewarewa, pukatea, and hinau. Further south, an area of 4.7 ha adjacent to the **Makiri Station** homestead (30) is dominated by tawa, but with occasional rimu, pukatea, kahikatea, fivefinger, lacebark, rangiora, kohekohe, and matai.

5.11 Mata Plateau

(31) **Mata Crown Forest Assets covenant** (≈30 ha) protects a fine stand of primary hill slope forest on the eastern bank of the upper reaches of the Mata River. It consists of scattered rimu and kahikatea emergent over a canopy of tawa, rewarewa, and hinau, and with an understorey which includes mahoe, supplejack, pate, and kawakawa. Other tree species include matai, totara, white maire, titoki, tanekaha, and black beech. Lacebark, kowhai, wineberry, and lancewood occur around the margins. Unfortunately the understorey has been severely damaged through the combined effects of browsing by feral goats and domestic cattle.

5.12 Waingaromia

(32) **Tutamoe Conservation Area** contains a sizeable tract (≈196 ha) of diverse primary forest on a gently undulating plateau, consisting of scattered miro, rimu, and tanekaha emergent over a canopy of tawa, hinau, and pukatea. Other species include tarata, rewarewa, lancewood, kohuhu, kawakawa, and titoki. Smaller areas of secondary forest, scrub, and shrubland occur on steeper faces on the edge of the plateau. These are variable in composition, with kohuhu, lancewood, kowhai, and putaputaweta all common, as well as forest species such as tawa, mahoe, hinau, and nikau. Small areas of almost pure black beech forest occur on dry sites around the plateau margin. Incursion by cattle from the surrounding farmland has resulted in severe damage to the understorey. A much smaller area (11 ha) on **Mangaoae Station** (33) has been placed under an Open Space Covenant to protect an area of primary hillslope forest dominated by tawa with scattered rewarewa and titoki.

5.13 Waipaoa

The only PNA in this subdistrict is an area of approximately 19 ha on **Poututu Station** (34) for which an Open Space Covenant is currently being registered. It has been identified as having RAP status in this survey, and is described as RAP 119.

5.14 Tapuaeroa

This subdistrict contains two of the largest reserves in the entire study area. (35) **Aorangiwai Scenic Reserve** (751 ha) encompasses the southern face of the prominent sandstone peak Aorangi (1276 m). It contains a mix of primary forest with rimu, miro, and matai emergent over tawa, gradually giving way with increasing altitude to red and silver beech with scattered rimu, miro, kamahi, and tawari, and finally to subalpine scrub.

(36) **Mangaraurokore Conservation Area** (≈125 ha) consists of a remnant of primary forest on a lower hill slope, largely surrounded by plantation forest, located in the upper Tapuaeroa Valley. The forest contains scattered rimu, matai, and kahikatea emergent over a canopy of tawa, rewarewa, mamaku, tarata, nikau, kohuhu, and hinau. One very large tree of northern rata was noted, along with several self-sown *Pinus radiata*.

(37) **Raukumara Forest Park** (≈3500 ha within the study area) - descriptions of forest based on J. L. Nicholls (unpubl. data), and of vegetation above treeline on Clarkson *et al.* (1986). Those parts of the Raukumara Forest Park on the southern side of Hikurangi include part of an Ecological Area approved in principle by the Minister of Forests c. 1983, but never gazetted. At lower altitudes the forest consists of scattered rimu over tawa, kamahi, and tawari, but this gives way to mixed red and silver beech with kamahi and tawari in the understorey, and then to pure silver beech, which becomes progressively more stunted towards the treeline. Other species around the treeline include scattered mountain beech,

broadleaf, *Dracophyllum* spp., kaikawaka, mountain toatoa, and pink pine. Above this is a belt of diverse subalpine scrub and shrubland dominated by *Olearia colensoi*, along with *Brachyglottis rotundifolia*, pink pine, *Coprosma pseudocuneata*, mountain toatoa, *Pseudopanax simplex*, and *P. colensoi*. Above about 1500 m this gradually changes to tussockland in which mid-ribbed snow tussock is dominant, along with a variety of shrubs and herbs. From about 1675 m tussocks decline in abundance, and are replaced by alpine herbfield dominated by *Celmisia spectabilis*, *C. incana*, *Ranunculus insignis*, *Hebe tetragona*, *Brachyglottis bidwillii*, and *Coriaria plumosa*. Above about 1710 m the plant cover is very patchy, consisting of alpine fellfield containing *Pentachondra pumila*, *Geum* sp. (*G. parviflorum* agg.), *Coprosma pumila*, *Parahebe colensoi*, *Epilobium glabellum*, *Lycopodium fastigiatum*, *L. australianum*, *Podocarpus nivalis*, *Oreomyrrhis colensoi*, *Gaultheria "novae-zelandiae"*, *Dracophyllum adamsii*, and *D. recurvum*.

5.15 Waitahaia

(38) **Waitahaia Crown Forest Assets covenant area** (≈12 ha) is situated on a lower hill slope adjacent to the Waitahaia River. It contains approximately equal areas of primary forest dominated by kahikatea, and secondary scrub containing manuka, kanuka, and a range of broadleaved species. Some regeneration of conifers is occurring around the primary forest margins. Three Open Space Covenants are currently being registered over forested blocks. Two of these are located on **Ihungia Station** (39, 40) and encompass parts (e) and (g) of RAP 129. Part (e) contains an extensive area (≈55 ha) of alluvial terrace forest, including older forest dominated by matai, kahikatea, and totara, and younger forest with very high densities of even-aged kahikatea, totara, and/or matai regenerating after clearance or inundation. A central swampy area contains kahikatea scattered across pasture. Part (g) contains matai, kahikatea, and tanekaha-dominant forest on alluvial terraces near the Waitahaia River, but with forest dominated by tawa with scattered emergent kahikatea on adjacent gently to moderately sloping hillslopes. Black beech forms small enclaves on more sharply defined spurs. The third contains an area of approximately 10 ha on **Puketoro Station** (41) which makes up part (f) of RAP 129. It contains terrace forest dominated by totara, rimu, and matai emergent over a canopy of tawa, titoki, and kowhai, with parts of the area reverting to forest after earlier clearance.

5.16 Mangatu

No Protected Natural Areas occur within this subdistrict.

5.17 Maungahaumi

A small area (≈3 ha) on **Toromiro Station** (42) has been placed under an Open Space Covenant to protect an area of modified forest in which scattered rimu, totara, and kahikatea are emergent over a canopy of tawa, pukatea, and rewarewa.

5.18, 19 Mangaotane and Waitangirua

No Protected Natural Areas occur within these subdistricts.

6. What Values Need Protection?

Of the 555 study sites assessed in this study, 532 or 96% currently have no formal protection. The following list, based on a two-stage selection process (see Appendix V for details), identifies as Recommended Areas for Protection (RAPs) the most significant of those unprotected areas.

In identifying RAPs, strong emphasis has been placed on a number of factors. First, in order to ensure that sites are protected across the full range of geology, landforms, and climate occurring in the study area as a whole, we have attempted to redress the uneven distribution of currently protected areas across the subdistricts by identifying a range of representative remnants in each of these subdivisions. In addition, we have attempted to redress the current imbalance of conservation protection by focusing on lowland fragments of primary forest, given their relative scarcity within the Ecological District. Finally, we have endeavoured to increase the representation of ecosystems such as secondary scrub and forest, freshwater wetlands, dunelands, and estuaries, which are not adequately represented in the PNA network at present.

Although no attempt has been made to rank the individual RAPs relative to each other, they have been allocated to one of three general priorities, indicating their overall conservation value when viewed in the context of the Ecological District as a whole.

Primary forest⁵ forms the bulk of the area of the proposed suite of RAPs, followed by secondary forest and scrub, and then advanced secondary forest (Table 5). However, in proportionate terms, the greatest increases are for the previously more neglected wetland, duneland, and estuarine ecosystems. The proposed RAPs are relatively evenly spread in relation to altitude (Fig. 10), although in proportionate terms (cf. Fig. 2) PNAs and RAPs are still more extensive at higher than lower altitudes, reflecting the altitudinal distribution of surviving natural vegetation remnants.

Although the geographic distribution of RAPs is much more even than that of the PNAs (Fig. 11), there are still marked disparities in the proportion of the total area of each subdistrict which they occupy (Table 6). For example, although RAPs constitute 8% of the total study area, this figure is strongly influenced by the very large areas recommended for protection in two of the western subdistricts, Mangaotane and Waitangirua. The area of RAPs as a proportion of total land area remains low in many of the eastern subdistricts; e.g., in the Whangara subdistrict, where clearance of the original forest cover and maintenance of pastoral farming has been almost universally successful, it barely reaches 1%. Only in two of the eastern subdistricts does it reach 10%, and then only in subdistricts where farming has been less successful, i.e., Mata Plateau and Tokomaru. As would be expected given the distribution of natural vegetation remnants, RAPs are greatest in extent on less productive land (Fig. 12).

The character of RAPs also varies across the subdistricts according to the character of each subdistrict (Appendix VII). For example, although lowland forest occurs in RAPs in all but four subdistricts, coastal and semi-coastal forest and estuarine and duneland systems occur in RAPs only in the eastern coastal subdistricts, and subalpine communities only in RAPs in the higher-altitude western subdistricts. But other more subtle differences are also apparent, with cliff communities, for example, represented in RAPs only in the Tokomaru,

⁵ A detailed breakdown of vegetation types by subdistrict is presented in Appendix VII.

Waitangirua, Tapuaeroa, Mangahaumi, and Waitangirua subdistricts, and significant wetlands occurring in RAPs mostly in the more eastern subdistricts.

Table 5 Areas and percentages of major vegetation/landform classes across all study sites, in Protected Natural Areas (PNAs), and in Recommended Areas for Protection (RAPs).

Vegetation/landform class	Total area (ha)	PNAs		RAPs	
		(ha)	(%)	(ha)	(%)
Primary forest	26278	4554	17	18464	71
Advanced secondary forest	5401	1918	36	2684	50
Secondary forest and scrub	32712	1600	5	9823	30
Freshwater wetland	100	3	3	91	91
Duneland	57	0	0	57	100
Estuarine	32	0	0	32	100
Above treeline	462	306	66	156	34
Exotic pasture/plantation	322	4	na	44	na
Total study sites:	65364	8631	13	31351	48

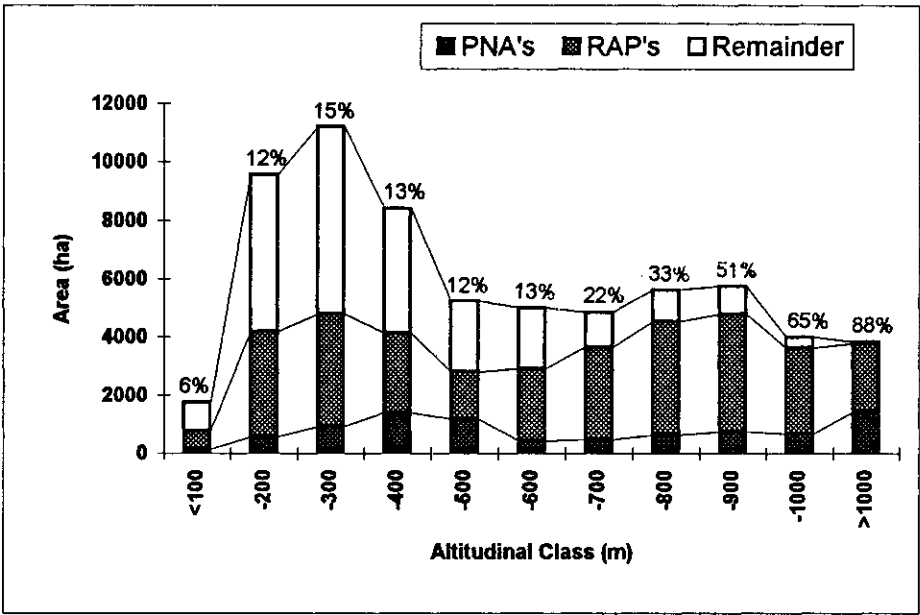


Fig. 10 Distribution of Recommended Areas for Protection (RAPs), current Protected Natural Areas (PNAs), and remaining natural vegetation in relation to altitude. Figures above each bar indicate the percentage of the total land area in the altitudinal class that is occupied by indigenous vegetation.

Fig. 11 Geographic distribution of Protected Natural Areas and Recommended Areas for Protection.

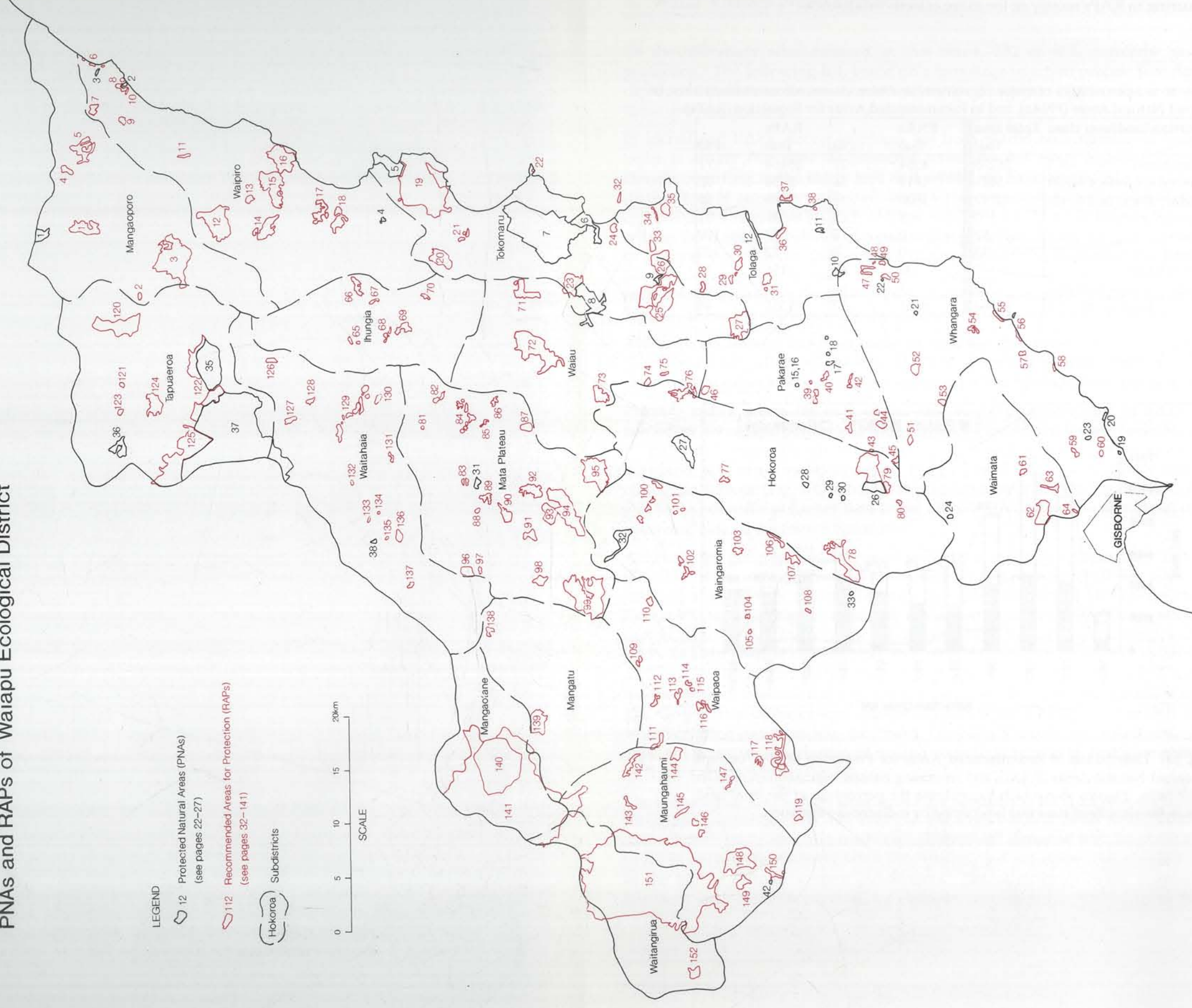


Table 6 Extent of Recommended Areas for Protection (RAPs), by priority, in the 19 subdistricts.

No.	Subdistrict name	Total area	Priority 1		Priority 2		Priority 3		Total	
			(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
1	Mangaoporo	22805	1031	4.5	222	1.0	0	0	1253	5.5
2	Waipiro	27630	756	2.7	600	2.2	708	2.6	2064	7.5
3	Tokomaru	22671	2582	11.4	236	1.0	505	2.2	3323	14.7
4	Tolaga	14973	197	1.3	218	1.5	5	0	420	2.8
5	Pakarae	14527	118	0.8	80	0.6	36	0.2	234	1.6
6	Whangara	26135	118	0.5	150	0.6	34	0.1	302	1.2
7	Waimata	15696	48	0.3	6	0	198	1.3	252	1.6
8	Ihungia	13778	0	0	141	1.0	93	0.7	234	1.7
9	Waiau	19268	895	4.6	81	0.4	130	0.7	1106	5.7
10	Hokoroa	29201	440	1.5	431	1.5	10	0	881	3.0
11	Mata Plateau	28056	835	3.0	1295	4.6	621	2.2	2751	9.8
12	Waingaromia	24306	158	0.7	139	0.6	15	0.1	312	1.3
13	Waipaoa	18127	366	2.0	67	0.4	20	0.1	453	2.5
14	Tapuaeroa	25748	1595	6.2	573	2.2	32	0.1	2200	8.5
15	Waitahaia	25256	257	1.0	72	0.3	84	0.3	413	1.6
16	Mangatu	16843	38	0.2	2	0	409	2.4	449	2.7
17	Mangaotane	11067	1559	14.1	0	0	4751	42.9	6310	57.0
18	Maungahaumi	19704	2587	13.1	381	1.9	436	2.2	3404	17.3
19	Waitangirua	11784	4769	40.5	72	0.6	233	2.0	5074	43.1
Totals: 387575			18349	4.7	4766	1.2	8320	2.1	31435	8.1

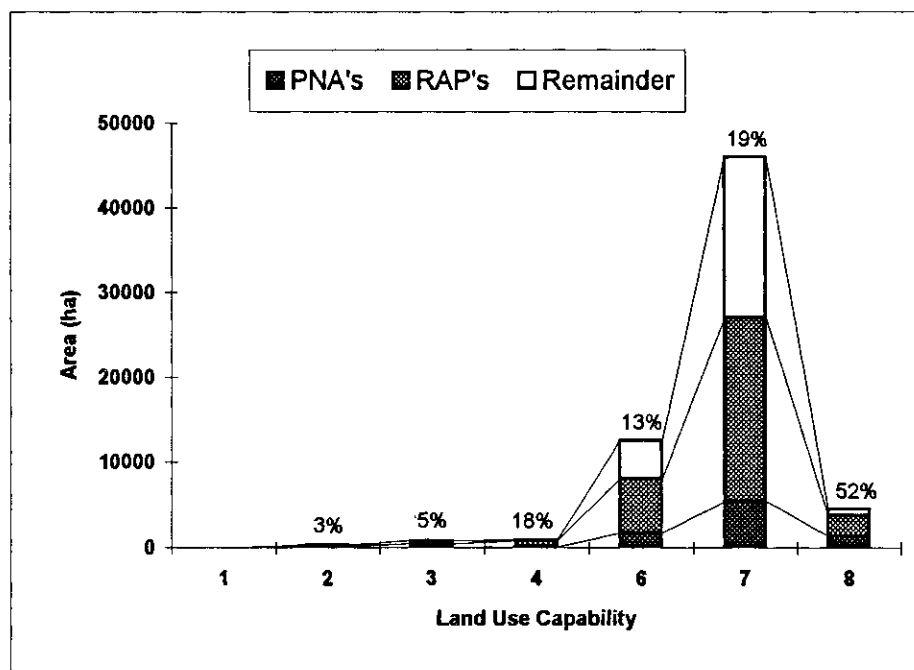


Fig. 12 Distribution of Recommended Areas for Protection (RAPs), current Protected Natural Areas (PNAs), and remaining natural vegetation in relation to Land Use Capability Class. Figures above each bar indicate the percentage of the total land area in the class that is occupied by indigenous vegetation.

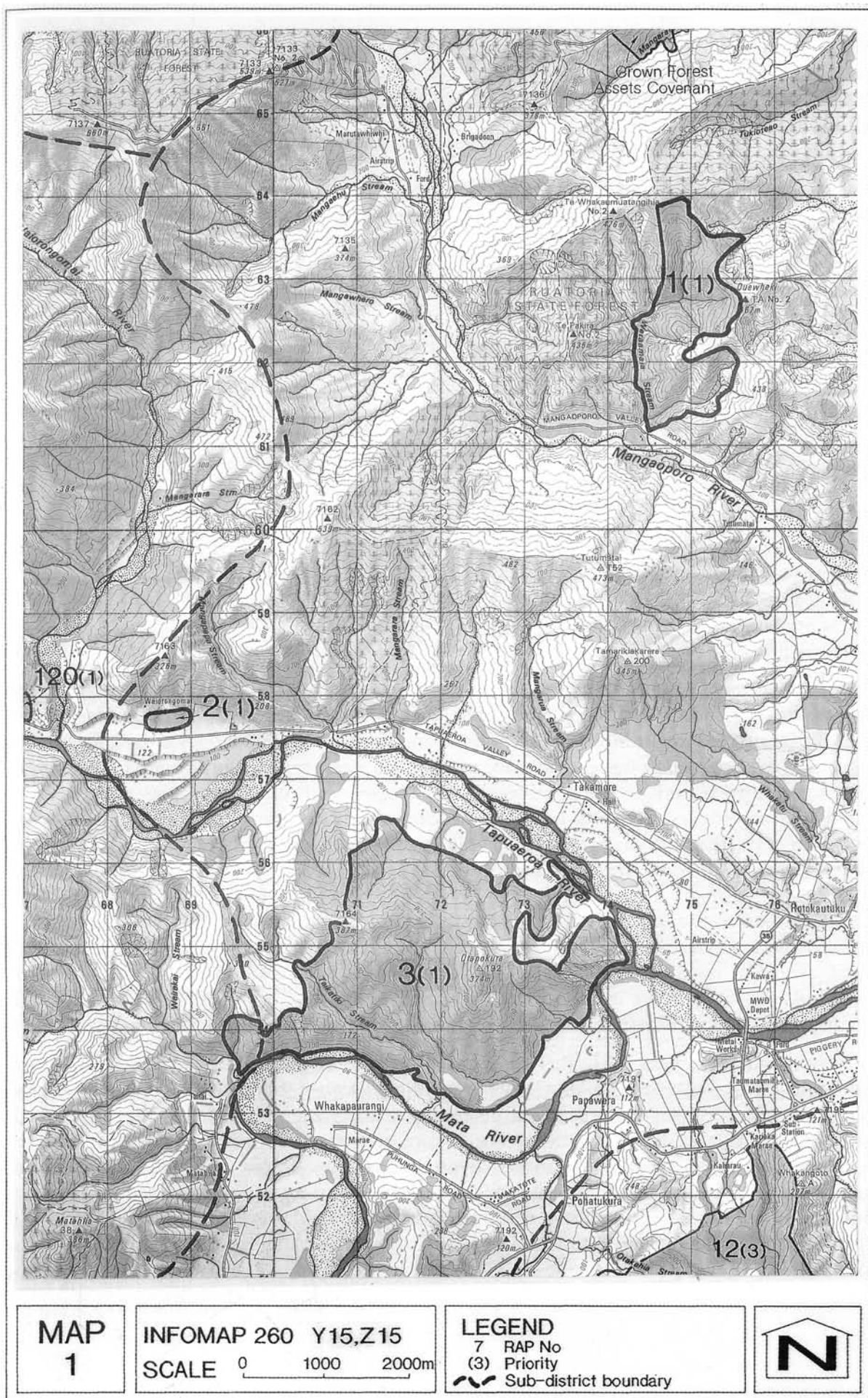
6.1 Mangaoporo RAPs

The Mangaoporo subdistrict contains some of the most heavily modified landscapes in the north of the study area. The fertile alluvial terraces of the Waiapu River system which are one of its dominant features, were almost entirely cleared of the former mainly kahikatea-dominant forests, probably very early on, and only one small remnant of reasonably intact forest was identified on them in this survey. Similarly, the hill slopes which rise from the Waiapu River westwards towards the main divide have also been largely cleared, and only one extensive remnant of primary hill slope forest remains. Although grazed for many years, some of these hill slopes have now reverted to secondary scrub and forest, and large areas are now being used for production of timber from exotic species rather than agriculture. RAPs identified in this subdistrict encompass both the remaining remnants of primary forest and the best representative areas of secondary scrub and forest with potential to succeed to diverse secondary forest in the longer term.

RAP 1:	Ouewheki/Weraamaia Stream (Map 1)
Priority:	1
NZMS 260 ref:	Z15 750630
Total area:	221 ha
Percent primary:	64%
Altitudinal range:	120-480 m
Bioclimatic zone:	lowland

This RAP is situated north of Ruatoria on steep hill slopes comprising most of the eastern half of the catchment of the Weraamaia Stream, a south-flowing tributary of the Mangaoporo River, as well as a small part of the upper headwaters of the Puhapata Stream, a northeast-flowing tributary of the Poroporo River. It contains a complete range of hillcountry landforms typical of the district, from rounded ridge crests, through steep side slopes, to valley bottoms with fans and debris-filled stream beds. Erosion has been a feature of the area for an extended period; a large, active erosion scar runs through the centre of the RAP, and several older erosion scars support a range of primary successional vegetation. The northern two-thirds of the RAP comprises primary hill-slope forest of exceptionally high diversity, dominated by rimu, rewarewa, and tawa with scattered black beech, hinau, lacebark, matai, pukatea, heketara, tanekaha, narrow-leaved maire, miro, and nikau. The balance, and mostly in the lower parts of the Weraamaia catchment, consists of secondary vegetation of a range of ages. Much of it is scrub and forest dominated by kanuka which has developed by invasion of former pasture, but manuka or tutu occupies old erosion surfaces. Some advanced regrowth of forest species occurs on the lower slopes from remnants of the original forest cover which survived in protected gullies. Although the area is fenced, it is still grazed, and this undoubtedly has some influence on the course of both primary and secondary successions. It is well buffered to the west by plantation forest.

The high significance of this RAP stems from the extent, diversity, and intactness of its primary forest, which is unrivalled in the subdistrict, its wide range of landforms, and the range of dynamic vegetation processes which have resulted both from past and ongoing erosion and clearance for agriculture. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', containing good numbers of common bush birds including kereru and weka at the time of that survey.



RAP 2:	Waiorongomai Station (Map 1)
Priority:	1
NZMS 260 ref:	Y15 686578
Total area:	10 ha
Percent primary:	100%
Altitudinal range:	120 m
Bioclimatic zone:	lowland

This RAP consists of a small forest remnant surrounded by pasture and located on a gently sloping, fertile alluvial terrace in the lower reaches of the Tapuaeroa River. The forest it contains comprises tall kahikatea and pukatea emergent over a canopy of titoki and tawa. Other species present include totara, matai, pigeonwood, putaputaweta, rewarewa, and mahoe. Although fenced, the remnant is still subject to grazing, and as a consequence the understorey is sparse. However, given the range of species still present, good recovery could be expected if stock were excluded.

Although small and modified, this remnant has been accorded a high priority because of the relative scarcity of forest of this type, which was once widespread on the Waipua River flood plains but is now largely eliminated through clearance for agriculture.

RAP 3:	Otapokura (Map 1)
Priority:	1
NZMS 260 ref:	Z15 725548
Total area:	824 ha
Percent primary:	5%
Altitudinal range:	80-387 m
Bioclimatic zone:	lowland

This RAP is centred on the high point Otapokura, a prominent hill situated at the confluence of the Mata and Tapuaeroa rivers, just west of Ruatoria. It encompasses a wide range of landforms, including rounded ridges and long, gentle hill slopes on a full range of aspects. On three sides these gradually merge into very gently sloping lower toe-slopes with some terraces, but in the southwest steep slopes, with one active erosion scar, drop into the Mata River. Kanuka has become dominant over most of the RAP following reversion of pasture, although the latter remains either as narrow ribbons along some of the upper spurs or in more recently cleared enclaves on the northern lower slopes. Small remnants of primary forest survive, mainly along the southern margins on steep slopes running down to the Mata River, or where the more deeply incised lower reaches of small streams have proved difficult to successfully clear for agriculture. These contain matai, titoki, pukatea, tawa, kohekohe, and kahikatea; matai regeneration is common in some stands. At this stage there is only limited regrowth of forest species under the kanuka, and the understorey is dominated mainly by *Coprosma rhamnoides* and introduced grasses.

The significance of this RAP stems from its excellent representation of older kanuka-dominant forest and scrub on landforms and soils typical of this and the adjacent Waipiro subdistrict. In addition, these secondary stands are of a wide range of ages, occur on a full range of aspects, and include scattered enclaves of primary forest able to act as seed sources to allow future progression to more diverse secondary forest, provided numbers of domestic and feral animals are reduced. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', containing common bush and field birds including kereru and whitehead. The suggested boundary encompasses a full range of aspects, and includes both primary remnants and secondary kanuka forest of varying ages and on a full range of

sites, while excluding some of the larger areas of more recently cleared land which are still in pasture.

RAP 4: **Poroporo Road (Map 2)**
 Priority: 2
 NZMS 260 ref: Z15 818634
 Total area: 44 ha
 Percent primary: 7%
 Altitudinal range: 80-200 m
 Bioclimatic zone: semi-coastal

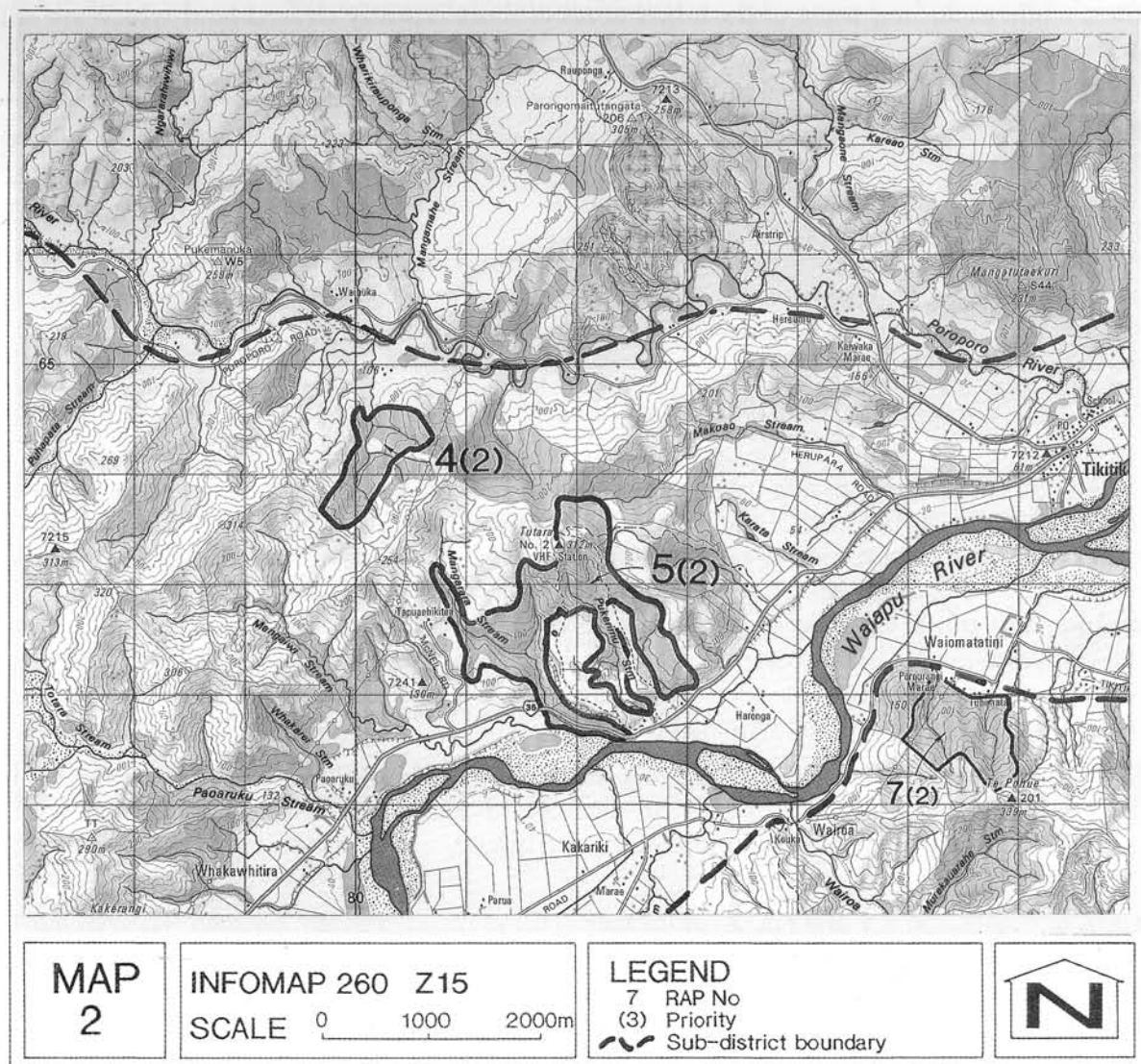
Located near the northern boundary of the Ecological District, this RAP consists of a small catchment draining northwards into the Poroporo River and containing moderate hillslopes with some eroded gullies in the upper reaches, but gentler lower hillslopes and toeslopes in the lower reaches. It contains two small remnants of modified primary forest, one on lower hillslopes in the upper part of the catchment, and one towards the bottom, both containing kohekohe, tawa, puriri, and rewarewa, but with some black beech on a spur in the upper piece. The balance of the area is covered by secondary scrub and forest dominated by kanuka, but quite variable in age and degree of successional development, with some stands containing both components of the former primary forest and advanced regeneration of forest species. Erosion control planting with exotic species has been carried out along the margins of one of the side streams.

The priority accorded to this area reflects the diverse range of canopy species contained in its primary forest remnants, and the presence of advanced regeneration of primary forest species, particularly in the lower parts of the catchment.

RAP 5: **Tutara (Map 2)**
 Priority: 2
 NZMS 260 ref: Z15 818634
 Total area: 181 ha
 Percent primary: 40%
 Altitudinal range: 40-300 m
 Bioclimatic zone: semi-coastal

This irregularly shaped RAP is situated on the southern and eastern slopes of Tutara, a small rounded hill west of Tikitiki. It consists of a mixture of primary and secondary forest which is most extensive on the upper hillslopes of Tutara. However, it also extends down the southern slopes along a series of small streams which in their lower reaches become more deeply incised into the lower hillslopes and elevated older terraces of the Waiapu floodplain. Primary forests remnants, which have generally survived in the more protected lower reaches of these streams, are dominated by tawa, puriri, rimu, and kohekohe, with rewarewa suggestive of historical fire disturbance. Both kanuka and manuka occur in the more recently regenerating areas, with a complex intermingling of different species mixes and disturbance ages. As a consequence of the variation both in stand age and proximity to seed source, regeneration under the secondary stands is variable, with introduced grasses still dominant in younger stands but with shrubby forest species in older stands and close to primary forest remnants.

The significance of this RAP reflects its diversity of successional stages, with variation from almost pure kanuka through to stands with advanced growth of primary forest species. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', containing moderate numbers of common bush birds.



6.2 Waipiro RAPs

Although most of this subdistrict has been cleared for agriculture, probably largely at the time of European settlement, it has more surviving primary forest than any of the other coastal subdistricts. Primary forest remnants vary widely in size, few exceeding 20 ha, and most remaining unfenced and subject to ongoing modification by domestic stock. Kanuka-dominant secondary scrub and forest is also widespread, occupying nearly 25% of the total subdistrict, and reflecting the difficulty of preventing reversion of pasture without regular inputs of fertiliser and maintenance of high stock numbers. In contrast to the dominance of kanuka in secondary successions, primary successions on eroded sites are generally dominated by manuka, with tauhinu also common, particularly close to the coast. One of the more unusual features of the subdistrict is the number of wetlands, with three featuring in RAPs (Nos 10, 11, 16), and a further site visited but not recommended for protection.

RAP 6: Port Awanui (Map 3)
 Priority: 1
 NZMS 260 ref: Z15 895615
 Total area: 16 ha
 Percent primary: 87%
 Altitudinal range: 0-160 m
 Bioclimatic zone: coastal

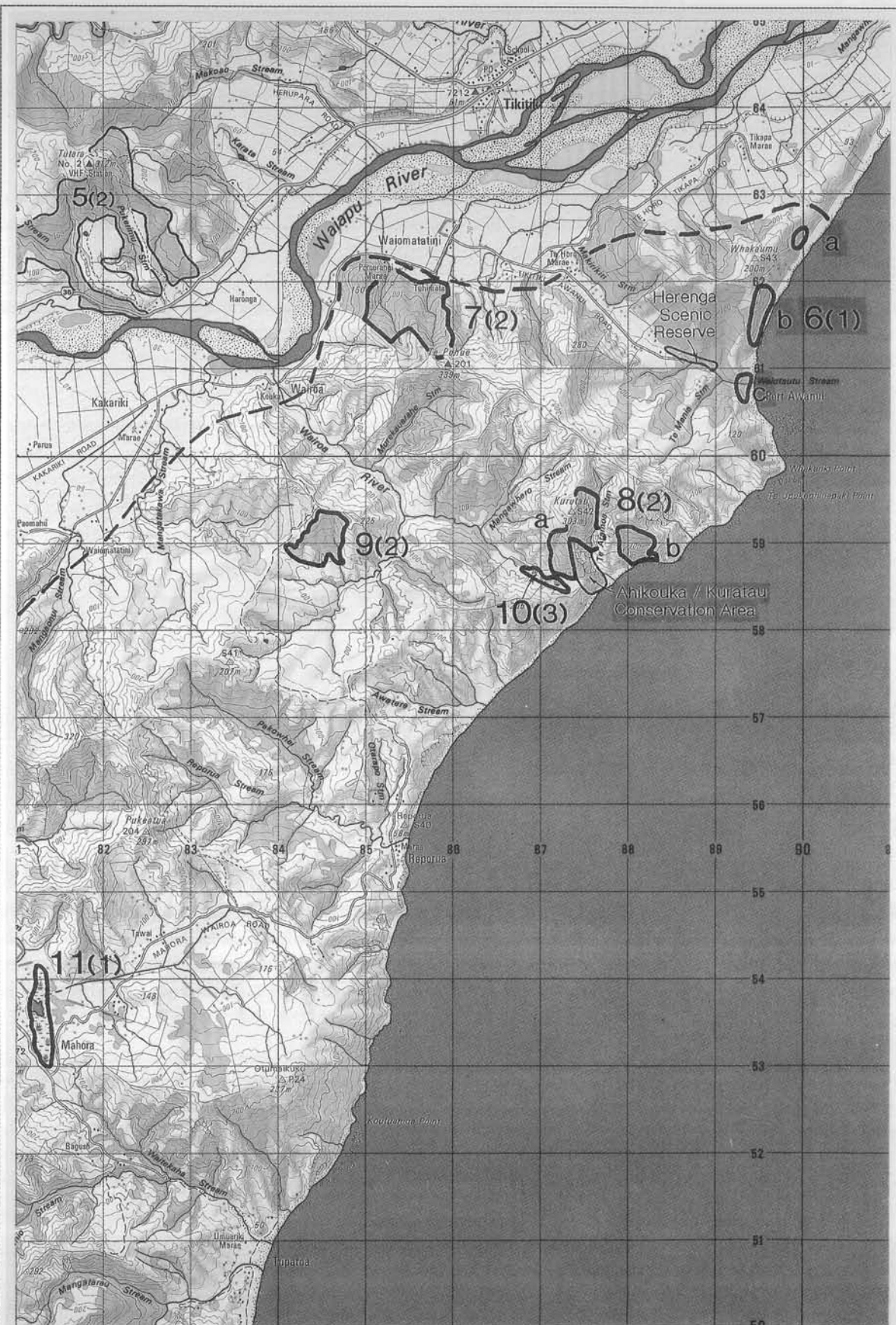
This RAP is situated in the northeast of the Ecological District at Port Awanui. It consists of three separate, small remnants of pohutukawa treeland growing on steep, eroding hillsides running down onto the beach. Of these, the northern two are the most extensive and least modified. Although the canopy trees are for the most part in good health, all three stands are very open, and weeds, in particular pampas and gorse, have the potential to cause problems. Other species present include *Pinus radiata*, ngaio, cabbage tree, manuka, kanuka, tauhinu, wharariki, and taupata.

Although the RAP is small, fragmented, and in poor condition, the ranking given it reflects the value of the pohutukawa stands it contains. Few healthy stands of this species remain in the Ecological District, and only one of these, at Waimahuru Bay, is more extensive. Given that the future of pohutukawa now seems largely dependent on active management, this stand would seem to have high potential for restoration, which would require control of domestic stock, feral goats, and possums, removal of weeds, and perhaps supplementary planting of young pohutukawa and associated coastal species.

RAP 7: Porourangi Marae (Map 3)
 Priority: 2
 NZMS 260 ref: Z15 855616
 Total area: 60 ha
 Percent primary: 35%
 Altitudinal range: 30-180 m
 Bioclimatic zone: semi-coastal

This RAP is situated on steep north-facing hillslopes north of Ruatoria, where it provides a backdrop to the historic Porourangi Marae. It contains two small elongated remnants of primary forest, which have survived in the two major gullies, and which are surrounded by secondary kanuka-dominant scrub and forest. The primary forest is dominated by tawa, kohekohe, and puriri, with occasional rewarewa. Gorse is locally abundant in the secondary stands, particularly on steep faces in the west adjacent to the road and on upper parts of the ridge between the two main streams, and wildling pines are scattered along the eastern margin. Feral goats are present in moderate numbers, and will require control if regeneration of tall forest species is to continue.

The significance of the RAP stems mainly from the primary forest remnants it contains, there being few remnants of such semi-coastal forest left on drier (and hence more easily cleared) north-facing slopes.



MAP
3

INFOMAP 260 Z15

SCALE 0 1000 2000m

LEGEND

7 RAP No

(3) Priority

 Sub-district boundary



RAP 8: **Kuratau (Map 3)**
 Priority: 2
 NZMS 260 ref: Z15 875593
 Total area: 49 ha
 Percent primary: 33%
 Altitudinal range: 0-300 m
 Bioclimatic zone: coastal

Situated northeast of Ruatoria and adjacent to the Kuratau Conservation Area, this RAP contains both steep hillslopes facing eastwards to the coast and gentler hillslopes facing inland and to the southwest. It contains a mix of primary forest and secondary forest and scrub, the primary forest dominated by kohekohe, puriri, and tawa, with pohutukawa and karaka on the coastal faces, and the secondary scrub and forest dominated by kanuka, except on more eroded coastal sites, where manuka and tauhinu are dominant. Both introduced weeds and soil erosion would present a problem to future reserve management.

The significance of this RAP reflects the value not only of the coastal and semi-coastal primary forest it contains, including the small stands of pohutukawa, but also the variety of primary and secondary successional communities dominated by either kanuka or manuka, with the latter unusual in the context of the Ecological District. It would strongly complement the values of the adjacent Conservation Area, which contains only small enclaves of primary forest and is dominated by a large, eroding gully.

RAP 9: **Wairoa River headwaters (Map 3)**
 Priority: 2
 NZMS 260 ref: Z15 844591
 Total area: 25 ha
 Percent primary: 93%
 Altitudinal range: 100-180 m
 Bioclimatic zone: semi-coastal

This RAP is situated northeast of Ruatoria on gentle upper hillslopes of southerly aspect in the headwaters of the Wairoa River. It contains a fine remnant of primary semi-coastal forest which is dominated by tawa and puriri with scattered kahikatea; some of the puriri are very large, up to 2 m in diameter. Other forest species include lancewood, pigeonwood, kohekohe, matai, totara, rimu, tanekaha, white maire, kaikomako, nikau, kiekie, and kohuhu. Smaller areas of secondary scrub and low forest, mostly dominated by kanuka, occur locally as a narrow fringe around the margins and form a more extensive stand in the southwest.

The significance of this RAP lies in the extent and diversity of its primary forest. The major priority for management should be exclusion of domestic stock. The understorey is at present very open as a result of grazing, but good recovery could be expected given the diversity and health of the canopy.

RAP 10: **Wairoa River Swamp (Map 3)**
Priority: 3
NZMS 260 ref: Z15 872586
Total area: 4 ha
Percent primary: nil
Altitudinal range: 90 m
Bioclimatic zone: coastal

This small wetland RAP, situated 0.5 km from the coast in the headwaters of the Wairoa River, is located on a flat valley floor where ponding has occurred following narrowing of the valley by an alluvial fan derived from slopes to the north. The vegetation is dominated by raupo in the central parts of the wetland, and with a fringe dominated by *Juncus* and *Carex* species around the drier margins. Associated species include *Cyperus ustulatus*, *Callitriche stagnalis*, *Myriophyllum propinquum*, and willows.

Although small and subject to heavy pugging and grazing by cattle, this RAP is significant given the relative scarcity of wetlands in the Ecological District.

RAP 11: **Mahora Swamp (Map 3)**
Priority: 1
NZMS 260 ref: Z15 813537
Total area: 19 ha
Percent primary: nil
Altitudinal range: 80 m
Bioclimatic zone: semi-coastal

Located approximately 4 km east of Ruatoria, this is the second of two wetland RAPs in the Waipiro subdistrict. It consists of a small lake situated in the centre of an extensive alluvial terrace, and is surrounded by vegetation containing a wide range of wetland plants, e.g., raupo, and species of *Juncus*, *Baumea*, *Isolepis*, and *Carex*. Although large parts of the area surrounding the lake have been invaded by willows, particularly in the north and east, a significant area in the south remains willow-free and consists of a shrub mire in which manuka forms a canopy over a range of wetland species.

Despite the significant modification due to invasion of introduced species, this RAP must be regarded as having high significance given its size, the diversity of wetland vegetation it contains (cf. RAP 10), and the relative paucity of wetland vegetation left in the Ecological District. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', containing spotless crane as well as common waders, waterfowl, and field birds.

RAP 12: **Kahuitara (Map 4)**
 Priority: 3
 NZMS 260 ref: Z15 755505
 Total area: 533 ha
 Percent primary: 6%
 Altitudinal range: 100-370 m
 Bioclimatic zone: semi-coastal

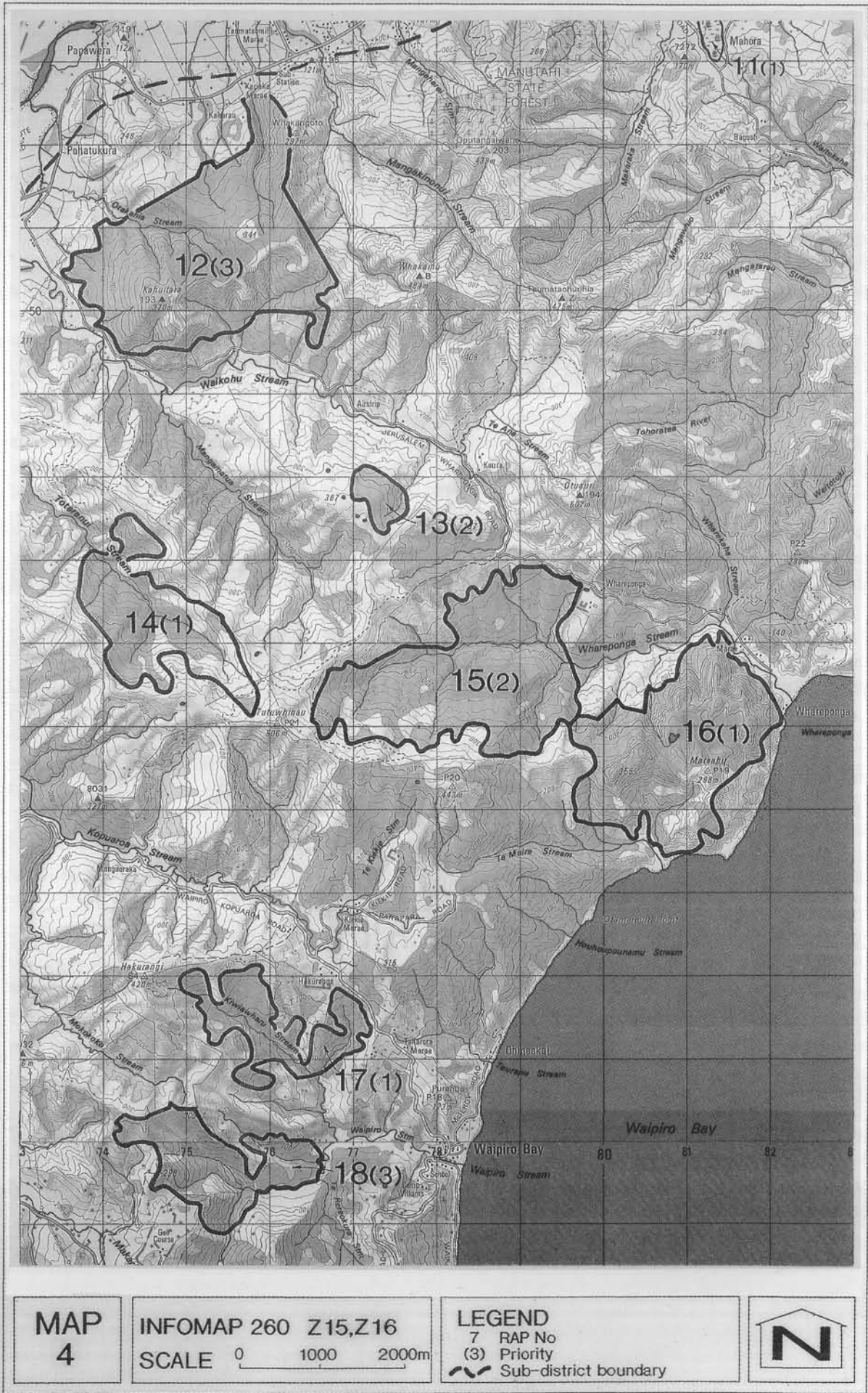
This RAP encompasses the slopes of Kahuitara, a high point just to the south of Ruatoria. The area contains a wide range of landscape elements, notably rounded undulating ridges and hillslope sequences on a full range of aspects. The vegetation is predominantly secondary kanuka-dominant forest and tall scrub, but several small patches of primary forest remain, mainly in gullies on the south-eastern slopes. Emergent rewarewa are scattered throughout the older secondary stands, and the understorey is relatively diverse, with *Coprosma rhamnoides* and introduced grasses widespread, and regeneration of forest species occurring in more protected gullies. Primary remnants are dominated by kohekohe, tawa, and puriri, with matai, mahoe, hangehange, titoki, pukatea, and hinau less abundant. Extensive areas of kanuka bordering Whareponga Road were being felled for firewood at the time of the survey.

The significance of the RAP stems from its combination of varying ages of secondary scrub and forest growing on a wide range of landforms and aspects, enhanced locally by developing regeneration of forest species. These values are enhanced by the seed sources represented by the scattered remnants of primary forest. It is closely similar in these values to the nearby RAP 3, Otapakura, which lies directly across the Mata River. The latter has been given a higher ranking because of its larger size, inclusion of river terrace landforms, and marginally more extensive regeneration.

RAP 13: **Waikohu Stream (Map 4)**
 Priority: 2
 NZMS 260 ref: Z15 773477
 Total area: 32 ha
 Percent primary: 100%
 Altitudinal range: 240-360 m
 Bioclimatic zone: semi-coastal

This RAP is situated in the headwaters of the Waikohu Stream on gently to moderately sloping, north-facing hillslopes above the Jerusalem-Whareponga road. It contains a moderate-sized piece of diverse, primary, semi-coastal forest dominated by tawa and kohekohe, with scattered rewarewa, puriri, matai, miro, rimu, titoki, pukatea, and kahikatea. Mahoe and pigeonwood, along with scattered kanuka, grow around the margins. Small ponds with scrub and wetland around the margins occur on the southern edge of the RAP in an area where slumping has occurred.

Unfortunately the most significant feature of this RAP, its primary forest, has been strongly modified by domestic stock, and now consists predominantly of big old canopy trees, with the understorey largely removed. However, sufficient of the canopy remains that strong recovery could be expected if the remnant were fenced.



RAP 14:	Totaranui Stream (Map 4)
Priority:	1
NZMS 260 ref:	Z15 740470
Total area:	207 ha
Percent primary:	20%
Altitudinal range:	140-450 m
Bioclimatic zone:	semi-coastal

This RAP occupies most of the upper section of the Totaranui catchment, a broad valley with moderately sloping sides formed by old slumps and earthflows in a manner very characteristic of this subdistrict. It contains three moderate-sized and several smaller pockets of relatively unmodified primary forest, scattered through a matrix of secondary scrub and forest of varying age. The primary forest is dominated by pukatea, rewarewa, tawa, and kohekohe, with variable amounts of rimu. Kanuka is dominant in the secondary communities, with occasional isolated large trees left from felling of the original forest. The understorey consists generally of either exotic grasses or *Coprosma rhamnoides*. Manuka occurs in a few small areas along the main streambed where it is colonising recent erosion debris.

The high significance accorded to this RAP reflects its mixture of diverse semi-coastal forest and secondary scrub and forest, and its relatively complete catchment boundaries. The boundary as recommended includes both the majority of the primary forest remnants and the older stands of kanuka which occur predominantly in the upper half of the catchment, while excluding discontinuous younger kanuka stands in the lower part of the catchment which have reverted from pasture to scrub more recently. Exclusion of stock would markedly improve understorey condition, and allow unhindered regeneration of broadleaved forest species under the secondary kanuka stands.

RAP 15:	Whareponga Stream (Map 4)
Priority:	2
NZMS 260 ref:	Z15 785455
Total area:	432 ha
Percent primary:	13%
Altitudinal range:	70-440 m
Bioclimatic zone:	semi-coastal

This RAP consists of the upper headwaters of the Whareponga Stream, a coastal catchment containing very similar landforms to the previous RAP, but draining to the east. The vegetation consists of primary forest remnants scattered in a matrix of secondary scrub and forest; the primary forest patches are dominated by tawa, pukatea, and kohekohe along with rewarewa, tanekaha, and/or rimu and occasional puriri, titoki, pukatea, and kahikatea. Some of the secondary kanuka scrub and forest is old enough also to contain rewarewa and mamaku.

This RAP is very similar in character to those on the nearby Totaranui, Kiwiawharu, and Te Rereokura/Waipiro streams RAPs (Nos 14, 17, 18). Its ranking reflects the more fragmented and modified nature of its primary forest (cf. RAP 17) and the narrow range of aspects over which this is distributed (cf. RAP 14).

RAP 16:	Mataahu (Map 4)
Priority:	1
NZMS 260 ref:	Z15 804445
Total area:	376 ha
Percent primary:	nil
Altitudinal range:	20-355 m
Bioclimatic zone:	coastal to semi-coastal

Although lying between RAP 15 and the coast, this RAP differs markedly in the character of its landforms, consisting of an elevated plateau surrounded by steep, often precipitous slopes. This steeper relief reflects the base geology of Tokomaru sandstone, which has much higher mass strength than the surrounding Whangai Formation argillite/mudstones, and is therefore much less easily eroded. As such it is somewhat atypical of the Waipiro subdistrict, and is ecologically more akin to landforms of the Tokomaru subdistrict. The vegetation cover is predominantly secondary scrub and forest in which kanuka is dominant. However, advanced regeneration of forest species such as rewarewa and tree ferns, along with scattered wildling pines, occurs over quite large areas, particularly on less accessible parts of the main plateau and in sheltered gullies. Other important floristic elements include a number of large pohutukawa on some of the high cliffs, and areas of tauhinu-manuka scrub on eroded, steep coastal slopes in the southeast. Two small wetlands occur on the plateau (Photo 5), and these are dominated by raupo, *Baumea*, *Eleocharis*, and/or *Sphagnum*.

The high significance accorded to this RAP reflects its extensive areas of advanced secondary vegetation on a wide range of aspects and landforms, the high conservation value of its wetlands, which - with the exception of those on similar sites in the Waipare and Nuhiti scenic reserves - are less modified than any others seen in the Ecological District, and the presence of pohutukawa. The RAP also contains the site of a major historic Maori settlement, and has very high significance for local Maori.



Photo 5. The relatively unmodified wetland on Mataahu (Z15 808448). The vegetation is dominated by *Baumea* and *Sphagnum* in the foreground, with raupo abundant in the middle distance. In the background wildling pine occur as emergents through a canopy of kanuka.

RAP 17:	Kiwiawharu Stream (Map 4)
Priority:	1
NZMS 260 ref:	Z15 760412
Total area:	137 ha
Percent primary:	57%
Altitudinal range:	40-340 m
Bioclimatic zone:	semi-coastal

This RAP is situated just south of the Waipiro-Kopuaroa road on landforms very similar in character to RAPs 14, 15, and 18. It contains three sizeable remnants of relatively unmodified primary semi-coastal forest, mostly on slopes of southerly aspect, and surrounded by secondary scrub and forest. The primary forest is dominated by kahikatea, tawa, titoki, pukatea, and kohekohe; kanuka dominates in the secondary forest and scrub.

The significance of this RAP stems mainly from the very high values of the primary forest remnants it contains. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', containing common bush birds. Although erosion control plantings of exotic species have been made in the upper parts of the catchment, these probably represent little threat to the high conservation values, particularly of the primary forest. The major threat to the high natural values is probably domestic stock, and their exclusion would significantly enhance forest values in the long term.

RAP 18:	Te Rereokura/Waipiro streams (Map 4)
Priority:	3
NZMS 260 ref:	Z15/Z16 766395
Total area:	167 ha
Percent primary:	37%
Altitudinal range:	30-320 m
Bioclimatic zone:	semi-coastal

This RAP is very similar in its landforms and vegetation to the Totaranui, Whareponga, and Kiwiawharu RAPs (Nos 14, 15, and 17), which are situated to the north. However, it has been ranked lower in priority because of the more modified and fragmented nature of the primary forest remnants it contains. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', containing common bush birds. Manuka is locally dominant in primary successions which occur along the margins of the numerous erosion scars.

6.3 Tokomaru RAPs

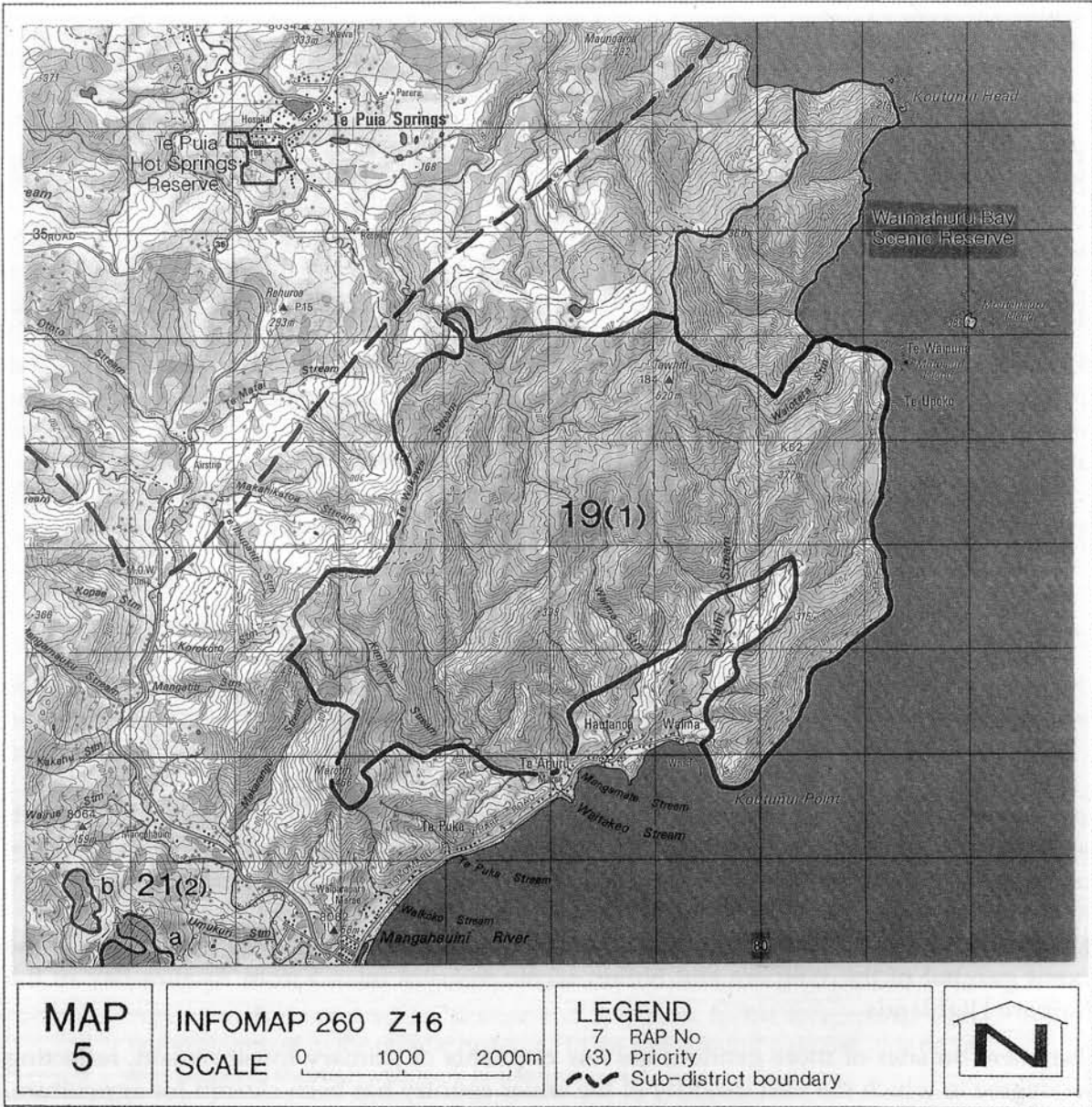
The most prominent feature of this subdistrict are the sometimes extensive areas of secondary vegetation on steep landforms on the various massifs of Tokomaru Sandstone which are scattered along this part of the coast. Although the original vegetation on these sites was cleared for agriculture, this has not proved a sustainable land-use, and most sites have now either been planted in exotic forest or reverted to secondary forest and scrub dominated by native species. Many of the older secondary stands contain a wide range of forest species which survived in small enclaves in steep gullies that gave a measure of protection from fire, and which are now reinvading the surrounding generally kanuka-dominant forest. The conservation value of such areas has already been recognised by the recent gazettal of the Waipare and Nuhiti scenic reserves inland from Anaura Bay in the Waipare Highlands.

Elsewhere on sites of more gentle slope few remnants of primary forest remain, reflecting the degree to which the vast majority of the easier country has been cleared for agriculture.

Those that are left generally have diverse canopies, but understoreys are often heavily modified by browsing, mainly by domestic stock.

RAP 19:	Tawhiti (Map 5)
Priority:	1
NZMS 260 ref:	Z16 785325
Total area:	1741 ha
Percent primary:	3%
Altitudinal range:	0-520 m
Bioclimatic zone:	coastal to lowland

Situated on the coast at the northeast end of Tokomaru Bay, this large RAP occupies an extensive area of relatively high altitude and steep relief on a large block of Tokomaru Sandstone (cf. RAPs 16, 23, 25, 26), immediately south of the Waimahuru Bay Scenic Reserve. The central and western parts are drained by streams running generally north-south, and draining either into Tokomaru Bay or Waipiro Bay. Slopes are particularly steep in the east where faces drop off to the sea, and in the south towards Tokomaru Bay.



The bulk of the area is occupied by secondary forest dominated by kanuka, which varies widely in age and in the amount of regeneration of forest species. Highly modified remnants of the original forest, mainly tawa, kohekohe, and puriri, survive mostly on sites protected from fires such as in the middle sections of some of the more deeply incised streams. A few black beech trees have also survived on one or two sites in the centre of the RAP. Older secondary stands, often with good regeneration of forest species, predominate on the main plateau, but are less widespread on the steep south-facing slopes behind Tokomaru Bay where young stands with small enclaves of pasture predominate. Small groups of *Pinus radiata* are scattered throughout, mainly on upper slopes and ridgecrests.

The eastern coastal faces are covered generally with secondary scrub and forest on the upper slopes, but vegetation on the lower slopes is generally more open, with large pohutukawa scattered through a mixture of shrubland, exotic pasture species, and active erosion surfaces. Manuka is locally dominant on eroded and/or more recently burnt areas, particularly on the coastal faces in the east.

The significance of this RAP stems largely from the quality of its secondary vegetation, which is extensive, contains good regeneration of primary forest species, and occurs over a wide range of altitudes and topographic units. Just as important, sufficient seed sources of tall forest species occur over most of the area to allow ongoing succession to tall broadleaved forest. The area also has high scenic qualities, providing an impressive backdrop to Tokomaru Bay.

RAP 20:	Maungaroa (Map 6)
Priority:	3
NZMS 260 ref:	Y16 718306
Total area:	210 ha
Percent primary:	nil
Altitudinal range:	250-540 m
Bioclimatic zone:	lowland

This RAP is centred on the high point Maungaroa, a prominent hill 5 km northwest of Tokomaru Bay township. It contains a range of secondary scrub and low forest growing on generally steep to very steep slopes, and covering a full range of aspects. Vegetation composition varies widely, depending on site and age since last disturbance. More recently disturbed areas are dominated by manuka, bracken, and/or tauhinu, but in older communities kanuka and rewarewa become increasingly prominent, along with tawa, cabbage tree, kohuhu, mahoe, kamahi, prickly mingimingi, five finger, mamaku, and *Pittosporum ralphii*. Two elongated wetlands, each several hectares in extent and dominated by raupo, occur along the eastern margin.

Although highly modified, this RAP is valuable for the wide range of secondary vegetation it contains, with early successional vegetation dominated by bracken or manuka uncommon in the wider Ecological District. The two wetlands are also a valuable feature, given the comparative scarcity of wetlands in the Ecological District as a whole.

RAP 21: **Mangahauini Bush (Map 6)**
 Priority: 2
 NZMS 260 ref: Z16 741284
 Total area: 30 ha
 Percent primary: 94%
 Altitudinal range: 80-280 m
 Bioclimatic zone: semi-coastal

This RAP consists of two small remnants of modified primary forest situated on moderately steep hillslopes immediately behind the Tokomaru Bay township. Both contain coastal primary hillslope forest in which tawa, kohekohe, and titoki are dominant, with puriri, rewarewa, pukatea, matai, kahikatea, kohuhu, and black beech also present. The presence of scattered kanuka in these stands suggests that some canopy modification has occurred in the past.

The significance placed on this RAP reflects the relative scarcity of semi-coastal primary forest remnants in this subdistrict. Although both patches are currently subject to modification by domestic stock, good recovery could be expected if they were fenced.

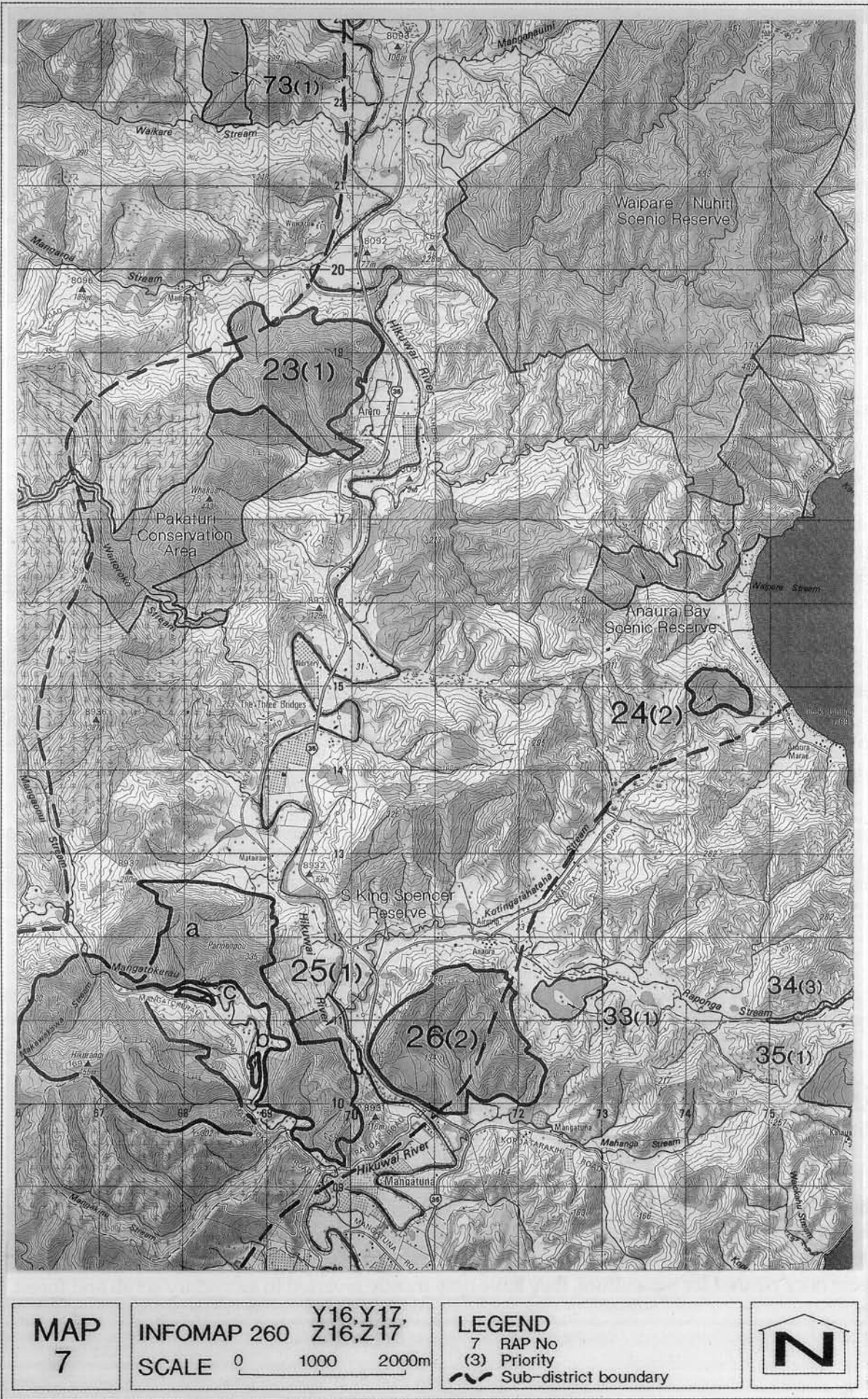
RAP 22: **Mawhai Point (Map 6)**
 Priority: 2
 NZMS 260 ref: Z16 795222
 Total area: 1 ha
 Percent primary: 100%
 Altitudinal range: 60-100 m
 Bioclimatic zone: coastal

This RAP consists of a small and isolated stand of pohutukawa forest situated on a coastal hilltop and adjacent steep, eroding faces on Mawhai Point, at the southern end of Tokomaru Bay. Although not visited on the ground, it was identified during an aerial inspection of coastal sites, and was estimated to contain 30 or more large canopy trees in relatively good health.

The significance of this RAP stems from the healthy pohutukawa forest it contains, a community now rare in the Ecological District. The only other substantial stands are located at Port Awanui (RAP 6), in the Waimahuru Bay Scenic Reserve, and on the coastal parts of Tawhiti (RAP 19). The area is currently unfenced and subject to grazing by domestic stock.

RAP 23: **Arero (Map 7)**
 Priority: 1
 NZMS 260 ref: Y16 695188
 Total area: 236 ha
 Percent primary: 14%
 Altitudinal range: 50-420 m
 Bioclimatic zone: lowland

This is one of three RAPs with strong similarities in vegetation and landforms, all located along the Hikuwai River and adjacent to State Highway 35 between Tolaga Bay and Tokomaru Bay, the others being Mangatokerau Gorge and Mangatuna Bush (RAPs 25 and 26). All three have steep to very steep slopes because of the underlying Tokomaru Sandstone, and although all were once cleared for agriculture, they have now mostly reverted to secondary scrub and forest.



This, the northernmost of the three, is centred along a steep sandstone ridge immediately to the north of the Pakaturi Conservation Area, and extends to the northwest to encompass an area of more gentle topography in the Waiau subdistrict. It contains a large remnant of primary hillslope forest, a fine stand on the more gentle northwestern slopes dominated by tawa, kohekohe, pukatea, and rewarewa with scattered kahikatea, matai, titoki, and hinau. A smaller stand of primary forest on an alluvial fan on the eastern boundary is dominated by kahikatea, with tawa-dominant forest on the footslopes above. Kanuka is dominant in the secondary stands, along with kowhai, lacebark, kohuhu, and tutu, more particularly on steep sites, and rewarewa in older stands.

The high ranking assigned to this RAP reflects the very high values of its primary forest, complemented by the extensive older secondary stands. Parts of the RAP are heavily modified by grazing, and particularly the primary hillslope forest in the northwest, where the understorey has been largely eliminated. Given the diverse and healthy nature of the canopy, recovery should be strong if stock are excluded.

RAP 24: **Anaura Bush (Map 7)**
 Priority: 2
 NZMS 260 ref: Z16 744150
 Total area: 33 ha
 Percent primary: 77%
 Altitudinal range: 20-200 m
 Bioclimatic zone: coastal

This RAP lies in a gently sloping basin of southerly aspect on the coast approximately 1 km south of the Anaura Bay Scenic Reserve. The majority of the area is covered in primary forest in which tawa, puriri, and kohekohe are dominant, with pukatea, hinau, lacebark, rewarewa, cabbage tree, lancewood, and karaka also present. The balance is secondary kanuka forest which also contains scattered puriri, putaputaweta, and kowhai, with *Coprosma rhamnoides* dominant in the understorey. A number of introduced silk tree occur along one margin, and may cause problems if they spread into the secondary stands.

Although the semi-coastal forest of this RAP is similar in composition to that found in the nearby Anaura Bay Scenic Reserve, protection has been recommended because of the comparatively small amount of primary forest left in this subdistrict.

RAP 25: **Mangatokerau Gorge (Map 7)**
 Priority: 1
 NZMS 260 ref: Y16 680114
 Total area: 630 ha
 Percent primary: 2%
 Altitudinal range: 20-455 m
 Bioclimatic zone: lowland

This RAP, closely similar in character to RAPs 23 and 26, is centred on steep to very steep hillslopes and bluffs (Tokomaru Sandstone) in the middle reaches of the Mangatokerau River. The river runs through gorges in the northwest and southeast of the area, but in between meanders through broad alluvial terraces which are extensively farmed and hence are excluded from the RAP. Steep faces and bluffs above the Hikuwai River are also included.

Secondary kanuka forest and scrub are dominant over most of the steep country. Kowhai and lacebark are common associates on steeper sites, and scattered rewarewa occur in older

stands. Steep cliff sites support distinctive vegetation dominated by species such as *Hebe stricta* var. *stricta*, tutu, and wharariki. One of the few surviving wild populations of kowhai ngutukaka (kaka beak) is located on steep cliffs in the upper part of the RAP. Two small remnants of primary forest survive on the river terraces, both dominated by kahikatea, titoki, and pukatea in varying proportions.

Although essentially dominated by secondary vegetation, the RAP has very high values given the small remnants of primary forest on alluvial terraces and the distinctive communities of the steep faces and cliffs; the presence of kowhai-ngutukaka is particularly important. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with common bush and field birds including pied tit, kereru, and weka recorded at the time of survey. The RAP also has very high scenic qualities.

RAP 26: Mangatuna Bush (Map 7)

Priority: 2
 NZMS 260 ref: Z16 712107
 Total area: 249 ha
 Percent primary: 2%
 Altitudinal range: 20-290 m
 Bioclimatic zone: lowland

This RAP is situated on the east side of the Hikuwai River approximately 12 km north of Tolaga Bay. Secondary kanuka forest is dominant on steep hillslopes and cliffs over most of the area, but very small remnants of primary tawa-titoki forest survive in some gullies. Kanuka stands are of several ages, the older stands also containing rewarewa, mapou, heketara, silver fern, and rangiora. Introduced pines occur in some of these secondary stands. Kowhai, wharariki, *Hebe* spp., and *Pittosporum ralphii* are dominant on the cliffs.

The RAP is similar in both landforms and vegetation to the Arero and Mangatokerau Gorge RAPs (23 and 25), although with less dramatic topography. It also lacks some of the qualities of these higher-ranked areas, i.e., the more extensive primary forest of Arero and the kowhai-ngutukaka in Mangatokerau Gorge. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with common bush birds including weka, kereru, and pied tit recorded at the time of survey.

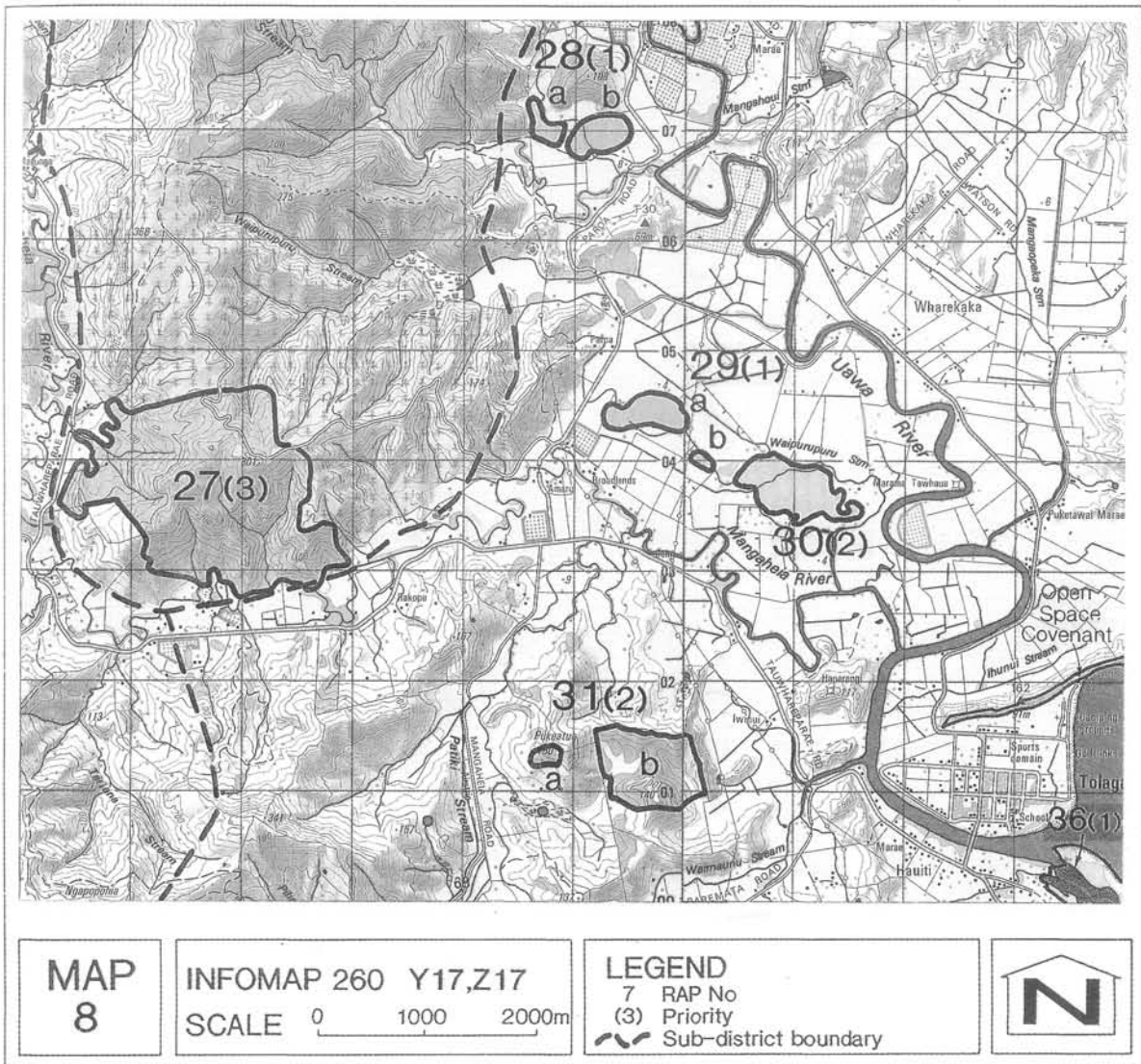
RAP 27: Takapau Hill (Map 8)

Priority: 3
 NZMS 260 ref: Y17 655040
 Total area: 294 ha
 Percent primary: 7%
 Altitudinal range: 20-300 m
 Bioclimatic zone: lowland

This RAP contains an area of moderate to very steep hillslopes located on the north side of the Mangaheia River, approximately 7 km inland from Tolaga Bay township. It has some similarities in both landform and vegetation to a number of other RAPs further north (see Nos 23, 25, 26), reflecting similarities in both geology and past land use. However, there are also some differences, this RAP including more extensive areas of less steeply sloping land and a higher proportion of lower slope units. In addition, the regeneration of the secondary kanuka stands which predominate is less advanced than in these other RAPs. Kowhai and cabbage tree are common associates in older stands, along with scattered wilding pines. One small area of relatively modified primary forest survives in the west, and contains scattered pukatea, emergent over a canopy of tawa and kohekohe. Elsewhere

small, very fragmented and modified remnants of primary forest have survived in protected gullies.

These differences are reflected in the lower ranking of this RAP, perhaps its most important ecological feature being the presence of several plants of the endangered parasitic species *Dactylanthus taylorii* or wood rose.



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6.4 Tolaga RAPs

The Tolaga subdistrict differs quite markedly from the more northern coastal subdistricts. For example, it contains only small areas of natural vegetation, a feature which is largely a reflection of its generally much easier topography and hence the greater ease with which it has been able to be converted to and maintained under agriculture or horticulture. A few remnants of primary hillslope forest remain, and a number of secondary forest remnants are notable for dominance not by kanuka, as is almost universal elsewhere, but by advanced regeneration of kahikatea and a range of other primary forest species. These secondary forests are all that remain of the original dense kahikatea-totara-matai forests which once occupied the extensive alluvial flats and terraces in the lower reaches of the

Uawa River. Distinctive aspects of the topography also contribute in other ways: the subdistrict contains the only two offshore island RAPs, Motuoroi (RAP 32) and Pourewa (RAP 37), and RAP 36 contains the only sizeable estuary in the entire Ecological District.

RAP 28: **Paroa Station (Map 8)**
Priority: 1
NZMS 260 ref: Y17 690070
Total area: 24 ha
Percent primary: nil
Altitudinal range: 10-20 m
Bioclimatic zone: semi-coastal

This is one of several RAPs containing stands of kahikatea-dominant forest growing on extensive, flat terraces in the lower reaches of the Uawa River, north-west of Tolaga Bay township (see also Nos 29 and 30). These forests are all that remain of the original podocarp-dominant primary forests which were cleared to varying degrees both for their timber and to allow agricultural development on these fertile sites. The small remnants which remain are now in varying degrees of recovery, consisting of scattered original trees of less-favoured timber species such as puriri and pukatea surrounded by regenerating saplings, poles, and small trees, principally of kahikatea.

This RAP consists of two pieces of forest separated by a narrow neck of pasture, and dominated by young kahikatea with pockets of matai, puriri, and/or titoki; a few karaka are also present. A large number of divaricate shrub species are found in the understorey. Although modified in comparison with the original primary forest, this RAP has very high significance, given that no unmodified remnants remain and that substantial recovery of an intact forest structure is already well under way. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate-high', with common bush birds including kereru and weka recorded. Although some parts are quite heavily modified by grazing, good recovery of the understorey could be expected if stock were excluded.

RAP 29: **Parkers Bush (Map 8)**
Priority: 1
NZMS 260 ref: Y17 696045
Total area: 23 ha
Percent primary: nil
Altitudinal range: 5 m
Bioclimatic zone: semi-coastal

This RAP is very similar to No. 28 in landform and forest composition, but lacks some of its diversity. Totara and matai have been selectively removed by logging, and fencing to exclude stock has been largely ineffective. A Queen Elizabeth the Second Trust Open Space Covenant is currently being negotiated for the site. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', containing a range of common bush birds.

RAP 30: **Waipurupuru Stream (Map 8)**
 Priority: 2
 NZMS 260 ref: Z17 710037
 Total area: 41 ha
 Percent primary: nil
 Altitudinal range: 5 m
 Bioclimatic zone: semi-coastal

This RAP is similar in both landform and composition to Nos 28 and 29. Although larger in extent, it has been ranked lower in priority to reflect its more open canopy and the heavy modification of the understorey which has occurred as a result of grazing by domestic livestock. Manuka is invading some of the more open parts of the stand, and hawthorn, a species resistant to browsing, is quite dense in the understorey. Exclusion of stock should be accorded high priority in any management for conservation purposes.

RAP 31: **Iwinui Bush (Map 8)**
 Priority: 2
 NZMS 260 ref: Y17/Z17 697013
 Total area: 66 ha
 Percent primary: 9%
 Altitudinal range: 20-180 m
 Bioclimatic zone: semi-coastal

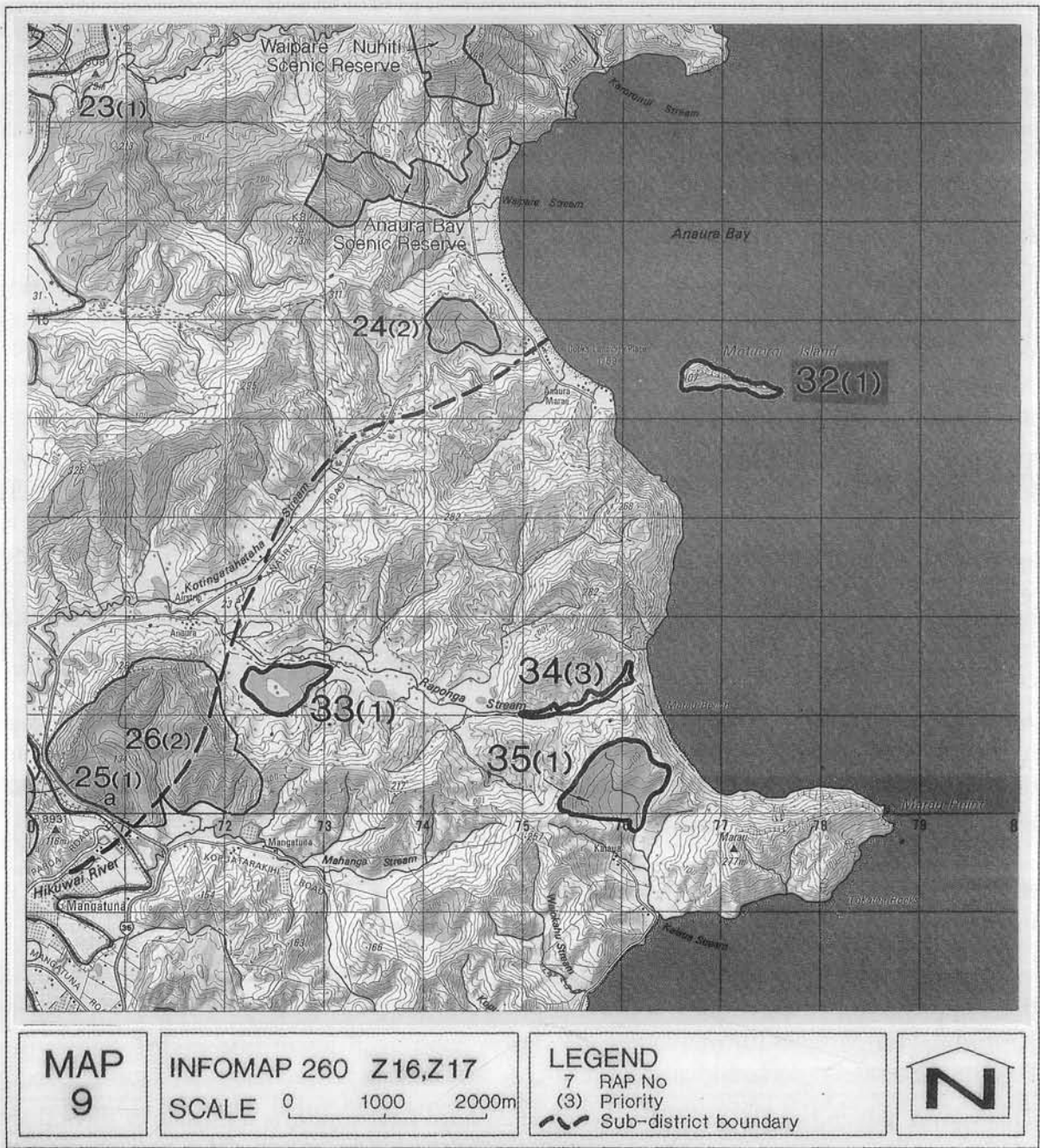
This RAP consists of two pieces of land located on gently rolling hillslopes approximately 4 km west of Tolaga Bay township. Although dominated by secondary scrub and forest, it also contains two remnants of primary forest, one of which forms the western outlier. A wetland dominated by raupo and *Carex secta* is located in a valley head on the western side of the main block. The pockets of primary forest, both located on south-facing upper hillslopes, are dominated by tawa and kohekohe along with rewarewa, kahikatea, cabbage tree, titoki, and puriri. Secondary kanuka stands are of several ages; some of them also contain broadleaved species such as lacebark, kohuhu, mahoe, and putaputaweta.

Although fragmented and modified, this RAP is valuable mainly for its primary forest remnants and wetland. The high potential for regeneration of a range of forest species in the secondary stands is already apparent, and will further enhance the value of this RAP provided the effects of browsing by both domestic stock and feral goats can be reduced.

RAP 32: **Motuoroi Island (Map 9)**
 Priority: 1
 NZMS 260 ref: Z16 770145
 Total area: 17 ha
 Percent primary: nil
 Altitudinal range: 0-107 m
 Bioclimatic zone: coastal

This island, which lies 700 m off the beach at Anaura Bay, supports a mosaic of secondary vegetation the composition of which is strongly influenced by aspect. On the northern side eroding, bare rockfaces predominate, but small pockets of scrub and low forest contain *Pittosporum ralphii*, karamu, titoki, mapou, mahoe, and cabbage tree. In contrast, the southern face and western end are mainly vegetated, and support low coastal forest dominated by titoki, whau, mahoe, kohekohe, mapou, and *Pittosporum ralphii*; karaka occur on the lower spurs. A wide range of introduced plant species are also present.

The significance of the RAP stems mainly from its distinctive island character, its archaeological sites, and the presence of breeding populations of seabirds, including probably grey-faced petrels. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate'.



RAP 33:	Anaura Station (Map 9)
Priority:	1
NZMS 260 ref:	Z16 725113
Total area:	29 ha
Percent primary:	nil
Altitudinal range:	30-40 m
Bioclimatic zone:	semi-coastal

This RAP is located on an extensive alluvial flat in the lower reaches of the Raponga Stream on Anaura Station, approximately 4 km inland from Anaura Bay (cf. RAP 34). It is similar in landform, origin, and forest composition to the secondary kahikatea-dominant stands which have regenerated locally following clearance of the original forest cover in the lower parts of the Uawa River catchment (RAPs 28-30). Although it consists in the main of a dense pole stand of kahikatea, a wide range of other forest species are also present, including matai, titoki, kanuka (around the margin), tawa, and pukatea. A small poorly drained area in the centre supports wetland vegetation dominated by sedges and blackberry.

The high significance of this RAP stems from the almost complete clearance of the forests which originally occupied these alluvial terraces. Although stands such as this have been severely modified, a diverse range of forest species is still present, and with time these will closely approach in composition and structure the original forests. The area has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with common bush birds including pied tit and weka recorded.

RAP 34:	Raponga Stream (Map 9)
Priority:	3
NZMS 260 ref:	Z16 753111
Total area:	5 ha
Percent primary:	nil
Altitudinal range:	40 m
Bioclimatic zone:	coastal

This RAP, very similar in character to RAP 10, is located near the coast above Marau Beach, between Tolaga Bay and Anaura Bay. It contains a small, elongated area of wetland vegetation which occupies a very gently sloping site in the head of the Raponga Stream, a catchment draining away from the coast towards the west. The vegetation consists predominantly of raupo reedland in wetter areas, with *Cyperus ustulatus* and *Carex geminata* more abundant towards the better drained margins. Cabbage trees are scattered throughout.

Although modification by stock threatens the ecological integrity of the site, it remains significant given the relative paucity of wetlands in the Ecological District.

RAP 35:	Kaiaua Bush (Map 9)
Priority:	1
NZMS 260 ref:	Z17 760104
Total area:	62 ha
Percent primary:	100%
Altitudinal range:	20-180 m
Bioclimatic zone:	coastal

This RAP is located in a gently sloping, southward-facing basin on the coast at the northern end of Kaiaua Bay. It contains a fine example of primary mixed coastal forest, which occupies a full sequence of landforms from ridges, through gentle sideslopes, to alluvial valley floor. The canopy is dominated by tawa, puriri, and kohekohe, with rewarewa, northern rata, kahikatea, titoki, hinau, lacebark, and ngaio also common. Smaller areas of scrub to the east contain woolly nightshade and gorse, and these may cause problems if there is any disturbance to the canopy.

This RAP has been ranked highly given that it contains the best example of primary semi-coastal forest on hillslopes left in the subdistrict, and arguably one of the best examples of such forest in the entire Ecological District. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with common bush and field birds including kereru recorded. Grazing by domestic stock is causing ongoing modification of the understorey, but given the fertility of the site and the warm climate, good recovery could be expected if the block were fenced. Remains of the old coastal coach road which runs through the RAP are still visible, including some of the original culverts constructed from puriri.

RAP 36:	Tolaga Estuary (Map 10)
Priority:	1
NZMS 260 ref:	Z17 740997
Total area:	48 ha
Percent primary:	nil
Altitudinal range:	0 m
Bioclimatic zone:	coastal

Located immediately southeast of Tolaga Bay township, this RAP consists on an estuary formed where a southern tributary of the Uawa River has been enclosed by a sand dune spit. At the southern end of the estuary and along its western margins, oioi-*Isolepis* sedgeland occurs on the lowest-lying areas, while saltmarsh species such as marsh ribbonwood and *Muehlenbeckia complexa* dominate the margins (Photo 6). Vegetation on the sandspit has been subject to severe modification. Recently burnt areas are covered by spinifex and marram, but elsewhere these species have been overtopped by a range of woody weeds including boxthorn, gorse, and blackberry, and planted *Pinus radiata*. Behind the camping ground there are small areas of *Spartina* and mangrove, both of which have been planted, and a number of individuals of *Olearia solandri*, a shrub with a very localised regional distribution.

The RAP has very high significance, containing the only sizeable estuary in the entire Ecological District. As such it contains a number of plant species which in the Ecological District are almost entirely restricted to this site. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate-high', with a diverse range of wader and field species including banded dotterel and reef heron recorded. The western margins of the estuary have been heavily modified by cattle grazing and rubbish dumping, and some protection/amelioration would greatly benefit the area.

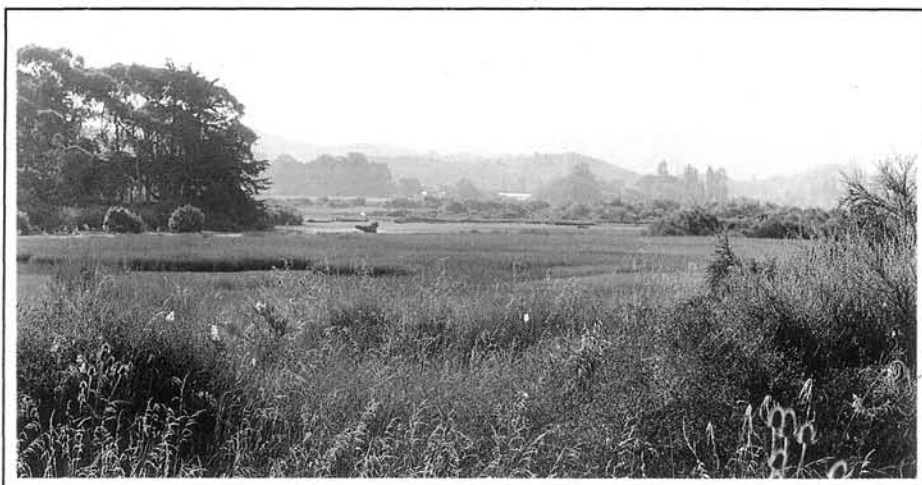
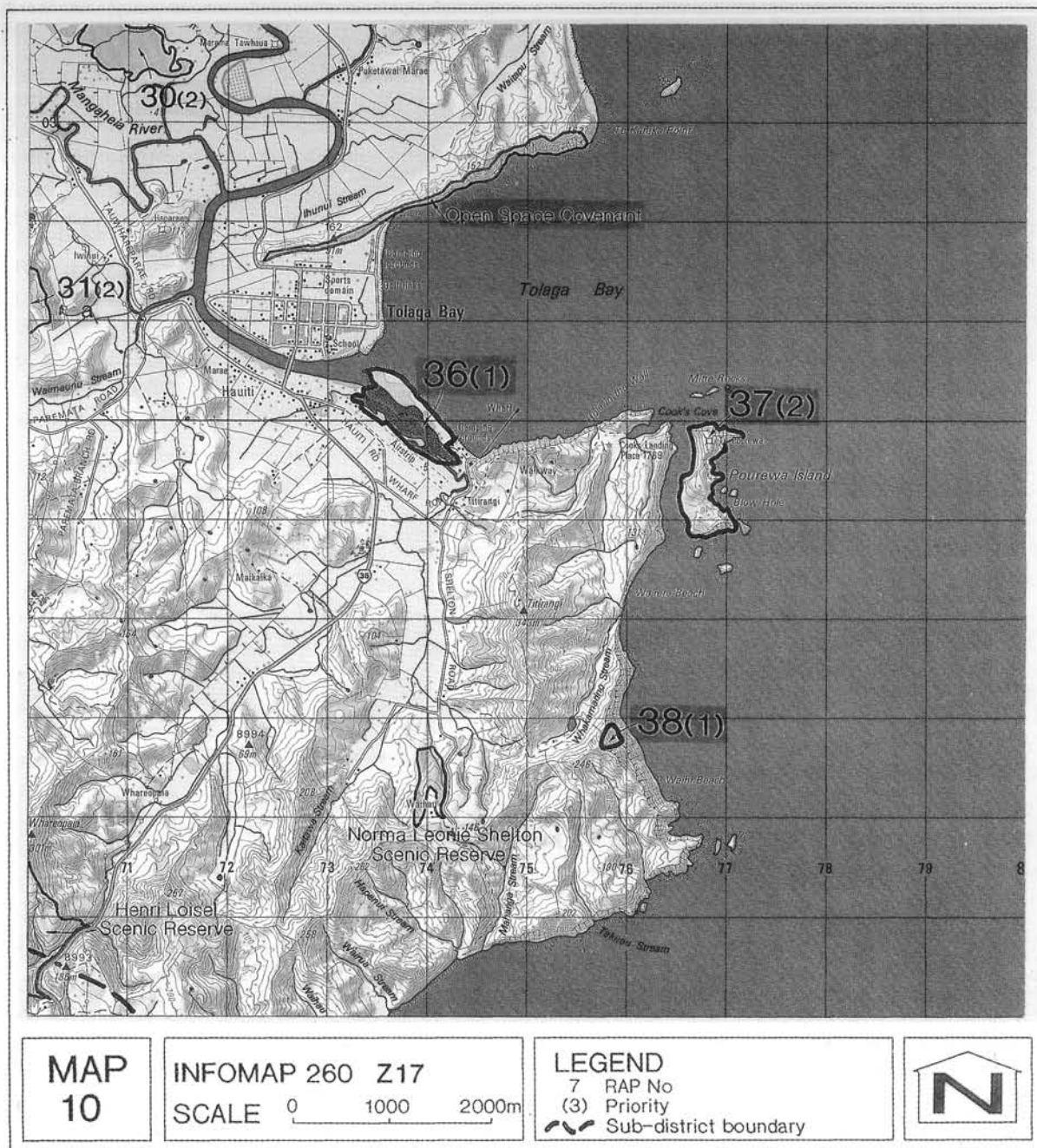


Photo 6. The one extensive area of estuarine vegetation in the Ecological District occurs in the Tolaga Estuary - RAP 36 (Z17 744996). Saltmarsh species including marsh ribbonwood, *Muehlenbeckia complexa*, and *Olearia solandri* occur in the foreground, gradually merging into a sedgeland of oioi and *Isolepis*.

RAP 37:	Pourewa Island (Map 10)
Priority:	2
NZMS 260 ref:	Z17 767995
Total area:	39 ha
Percent primary:	nil
Altitudinal range:	0-100 m
Bioclimatic zone:	coastal

Pourewa Island lies at the entrance to Tolaga Bay immediately adjacent to Cook's Cove, and is separated from the mainland by only a small channel, shallow enough to be waded at low tide. Although the western faces of the island are only moderately steep, the northern, eastern, and southern slopes are mostly precipitous and unvegetated, reflecting their much greater degree of exposure to erosion by wave action. The vegetation is highly variable, reflecting its periodic disturbance as a result of prolonged human use. Rank pasture has been gradually invaded by woody species, so that scrub and low forest now predominate over approximately half the island, and particularly on steep sites. It consists of varying proportions of manuka, karo, brush wattle, kawakawa, wharariki, and tutu. Bracken and exotic pasture species are dominant on the balance of the vegetated area, generally on sites of moderate slope. One small area with poor drainage is dominated by raupo.

In common with Motuoroi Island (RAP 32), this RAP has high conservation value given its distinctive island character, breeding populations of several common seabirds, and very high archaeological and historical values. However, it lacks the diversity of vegetation and the breeding populations of burrowing seabirds of the former. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate-high'.



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RAP 38:	Hauiti coastal karaka forest (Map 10)
Priority:	1
NZMS 260 ref:	Z17 758968
Total area:	4 ha
Percent primary:	100%
Altitudinal range:	85-220 m
Bioclimatic zone:	coastal

This small RAP is located on a very steep face surrounded by unstable coastal cliffs, approximately 3 km south of Cook's Cove. Although small, it has been given a high ranking because it contains the only reasonably extensive example of coastal karaka-dominant forest remaining in the Ecological District. Other species present include kohekohe, mahoe,

and puriri. Lancewood, kowhai, kohuhu, and *Pittosporum ralphii* are common around the margins, and tauhinu and exotic grasses are dominant on vegetated parts of the adjacent unstable faces. Removal of feral goats would greatly enhance the viability of the forest.

6.5 Pakarae RAPs

This subdistrict is typified by a predominance of pastoral landscapes, with generally only very small fragments of the original primary forest cover remaining. In addition, as a result of the predominance of gently to moderately sloping terrain and relatively fertile soils, there is very little secondary forest, and almost none in which kanuka is dominant. The one sizeable piece of secondary forest identified on gentle landforms is dominated by totara.

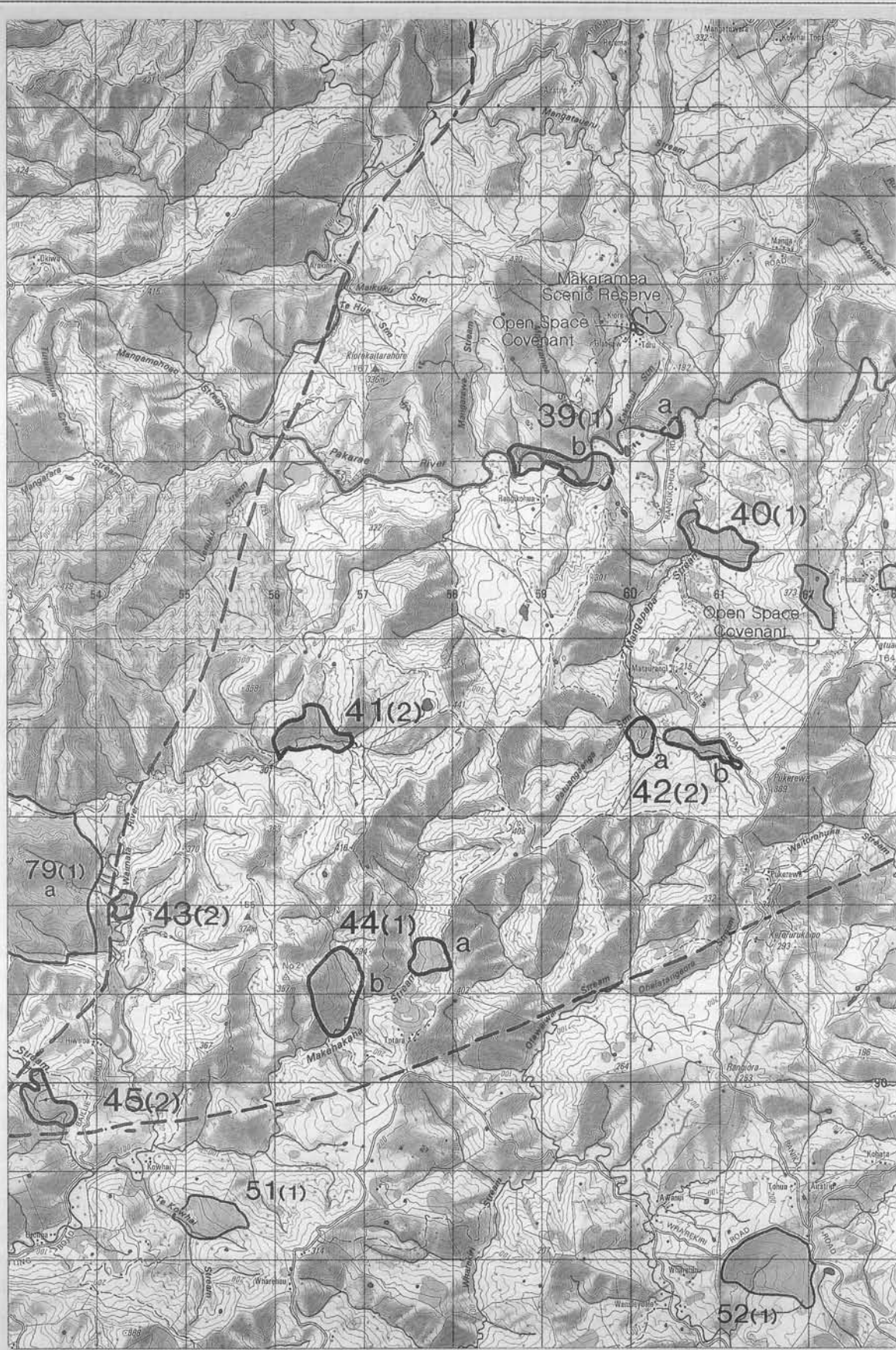
RAP 39:	Rangikohua Station Bush (Map 11)
Priority:	1
NZMS 260 ref:	Y17 595968, 605974
Total area:	34 ha
Percent primary:	100%
Altitudinal range:	70-140 m
Bioclimatic zone:	lowland

This RAP consists of two areas of alluvial terrace and lower hillslopes in the middle reaches of the Pakarae River. Slopes are generally very gentle on the terraces proper, but very steep faces drop into the river along the edges, and at the back of the terrace the lower hillslopes are moderate. Both areas contain remnants of diverse podocarp-broadleaved forest. Podocarp densities are generally highest on the alluvial terraces, but decline on the adjacent hillslopes, where the canopy is dominated instead by tawa and titoki. Although kahikatea is the most prominent podocarp, matai, totara, and rimu are also present. Kowhai, lacebark, young totara, and cabbage trees are locally common along the margins.

These remnants have high significance, given that forest similar to that which they contain would have once occurred on fertile hillslopes and alluvial sites along the larger streams and rivers throughout the subdistrict, but has now been largely eliminated through pastoral development. Although parts of this RAP are currently grazed, and some canopy trees have recently been logged in the smaller area, they would recover well if fenced because of their high fertility.

RAP 40:	Mangapapa Stream Bush (Map 11)
Priority:	1
NZMS 260 ref:	Y17 610961
Total area:	26 ha
Percent primary:	25%
Altitudinal range:	100-280 m
Bioclimatic zone:	lowland

This RAP is located on moderate lower hillslopes above the Mangapapa Stream, a tributary of the Pakarae River. It consists of a mixture of primary forest and advanced secondary forest. Tawa and kohekohe are dominant in the primary stand, along with occasional matai, kahikatea, pukatea, rewarewa, totara, and titoki. The secondary forest consists almost entirely of totara, with only very occasional kowhai, matai, kahikatea, kanuka, lacebark, and titoki.



MAP
11

INFOMAP 260 Y17
SCALE 0 1000 2000m

LEGEND
7 RAP No
(3) Priority
Sub-district boundary



The RAP has very high significance not only for its primary forest, little of which remains in the subdistrict, but also for the composition of the secondary forest it contains. Totara-dominant secondary stands such as this, although probably once common on fertile sites which had been disturbed, are now scarce in both the subdistrict and the wider district. Given these values, fencing of the area should be given high priority in order to reduce the impacts of grazing by both domestic stock and feral goats.

RAP 41: **Totara Station Bush (Map 11)**
 Priority: 2
 NZMS 260 ref: Y17 565939
 Total area: 30 ha
 Percent primary: 100%
 Altitudinal range: 220-320 m
 Bioclimatic zone: lowland

This RAP is situated on moderate lower hillslopes and shorter but steep riparian faces on a relatively remote site in the Waimata River headwaters. It consists of a triangular remnant of primary lowland forest in which scattered kahikatea and matai are emergent over a canopy of mainly tawa, titoki, and pukatea. Although the canopy is more or less intact over most of the area, some of the forest along the margins is more fragmented, particularly at the downstream end.

This RAP contains a significant primary forest remnant in a landscape now largely dominated by exotic pasture and plantation. Although partially fenced, it appears to be suffering some ongoing degradation by domestic stock, and this should be remedied if values are to be preserved in the long term.

RAP 42: **Mataurangi Bush (Map 11)**
 Priority: 2
 NZMS 260 ref: Y17 602939, 608938
 Total area: 25 ha
 Percent primary: 100%
 Altitudinal range: 150-320 m
 Bioclimatic zone: lowland

This RAP contains two pieces of land located on gently to moderately sloping, erosion-prone country in the headwaters of the Mangapapa catchment. The lower and more westerly of these is predominantly of northwesterly to northeasterly aspect, whereas the eastern piece extends to higher altitudes, and is predominantly of southerly aspect. Both pieces contain remnants of primary hillslope forest dominated by tawa and kohekohe, with occasional emergent rewarewa and pukatea. Kohekohe is perhaps more extensive in the eastern piece, and puriri also occurs there. Other species present include matai, titoki, lacebark, totara, and ngaio.

Between them these two blocks contain forest which is highly representative of the original hillslope broadleaved forest of this subdistrict, although probably lacking the original density of podocarps, which may have been selectively removed for their timber. The eastern block has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with common bush birds including kereru recorded. Although both blocks are unfenced and subject to grazing, the canopy remains reasonably intact, and a good response could be expected in the understorey if stock were excluded. A small stand of *Robinia pseudoacacia* has been planted in the north-east corner of the eastern block, but should present few problems to future management for conservation purposes.

RAP 43: **Hiwiroa (Map 11)**
 Priority: 2
 NZMS 260 ref: Y17 543920
 Total area: 7 ha
 Percent primary: 100%
 Altitudinal range: 120-200 m
 Bioclimatic zone: lowland

This small RAP is located on an alluvial terrace and associated lower hillslopes in the upper reaches of the Waimata River. It consists of a small remnant of primary kahikatea/tawa-titoki forest, including one kahikatea of particularly impressive dimensions. Other species present in the canopy include totara, white maire, and mahoe. The understorey has been subject to severe modification by grazing by domestic stock, and gaps have appeared in the canopy, some as a result of selective removal of podocarps, presumably for timber. However, despite its small size and somewhat fragmented nature it is still strongly representative of lower slope and terrace podocarp/broadleaved forest, which was once widespread in this subdistrict.

RAP 44: **Makahakaha Stream Bush (Map 11)**
 Priority: 1
 NZMS 260 ref: Y17 566910, 575910
 Total area: 57 ha
 Percent primary: 100%
 Altitudinal range: 120-280 m
 Bioclimatic zone: lowland

This RAP contains two very similar blocks of primary forest situated on moderately steep slopes approximately 1 km apart in the upper reaches of the Makahakaha Stream. In physical terms they differ mostly in aspect, with the western block mostly of easterly aspect and the eastern block mostly of westerly aspect. The forest of both blocks is dominated by locally frequent rimu, matai, miro, and totara emergent over a canopy of tawa and kohekohe. Other widespread species include pukatea, nikau, rewarewa, and titoki in the western block, and white maire, puriri, rewarewa, pukatea, and mahoe in the eastern block. One small patch of black beech occurs on a harsh site in the western block. Although the block is grazed throughout, the canopy remains reasonably intact.

Stands such as these are of the highest significance, and encompass much of the diversity of the original hillslope forest communities common in the Ecological District. They contain some of the best examples of forest with emergent podocarps still present, and their broadleaved canopies, although dominated by tawa and kohekohe, contain a diverse range of other species including local black beech. The values of these two remnants would be greatly enhanced by fencing to minimise the effects of grazing animals.

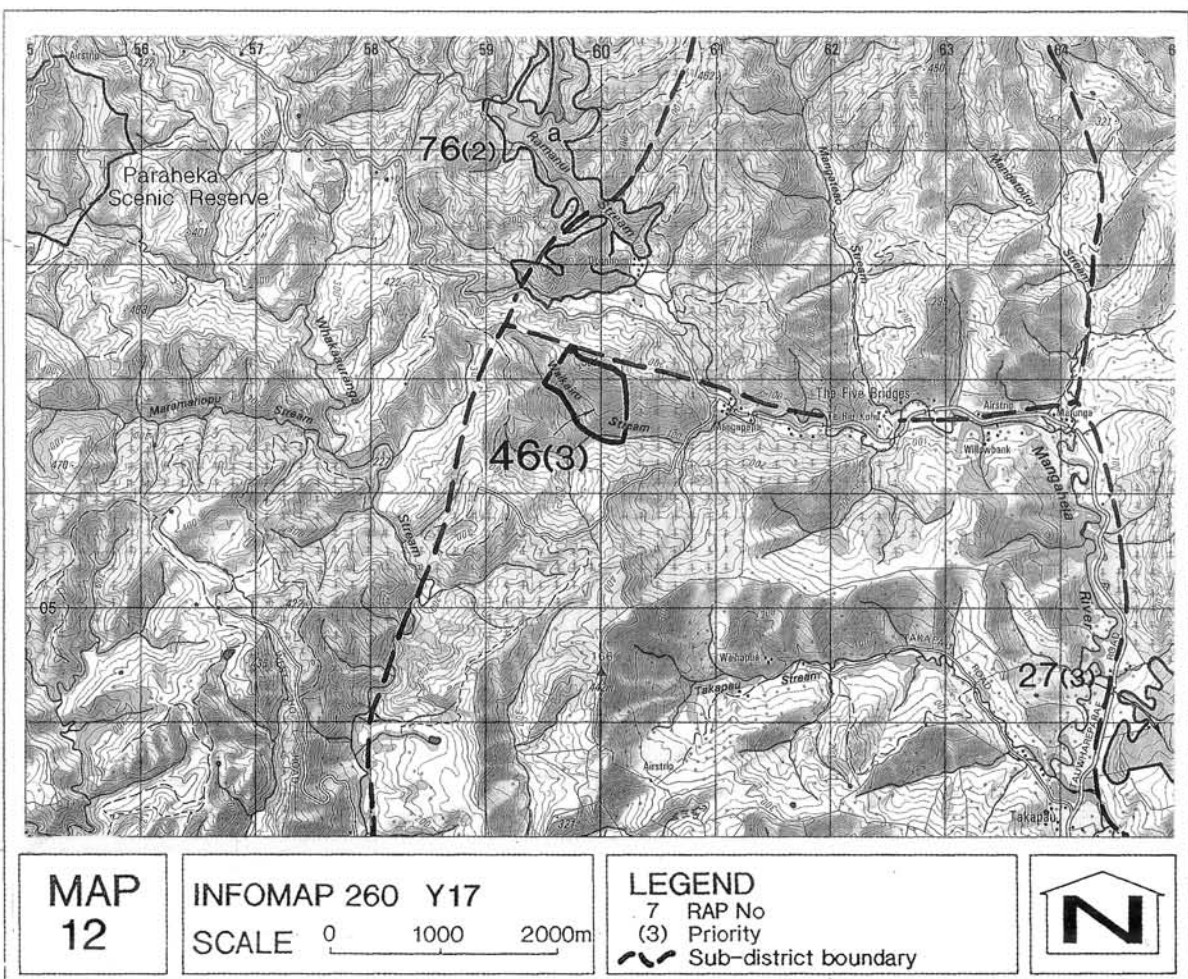
RAP 45: **Kokakonui Stream Bush (Map 11)**
 Priority: 2
 NZMS 260 ref: Y17 534897
 Total area: 20 ha
 Percent primary: nil
 Altitudinal range: 100-170 m
 Bioclimatic zone: lowland

This small RAP is located on moderate lower hillslopes of predominantly southwesterly aspect in the lower reaches of the Kokakonui Stream, a tributary of the Waimata River. It

contains an area of modified but regenerating forest dominated by moderate-sized totara and kahikatea, but with lacebark, lancewood, matai, tawa, and mahoe also present. It is significant for the advanced regeneration of podocarps it contains, as well as a diverse range of broadleaved species. Although surrounded by pasture, it is well fenced. Pines buffer the RAP along parts of the boundary.

RAP 46: Waikairo Stream (Map 12)
Priority: 3
NZMS 260 ref: Y17 600069
Total area: 37 ha
Percent primary: 42%
Altitudinal range: 140-470 m
Bioclimatic zone: lowland

This small RAP is located in the north of the subdistrict on moderately steep hillslopes of southerly aspect in the headwaters of the Waikairo Stream. It contains a mix of primary and secondary hillslope communities. The primary forest is dominated by tawa and kohekohe, with pukatea, kahikatea, karaka, kowhai, nikau, and lacebark also present. Manuka and kanuka, together with kowhai, rewarewa, five finger, tauhinu, kohuhu, and/or mamaku dominate secondary communities on the upper hillslopes, while those on lower hillslopes are dominated solely by kanuka.



Although the significance of this RAP stems mainly from the diverse primary hillslope forest it contains, the dominance of some successions by manuka and tauhinu, generally on sites with thinner soils, is unusual in the Ecological District, and in this subdistrict in particular. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded. The area is unfenced and subject to heavy browsing pressure by goats; this will require some management intervention if the qualities of the site are to be maintained in the long term.

6.6 Whangara RAPs

The Whangara subdistrict, in common with the two previous subdistricts, is typified by having a very high proportion of its total area in productive farmland and a correspondingly small area remaining in natural vegetation. Small remnants of primary forest make up a large proportion of the latter, but these are often in poor condition as a consequence of grazing and browsing by domestic stock. Only very small amounts of secondary vegetation occur in the subdistrict. Notable features include a number of wetlands (RAPs 47-50), most of which are clustered in an area of flat terrain in the northeast, and areas of duneland along the coast (RAPs 55, 56, 58).

RAP 47:	King's Farm wetland (Map 13)
Priority:	2
NZMS 260 ref:	Z17 705926
Total area:	23 ha
Percent primary:	nil
Altitudinal range:	70 m
Bioclimatic zone:	semi-coastal

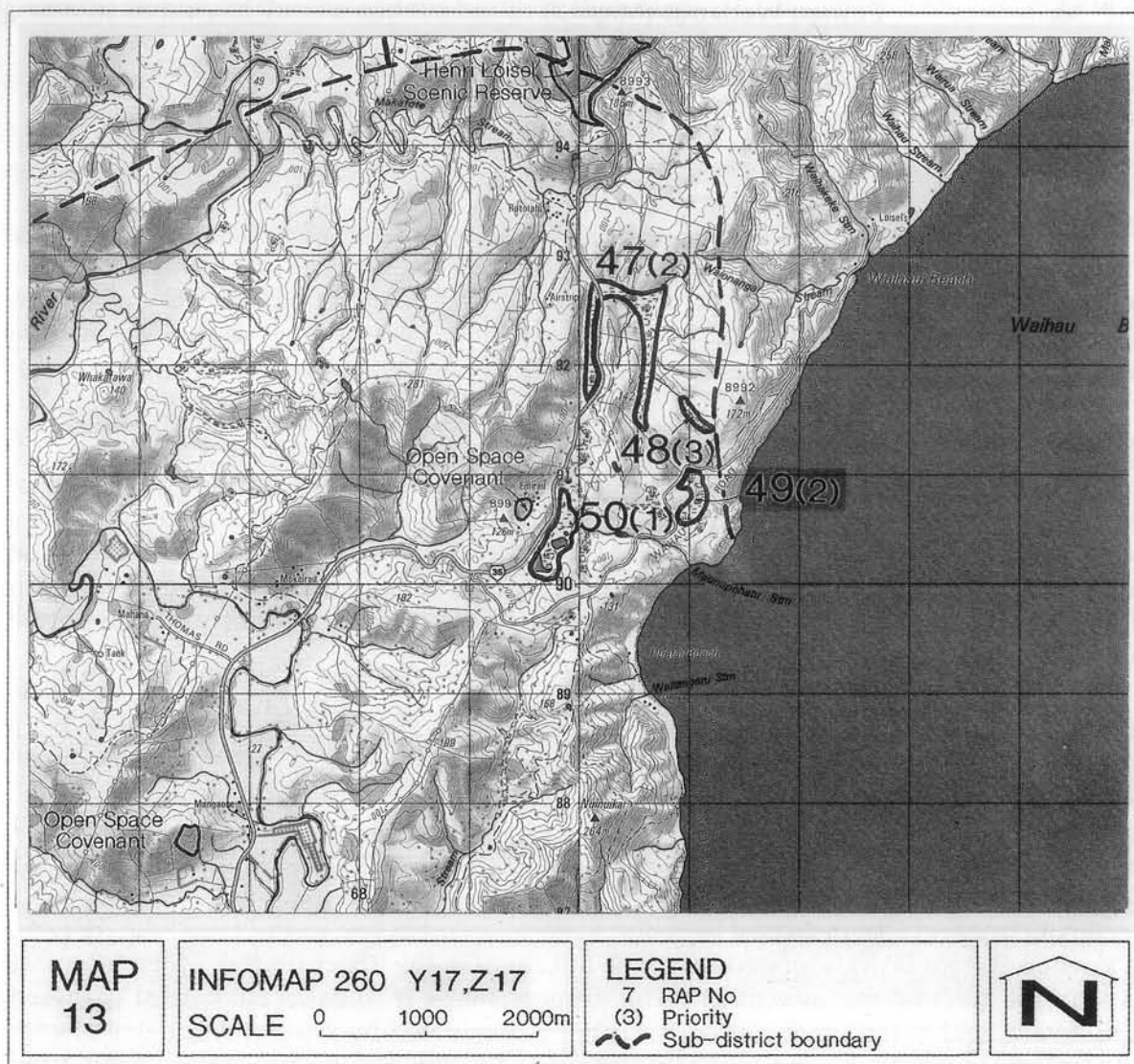
This RAP stretches along two arms of a poorly drained, silted valley system adjacent to State Highway 35. Raupo is the dominant species, but small clumps of manuka, kohuhu, cabbage tree, and karamu are scattered throughout. A wide range of weed species are present including *Apium nodiflorum*, willow, poplar, blackberry, and sweet briar. The area is unfenced, and is subject to modification around the margins by stock.

This is one of four small wetland RAPs clustered together approximately 15 km south of Tolaga Bay township (see also Nos 48-50). Although modified by stock, weed invasion, and probably also eutrophication, wetlands of this size are unusual in the context of the wider Ecological District, and are significant for both their botanical and wildlife values.

RAP 48:	Waihau Road wetland (a) (Map 13)
Priority:	3
NZMS 260 ref:	Z17 710916
Total area:	1 ha
Percent primary:	50%
Altitudinal range:	110 m
Bioclimatic zone:	coastal

This wetland RAP is situated in the bottom of a shallowly incised valley adjacent to a number of other wetland RAPs (see also Nos 47, 49, and 50). It consists of a small, elongated pond surrounded by a fringe of coastal tawa-kohekohe forest. Pukatea and kahikatea are common along the pond margins. Other species include rewarewa, karaka, nikau, cabbage tree, and hinau. Wetland species around the pond margins include raupo, *Carex secta*, and *Cyperus ustulatus*.

Although this RAP is very small and somewhat modified, its significance stems from its unusual combination of wetland surrounded by reasonably intact primary forest. It is unfenced, and is subject to grazing and browsing by domestic stock.



RAP 49: Waihou Road wetland (b) (Map 13)
Priority: 2
NZMS 260 ref: Z17 710910
Total area: 8 ha
Percent primary: nil
Altitudinal range: 80 m
Bioclimatic zone: coastal

This wetland RAP is situated in a very gently sloping valley bottom, just to the south of RAP 48 (see also Nos 47, 48, and 50). The vegetation is dominated by raupo, manuka, and harakeke, but with a sedge and rush-lined margin. Blackberry, sweet briar, and willows

also occur around the margins. As already noted, comparatively few wetlands occur in the Ecological District, and areas such as this are valuable despite their ongoing modification by grazing, particularly by cattle, which present a significant threat to the long-term integrity of the site.

RAP 50: Emirau Wetlands (Map 13)

Priority: 1
 NZMS 260 ref: Y17 697905
 Total area: 15 ha
 Percent primary: nil
 Altitudinal range: 80 m
 Bioclimatic zone: semi-coastal

This wetland RAP is located in a flat silted valley bottom adjacent to a number of other wetland RAPs (see also Nos 47-49). It consists of several small ponds, surrounded by a fringe of raupo with *Juncus* and *Carex* species, merging into extensive wetland vegetation consisting of a canopy of manuka growing over sphagnum moss and a very diverse range of wetland species. Some of the more widespread of these include harakeke, willow, poplar, karamu, *Blechnum minus*, and *B. 'blackspot'*.

This is the largest and most diverse of this group of wetlands. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a wide range of waterfowl species including dabchick recorded. Although the hydrology has been modified in part through efforts to raise the water level, and despite the presence of potentially invasive weeds such as willow and pampas, this site is probably one of the most significant wetlands in the entire Ecological District.

RAP 51: Te Kowhai Stream Bush (Map 14)

Priority: 1
 NZMS 260 ref: Y17 554885
 Total area: 27 ha
 Percent primary: 100%
 Altitudinal range: 100-240 m
 Bioclimatic zone: semi-coastal

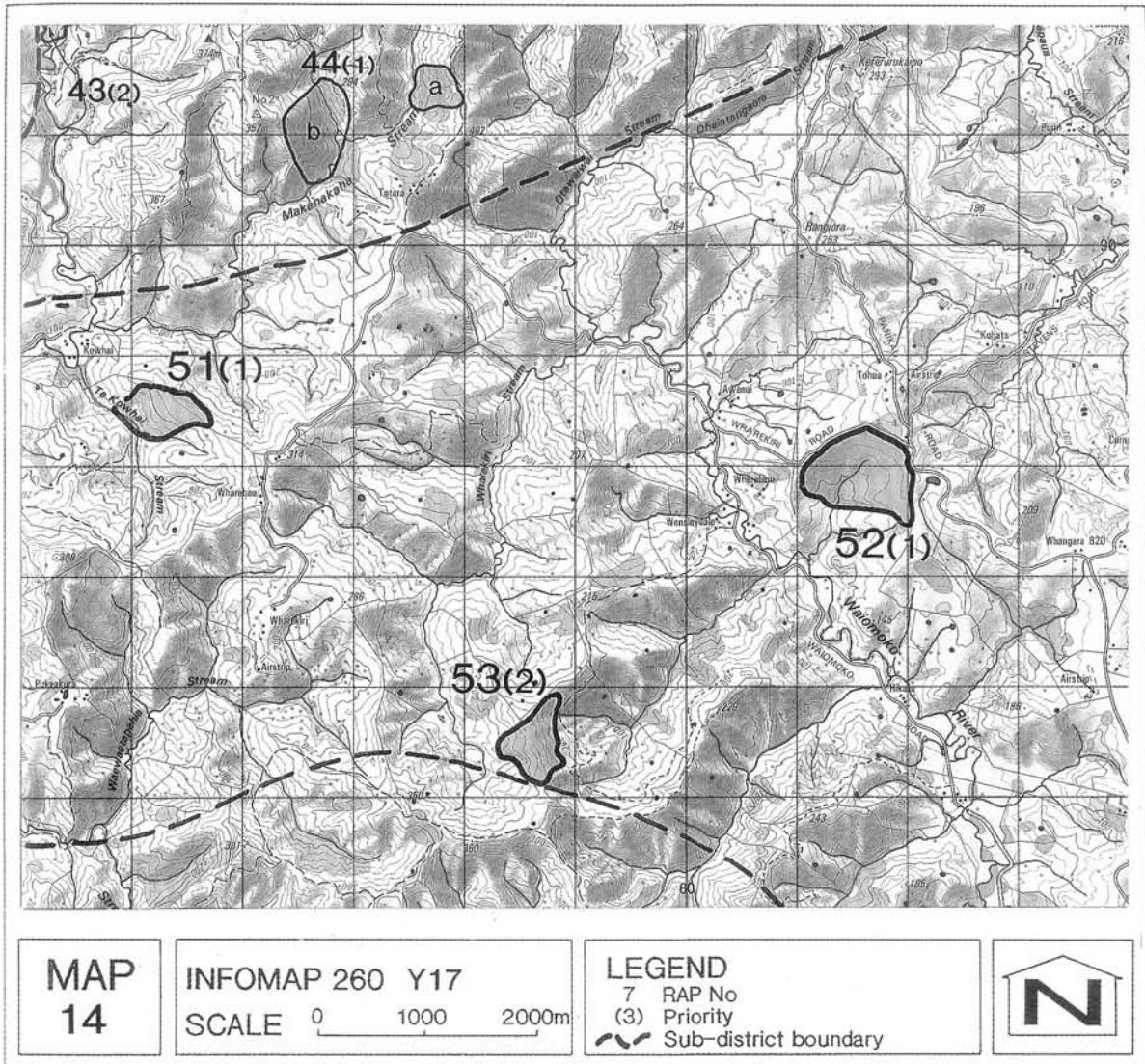
Te Kowhai Stream Bush is located on gentle hillslopes in the upper reaches of the Waimata River in the west of the subdistrict. The primary forest it contains consists of scattered rimu, totara, and matai emergent over a canopy dominated by tawa and kohekohe, with pukatea, rewarewa, titoki, and puriri also present. Its high significance stems largely from the quality of the primary forest it contains, which is notable for the survival of emergent podocarps. Although the area is grazed throughout, the canopy remains intact. The long-term viability of the forest would be greatly enhanced by fencing to exclude stock.

RAP 52: Waiomoko Stream Bush (Map 14)

Priority: 1
 NZMS 260 ref: Y17 615879
 Total area: 62 ha
 Percent primary: 100%
 Altitudinal range: 70-180 m
 Bioclimatic zone: semi-coastal

This RAP is located in a gentle, south-facing basin in the upper reaches of the Waiomoko River. The forest is dominated by tawa and kohekohe, with frequent puriri and pukatea, occasional rimu, titoki, rewarewa, and matai, and scattered small groves of regenerating

kahikatea. It contains the largest remaining piece of mixed primary forest left in the subdistrict, and has particularly high conservation value because of its relatively large size and the unmodified state of the canopy. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including kereru and weka. Although grazed throughout, good recovery of the understorey could be expected given the fertility of the site and the health of the canopy.



RAP 53:	Wensleydale Bush (Map 14)
Priority:	2
NZMS 260 ref:	Y17 587855
Total area:	27 ha
Percent primary:	100%
Altitudinal range:	200-300 m
Bioclimatic zone:	semi-coastal

This RAP is situated on moderate slopes and ridge crests with contrasting northeasterly and southwesterly aspect in the upper headwaters of the Waiomoko River. It consists of a

moderate-sized remnant of primary forest dominated by kohekohe and tawa, with other species present including puriri, pukatea, rimu, totara, rewarewa, matai, and pigeonwood. The remnant is partly fenced, and the canopy is in good condition.

RAP 54: **Whangara Bush (Map 15)**
Priority: 2
NZMS 260 ref: Y17 651827
Total area: 31 ha
Percent primary: 100%
Altitudinal range: 30-95m
Bioclimatic zone: semi-coastal

This RAP is situated on gentle lower hillslopes alongside State Highway 35. It contains a remnant of modified puriri-tawa forest and woodland in which pukatea, kahikatea, totara, matai, titoki, kanuka, rewarewa, kohekohe, and lacebark are also present. The area is grazed throughout, and as a consequence the margins have become very ragged. Considerable dieback of puriri was noted.

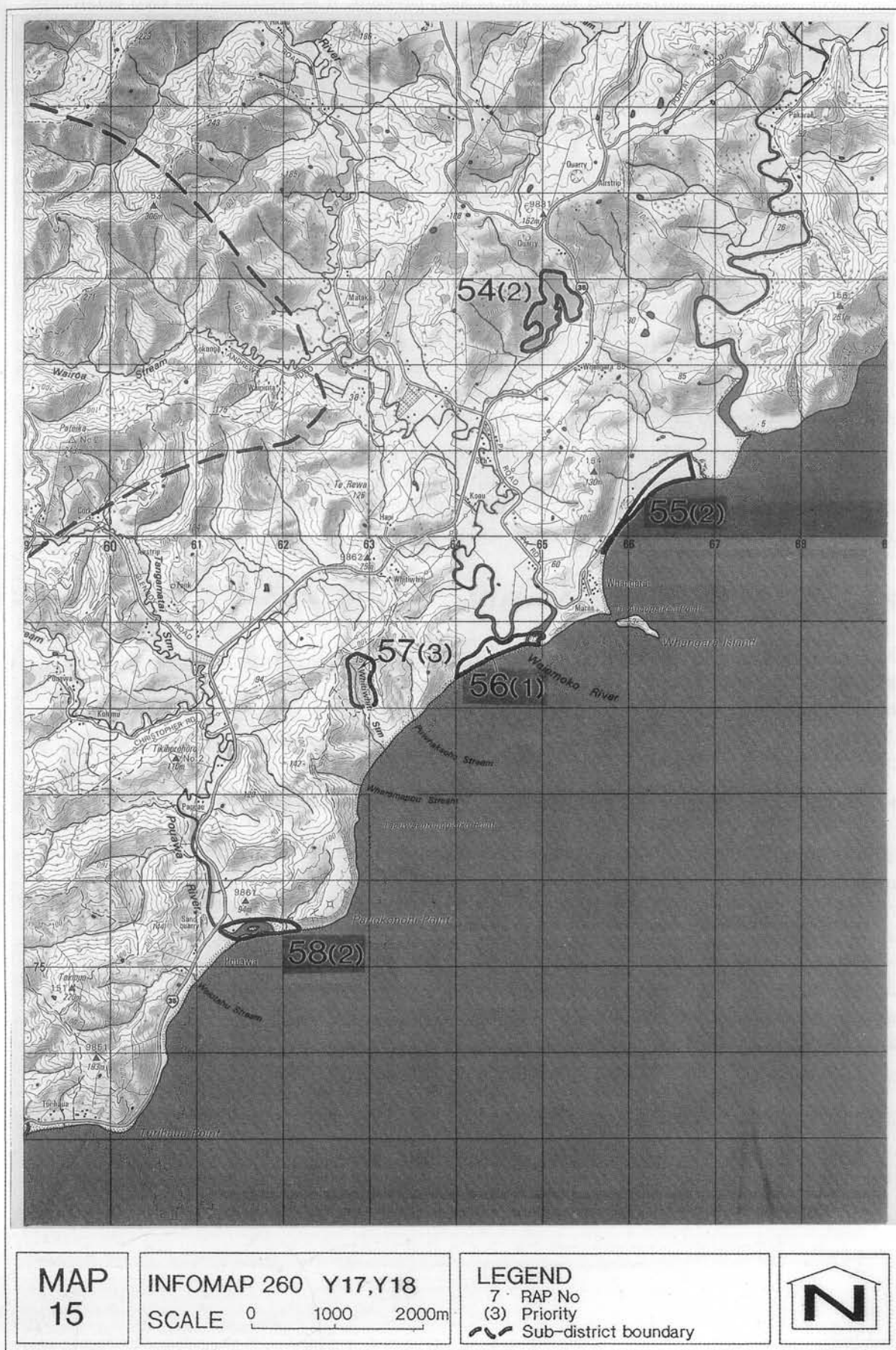
Despite its degree of modification, the forest of this area is still valuable given the very small proportion of primary forest surviving in the subdistrict. Fencing, and perhaps also restoration planting, should be included as part of any proposal for protection, but given the relatively diverse nature of the canopy and the fertility of the site, reasonable recovery could be expected.

RAP 55: **Whangara Beach (Map 15)**
Priority: 2
NZMS 260 ref: Y18 658800
Total area: 22 ha
Percent primary: nil
Altitudinal range: 0-5 m
Bioclimatic zone: coastal

This RAP consists of a relatively narrow string of duneland stretching approximately 1 km north along the coast from the settlement of Whangara. The vegetation over most of the area consists of spinifex and/or marram, with occasional *Isolepis nodosa*, haretail, Indian doab, rattail, catsear, *Calystegia soldanella*, *Zoysia pauciflora*, *Coprosma acerosa*, and one patch of planted pingao. This is one of three coastal RAPs clustered together in this subdistrict (see also Nos 56 and 58), all of which are significant given the relative scarcity of dunelands in the Ecological District.

RAP 56: **Waiomoko River Mouth (Map 15)**
Priority: 1
NZMS 260 ref: Y18 650788
Total area: 16 ha
Percent primary: nil
Altitudinal range: 0-5 m
Bioclimatic zone: coastal

This is one of a cluster of three RAPs situated on the coast in the east of this subdistrict (see also Nos 55 and 58), and consists of dunelands stretching southwards from the mouth of the Waiomoko River. It is probably the most valuable of these coastal RAPs. The vegetation is notable for the dominance by native grasses and sedges, including *Spinifex*, *Zoysia*, *Deyeuxia*, *Isolepis*, and *Austrofestuca*, the latter a threatened species of very local



distribution. Although introduced marram is also present, it is restricted to two relatively small areas. The area has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of waders and waterfowl recorded, including banded dotterel.

RAP 57: **Whitiwhiti Stream Bush (Map 15)**
 Priority: 3
 NZMS 260 ref: Y18 628783
 Total area: 15 ha
 Percent primary: 100%
 Altitudinal range: 20-100 m
 Bioclimatic zone: semi-coastal

This RAP consists of a small fragment of primary coastal hillslope forest growing on moderately steep hillslopes, approximately halfway between the Waiomoko and Pouawa river mouths. Kohekohe, puriri, and tawa are dominant in the canopy, with rewarewa, kanuka, pukatea, titoki, matai, white maire, lacebark, and ngaio also present. The RAP is unfenced and subject to grazing; as a consequence, the margins are becoming quite ragged.

Despite its small size and high degree of modification this RAP contains the most sizeable piece of coastal forest remaining in the southeast of the Ecological District. An adjacent small fragment to the west has been excluded as, given its small size, it is unlikely to form a viable unit for protection in the long term.

RAP 58: **Pouawa River Mouth (Map 15)**
 Priority: 2
 NZMS 260 ref: Y18 615755
 Total area: 13 ha
 Percent primary: nil
 Altitudinal range: 0-5 m
 Bioclimatic zone: coastal

This is the third of a cluster of three RAPs situated on the coast in the east of this subdistrict (see also Nos 55 and 56), and consists of a small area of estuary and duneland centred on the mouth of the Pouawa River. A small area of ponded estuary along the northern margin is lined by *Juncus* and *Carex* species. Duneland on both sides of the river mouth is dominated by *Spinifex* and marram, along with *Isolepis nodosa*, *Carex pumila*, harakeke, and a wide range of introduced species. A long-established patch of pingao grows on the eastern side of the river mouth, and a small area of willow-dominated shrubland lies along the road margin in the northeast. The area has high significance both for its duneland and estuarine vegetation and for the feeding and breeding habitats it offers to coastal and wading birds.

RAP 59: **Goodwin Road Bush (Map 16)**
 Priority: 2
 NZMS 260 ref: Y18 540737
 Total area: 24 ha
 Percent primary: 100%
 Altitudinal range: 80-175m
 Bioclimatic zone: semi-coastal

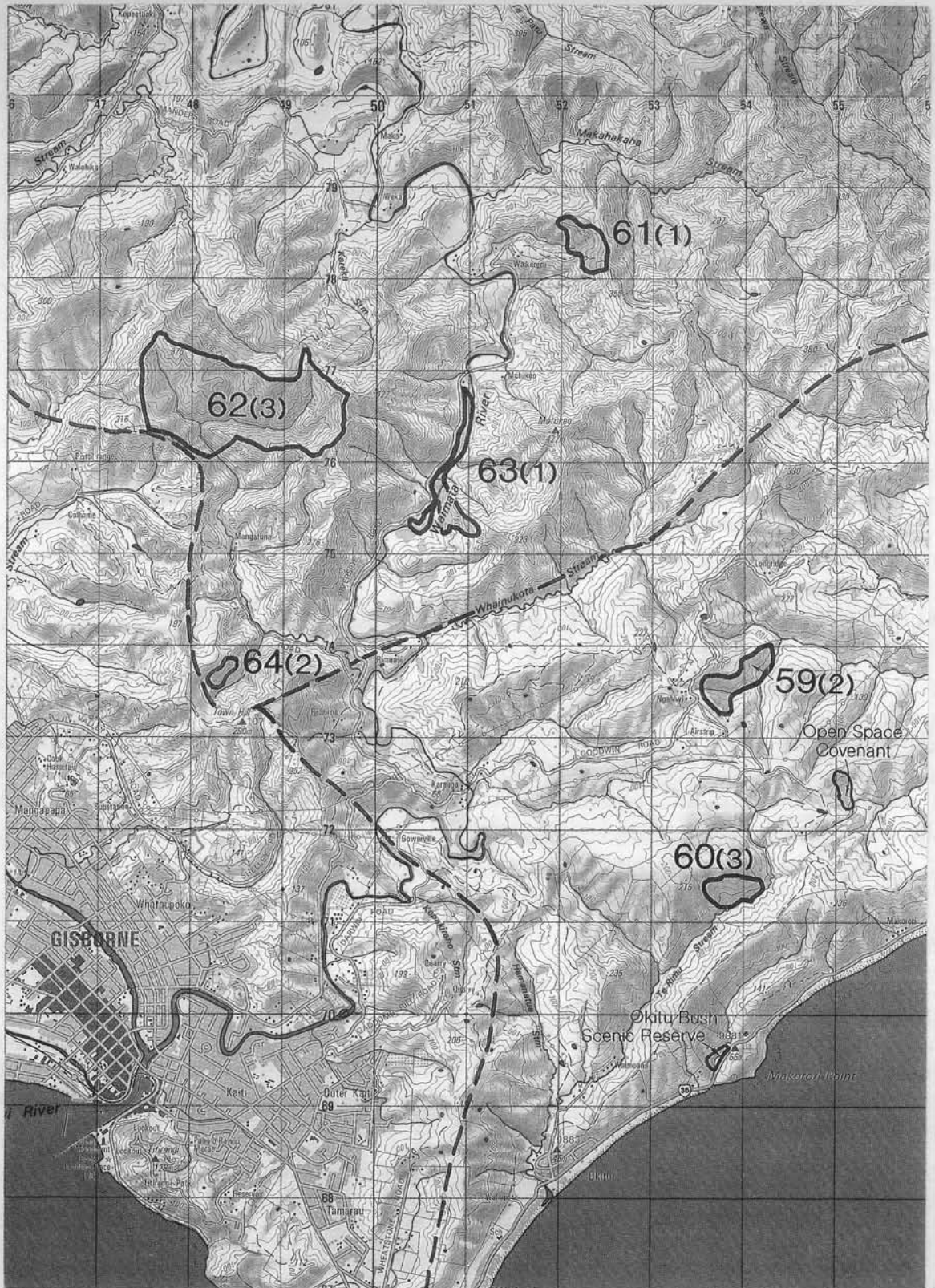
This RAP is located on moderately steep, lower to middle hillslopes of southerly to easterly aspect in the headwaters of the Turihaua Stream, approximately 8 km northeast of Gisborne City. It contains a moderate-sized remnant of primary forest in which kohekohe, tawa, and puriri are dominant, along with occasional kanuka, pukatea, lancewood, kohuhu, matai, totara, rewarewa, karaka, and ngaio. This remnant is typical of the semi-coastal podocarp-broadleaved forest which was once widespread on hillslopes in this subdistrict. The RAP was fenced 5-6 years ago, and is now surrounded by a buffer strip of young pines.

RAP 60: **Te Rimu Stream Bush (Map 16)**
 Priority: 3
 NZMS 260 ref: Y18 538714
 Total area: 17 ha
 Percent primary: 100%
 Altitudinal range: 60-160 m
 Bioclimatic zone: semi-coastal

This RAP is situated approximately 2 km to the south of No. 59, to which it is very closely similar in ecological character. It consists of a primary forest remnant dominated by tawa, kohekohe, and puriri; pukatea, karaka, totara, pigeonwood, mahoe, and young kahikatea are also present. It has been accorded a lower priority than No. 59 both because of its small size and because it is unfenced and subjected to heavy grazing modification, with the result that the canopy is now starting to disintegrate.

6.7 Waimata RAPs

Only four RAPs have been recommended for the Waimata subdistrict, reflecting not only its smaller size but also the predominance of drastically man-modified landscapes which are found in it. Only a few small remnants of primary forest remain, and these are often fragmented and heavily modified by stock. In contrast to the previous three subdistricts, significant areas of secondary forest and scrub remain, probably reflecting the greater effort required to keep the less fertile soils of these steeper landforms in pasture.



MAP
16

INFOMAP 260 Y18

SCALE 0 1000 2000m

LEGEND

- 7 RAP No
- (3) Priority
- Sub-district boundary



RAP 61: **Waikereru Bush (Map 16)**
 Priority: 1
 NZMS 260 ref: Y18 523784
 Total area: 19 ha
 Percent primary: 84%
 Altitudinal range: 100-280 m
 Bioclimatic zone: semi-coastal to lowland

This RAP is situated on steep upper hillslopes of westerly to southwesterly aspect in the middle reaches of the Waimata River. It consists of two pieces of primary hillslope tawa-kohekohe forest separated by a piece of tall secondary kanuka forest. Other species occurring in the primary forest include pukatea, mahoe, ngaio, kahikatea, kowhai, rewarewa, and matai. Although the RAP is generally representative of semi-coastal hillslope forest, the absence of puriri is unusual, and perhaps reflects the lower fertility of this steep upper hillslope site. The canopy has remained reasonably intact, despite grazing by domestic stock, but the block would doubtless benefit from fencing.

RAP 62: **Cave Road (Map 16)**
 Priority: 3
 NZMS 260 ref: Y18 485765
 Total area: 197 ha
 Percent primary: 1%
 Altitudinal range: 80-430 m
 Bioclimatic zone: semi-coastal to lowland

Located approximately 7 km north of Gisborne City, this RAP contains an extensive area of predominantly secondary scrub and low forest growing over a full range of aspects on steep to very steep hillslopes. One small remnant of primary forest dominated by kohekohe and tawa survives on a steep, east-facing upper hillslope on the southwest boundary. Although kanuka is dominant throughout the bulk of the area, there is wide variation in the age of different patches, presumably due to recurrent clearing and burning over a long period of time. As a consequence the range of associated species also varies markedly, with rewarewa, five finger, and mahoe common in older stands and tauhinu locally common in younger stands or on drier ridges.

Although containing predominantly secondary vegetation, the RAP is significant for its size, its full range of landforms and aspects comprising a complete headwater catchment system, the wide range of successional stages which are present, and the presence of a primary forest remnant capable of acting as a seed source for tall forest species. The RAP is currently fenced.

RAP 63: **Riverside Road (Map 16)**
 Priority: 1
 NZMS 260 ref: Y18 508758
 Total area: 29 ha
 Percent primary: 100%
 Altitudinal range: 20-200 m
 Bioclimatic zone: semi-coastal to lowland

This RAP is located in the lower reaches of the Waimata River. It contains both a narrow strip of modified riparian forest on alluvial terraces adjacent to the road and a patch of broadleaved forest on an adjacent hillslope. Tawa, kohekohe, and titoki are dominant on the terraces, but titoki is less common on the hillslopes. Small stands of young pole

kahikatea are scattered on the alluvial terraces, presumably offspring of a former kahikatea-dominant forest. Kanuka occurs around the margins of the hillslope forest.

Although modified - the most obvious sign of this being the general absence of mature podocarps, particularly on the alluvial terraces - the RAP contains one of only a very few sites in this subdistrict that includes a full sequence of landscape units from alluvial terrace up onto adjacent hillslopes. Although podocarps have obviously been selectively removed, the regeneration of kahikatea foreshadows an eventual return to forest more representative of that which originally occurred. The RAP is not fenced and is grazed, but the canopy remains intact.

RAP 64:	Town Hill Bush (Map 16)
Priority:	2
NZMS 260 ref:	Y18 483736
Total area:	5 ha
Percent primary:	94%
Altitudinal range:	140-200 m
Bioclimatic zone:	semi-coastal

This RAP is situated on a mix of gentle but unstable upper slopes and steep midslopes in a valley side north of Town Hill behind Gisborne City. It contains a small remnant of diverse primary forest in which small patches of black beech-dominant forest occur on older stable soils on the crests of side ridges, intermingled with forest dominated by kohekohe, tawa, and titoki growing on more unstable but fertile soils on the side-slopes. Other species include kahikatea, matai, kaikomako, mapou, hinau, lancewood, turepo, puriri, maire, mahoe, kowhai, rewarewa, pigeonwood, kiekie, supplejack, fuchsia, five finger, heketara, and tree ferns. A fringe of kanuka has invaded pasture on gentle slope along the northwestern margin.

Although small, this RAP is significant for the diverse remnant of primary forest it contains, including the only example of black beech forest known in this subdistrict. The remnant has been subject to heavy damage by domestic stock, and would greatly benefit from fencing. Exotic pines have been planted along the southeastern margin.

6.8 Ihungia RAPs

Little natural vegetation remains in the Ihungia subdistrict, and much of that has been greatly modified as a result of fragmentation and grazing by both domestic stock and feral goats. A number of the forest remnants on fertile but unstable lower hillslopes are notable for their domination by matai and totara, but elsewhere the pattern of dominance by kahikatea on alluvial terraces and tawa and other broadleaved trees on middle to upper hillslopes, as generally found elsewhere in the Ecological District, is represented in several small remnants.

RAP 65: Ihungia Station (Map 17)
 Priority: 1
 NZMS 260 ref: Y16 645388, 643382
 Total area: 15 ha
 Percent primary: 82%
 Altitudinal range: 210-270 m
 Bioclimatic zone: lowland

This RAP contains two small blocks of primary forest situated in the middle reaches of the Ihungia River. Although alluvial terraces are the predominant landform, the more northern piece also extends up onto gentle lower hillslopes. The forest in both blocks consists of tall podocarps, mostly kahikatea, but with some matai and totara. In the northern piece these podocarps are emergent over a canopy of tawa and titoki, but in the southern piece podocarps are at higher densities, forming a canopy over an understorey containing mahoe, putaputaweta, tanekaha, lancewood, kohuhu, tawa, and a range of small-leaved divaricate species. A small, highly modified wetland occurs at the northern end, surrounded by pasture, willows, and *Pinus radiata*.

The RAP has high significance as an example of the podocarp-dominant primary forest once widespread throughout valley bottoms in this subdistrict, but now largely cleared. In addition it provides a powerful demonstration of the response of native forest to protection from grazing, approximately one-half of the northern block having been fenced some years ago to exclude stock. As a consequence, although the canopies in the two halves differ little in composition, the understories are profoundly different, with palatable species such as mahoe, hangehange, and rangiora abundant only in the fenced half. Obviously, fencing of the remainder would enhance the values of the entire RAP. An Open Space Covenant is being registered over the northernmost block with the Queen Elizabeth the Second National Trust.

RAP 66: Maungapaukaka Stream (Map 17)
 Priority: 3
 NZMS 260 ref: Y16 695383
 Total area: 79 ha
 Percent primary: 22%
 Altitudinal range: 220-420 m
 Bioclimatic zone: lowland

This RAP is situated on moderately steep lower hillslopes in a small, erosion-prone catchment approximately 7 km northwest of Te Puia Springs. It contains both secondary forest and scrub and a small remnant of somewhat fragmented primary hillslope forest. Kanuka and manuka are dominant in the secondary communities, with manuka more common in primary successions on old slips, and kanuka more common as an invader of pasture. The primary forest is dominated by tawa, with rewarewa, kahikatea, matai, rimu, and kohekohe also present. Ngaio, kowhai, and cabbage tree are scattered throughout.

Although heavily modified and rather fragmented, this RAP contains one of the few remnants of tawa-dominant primary hillslope forest left in this subdistrict. The area is currently grazed not only by domestic stock but also by goats, and this is likely to lead to continuing decline in values unless reduced.

RAP 67: **Wahingamuku (Map 17)**
 Priority: 2
 NZMS 260 ref: Y16 679368
 Total area: 15 ha
 Percent primary: 100%
 Altitudinal range: 410-537 m
 Bioclimatic zone: lowland

This RAP is situated on upper hillslopes approximately 8 km west of Te Puia Springs, straddling the divide between the Ihungia and Makarika catchments. It consists of two pieces of intact primary forest joined by a thin ribbon of more fragmented forest, the more northern piece on steep slopes of northeasterly aspect and the more southern piece on moderate slopes of southeasterly aspect. The forest consists of scattered rimu emergent over a canopy of tawa, rewarewa, and pukatea; other species present include mahoe, pigeonwood, hinau, kohekohe, mamaku, kahikatea, titoki, and supplejack.

The RAP is significant for the primary hillslope forest it contains. Regeneration is very limited because of browsing, mainly by cattle, and fencing will be required if the values of the block are to be protected in the long term.

RAP 68: **Karikarihuata Stream (Map 17)**
 Priority: 2
 NZMS 260 ref: Y16 648355
 Total area: 28 ha
 Percent primary: 19%
 Altitudinal range: 230-360 m
 Bioclimatic zone: lowland

This RAP and No. 69, closely similar in character, are located on moderately steep, eroded slopes in an area of jumbled topography in the middle reaches of the Ihungia River. Both contain fragmented but very diverse mixtures of forest, consisting of modified primary remnants linked by areas of secondary scrub and forest interspersed with pasture. Primary forest fragments are dominated by totara and matai along with varying amounts of kanuka, tawa, titoki, mahoe, mapou, white maire, cabbage tree, houhere, and kowhai; one large black beech was noted. Secondary communities are diverse, containing a mixture of totara, kowhai, kanuka, matai, lacebark, lancewood, and kohuhu. Wharariki is common locally on bluffs in one sidestream, and manuka is locally common on unstable debris slides. Introduced trees are scattered throughout and include poplars and willows planted for soil conservation purposes, and one large *Pinus radiata*.

This RAP is unusual for the dominance of its forest by matai and totara, the generally low abundance of broadleaved trees such as tawa, and the rarity of kahikatea. This mix of species suggests that the site not only has relatively high fertility, but also has been prone to disturbance in the past. The vegetation has been heavily modified by grazing by domestic stock, and fencing would be of great benefit.

RAP 69:	Waipapa Stream (Map 17)
Priority:	2
NZMS 260 ref:	Y16 657341
Total area:	78 ha
Percent primary:	nil
Altitudinal range:	250-420 m
Bioclimatic zone:	lowland

This RAP is closely similar in ecological character to the adjacent Karikarihuata Stream RAP (No. 68), consisting of a complex mixture of fragmented primary remnants and secondary scrub and forest. Kahikatea, totara, and matai are the main survivors from the former primary forest, which occurs predominantly on the lower slopes, and particularly on sites of southerly aspect. Other species present include occasional titoki, kowhai, and rewarewa. Secondary communities, which extend up onto more stable upper hillslopes, including one extensive area of more northerly aspect, are dominated by kanuka, but with abundant totara, lacebark, cabbage tree, kowhai, and lancewood. As in RAP 68, there are plantings of poplar and willow.

In common with RAP 68, the significance of this area stems both from its primary forest remnants and its diverse secondary communities, with the primary forest notable for its generally low abundance of broadleaved trees. However, it lacks some of the qualities of RAP 68: the primary forest remnants here are more fragmented and more modified. The area is grazed by domestic stock, and would require fencing to protect its values in the long term.

RAP 70:	Puketiti Station (Map 17)
Priority:	3
NZMS 260 ref:	Y16 685320
Total area:	16 ha
Percent primary:	100%
Altitudinal range:	280-420 m
Bioclimatic zone:	lowland

This RAP is located on moderate upper hillslopes of southeasterly aspect in the head of the Onetohunga Stream, a northern tributary of the Hikuwai River. It consists of a small remnant of primary hillslope forest fragmented by eroding gullies. The canopy is dominated by pukatea, tawa, rewarewa, kohekohe, and matai, with occasional black beech, puriri, putaputaweta, totara, and kahikatea.

Although the RAP has been subject to severe modification through grazing and trampling by domestic stock, it is one of few remnants of broadleaved forest left in this subdistrict. Fencing will be required if the values of the area are to be protected in the long term.

6.9 Waiau RAPs

The character of the Waiau subdistrict varies quite markedly with altitude, the lower-altitude country to the east having a much lower proportion of natural vegetation than in the west, where secondary vegetation has at times been quite extensive. The subdistrict has undergone recent large-scale changes in land use, particularly in the west, with extensive areas of both farmland and secondary kanuka-dominant scrub and forest converted to exotic plantation. Small remnants of primary forest have generally been left during this process, and remain as small islands in a landscape now dominated by ordered lines of *Pinus radiata*.

RAP 71:	Makioro Stream (Map 18)
Priority:	1
NZMS 260 ref:	Y16 685225
Total area:	172 ha
Percent primary:	64%
Altitudinal range:	40-270 m
Bioclimatic zone:	lowland

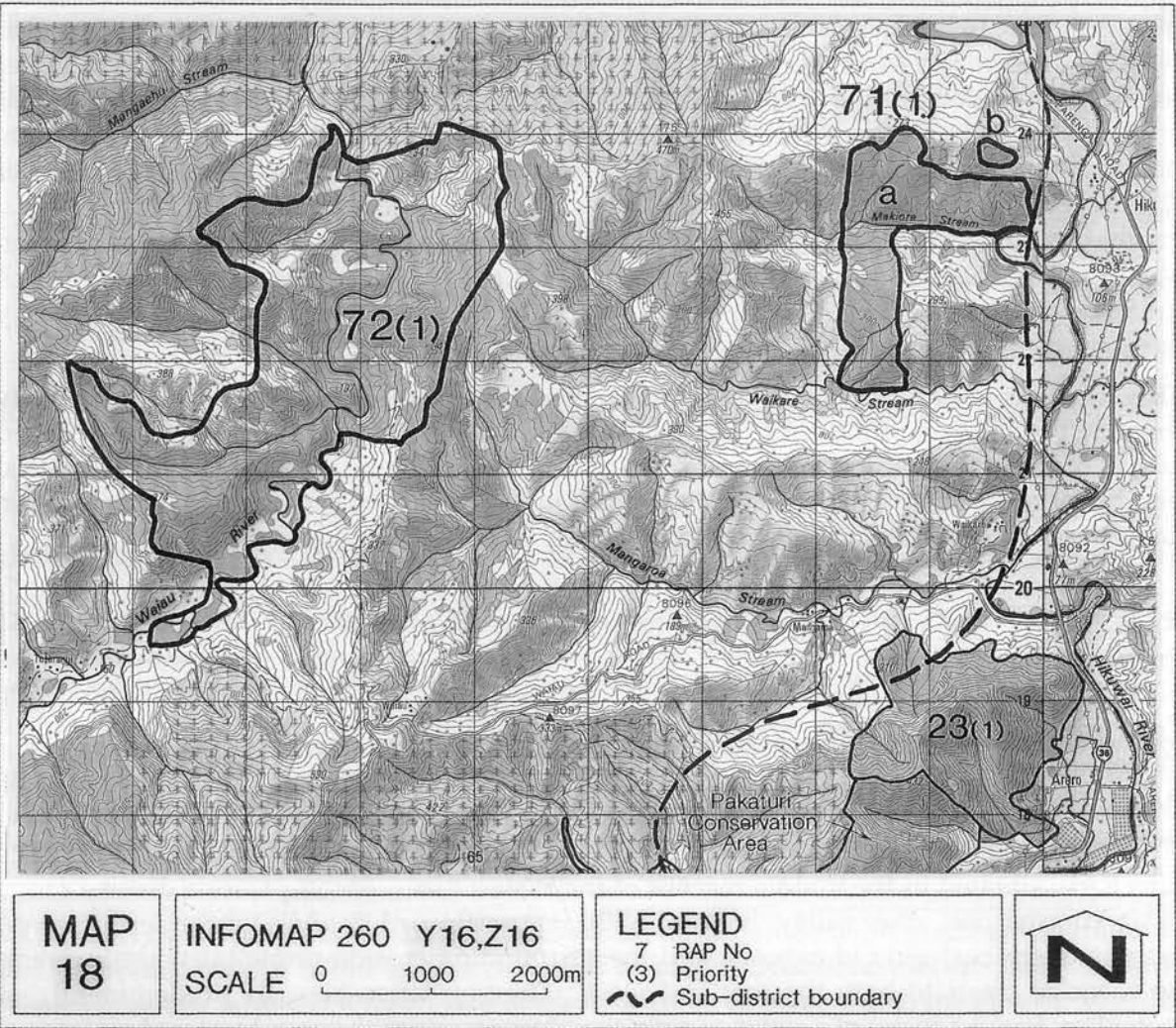
This RAP encompasses an area of moderately steep hill country in the lower reaches of the Makioro and Waikare streams, both flowing eastwards to enter the Hikuwai River approximately midway between the Tolaga Bay and Tokomaru Bay townships. It consists of two blocks, one a large area covering a mixture of northerly and southerly aspects and with a full sequence from ridges through to valley bottoms, and the second a small outlier to the northeast on an upper hillslope of southerly aspect. Most of the western two-thirds of the large block, plus the small outlier, are primary forest; tawa and kohekohe are dominant throughout, with scattered emergent pukatea and kahikatea, some of the latter reaching very impressive dimensions. Other common species include titoki, rewarewa, kowhai, miro, white maire, totara, and lacebark. The balance of the RAP, and mostly on south-facing slopes to the north of the Makioro Stream, is dominated by tall kanuka of uniform age with occasional rewarewa and kowhai, over an understorey of prickly mingimingi and *Coprosma rhamnoides*.

This RAP has very high values given that it contains one of the largest blocks of primary forest left in the east of the entire Ecological District. Unfortunately, through the combined effects of clearing around the margins and grazing by both feral goats and domestic stock, parts of it are in very poor condition and the forest cover has become patchy with open areas of pasture, particularly on northerly faces.

RAP 72:	Waiau secondary forest and scrub (Map 18)
Priority:	1
NZMS 260 ref:	Y16 625225
Total area:	709 ha
Percent primary:	<5%
Altitudinal range:	100-532 m
Bioclimatic zone:	lowland

This RAP, situated in the middle reaches of the Waiau River, encompasses a diverse range of landforms, i.e., the valley bottom with its northward-flowing, meandering river, extensive terraces, and old oxbows, and the surrounding erosion-prone hillslopes running up to ridge crests to both the east and west. The vegetation consists predominantly of secondary kanuka forest of a range of ages, the older stands with some emergent rewarewa. Some manuka is also present, mainly on old erosion scars. A few very small, modified primary remnants remain scattered throughout, mainly along terraces in the valley bottom, and in some more protected gullies. These contain varying components of the original forest, consisting mainly of scattered kahikatea and matai, which would have once reached highest densities on the alluvial terraces, emergent over a canopy of tawa, kohekohe, and titoki. Indigenous species have been slow to invade some of the alluvial terraces following clearance, particularly in the old oxbows in the lower part of the catchment, and although the surrounding hillslopes are now in dense kanuka, these terraces remain in a dense sward of introduced grasses.

The significance of this RAP stems from its combination of extensive areas of kanuka-dominant secondary forest on a full range of landforms which constitute a complete segment of the valley of a medium-sized river. As such it is representative of the secondary communities which were once much more extensive in this subdistrict, but which are now gradually being converted to exotic plantation. The value of the area is further enhanced by the presence of primary forest remnants, which provide an important source of seed for primary forest species. Despite the dominance of indigenous vegetation, the area is still subject to grazing by domestic stock.



RAP 73: **Stalker's Glen (Map 19)**
 Priority: 3
 NZMS 260 ref: Y16 595165
 Total area: 130 ha
 Percent primary: nil
 Altitudinal range: 370-500 m
 Bioclimatic zone: lowland

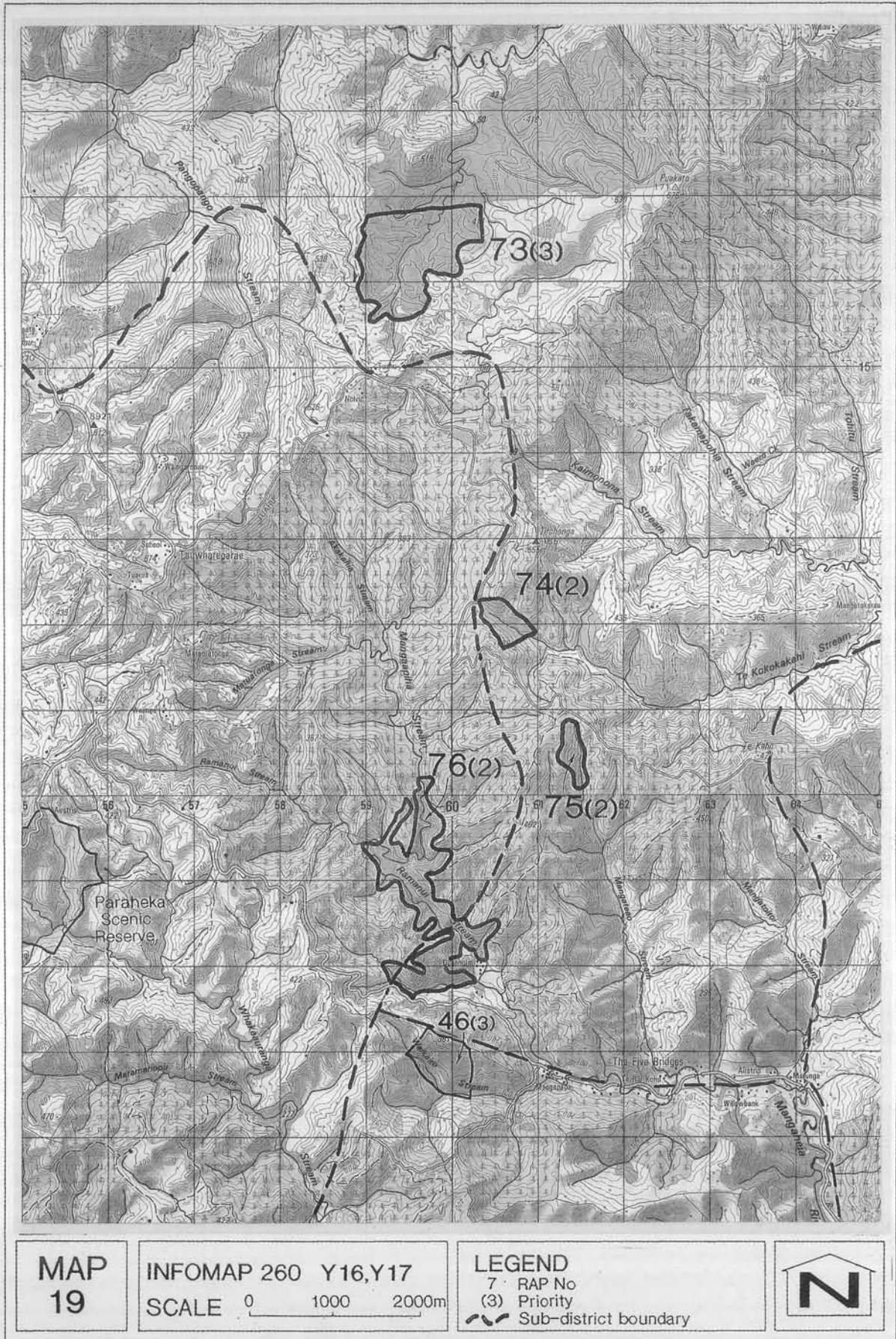
This RAP is located in a gently sloping, elevated basin encompassing a range of aspects in an upper tributary of the Waiau River. It contains an extensive area of older secondary hillslope forest. Although kanuka is the most widespread dominant, rewarewa is also common in the canopy and has almost completely replaced the kanuka to form a dense monospecific stand in the northeast corner. Other widespread species include lacebark, lancewood, kohuhu, and cabbage tree. A few tawa, remnants of the original forest, survive in the valley bottom.

The significance of this RAP stems mainly from the age of the secondary stands it contains, with kanuka in the process of being replaced by rewarewa, a species usually dominant in stands of intermediate age, and likely to be replaced in time with primary forest species. The RAP is currently grazed by domestic stock.

RAP 74: **Tirohanga Road (Map 19)**
 Priority: 2
 NZMS 260 ref: Y16 605120
 Total area: 22 ha
 Percent primary: 100%
 Altitudinal range: 300-440 m
 Bioclimatic zone: lowland

This small RAP occupies both sunny and shady aspects in a steep valley head in hill country in the south of the subdistrict. It contains a small remnant of modified primary forest bypassed when the surrounding scrub was cleared for afforestation. Rewarewa, tawa, and hinau are dominant; other species present include tarata, lancewood, mahoe, putaputaweta, mamaku, tutu, rimu, and kanuka. A wide range of palatable species are present in the understorey, reflecting the removal of grazing following afforestation of the surrounding land.

The RAP contains one of the few examples of primary hillslope forest left at moderate altitudes in this subdistrict. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush and field birds recorded, including weka and numerous pigeons. Although obviously somewhat modified, it is well buffered by the surrounding plantation forest, and given the control of browsing animals carried out in the surrounding pine forests, should recover well.



RAP 75: **Spencer Road (Map 19)**
 Priority: 2
 NZMS 260 ref: Y16 613105
 Total area: 16 ha
 Percent primary: 100%
 Altitudinal range: 390-440 m
 Bioclimatic zone: lowland

This RAP, closely similar in both character and significance to RAP 74, consists of a remnant of modified primary forest on a steep, east-facing upper hillslope in the headwaters of the Mangaheia River. The forest canopy is dominated by rewarewa, tawa, kanuka, and hinau, with pukatea, tanekaha, lancewood, and mamaku also present. The area is surrounded by plantation forest, and modification by grazing is now much reduced.

6.10 Hokoroa RAPs

The Hokoroa subdistrict, in common with other subdistricts in the southeast, now contains generally only small, isolated remnants of primary forest, most of these consisting of tawa-dominant forest with scattered emergent podocarps on steep hillslopes. Secondary forest and scrub on reverted pasture, most of it dominated by kanuka, is more widespread, but as in the previous subdistrict large areas of this have either already been, or are in the process of being converted to exotic plantation.

RAP 76: **Ramanui Stream (Map 19)**
 Priority: 2
 NZMS 260 ref: Y17 595092
 Total area: 127 ha
 Percent primary: 6%
 Altitudinal range: 100-340 m
 Bioclimatic zone: lowland

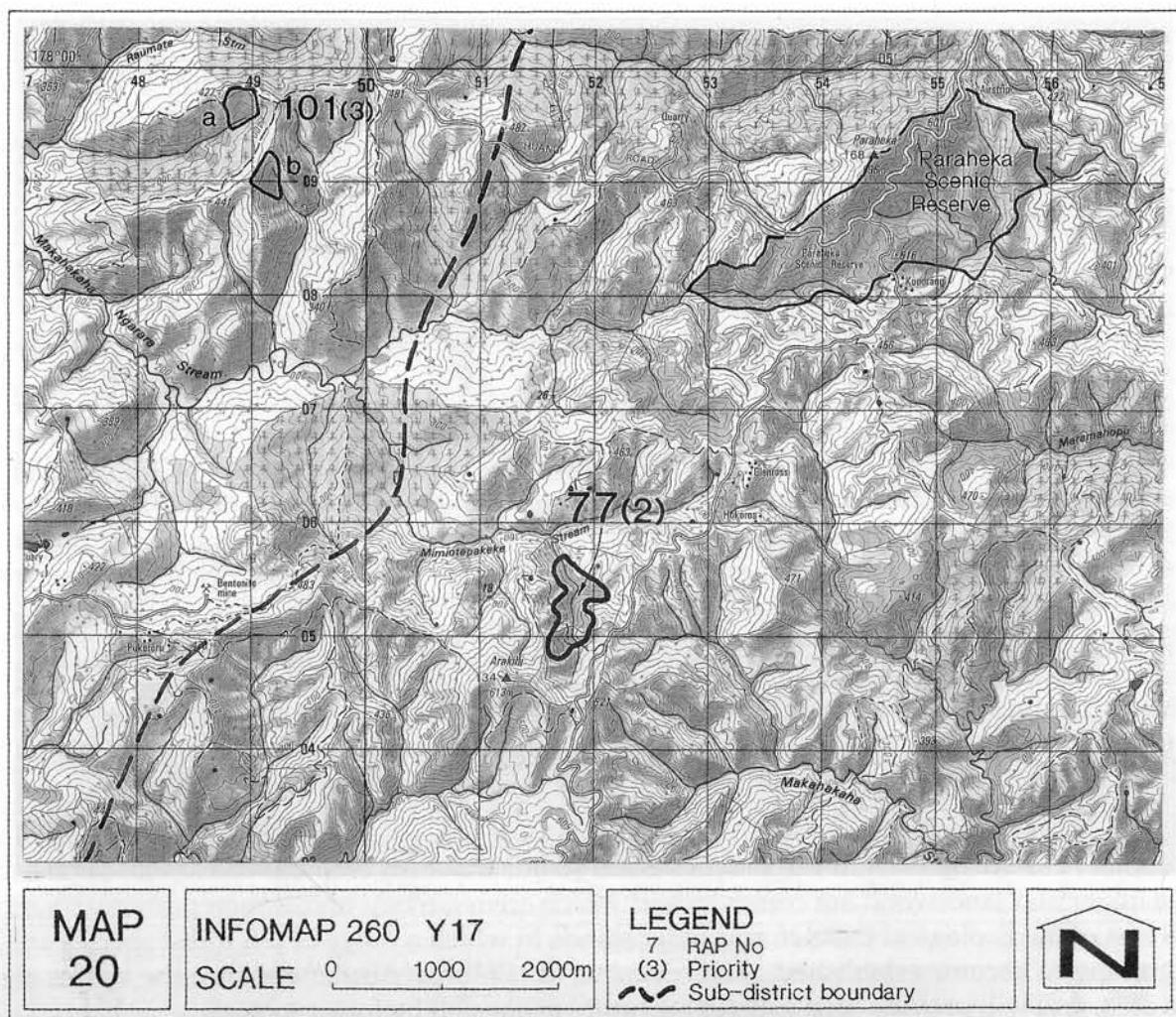
This RAP consists of an irregularly shaped piece of land which encompasses a valley bottom and very steep lower hillslopes in the Ramanui Stream and its tributary in the upper headwaters of the Mangaheia River, approximately 15 km north-west of Tolaga Bay. Although the bulk of this area falls within the Hokoroa subdistrict, it also extends over into the Waiau subdistrict and shares some attributes of both. It contains a range of secondary and modified primary forests almost entirely surrounded by plantation forest. Kanuka is the most widespread species, but rewarewa, kamahi, kohekohe, tawa, and occasional rimu, kahikatea, and totara are also present, either in older stands or where there was only partial destruction of the original primary forest. Mixed scrub and low forest occur on more recently disturbed sites, particularly in the southern tributary and the narrow area over the ridge linking it to the main forest area in Ramanui Stream. Common species associated with the kanuka include kowhai, kohuhu, lancewood, five finger, and lacebark.

Although strongly modified, the RAP is significant for the range of secondary vegetation it contains. This includes both early successional stands in which broadleaved shrubs such as five finger and lancewood are common, and which are relatively uncommon particularly in the east of the Ecological District, and older stands in which a range of tall forest species are beginning to become established. The remnants of tall forest further enhance the values of the area, and will provide seed sources for future expansion by forest species.

RAP 77: **Mimiotepakeke Stream (Map 20)**
Priority: 2
NZMS 260 ref: Y17 515050
Total area: 25 ha
Percent primary: 78%
Altitudinal range: 300-500 m
Bioclimatic zone: lowland

This RAP is located adjacent to the Waimata-Hokoroa road in a steep-sided valley on the western side of the ridge which forms the main spine running down the centre of the subdistrict. It consists predominantly of primary forest, mostly on middle to upper hillslopes; some secondary forest occurs at the southern end. The primary forest shows some evidence of past disturbance, with rewarewa sharing dominance with tawa in the canopy. Other species present include matai, cabbage tree, lacebark, putaputaweta, mahoe, kowhai, kohuhu, and pukatea. Kanuka is dominant in the secondary forest, along with putaputaweta, kohuhu, mahoe, lacebark, cabbage tree, and kowhai.

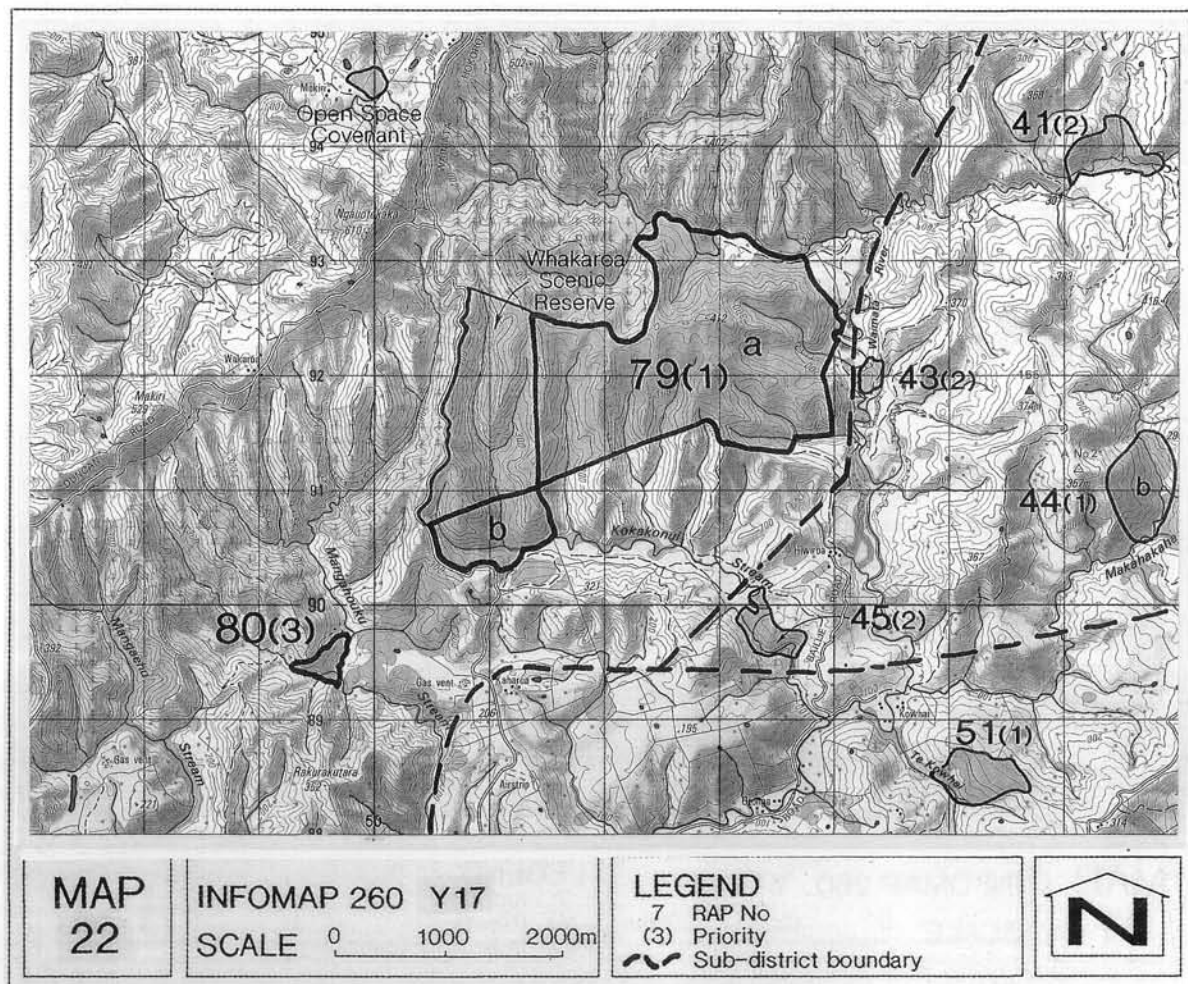
Although the primary forest contained in this RAP is somewhat modified, it remains significant given the diversity of species which remain and the relative scarcity of primary forest in this landscape. Fencing to exclude domestic stock will be required if the ongoing negative effects of browsing are to be reversed.



RAP 79: **Hiwiroa kanuka (Map 22)**
Priority: 1
NZMS 260 ref: Y17 530920
Total area: 439 ha
Percent primary: nil
Altitudinal range: 140-412 m
Bioclimatic zone: lowland

This large RAP encompasses several small catchment systems in the upper reaches of the Waimata River, adjacent to the Whakaroa Scenic Reserve. It contains extensive older stands of tall secondary forest dominated by kanuka but with scattered rewarewa, growing on steep hillslopes on a wide range of aspects and extending from ridge crests to valley bottoms. One small area on the northern boundary contains black beech and rewarewa. The understorey is diverse, containing *Coprosma rhamnoides*, prickly mingimingi, mahoe, lacebark, kowhai, kohuhu, and mapou.

Although this RAP is similar in character to No. 78, it contains much more uniform secondary forest which is older and more successional advanced than the majority of the stands in that area. Although primary forest species are not common in the RAP, seed sources for a wide range of species occur in the adjacent Scenic Reserve. Additional values include occasional falcon and one lone kaka reported in the area by local landowners. A rich collection of moa bones has been discovered in a cave on the northern boundary of the RAP (J. Baillie, pers. comm.). Although the area is not fenced, stock enter to only a limited extent because of the dense undergrowth. Goats are perhaps more of a problem, as they are present in the adjacent Whakaroa Scenic Reserve, and will require ongoing control if the values of both the Reserve and the RAP are to be protected.



RAP 80:	Hall's Bush (Map 22)
Priority:	3
NZMS 260 ref:	Y17 496896
Total area:	10 ha
Percent primary:	100%
Altitudinal range:	140-200 m
Bioclimatic zone:	lowland

This RAP is situated on lower hillslopes of predominantly southeasterly aspect in the middle reaches of the Mangahouku Stream, a tributary of the Waimata River. It contains a small, fragmented remnant of primary hillslope forest in which kahikatea, matai, and totara of a range of ages are scattered through a canopy of tawa and titoki. Other species present include pukatea, white maire, lacebark, pigeonwood, mamaku, and kowhai.

The RAP is significant for its primary forest, representative of the forests once widespread in this subdistrict but now largely cleared for agriculture. Although partially fenced, it is still grazed by domestic stock, and as a consequence the understorey is now sparse.

6.11 Mata Plateau RAPs

This subdistrict, in common with the previous two, contains a larger proportion of natural vegetation than many of the more eastern subdistricts, but still with only generally small remnants of primary forest. Within the subdistrict a broad division in ecological character can be made between remnants in the north (Nos 81-88), which are generally smaller and on lower-altitude, dissected landforms, and those in the southern half (Nos 89-99), which are generally larger, contain a higher proportion of secondary vegetation, and are on more gentle, higher-altitude landforms. Because of the wide variation in altitude and landforms there is also marked variation in primary forest composition. Podocarps are dominant in several remnants both on alluvial terraces (Nos 83-85 and 88) and hillslopes (Nos 82, 86, 88, and 89), the latter with occasional small enclaves of black beech on drought-prone sites. With increasing altitude there is a gradual transition to dominance by beech species, which reach their greatest dominance at high altitudes in the west of the subdistrict (No. 98). At intermediate altitudes complex mixtures of beech-dominant and podocarp-broadleaved-dominant forest are mediated by variation in topography (Nos 93 and 94), with the beeches dominant on the more infertile soils of the flat plateau sites, and podocarps and broadleaved species dominant on the more fertile soils of steeper sites. Although kanuka is generally dominant in secondary stands at lower altitudes, flat sites at higher altitudes are some of the few to support extensive manuka-dominant scrub (Nos 90, 93, and 94), and a number of adjacent later successional stands contain kamahi (Nos 91, 93, and 94), a species which is relatively uncommon at lower altitudes and towards the coast.

A substantial part of the southern half of the subdistrict (11 269 ha) was endowed to the Gisborne Harbour Board in 1884, and recently transferred to the newly formed Gisborne Port Company. Because natural vegetation on this land had been surveyed for conservation values and prioritised by DoC staff in 1989, not all of these areas were inspected as part of this PNAP survey. However, results from the original DoC survey, from subsequent visits by DoC staff, and from aerial inspections and photographs have been taken into account in assessing subdistrict priorities, and revised priorities for conservation of these blocks have been proposed.

RAP 81: Pirauau (Map 23)
Priority: 3
NZMS 260 ref: Y16 567324
Total area: 6 ha
Percent primary: 100%
Altitudinal range: 640-720 m
Bioclimatic zone: lowland

This RAP consists of a small forest remnant located on a moderately steep upper hillslope of northerly aspect just below the high point of Pirauau. It contains primary hillslope forest consisting of miro and rimu emergent over a canopy of tawa, tarata, and rewarewa. Other species present include lacebark, pigeonwood, kaikomako, mahoe, rangiora, supplejack, cabbage tree, fuchsia, and pate. The RAP is unfenced and subject to severe browsing and trampling by domestic stock. Stumps indicate that native conifers have been selectively removed in the past. Although small and modified, this RAP is still significant given the thoroughness with which the original forest cover on the upland surfaces in the north of this subdistrict was cleared. Fencing to exclude stock would allow recovery of the understorey.

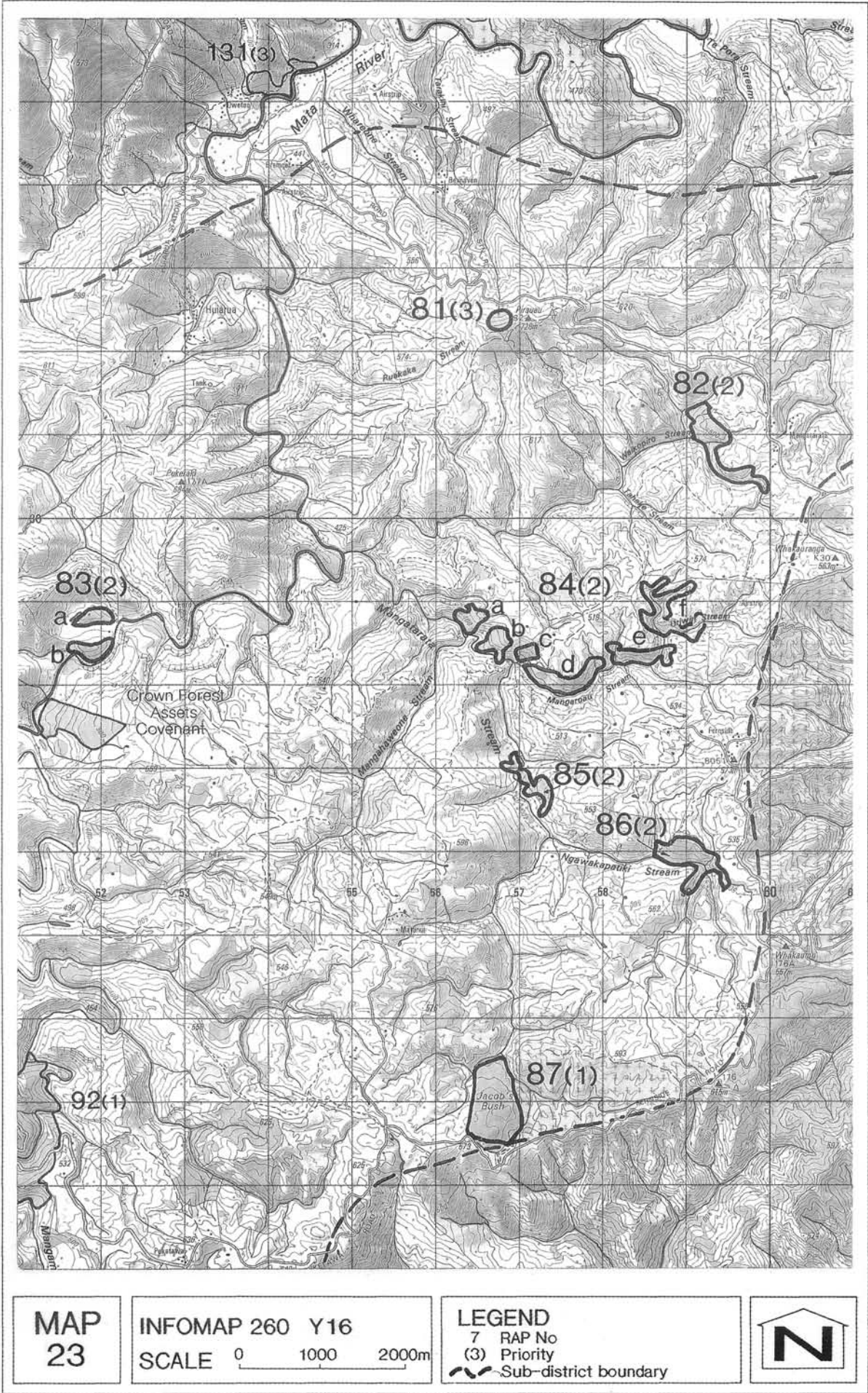
RAP 82: Waikopiro Stream (Map 23)
Priority: 2
NZMS 260 ref: Y16 593312
Total area: 29 ha
Percent primary: 100%
Altitudinal range: 420-520 m
Bioclimatic zone: lowland

This RAP, located in the head of a side tributary of the Mata River, encompasses an area of steep lower hillslopes with moderate upper hillslopes and spurs above, mostly of southerly to southwesterly aspect. It contains diverse primary forest dominated by matai, rimu, and kahikatea emergent over a canopy of tawa, hinau, cabbage tree, lacebark, tanekaha, and white maire; black beech is locally present on drought-prone soils.

This RAP is significant for the quality of the primary forest it contains, and which is representative of that which once would have been widespread at intermediate altitudes through this subdistrict. Although the canopy remains reasonably intact, both domestic stock and feral goats are having a severe effect through browsing and trampling, and this will lead to significant degradation of values in the long term unless numbers are reduced. Some erosion is occurring along the lower margins of the RAP.

RAP 83: The Pond Bush (Map 23)
Priority: 2
NZMS 260 ref: Y16 516288
Total area: 17 ha
Percent primary: 100%
Altitudinal range: 360-420 m
Bioclimatic zone: lowland

This RAP consists of two blocks encompassing primary forest on lower hillslopes and small areas of alluvial terrace in an old meander in the middle reaches of the Mata River. Totara is the most widespread tree, with kahikatea more abundant on terrace sites and matai and black beech on drier ridges. Other species present include kowhai, tawa, mapou, tarata, putaputaweta, tanekaha, and miro.



A small pond in which the water level has been artificially raised with a dam abuts the forest on the western side of the western block. The margins have been severely modified by stock, and raising of the water levels has resulted in the death of a number of trees.

The forests of this RAP provide an excellent example of lower valley bottom forest, including both lower hillslope and terrace sites. Although domestic stock has access to most of the RAP and causes some modification to the understorey, fencing to exclude stock from steep faces running down to the Mata River has resulted in good recovery of palatable understorey species.

RAP 84: **Mangatarata Stream (Map 23)**
 Priority: 2
 NZMS 260 ref: Y16 575280
 Total area: 89 ha
 Percent primary: 25%
 Altitudinal range: 380-500 m
 Bioclimatic zone: lowland

This RAP consists of six areas containing steep faces, mostly of southerly aspect, dropping off from a plateau into the Mangatarata Stream and its tributary the Mangaroau Stream. Small areas of gentler footslopes and alluvial terraces occur along the stream margin, mostly in the two westernmost pieces. The more intact and extensive pieces of primary forest survive on toeslopes and terraces, mainly in the lower part of the catchment, while fragmented patches of modified primary forest along with secondary forest and scrub predominate further upstream. Tawa and matai are the dominant species in the primary forest, but totara, kahikatea, miro, and rimu are also present, with the largest individuals on the lower terraces; black beech form isolated stands on dry ridges. The secondary forest and scrub is dominated by kanuka with scattered kowhai.

The significance of this RAP stems mainly from the diverse primary forest it contains, and which has survived largely because of the unsuitability of the site for agricultural development. There is good potential for invasion of primary forest species into the secondary kanuka stands, given the intermingling of primary and secondary stands. The area has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush and field birds recorded, including kereru and pied tit. Fencing would reduce the impact of domestic stock, but feral goats would also require control.

RAP 85: **Fernside Bush (Map 23)**
 Priority: 2
 NZMS 260 ref: Y16 570270
 Total area: 12 ha
 Percent primary: 100%
 Altitudinal range: 370-460 m
 Bioclimatic zone: lowland

This RAP, located approximately 1.5 km south of No. 84, encompasses a small area of gentle alluvial terraces and lower hillslopes extending to both sides of the Mangatarata Stream. The fragmented primary forest it contains is dominated by matai and kahikatea, with matai more abundant on lower hillslopes, and kahikatea more abundant on alluvial terraces. Other species present include tanekaha, totara, tarata, kowhai, white maire, putaputaweta, kohuhu, cabbage tree, pokaka, and lancewood.

The forests of this RAP, although fragmented, are broadly representative of those typical of more gentle valley bottom sites in this subdistrict (cf. the dominance of tawa and matai on steeper sites in No. 84). The RAP is surrounded by pasture, and is currently subject to modification by domestic stock.

RAP 86: Ngawakapatiki Stream (Map 23)
 Priority: 2
 NZMS 260 ref: Y16 590260
 Total area: 27 ha
 Percent primary: 32%
 Altitudinal range: 400-500 m
 Bioclimatic zone: lowland

This RAP contains an area of moderate to steep hillslopes of predominantly southerly aspect in the headwaters of a small catchment draining westwards into the Mata River; very steep, unstable slopes drop into the stream in the southern part. It contains a small area of diverse primary podocarp-dominant forest on a more moderate slope in the north, and a more extensive area of secondary forest and scrub which extends onto steeper slopes in the south. Kahikatea, matai, totara, and tanekaha are dominant in the primary forest, with rimu and pukatea also common. Both manuka and kanuka occur in the secondary scrub and forest, along with kowhai, tanekaha, totara, and mahoe. Although partly fenced, the area is subject to grazing by both goats and domestic stock.

The significance of this RAP is very similar to that of Nos 84 and 85, i.e., a small representative area with values somewhat diminished by both fragmentation and modification by browsers. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including weka, kereru, whitehead, and pied tit.

RAP 87: Jacob's Bush (Map 23)
 Priority: 1
 NZMS 260 ref: Y16 568230
 Total area: 61 ha
 Percent primary: 100%
 Altitudinal range: 460-560 m
 Bioclimatic zone: lowland

This RAP is situated on an area of gently undulating topography of generally northerly to easterly aspect adjacent to Fernside Road. Steeper slopes occur around the margins, dropping off into the headwaters of the Mangatarata Stream. The primary forest it contains consists of scattered conifers emergent over a canopy of tawa. Rimu is more common on flatter sites in the upper parts of the RAP, and matai, kahikatea, and totara on steeper sites in the lower parts. Hinau, titoki, and pukatea also occur in the canopy, and a few black beech grow on harshly drained sites around the northern boundary.

This RAP has very high significance; the forest it contains is one of only two sizeable primary remnants surviving on the gentle plateau country which is characteristic of this subdistrict (see also RAP 96). It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded.

RAP 88: Mata/Mangamatukutuku confluence (Map 24)
Priority: 1
NZMS 260 ref: Y16 493275
Total area: 12 ha
Percent primary: 100%
Altitudinal range: 370-420 m
Bioclimatic zone: lowland

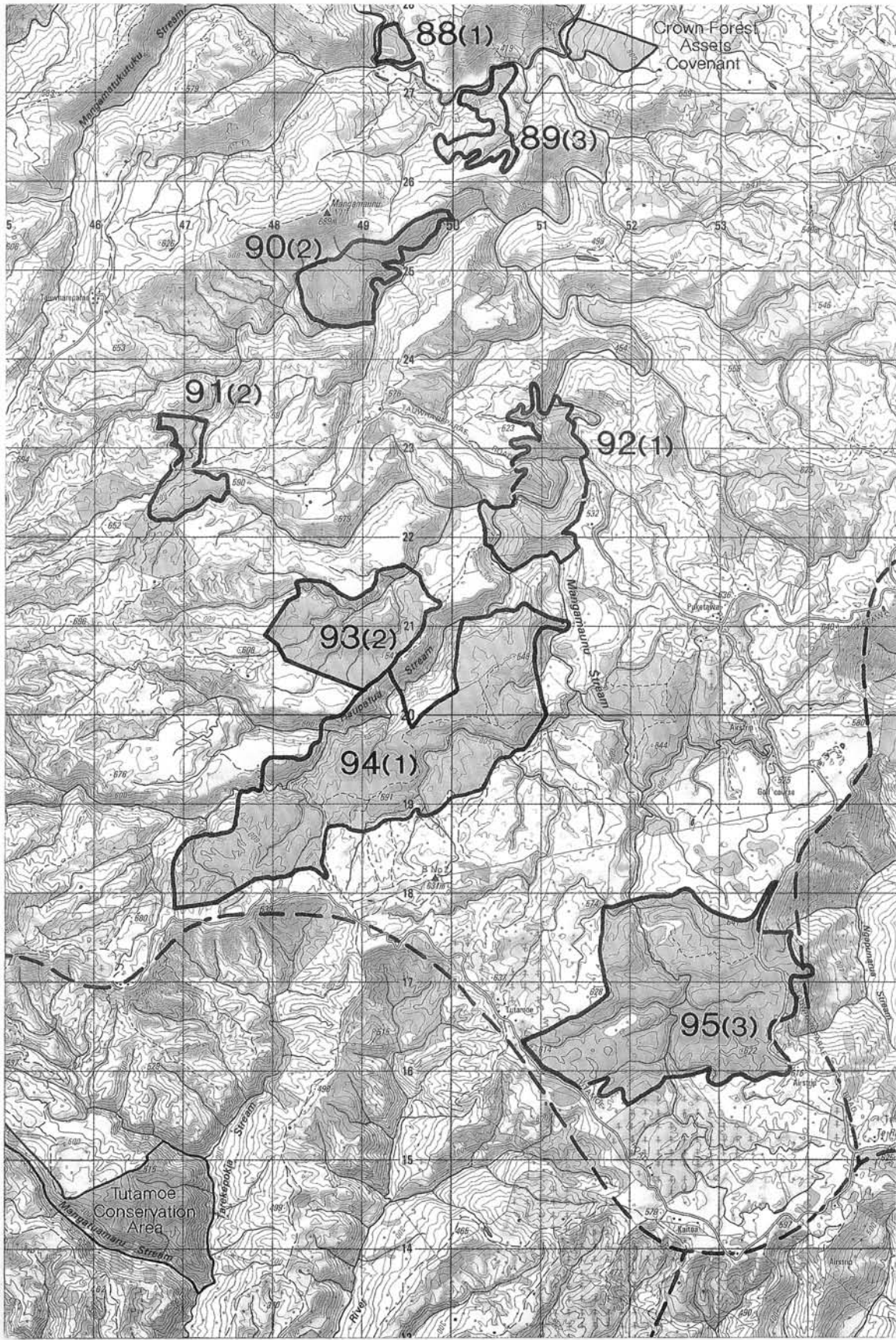
This RAP, which is similar in character to No. 83, 3 km to the northeast, occupies an area containing both old alluvial terraces in an old meander now cut off from the main course of the Mata River and adjacent lower hillslopes. The primary forest it contains is variable, with composition closely related to site. Matai and black beech are dominant on the older raised terraces, but kahikatea is dominant in lower and less well drained terrace sites. Tawa and totara are dominant on the lower hillslopes. Other widespread species include miro, rimu, kowhai, tanekaha, tarata, cabbage tree, lancewood, putaputaweta, white maire, heketara, mahoe, mapou, and fuchsia. The old river course consists largely of a treeland, with trees scattered across grazed pasture, but wetland species survive in the eastern end.

The high ranking given to this site reflects the diverse and relatively unmodified nature of the forest it contains, representative of the forests which once would have occurred along much of the course of the Mata River and its larger tributaries. Although partially fenced, the area is still subject to grazing by domestic stock and feral goats. Pugging of the poorly drained areas by cattle is causing heavy damage, diminishing the semi-natural values of the old river course. A wide range of bird species were noted in the area.

RAP 89: Mata/Mangamaunu confluence (Map 24)
Priority: 3
NZMS 260 ref: Y16 504264
Total area: 47 ha
Percent primary: 19%
Altitudinal range: 360-530 m
Bioclimatic zone: lowland

This RAP occupies an area of gentle to moderate lower hillslopes of predominantly northerly aspect just above the junction of the Mangamaunu Stream with the Mata River. Steeper, unstable faces run along the river margin on the northern edge. It contains a moderate-sized remnant of modified primary forest on hillslopes dominated by matai, totara, and kahikatea, and with a small enclave of black beech growing on a gentle bench immediately above the river. Upslope from this is an area of scattered secondary low forest, treeland, and scrub consisting mainly of kanuka, matai, and totara on steeper slopes, linking to two more gentle valleys with small pockets containing denser stands of young podocarps and beech-broadleaved forest.

Although modified and fragmented, the RAP is significant both for the small remnant of diverse primary forest and for the amount of podocarp regeneration it contains.



MAP 24	INFOMAP 260 Y16 SCALE 0 1000 2000m	LEGEND 7 RAP No (3) Priority Sub-district boundary	
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RAP 90: Mangamaunu Jungle (Map 24)
Priority: 2
NZMS 260 ref: Y16 490250
Total area: 91 ha
Percent primary: 52%
Altitudinal range: 400-540 m
Bioclimatic zone: lowland

This RAP encompasses both a flat to gently undulating terrace just south of the high point Mangamaunu and steep to very steep sideslopes running down off it into a tributary of the Mangamaunu Stream. A mixture of manuka and kanuka, along with a few *Pinus radiata*, predominates over much of the terrace, but diverse primary forest has survived on gentle slopes at the northern end, and spills over onto the adjacent hillslopes. This contains a range of podocarp species, and small enclaves of beech. Strong regeneration of podocarps is occurring in the manuka/kanuka stand around the margins of the primary forest.

The RAP is significant both for its diverse primary forest and for the composition of its secondary communities. The latter are unusual in the context of the Ecological District both for their dominance by manuka and for the regeneration of podocarps that is occurring in them.

RAP 91: Shelton's Bush (Map 24)
Priority: 2
NZMS 260 ref: Y16 470225
Total area: 61 ha
Percent primary: nil
Altitudinal range: 520-620 m
Bioclimatic zone: lowland

This RAP contains an area of rolling plateau country with a wide range of aspects, bisected by the Tauwhareparae Road. Steeper sideslopes fall away into a tributary of the Mangamaunu Stream along the southeastern boundary. This RAP contains approximately equal areas of advanced secondary kamahi-rewarewa and kamahi-manuka forest. A few wildling *Pinus radiata* are scattered throughout. The RAP is significant for the composition of its secondary forest communities, with the dominance of kamahi unusual in a regional context.

RAP 92: Mangamaunu Gorge (Map 24)
Priority: 1
NZMS 260 ref: Y16 510225
Total area: 142 ha
Percent primary: 100%
Altitudinal range: 400-520 m
Bioclimatic zone: lowland

This RAP contains an area of steep hillslopes of a range of aspects in a gorge in the middle reaches of the Mangamaunu Stream, and is bisected by the Tauwhareparae Road. It contains forest in which matai and rimu are emergent over a diverse canopy consisting of Hall's totara, tanekaha, tawa, and occasional maire; black beech forms local enclaves on harsh sites. The understorey is diverse, containing a wide range of divaricate shrubs, *Dicksonia fibrosa*, and regenerating conifers.

The significance of the RAP stems from the extent, diversity, and relative intactness of its primary forests, which are representative of the original cover on steep fertile sites such as this. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including weka. Both domestic stock and feral goats are present, and erosion is locally severe on steep sites.

RAP 93: Misery Block (Map 24)
 Priority: 2
 NZMS 260 ref: Y16 488208
 Total area: 159 ha
 Percent primary: 10%
 Altitudinal range: 450-590 m
 Bioclimatic zone: lowland

This RAP, located south of the Tauwhareparae Road, consists of a sequence of flat to gentle terraces into which small streams are shallowly but sharply incised. It is drained along the northern side by an eastward-flowing tributary of the Mangamaunu Stream, while the boundary along the southeastern margin runs along the top of slopes falling steeply into the larger valley of the Haupatua Stream. It contains an extensive and complex mosaic, mostly of secondary forest, scrub, and shrubland. Small areas of advanced secondary or surviving primary forest contain red beech, black beech, and tanekaha on less fertile soils on stable terrace sites, and matai, totara, rimu, rewarewa, and kamahi on more unstable but more fertile soils on the side-slopes dropping into the streams.

In the younger stands, sites on less fertile soils of the flatter terraces are dominated by manuka, and those on more fertile soils of the risers, sideslopes, and more dissected terraces by kanuka. Associated species include kohuhu, cabbage tree, broadleaf, tanekaha, heketara, rangiora, lancewood, kowhai, lacebark, black beech, and putaputaweta. Older secondary stands in the southwest are dominated by kamahi and rewarewa, often with putaputaweta, kohuhu, Hall's totara, and some red beech.

The significance of this RAP stems largely from the diverse range of secondary communities it contains, a number of which are successional advanced and contain an abundance of high forest species. The dominance of both manuka and kamahi is significant in the context of the Ecological District.

RAP 94: Yukon-Hollows (Map 24)
 Priority: 1
 NZMS 260 ref: Y16 493193
 Total area: 555 ha
 Percent primary: 3%
 Altitudinal range: 460-640 m
 Bioclimatic zone: lowland

This RAP is similar in ecological character to No. 93 immediately to the north, containing a flat to rolling plateau consisting of a flight of old terraces which are progressively more dissected with increasing altitude, and into which valleys have been cut by a tributary of the Mangamaunu Stream in the southeast and by the Haupatua Stream in the northwest. The vegetation consists of an extensive and complex mosaic mostly of secondary forest, scrub, and shrubland. One small area of surviving primary forest on the north side of the Haupatua Stream (GR 482195) contains tawa-dominant stands on upper slopes, matai-kahikatea forest on the mid-slopes, and red beech on the foot-slopes. In the secondary stands, sites on the less fertile soils of flatter sites are dominated by manuka, and those on

the more fertile soils of hillslopes and more dissected plateau sites by kanuka. Associated species include kohuhu, cabbage tree, broadleaf, tanekaha, heketara, rangiora, lancewood, kowhai, lacebark, black beech, and putaputaweta. Secondary stands of intermediate age are dominated by kamahi and rewarewa, often with putaputaweta, kohuhu, Hall's totara, and some red beech.

Although containing only a small area of primary forest, the RAP is highly significant both for the primary forest values which survive and the diverse range of secondary communities with their very distinctive relations to terrace landforms and soils. Red beech occurs at its lower altitudinal limits, and as already noted kamahi and manuka are both unusual in the context of the Ecological District.

RAP 95: Pineridge - Tutamoe (Map 24)

Priority: 3
 NZMS 260 ref: Y16 525168
 Total area: 475 ha
 Percent primary: 4%
 Altitudinal range: 500-620 m
 Bioclimatic zone: lowland

This extensive RAP consists of an undulating plateau drained through the centre by the headwaters of the Mangamaunu Stream, and on its eastern margin by the Ngapunarua Stream, an upper tributary of the Waiau River. The Tauwhareparae road runs through the eastern margin of the area. Although extensive areas of secondary scrub and low forest communities of a range of ages predominate, one small patch of primary forest east of the Tauwhareparae road is dominated by tawa with scattered pukatea, rimu, and rewarewa. Most of the secondary stands in the central parts are dominated by manuka, and those on the more dissected outer parts are generally dominated by kanuka. Older stands, which are most extensive in the southwest but with smaller areas in the northeast, also contain rewarewa, kamahi, kohuhu, five finger, lancewood, and/or mamaku. Wildling *Pinus radiata* are scattered throughout.

Although lacking the diversity of the nearby RAPs 93 and 94, the area is significant for the range of secondary communities it contains, including older stands with advanced growth of primary forest species. Given the availability of seed of forest species from its small primary remnant, the area has potential for substantial further successional development with time.

RAP 96: Bruces Bush (Map 25)

Priority: 2
 NZMS 260 ref: Y16 438285
 Total area: 72 ha
 Percent primary: 100%
 Altitudinal range: 460-580 m
 Bioclimatic zone: lowland

This RAP encompasses both a gentle plateau and steeper sideslopes, mostly of westerly aspect, in the upper reaches of the Mata River in the west of the subdistrict. Tawa-dominant forest covers the plateau, with scrub and low forest dominated by mahoe, pate, mamaku, and wineberry occurring on more stable scarp edges, and more open scrub dominated by kowhai, kohuhu, and lancewood occurring on more unstable sites. One or two emergent rimu and matai remain in the tawa forest, along with scattered pukatea and rewarewa. Although there is no sign of recent activity, one or two grassy patches together

with a general paucity of emergent conifers suggest that logging may have occurred in the past.

This RAP is of similar character to Jacob's Bush (RAP 87), but has been ranked lower in significance because it lacks some of the qualities of the latter, i.e., the much lower density of podocarps and the absence of black beech. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush and field birds recorded, including kereru. Although it is largely fenced, domestic stock obviously still have an impact on the understorey.

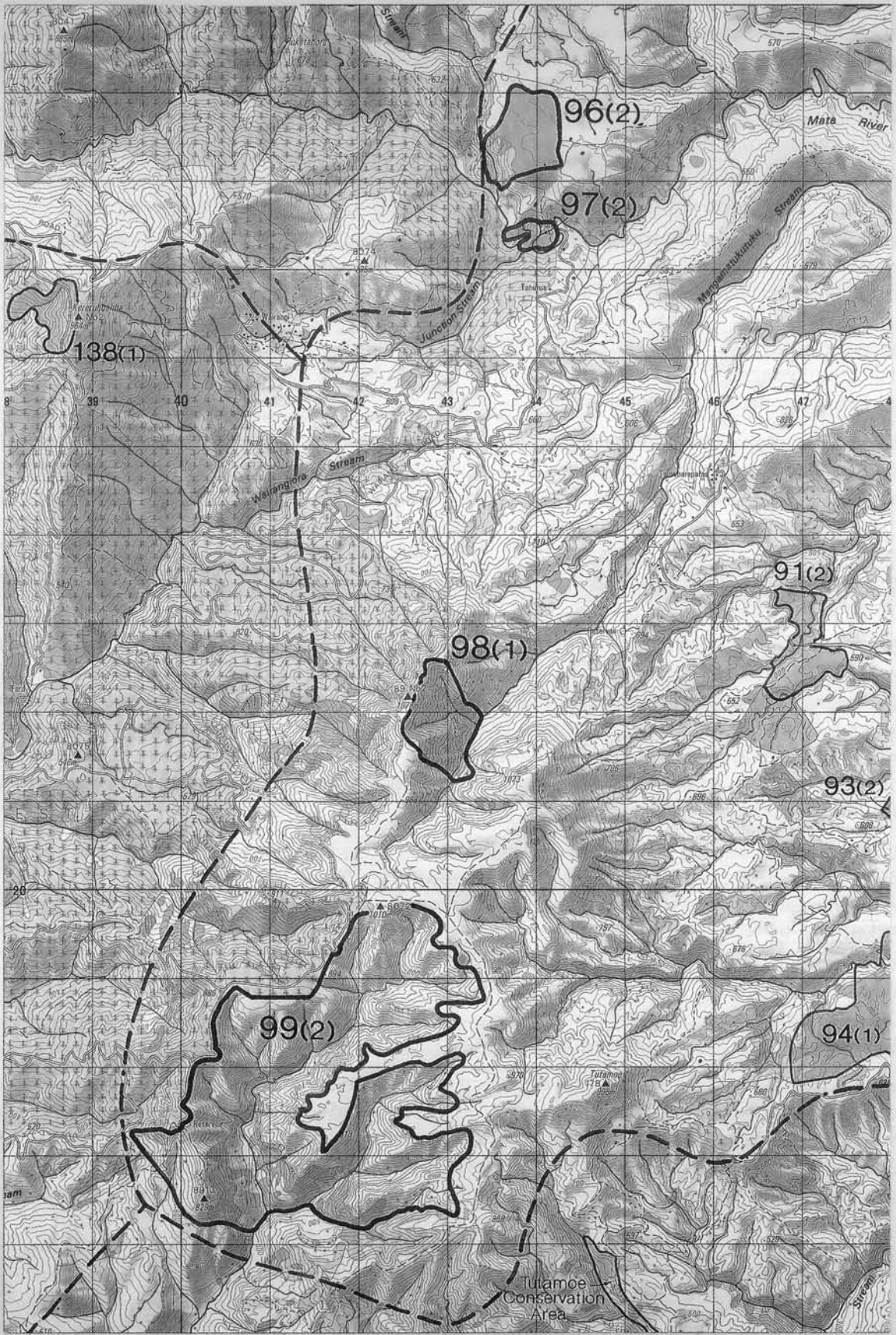
RAP 97: **Wairangi Bush (Map 25)**
 Priority: 2
 NZMS 260 ref: Y16 440274
 Total area: 12 ha
 Percent primary: 100%
 Altitudinal range: 450-460 m
 Bioclimatic zone: lowland

This RAP contains two small forest remnants on alluvial terraces to either side of the Mata River in its upper reaches. Densities of podocarps are high, with matai dominant and rimu, kahikatea, tanekaha, and totara also present. Tawa is common in the canopy, and lacebark, white maire, and hinau are scattered through the understorey. Although a few trees of red beech remain, it was formerly more common, but has been selectively removed, presumably for fencing material. Kowhai is common around the margins; one specimen was estimated to be 18 m high.

The forests of the RAP are significant for their high densities of podocarps, and are representative of those which once occurred as narrow ribbons on alluvial terraces along all the larger rivers in this subdistrict. The presence of red beech on alluvial terraces is notable, particularly at this altitude. The area is unfenced, and stock have severely modified the understorey. Because of both its landform and forest composition, this RAP strongly complements the adjacent No. 96, and any proposals for their formal protection should probably be handled concurrently.

RAP 98: **Upper Mangamatukutuku (Map 25)**
 Priority: 1
 NZMS 260 ref: Y16 430220
 Total area: 68 ha
 Percent primary: 100%
 Altitudinal range: 700-1070 m
 Bioclimatic zone: lowland-montane

This RAP encompasses an area of very steep hill country of mainly easterly aspect near the head of the Mangamatukutuku Stream at the western end of the Mata Plateau. It is crossed by a band of large sandstone bluffs at lower altitude, part of the dissected sandstone-dominated scarp standing above the general level of the Mata Plateau subdistrict on the northeast edge of the much higher Tutamoe plateau. It contains an extensive stand of primary lower montane forest with a canopy dominated by beeches, but overtopped by emergent Hall's totara, miro, rimu, and toatoa. Red beech is dominant at lower altitudes, with occasional tawa in the lowest pieces, but silver beech increases in prominence at higher altitudes. Other broadleaved species include *Dracophyllum traversii*, quintinia, broadleaf, haumakaroa, and mountain cabbage tree.



MAP
25

INFOMAP 260 Y16
SCALE 0 1000 2000m

LEGEND
7 RAP No
(3) Priority
Sub-district boundary



Very little beech-dominant forest remains in this subdistrict, and this particular piece is valuable for its wide altitudinal range (nearly 400 m) and consequent variation in composition, with lowland species such as tawa occurring at lower altitudes and a range of less common montane species in the upper parts. Browsing by goats, and perhaps also domestic stock, is having a severe impact on the understorey, particularly around the margins. These have also become rather ragged, particularly at lower altitudes, through the combined effects of patchy clearance and erosion.

RAP 99:	Areoma (Map 25)
Priority:	2
NZMS 260 ref:	Y16 415180
Total area:	823 ha
Percent primary:	nil
Altitudinal range:	400-1010 m
Bioclimatic zone:	lowland-montane

This extensive RAP, situated in the far southwest of the subdistrict, encompasses an area of very steep hillslopes and bluffs on the southern end of the Tutamoe Plateau. It is drained by a southwest-flowing tributary of the Waipaoa River, in contrast to the rest of the subdistrict, which mostly drains northwards into the Mata River. Soils are generally skeletal, as reflected in the bypassing of this area when the surrounding land was afforested with pines. The vegetation consists almost entirely of secondary scrub and low forest, with only a few trees of red, silver, and mountain beech, and tawari surviving in the southwest, to indicate what the original forest cover would have been. Broadleaf, kiokio, prickly mingimingi, bracken, and wharariki are dominant over the bulk of the area; mahoe, *Pittosporum ralphii*, and kamahi are more abundant on easier slopes and in the valley bottoms. Sites where mass-movement debris has accumulated are dominated by lacebark, mahoe, and kowhai interspersed with pasture, and cliff vegetation is dominated by tutu, *Chionochloa flavicans*, and wharariki.

This RAP is significant for the secondary vegetation it contains and which is unusual in the context of the wider Ecological District because of the dominance of ferns and broadleaved shrubs, this probably reflecting largely the skeletal nature of the soils and the high altitude. The historic pa site of Areoma is situated in the southwestern corner of the RAP.

6.12 Waingaromia RAPs

This subdistrict, in common with the other eastern and southern subdistricts, contains generally only small, isolated remnants of primary forest. Secondary communities are also of generally small extent, except where steep terrain has made maintenance of pasture cover difficult. The composition of the primary forests is subtly different from that at comparable altitudes in the more eastern subdistricts, with kohekohe much less abundant here, and with titoki often more widespread and abundant. Kahikatea, matai, and totara are all widespread in forests of the alluvial terraces, with high densities reached on some sites, particularly those scattered along the middle reaches of the Waingaromia River (RAPs 102, 104, and 105). Kanuka is generally dominant in secondary communities (e.g., RAPs 106 and 107), except where primary successions have occurred on erosion surfaces (e.g., RAP 102).

RAP 100: **Parariki Stream (Map 26)**
 Priority: 2
 NZMS 260 ref: Y16 484129, 492121, 500118, 515115,
 Total area: 76 ha
 Percent primary: 100%
 Altitudinal range: 200-320 m
 Bioclimatic zone: lowland

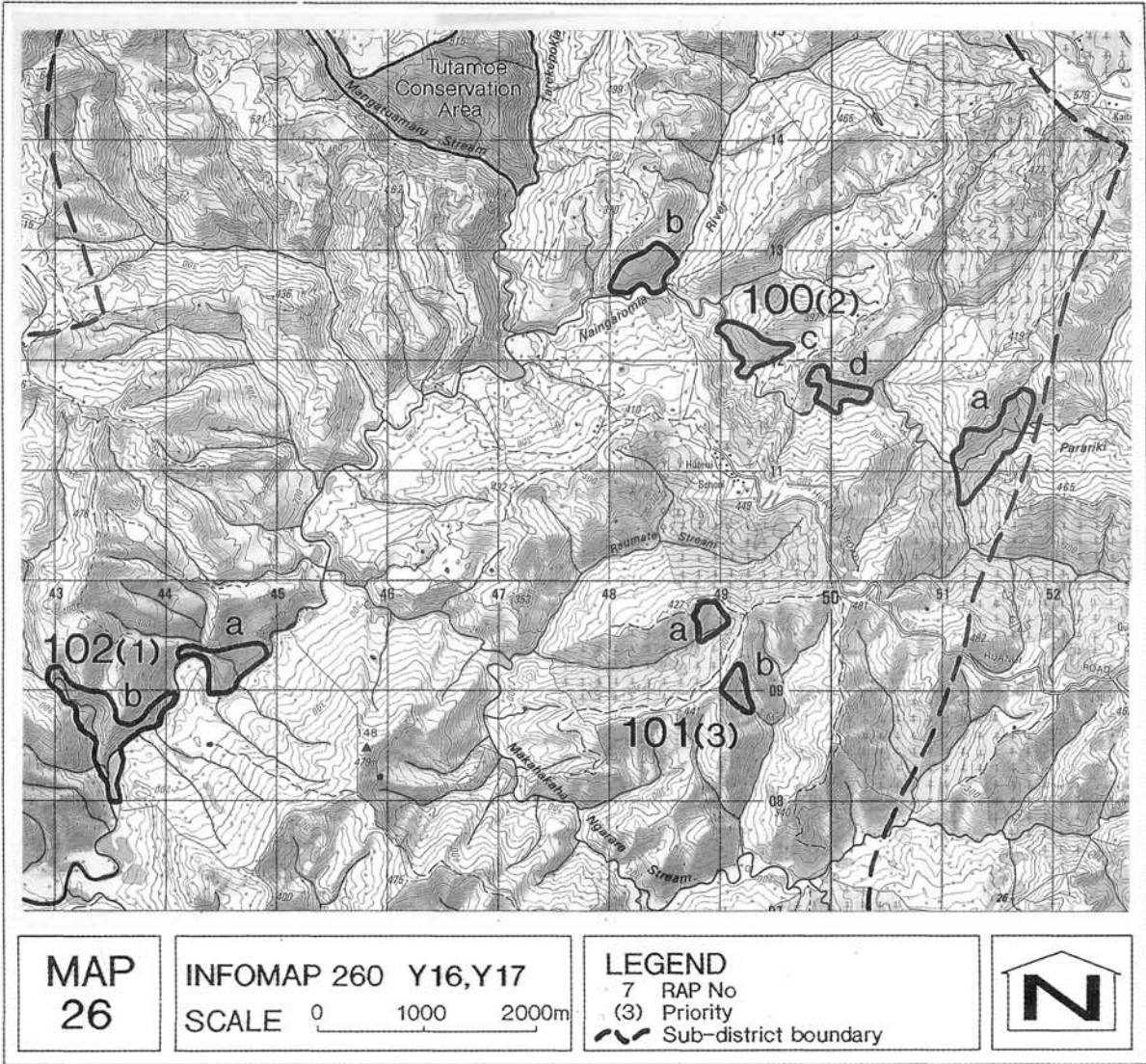
This RAP consists of four very similar pieces of primary forest located on lower hillslopes and adjacent small areas of alluvial terrace in the Parariki Stream, a meandering upper tributary of the Waingaromia River in the east of the subdistrict. Slopes vary from moderate to steep, with the steepest slopes in the easternmost piece. Aspects are predominantly southwesterly to southeasterly except in the easternmost piece, which also contains a large area of northwesterly aspect. The forest of the four blocks is closely similar, consisting of occasional to frequent large kahikatea with occasional matai and totara, emergent over a dense canopy dominated by tawa with scattered titoki and pukatea. Podocarp densities are generally highest on sites with less slope, and particular on the alluvial terraces. One stand of kahikatea poles occupies a very small area of toeslope and alluvial terrace in the easternmost block. Other species present, mostly around the margins, include lacebark, kowhai, cabbage tree, and rewarewa; kohekohe occurs in the easternmost block.

The significance of this RAP stems from its largely intact primary forest remnants, representative of the forest which once would have been widespread throughout the subdistrict. Although pines have been planted around the easternmost block, it and all the other blocks are still subject to grazing by domestic stock. If this continues, it will threaten the long-term viability of the stands.

RAP 101: **Huanui (Map 26)**
 Priority: 3
 NZMS 260 ref: Y17 489098, 492090
 Total area: 16 ha
 Percent primary: 100%
 Altitudinal range: 330-420 m
 Bioclimatic zone: lowland

This RAP contains two small areas of steep upper hillslope of southeasterly aspect, situated approximately 1 km west of Huanui Road on small sidestreams in the headwaters of the Waingaromia River. Both contain small remnants of primary forest consisting of scattered kahikatea, pukatea, matai, and/or rewarewa emergent over a canopy of tawa with titoki and hinau. Understorey species include pate, lacebark, mahoe, and wineberry.

Although small and fragmented, these two remnants contain representative stands of podocarp/broadleaved forest on upper hillslopes, complementing the lower hillslope/alluvial sites of the RAP 100. Both remnants are now surrounded by exotic plantation, which not only will provide some buffering but probably also will result in a reduction in grazing pressure.



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RAP 102:	Waingaromia River (Map 26)
Priority:	1
NZMS 260 ref:	Y17 435085, 445093
Total area:	59 ha
Percent primary:	86%
Altitudinal range:	140-300 m
Bioclimatic zone:	lowland

This RAP contains two pieces of land extending for about 3 km along the Waingaromia River, approximately 12 km upstream from its junction with the Waipaoa River. The upstream or more northern piece contains an older elevated terrace bisected by an erosion gut and a smaller area of lower and more recent alluvial terrace, as well as steep eroding slopes dropping into the river. The downstream piece, which also extends approximately 1 km up into a side tributary, contains predominantly steep slopes alongside the river on the western banks, but extends around an area of alluvial terrace on the eastern banks. The more intact pieces of forest occur predominantly on the terrace landforms, and consist of large kahikatea, matai, and totara emergent over a canopy of tawa and titoki, with lacebark and kowhai around the margins; podocarps reach highest densities on sites with little slope. Other species present in these stands include pukatea, hinau, and mahoe. Forests on the steeper and more unstable slopes are more variable, reflecting the patchy distribution of

erosion events. Podocarps are less abundant in the older stands than on adjacent stable sites, and forest generally consists of tawa, titoki, hinau, kowhai, and lacebark, the relative proportions varying widely according to site history. More recently disturbed areas contain lancewood, mapou, putaputaweta, kohuhu, lacebark, bracken, kowhai, tutu, tauhinu, and/or wharariki.

This RAP contains probably the best of several small primary forest remnants found along this stretch of river. It comprises a mix of stable terrace sites of varying age and less stable steep slopes, and this is reflected in the diversity of both older forest and younger communities which have resulted from primary successions on erosion surfaces. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush and field birds recorded. Exotic pines have recently been planted on the west side of the river on the lower hillslopes which separate the two pieces, and these will provide some buffering. Stock still has free access to both blocks, but fencing would be difficult given the nature of the site.

RAP 103:	Parehaka Bush (Map 27)
Priority:	1
NZMS 260 ref:	Y17 453041
Total area:	34 ha
Percent primary:	92%
Altitudinal range:	260-400 m
Bioclimatic zone:	lowland

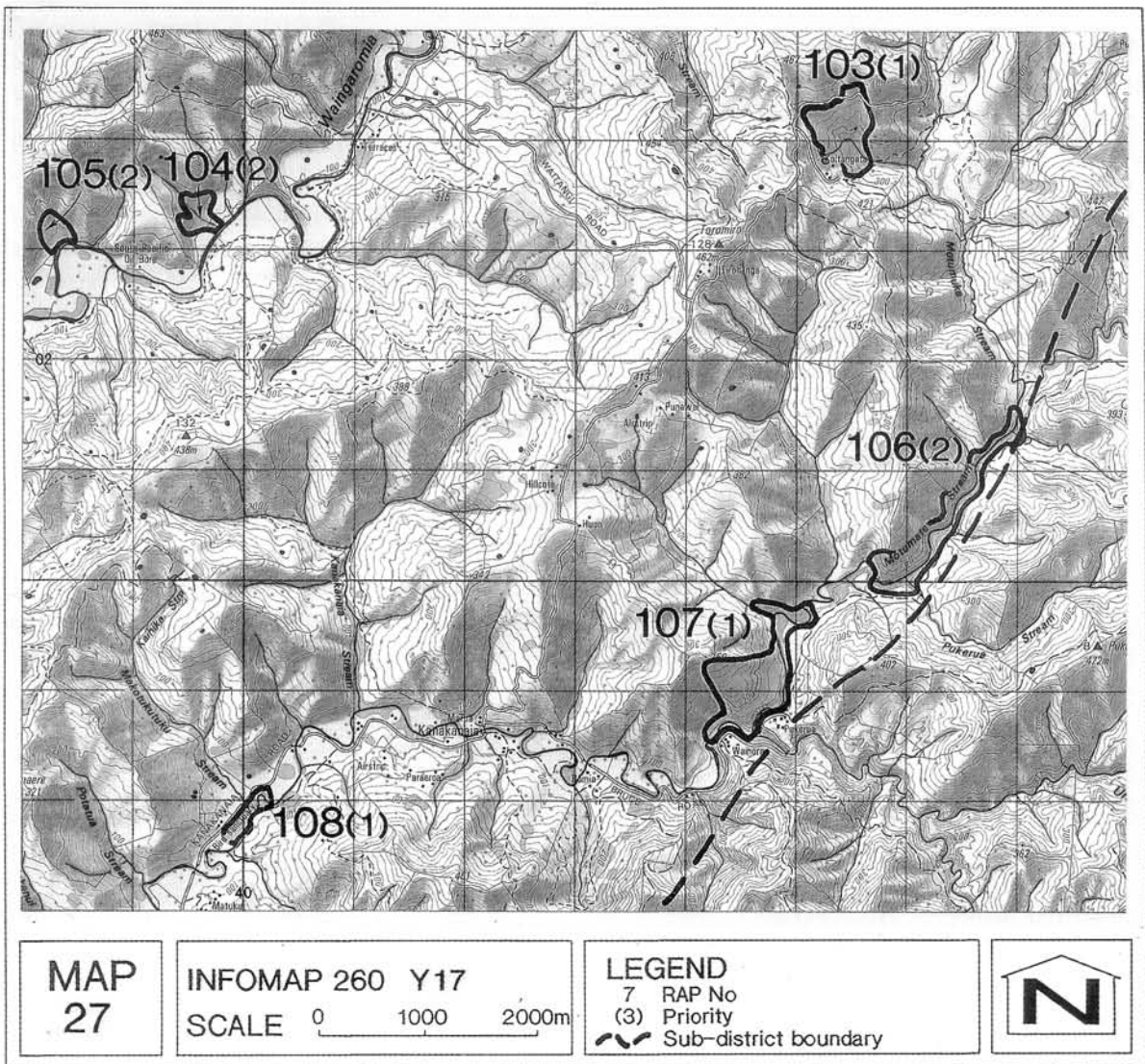
This RAP is located in a moderate to steeply sloping basin of southeasterly aspect near the crest of the divide between the Waihora and Waingaromia catchments. The primary forest it contains is dominated by tawa, pukatea, and hinau, with scattered large emergent kahikatea. Other species present include mamaku, mahoe, five finger, pate, and pigeonwood in the gullies, and mapou, white maire, matai, rewarewa, and putaputaweta on the ridges.

This RAP has very high significance, containing the largest surviving single remnant of primary mixed hillslope forest left in the Waingaromia subdistrict. A mixture of introduced plantings have been established on the southern boundary, but these do not appear to be spreading into the native forest. Although the area is mostly fenced, stock are used by the owner to keep the roadside verges clear of weeds, and in places this maintains the open character of the forest margin.

RAP 104:	Waitangi No. 1 (Map 27)
Priority:	2
NZMS 260 ref:	Y17 395304
Total area:	11 ha
Percent primary:	78%
Altitudinal range:	100-180 m
Bioclimatic zone:	lowland

This RAP and the adjacent No. 105, which are closely similar, are located on lower hillslopes and alluvial terraces of southeasterly aspect in the lower reaches of the Waingaromia River. Primary forest on the alluvial terraces is dominated by kahikatea of varying age from pole to mature, along with kanuka, lacebark, and kowhai. Matai, totara, and rewarewa are also present. Primary forest on the adjacent hillslope is dominated by tawa, kowhai, and titoki. Secondary stands contain manuka, lacebark, cabbage tree, and regenerating totara. The significance of the RAP stems from the primary forest it contains.

However, it lacks some of the qualities of the nearby RAP 102, particularly when considering the extent of unmodified forest and the dynamic successional processes of the latter. The RAP is unfenced, and is subject to modification by grazing.



RAP 105:	Waitangi No. 2 (Map 27)
Priority:	2
NZMS 260 ref:	Y17 383030
Total area:	8 ha
Percent primary:	90% approx.
Altitudinal range:	100-180 m
Bioclimatic zone:	lowland

This RAP is very similar in ecological character to the adjacent No. 104, differing mainly in having a greater predominance of hillslopes and a smaller area of alluvial terrace. It contains a remnant of primary forest most of which is on lower hillslopes of southeasterly aspect, and in which scattered kahikatea are emergent over a canopy dominated by tawa and titoki. Kanuka, kowhai, matai, totara, lancewood, mapou, kohuhu, lacebark, and mahoe are also present, along with some small areas of pole kahikatea.

This RAP is of similar significance to No. 104, containing a small remnant of primary forest typical of that which once would have been widespread on sites such as this. The area is unfenced, and is subject to modification by domestic stock.

RAP 106: **Motumate Gorge north (Map 27)**
Priority: 2
NZMS 260 ref: Y17 464005
Total area: 46 ha
Percent primary: nil
Altitudinal range: 140-260 m
Bioclimatic zone: lowland

This is one of two RAPs situated along the lower reaches of the Motumate Stream, a tributary of the Waihora River. Both consist of moderately steep hillslopes dropping down to more gentle slopes in the valley bottom, but with the stream itself incised into a shallow but steep-sided gorge. Almost pure kanuka scrub and forest is dominant on the hillslopes, but more diverse secondary forest occurs along the sides of the gorge. This contains young kahikatea, totara, and matai emerging through a lower canopy of kowhai, kohekohe, lancewood, kaikomako, and tawa. Tutu and wharariki are locally common on bluffs.

The significance of this RAP stems mainly from its diverse secondary forest along the sides of the gorge, and the potential this provides for expansion of tall forest species into the surrounding kanuka forest (cf. RAP 107). The occurrence of kohekohe this far inland is unusual.

RAP 107: **Motumate Gorge south (Map 27)**
Priority: 1
NZMS 260 ref: Y17 445990
Total area: 56 ha
Percent primary: nil
Altitudinal range: 100-360 m
Bioclimatic zone: lowland

This RAP is closely similar in landform and vegetation to No. 106, which lies immediately to the north. Although kanuka is dominant over most of the middle and upper hillslopes, sites on both sides of the sharply incised gorge have provided protection for adult podocarps from early clearing and fires, and scattered totara, matai, and tanekaha poles are now emerging through the kanuka on the lower hillslopes, although generally only close to surviving adults. The gorge walls themselves support species such as tutu, *Pittosporum ralphii*, kowhai, kohuhu, and mapou.

Although this RAP is similar to No. 106 it has been ranked more highly because of its more complete range of landforms, and because it is one of very few such sites in the entire Ecological District where podocarp regeneration has advanced sufficiently to emerge through a kanuka-dominant canopy. Local landowners report seeing as many as 18 kereru at a time in the area.

RAP 108:	Kanakanaia (Map 27)
Priority:	1
NZMS 260 ref:	Y17 400978
Total area:	9 ha
Percent primary:	100%
Altitudinal range:	60 m
Bioclimatic zone:	lowland

This small RAP is located on an alluvial terrace beside the Waihora River in its middle reaches. The bulk of the area is located on the western side of the river, but includes a small area on the eastern bank at the north end of the RAP. It contains a fine stand of large, mature kahikatea emergent over a dense canopy of tawa and titoki. Although scattered old stumps indicate where several kahikatea have been removed, a number of very large specimens remain. Other species include scattered poles of totara, mahoe, pate, and lacebark, with kowhai mainly along the river margin. Although the area was fenced in the past, flooding and storm damage have resulted in easy access for stock, and the understorey is now quite depleted.

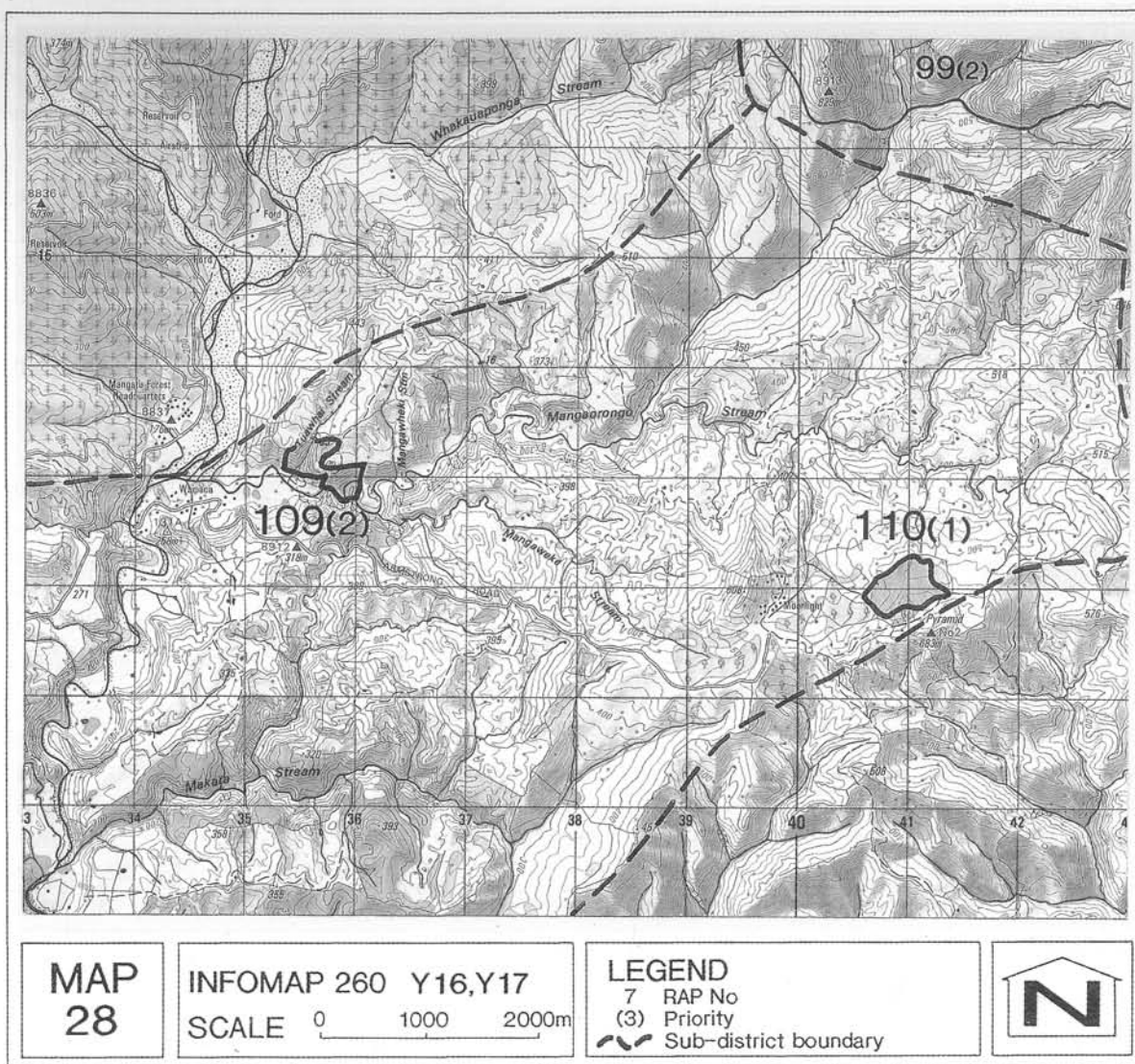
6.13 Waipaoa RAPs

The Waipaoa subdistrict is the most western in which pastoral farming is almost ubiquitous. Only small, scattered remnants of mostly primary forest remain, most of them on lower hillslopes and alluvial terraces along the Waipaoa River and the lower parts of its tributaries. Primary forest remnants are generally dominated by kahikatea, and sometimes totara and matai, emergent over canopies of tawa, pukatea, and titoki. Secondary communities are more diverse than in the eastern subdistricts, with kanuka, kohuhu, lacebark, and kowhai all common.

RAP 109:	Mangaorongo Stream (Map 28)
Priority:	2
NZMS 260 ref:	Y16 355132
Total area:	22 ha
Percent primary:	100%
Altitudinal range:	180-340 m
Bioclimatic zone:	lowland

This RAP is located on steep lower hillslopes in the lower reaches of the Mangaorongo and Tuawhai streams, two upper tributaries of the Waipaoa River situated just south of Mangatu Forest. It contains two small remnants of somewhat modified primary forest growing on very steep protected hillslopes of generally southerly to westerly aspect, dropping off from the more gentle terrain at higher altitude into the valley bottom. The two pieces are joined by a narrow neck of forest bisected by a farm road. The forest is dominated by titoki and tawa, with kowhai and kohuhu around the margins and on more unstable or eroded sites. Other species include pukatea, rewarewa, lancewood, lacebark, totara, kahikatea, mamaku, and cabbage tree; tutu is common on steep slopes on the margins.

The RAP is representative of the forests which once occurred locally on steep sites along the larger rivers and streams throughout much of this subdistrict, and which, because of their steep and often unstable nature, were often left when the surrounding easier country was cleared for agriculture. The area is unfenced, and is subject to modification by stock.



RAP 110: **Darkies Bush (Map 28)**
Priority: 1
NZMS 260 ref: Y16 410120
Total area: 25 ha
Percent primary: 100%
Altitudinal range: 520-620 m
Bioclimatic zone: lowland

This RAP consists of a gentle area of upper hillslopes over a full range of aspects on the northern side of Pyramid, a high point on the southern boundary of the Mangaorongo catchment. It contains primary hillslope forest consisting of scattered kahikatea and totara emergent over a canopy dominated by tawa, pukatea, and rewarewa; the last-named is more common in the south-eastern corner. Other species include hinau, lacebark, putaputaweta, mahoe, kohuhu, and cabbage trees.

This RAP is strongly complementary in character to No. 109, occupying a much more gentle and stable site on the upper hillslopes. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush and field birds recorded, including weka. Its conservation value has already been recognised by the owner, who has fenced the area off and planted a range of introduced tree species around the margins on three sides.

RAP 111: **Mangatahu Station Bush (Map 29)**
 Priority: 1
 NZMS 260 ref: X16 284113
 Total area: 40 ha
 Percent primary: 100%
 Altitudinal range: 170-300 m
 Bioclimatic zone: lowland

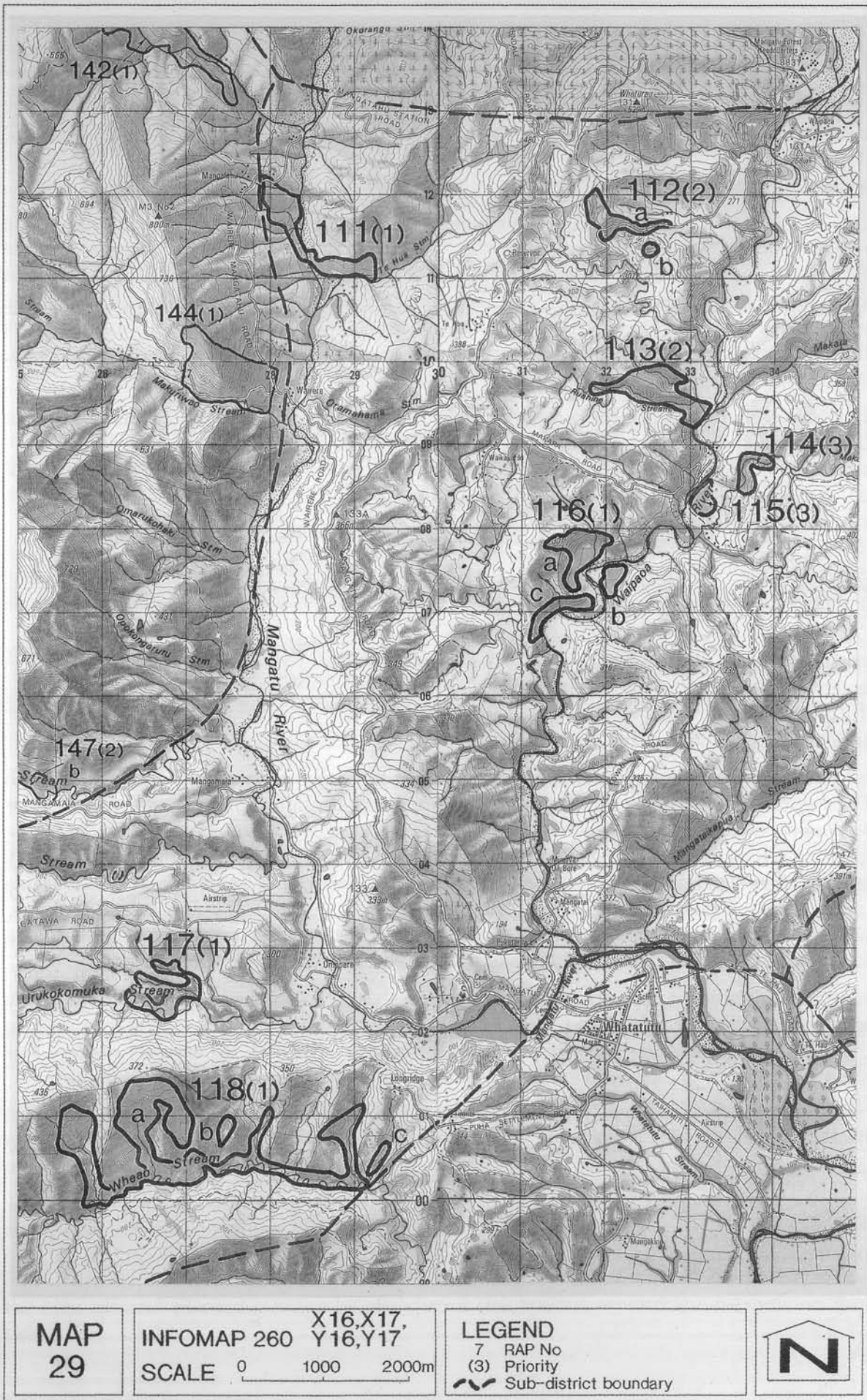
This RAP, located in the northwest of the subdistrict, contains two areas of very gentle lower hillslopes, with locally steeper sites, at the junction of Te Hua Stream and the Mangatu River. The more westerly piece, situated on the western bank of the Mangatu River, is of easterly aspect, but that on the eastern banks and which extends around into the lower parts of the Te Hua Stream is of southerly aspect. Both pieces contain fine examples of mixed broadleaved forest dominated by titoki, tawa, and pukatea, with kahikatea, rewarewa, and mahoe also common.

The RAP well represents the primary forest which once occurred on the gentle lower hillslopes in this catchment (cf. the steep lower hillslopes of RAP 109). Although the understorey is heavily modified as a consequence of grazing by both domestic stock and goats, the canopy is still in relatively good condition. Fencing should be considered a priority, given the lack of any topographic barriers to stock access.

RAP 112: **Armstrong Road (Map 29)**
 Priority: 2
 NZMS 260 ref: Y16 322115
 Total area: 25 ha
 Percent primary: 67%
 Altitudinal range: 280-420 m
 Bioclimatic zone: lowland

This RAP consists of two pieces of forest on rolling hillslopes of southerly aspect, just south of Mangatu Forest. The larger and more northern piece contains approximately equal areas of primary and secondary forest, with the primary forest concentrated on the south-facing slopes to either side of Armstrong Road; the southern piece consists entirely of primary forest. These primary stands are dominated by kahikatea, pukatea, and rewarewa emergent over a tawa canopy, along with mahoe, titoki, mamaku, putaputaweta, lacebark, and hinau. The secondary forest consists predominantly of rewarewa emergent over a canopy of kanuka and mamaku, but also contains some areas of pole kahikatea.

The RAP is significant not only for its primary forest, which is representative of the primary forest once widespread through this subdistrict, but also for its stand of secondary forest, in which succession towards high forest is well advanced. The area is currently grazed, and fencing to exclude stock would enhance values by allowing recovery of the understorey.



RAP 113:	Ruahine Stream (Map 29)
Priority:	2
NZMS 260 ref:	Y17 328097
Total area:	19 ha
Percent primary:	26%
Altitudinal range:	130-250 m
Bioclimatic zone:	lowland

This is one of a cluster of four RAPs (see also Nos 114-116) in the upper reaches of the Waipaoa River and containing varying proportions of gentle alluvial terraces and adjacent steeper lower hillslopes. All are surrounded by farmland, and for lack of fencing are subject to modification by domestic stock. This area contains mostly secondary forest and scrub on hillslopes. Steep upper hillslopes north of the Ruahine Stream are dominated by manuka, with scattered emergent kowhai and kohuhu over sparse understoreys dominated by exotic grasses. Steep and locally unstable lower faces dropping into the streams are dominated by kanuka with kowhai, kohuhu, ribbonwood, and scattered high forest species such as tawa and titoki; tutu occurs on old slip sites. A small area of primary forest on an alluvial terrace at the junction of the Ruahine Stream and the Waipaoa River is dominated by kahikatea emergent over a canopy of tawa, with occasional matai and cabbage trees.

The RAP is significant for its combination of reasonably intact primary forest with a range of secondary communities spread across a wide range of landforms and varying in composition with age and site conditions.

RAP 114:	Horseshoe Bush (Map 29)
Priority:	3
NZMS 260 ref:	Y17 337088
Total area:	12 ha
Percent primary:	80%
Altitudinal range:	140-220 m
Bioclimatic zone:	lowland

This is one of four RAPs clustered together in the upper reaches of the Waipaoa River (see also Nos 113, 115 and 116). It consists of a small remnant of mainly primary forest on very steep hillslopes along a sharply incised section in the lower reaches of the Makahakaha Stream, a small tributary of the Waipaoa River. The primary forest is dominated by tawa and titoki, with occasional emergent totara, kahikatea, and matai. A small piece of secondary forest on the southern margin contains lacebark, lancewood, kanuka, putaputaweta, kowhai, *Pittosporum ralphii*, mapou, cabbage tree, and wharariki. These species also occur locally on old slip sites through the rest of the block.

The significance of the RAP stems from its primary forest, which is typical of that occurring on unstable faces dropping into the lower reaches of side creeks flowing into upper stretches of the Waipaoa River (see also No. 109). The area is fenced, and exotic trees have been planted in places around the margins, particularly at the upper end.

RAP 115: **Makara Flats Bush (Map 29)**
Priority: 3
NZMS 260 ref: Y17 332085
Total area: 9 ha
Percent primary: 100%
Altitudinal range: 120 m
Bioclimatic zone: lowland

This is one of four RAPs clustered together in the upper reaches of the Waipaoa River (see also Nos 113, 114, and 116). It consists of a small remnant of tawa-dominant forest on an alluvial terrace adjacent to the Waipaoa River. Other species present include totara, kahikatea, titoki, matai, lacebark, lancewood, kanuka, rewarewa, white maire, and cabbage tree, the last-named mostly around the margins. Poplars and exotic conifers have been planted along the western margin adjacent to the river.

Although the values of this RAP have been diminished through modification by stock and through logging of the emergents, probably long ago, the block remains significant given the scarcity of natural vegetation on alluvial terraces such as this.

RAP 116: **Waikakariki (Map 29)**
Priority: 1
NZMS 260 ref: Y17 317077
Total area: 48 ha
Percent primary: 62%
Altitudinal range: 110-300 m
Bioclimatic zone: lowland

This is one of four RAPs clustered together in the upper reaches of the Waipaoa River (see also Nos 113-115). It is the most extensive, including blocks on both sides of the Waipaoa River and containing both primary and secondary forest on alluvial terraces and adjacent lower hillslopes over a wide range of aspects. Slopes are generally moderate, but steep slopes drop into the river in the southwest.

Primary forest occurs on the alluvial terraces on both sides of the river, and is dominated by pukatea and kahikatea emergent over a canopy of tawa and titoki. Other species present include totara, matai, rewarewa, and mahoe. Primary forest on the adjacent hillslopes, which also occurs on both sides of the river, consists of titoki and tawa, with scattered emergent rewarewa and pukatea. Secondary stands, which occur predominantly on steeper hillslopes in the western piece, but also around the margins in the eastern block, are dominated by kanuka, kohuhu, titoki, and kowhai, along with cabbage trees, rangiora, ngaio, and *Pittosporum ralphii*. Occasional dense patches of kahikatea poles occur on the terraces in the west, and fringes of kanuka grow along both banks of the river. A row of *Pinus radiata* has been planted along the southwest margin.

The high value accorded to this RAP reflects its diverse range of primary and secondary forest and wide range of landforms, making it strongly representative of the natural communities which once occurred along the upper reaches of the Waipaoa River. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including kereru. Fencing to exclude stock would enhance its values.

RAP 117:	Urukokomuka Stream bush (Map 29)
Priority:	1
NZMS 260 ref:	X17 268024
Total area:	31 ha
Percent primary:	44%
Altitudinal range:	120-180 m
Bioclimatic zone:	lowland

This RAP, situated approximately 5 km west of Whatatutu, encompasses an area of alluvial terrace and adjacent steep hillslopes in a narrow tributary of the Mangatu River which has become incised into a high terrace. Although secondary forest containing a mixture of young kahikatea and kowhai predominates over much of the area, small pockets dominated by mature kahikatea and matai give a good indication of the character of the original forest cover. Secondary vegetation on the adjacent hillslopes is dominated by kohuhu, kanuka, and regenerating totara, with occasional ngaio and kowhai.

Although modified and fragmented, the RAP remains one of the best examples of podocarp-dominant forest on alluvial terrace left in this subdistrict. It also has good potential for recovery, given the extensive regrowth of kahikatea on the terraces and totara on the hillslopes. Its values would be enhanced by fencing to exclude both domestic stock and goats.

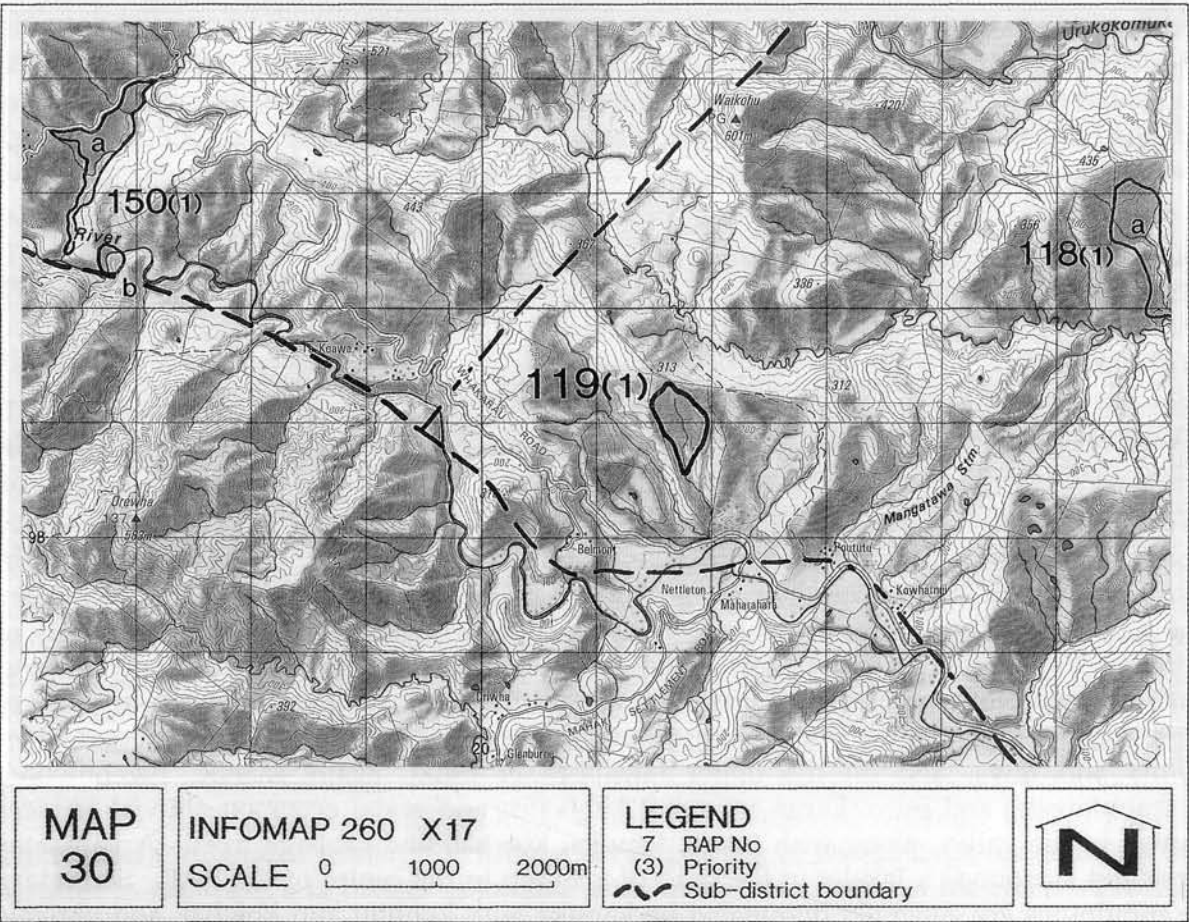
RAP 118:	Wheao Stream Bush (Map 29)
Priority:	1
NZMS 260 ref:	X17 280007
Total area:	176 ha
Percent primary:	63%
Altitudinal range:	90-360 m
Bioclimatic zone:	lowland

This RAP consists of a series of forest, treeland, and scrub remnants spread along the valley bottom and slopes on the northern side of the Wheao Stream. Slopes are mostly of southerly aspect, and are locally steep where raised alluvial terraces drop off into the valley bottom, but are generally moderate on the slump-prone valley sides. A wide diversity of primary forest and secondary forest and scrub are present, much of it fragmented and interspersed with pasture. The upstream part of the RAP contains remnants of primary forest, consisting on the lower hillslopes and terraces of kahikatea and matai emergent over titoki and tawa, and on the upper hillslopes of titoki, ngaio, mahoe, pigeonwood, putaputaweta, and miro. Large emergent kahikatea and matai occur on alluvial terraces lower in the valley, along with totara, kanuka, kowhai, and cabbage trees. A kahikatea treeland surrounds a lakelet in the head of a slump in the centre of the RAP. Secondary communities are generally dominated by kanuka with kohuhu and kowhai, and variable amounts of podocarp regeneration.

The high significance of this RAP stems from its fragmented but extensive areas of diverse forest, which occurs on a wide range of landforms and encompasses a range of successional stages. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush and field birds recorded, including kereru. Fencing to more effectively exclude stock would enhance the values of the RAP, but could be difficult given its convoluted shape.

RAP 119:	Poututu Bush (Map 30)
Priority:	1
NZMS 260 ref:	X17 215990
Total area:	20 ha
Percent primary:	100%
Altitudinal range:	130-280 m
Bioclimatic zone:	lowland

This RAP encompasses an area of gentle hill country of southerly aspect on the northern side of the Waikohu River. It contains primary forest dominated by titoki, tawa, and pukatea with rewarewa, totara, and black beech locally common. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including kereru. An open space covenant is being registered over this block with the Queen Elizabeth the Second National Trust.



6.14 Tapuaeroa RAPs

The Tapuaeroa subdistrict contains a wide variety of natural communities, reflecting its topographic diversity and wide altitudinal range. Few primary forest remnants survive at lower altitudes, and these almost all consist of tawa-dominant forest on hillslopes (e.g., RAP 121 and 123). Secondary forest and scrub is sometimes extensive, with large areas dominated by kanuka, and smaller areas of manuka-dominant scrub (e.g., RAP 120). The balance is reversed at higher altitudes, with extensive areas of primary forest in the Raukumara Forest Park passing through a dominance sequence from tawa at lower

altitudes, through mixed beech-tawa forest, to pure beech forest at the treeline. Extensive areas of scrub and herbfield occur above treeline on Hikurangi, and scrub communities also occur on the high sandstone peaks of Aorangi and Wharekia.

RAP 120: Mangatiti Stream (Map 31)

Priority: 1
 NZMS 260 ref: Y15 656595
 Total area: 464 ha
 Percent primary: 16%
 Altitudinal range: 140-782m
 Bioclimatic zone: lowland

This RAP, centred around a minor tributary on the north side of the Tapuaeroa River, is topographically complex. Several terraces of varying age and degree of elevation occur at lower altitudes, with the highest a sharply defined and extensive terrace 150 m above river level. Above this, gentle to moderately steep hillslopes of predominantly southerly aspect run up to the ridgecrest. One sizeable piece of primary forest in the centre of the area occupies a gentle face to the east of the Mangatiti Stream and steep, erosion-prone faces running down the western side of the stream. It is dominated by tawa, tarata, mahoe, rewarewa, pigeonwood, and heketara, with a number of black beech scattered along a more sharply defined spur running along the northern edge. A second smaller piece of primary forest occupies a terrace in the southeastern corner.

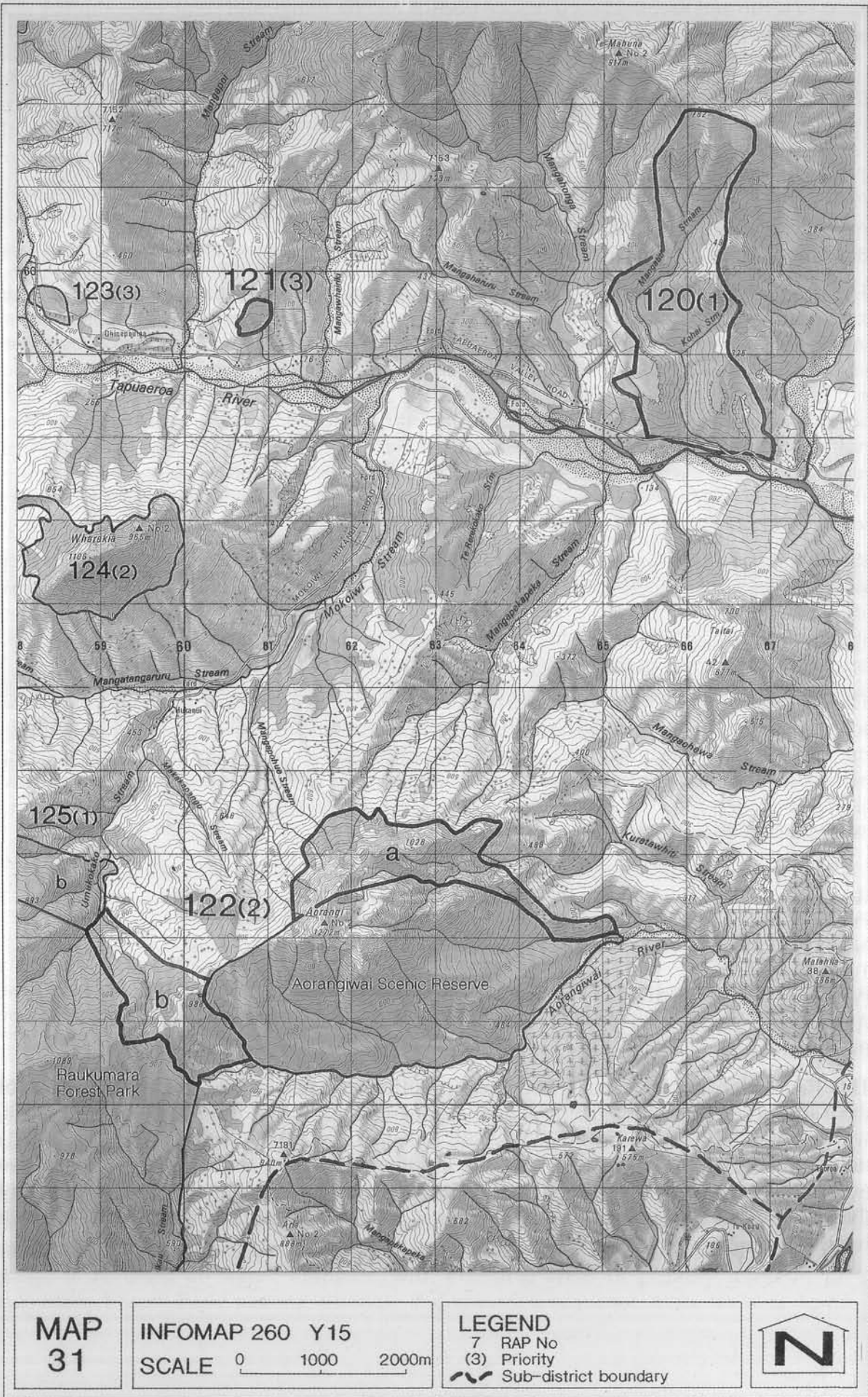
Kanuka and manuka are dominant in the surrounding secondary forest and scrub, which varies widely in age. Kanuka is generally dominant on intact hillslope soils at lower altitudes, and manuka is most abundant on old erosion scars or at higher altitudes. Older stands containing a mixture of the two species occur on the elevated terraces. A large and actively eroding gully in the southeast is surrounded by kanuka scrub and forest.

The RAP has high significance given its diverse range of primary and secondary forest and scrub and wide range of landforms. One particularly notable feature is the population of the endangered parasitic plant *Dactylanthus taylorii*, of which several reasonably healthy plants were found, mostly on mahoe and tarata hosts. Although the area is surrounded largely by secondary scrub and forest, cattle had recently been present and locally had caused substantial damage.

RAP 121: Aupouri Bush No. 1 (Map 31)

Priority: 3
 NZMS 260 ref: Y15 618595
 Total area: 14 ha
 Percent primary: 100%
 Altitudinal range: 260-330 m
 Bioclimatic zone: lowland

This RAP is located on a moderately steep, south-facing hillslope in the upper reaches of the Tapuaeroa River. It contains a small remnant of primary forest dominated by tawa, with mahoe, miro, kahikatea, pigeonwood, pukatea, and titoki also present. The area is unfenced and currently subject to grazing by domestic stock; some pig-rooting was also noted. Although small and somewhat modified, the area is still valuable as an example of the primary forest which was once extensive at low altitudes in this catchment, but which has now been largely cleared.



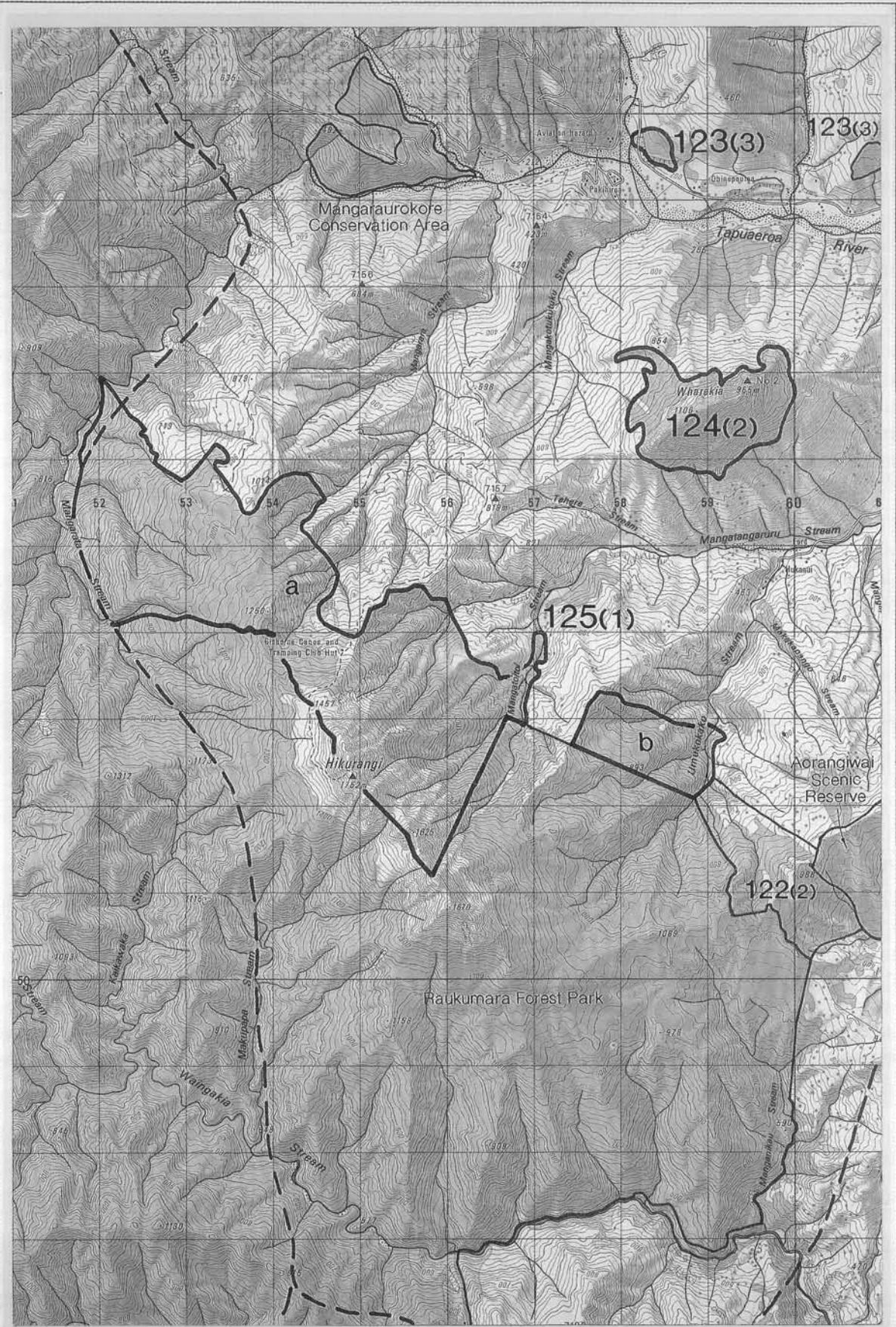
RAP 122: **Aorangi (Map 31)**
 Priority: 2
 NZMS 260 ref: Y15 620530
 Total area: 384 ha
 Percent primary: 58%
 Altitudinal range: 200-1200 m
 Bioclimatic zone: lowland-montane

This RAP contains two pieces of land abutting the Aorangiwai Scenic Reserve, a dissected upland plateau/summit with spectacular greywacke/sandstone bluffs above less steeply sloping, slump-prone hillslopes. The larger of the two pieces consists of an area of steep, often bluffy country along the northern and northeastern boundaries of the reserve with an elongated tongue running down to the east. The second piece contains more gentle country lying between the reserve and the adjacent Raukumara Forest Park. The first block contains some sizeable remnants of tawa-dominant forest which occurs both on steep rocky ridges and on more gentle upper hillslopes below the main bluffs, and is interspersed with scattered scrubby vegetation and erosion surfaces. Common species in the non-forested areas include wharariki, manuka, tutu, *Gaultheria antipoda*, *Cassinia leptophylla*, akepiro, and exotic grasses. The second piece contains an area of modified and fragmented tawa-dominant forest on upper hillslopes, heavily cut over in the past, but now regenerating.

The significance of the RAP is twofold. The more northern and larger piece is a natural addition to the Scenic Reserve, rounding out the range of aspects to include the northern slopes of the peak. The second area, although modified, is important for its ability to provide a corridor linking the Aorangiwai Scenic Reserve with the much more extensive forests of the Raukumara Forest Park.

RAP 123: **Aupouri Bush No 2 (Map 32)**
 Priority: 3
 NZMS 260 ref: Y15 585596
 Total area: 16 ha
 Percent primary: 100%
 Altitudinal range: 200-240 m
 Bioclimatic zone: lowland

This RAP is located a little over 2 km upstream from Aupouri Bush No. 1 (RAP 121), to which it is similar in ecological character. It contains a small remnant of primary forest on an alluvial terrace and adjacent gentle lower hillslopes, dominated by tawa and rewarewa along with titoki, kohekohe, wheki, *Cyathea smithii*, and tarata. Pukatea is more abundant in an area of poor drainage. As with RAP 121, this is one of very few remnants of primary forest left at lower altitudes in the Tapuaeroa Valley, and is valuable despite its small size. Although the area is currently subject to heavy modification by cattle, the canopy remains reasonably intact. Recovery should be rapid if the block can be fenced in the near future.



MAP 32	INFOMAP 260 Y15	LEGEND 7 RAP No (3) Priority Sub-district boundary	
	SCALE 0 1000 2000m		

RAP 124: Wharekia (Map 32)
 Priority: 2
 NZMS 260 ref: Y15 600565
 Total area: 188 ha
 Percent primary: nil
 Altitudinal range: 520-1100 m
 Bioclimatic zone: lowland-montane

This RAP is centred on the high point Wharekia, a spectacular block of hard, uplifted sandstone in the upper Tapuaeroa Valley. Steep bluffs and upper hillslopes surround the summit, but less steeply sloping faces occur at lower altitudes. The area has been substantially modified through clearance and burning, and now consists largely of secondary scrub and low forest in varying stages of recovery. Beeches and their common associates such as tawari, although present on nearby Hikurangi and Aorangi, were probably always absent on Wharekia, and the original cover on sites with soils capable of supporting forest would have consisted of scattered rimu, kahikatea, matai, and/or Hall's totara emergent over a canopy dominated by tawa, with kohekohe at lower altitudes. Although all these species still survive, only in a few places do they form forest with any resemblance to the original; they are now mostly growing mixed in with a range of other earlier-successional or understorey shrub and small tree species. A wide range of shrubs and herbaceous species are found on more skeletal soils on steep sites, including manuka, wharariki, tutu, *Gaultheria antipoda*, akepiro, and *Helichrysum aggregatum*.

The RAP is significant for its representation of the communities typical of the several high sandstone peaks in the Tapuaeroa Valley, but because of its degree of modification lacks the prime qualities of Aorangi (RAP 122) and Hikurangi (RAP 125).

RAP 125: Hikurangi (Map 32)
 Priority: 1
 NZMS 260 ref: Y15 548535
 Total area: 1128 ha
 Percent primary: 98%
 Altitudinal range: 340-1752m
 Bioclimatic zone: lowland-alpine

This RAP consists of two pieces of generally steeply sloping land on the northern and northeastern slopes of Hikurangi, the highest point on the Raukumara Range and a peak of particular cultural significance. Both blocks contain primary forest over a wide altitudinal range, exhibiting compositional variation similar to that in the adjacent forests of the Raukumara Forest Park, i.e., passing from tawa-dominant forest at low altitudes, through mixed rimu/tawa/red beech forest at middle-altitudes, to red/silver beech forest and finally silver beech forest with scattered mountain beech at the treeline. Above this subalpine scrub and shrubland gradually gives way to alpine tussockland, and finally to alpine herbfield and fellfield around the summit. Some scrub occurs around the lower margins.

This RAP is strongly complementary to those parts of Hikurangi which are contained in the Raukumara Forest Park, and if protected would go some way towards insuring the survival of the majority of the natural vegetation remaining on this mountain. The peak is important not only for its cultural and scenic values, but also as the northernmost limit for a number of New Zealand's alpine species. It also contains the main population of the local endemic *Coriaria pottsiana*.

6.15 Waitahaia RAPs

Although this subdistrict abuts the extensive, generally beech-dominant forests of the Raukumara Range it has very little remaining natural vegetation. Most of that which has survived generally consists - with one notable exception (RAP 129) - of small, isolated fragments of primary tawa or podocarp-dominant forest, now isolated in a landscape dominated by exotic pasture but with rapidly increasing areas of pine plantation. The majority of those surviving pieces are also lower in altitude and on less steep terrain than most of the adjacent Forest Park, and for this reason the forest they contain tends to complement rather than repeat the composition of those forests already protected.

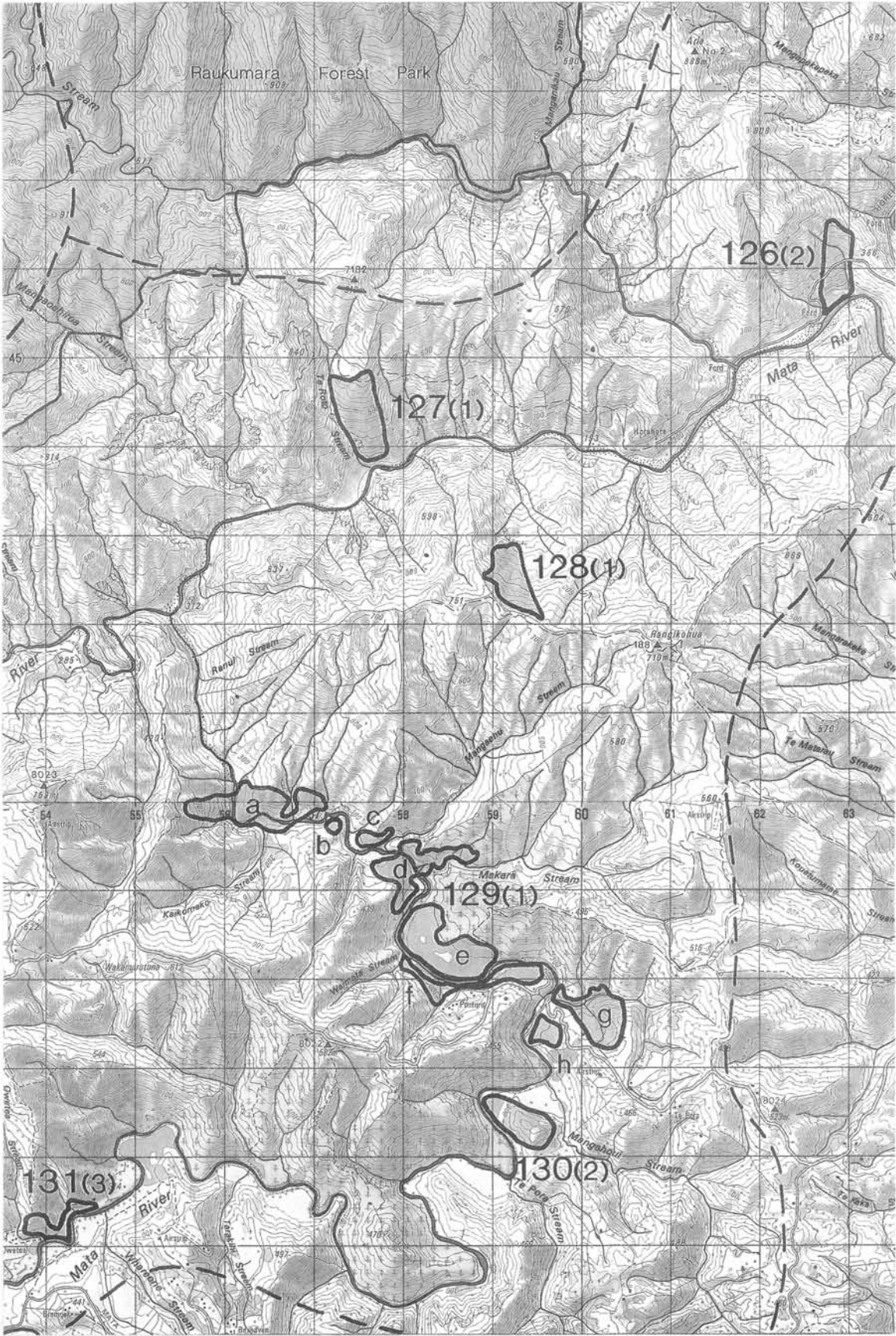
RAP 126:	Waingakia (Map 33)
Priority:	2
NZMS 260 ref:	Y15 628460
Total area:	28 ha
Percent primary:	100%
Altitudinal range:	160-420 m
Bioclimatic zone:	lowland

This RAP consists of an area of alluvial terrace and adjacent moderate to steep hill slope of southerly aspect on the north bank of the Mata River just above its junction with the Ihungia River. It contains a remnant of diverse primary forest consisting of scattered kahikatea, rewarewa, and pukatea emergent over a canopy of tawa; a small area of dense pole kahikatea occurs on the alluvial terrace. Other species present include white maire, mamaku, pigeonwood, hinau, nikau, titoki, mapou, tanekaha, tarata, tutu, totara, and heketara.

The significance of the RAP stems from the diverse lowland forest it contains. Although the extensive forests of the Raukumara Forest Park are only 3 km to the west, they do not extend to the low altitudes found in this block, and therefore lack some of the diversity found here. The RAP is unfenced and subject to heavy modification by grazing, but palatable species still survive on sites where steep topography prevents access by stock.

RAP 127:	Horehore Back Whare Bush (Map 33)
Priority:	1
NZMS 260 ref:	Y15 575445
Total area:	44 ha
Percent primary:	100%
Altitudinal range:	260-620 m
Bioclimatic zone:	lowland

This RAP is located on the Mata River approximately 3 km downstream from its junction with the Waitahaia River. It contains a fine remnant of diverse primary forest growing on a moderate to steep hillslope of southerly aspect. The forest is dominated by tawa and matai, but with a range of other species also abundant, including pukatea, miro, totara, titoki, rimu, white maire, and nikau. Parts of the eastern margins have been affected by logging operations, and cattle and pigs have also had some impact. However, both the canopy and the understorey remain relatively intact, partly through the provision of protected sites as a consequence of an old debris slide, which has left the terrain very broken in some parts. In common with No. 126, this RAP contains diverse forest at lower altitudes than is common on the adjacent eastern margins of the Raukumara Forest Park. Although lacking terrace forest, it has been ranked more highly than the previous RAP because of its more intact



MAP 33	INFOMAP 260 Y15,Y16 SCALE 0 1000 2000m	LEGEND 7 RAP No (3) Priority  Sub-district boundary	
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canopy and understorey. Access is difficult.

RAP 128: **Rangikohua Bush (Map 33)**
Priority: 1
NZMS 260 ref: Y15 593425
Total area: 26 ha
Percent primary: 100%
Altitudinal range: 480-700 m
Bioclimatic zone: lowland

This RAP is located on a moderately steep, upper hillslope of northerly aspect which descends from a ridge running west from the high point Rangikohua. It contains a large and reasonably intact remnant of mixed primary hillslope forest in which rimu, kahikatea, and matai are emergent over a canopy of tawa and pukatea. Mahoe, lacebark, five finger, and heketara are common on an old slip scar.

This is the largest area of intact primary forest on upper hillslopes left in the subdistrict, and is particularly valuable given the relatively good condition of the canopy. However, the understorey is in poor condition because the area is unfenced and grazed throughout. Bats have been reported in the vicinity by local landowners.

RAP 129: **Mata River podocarp forest (Map 33)**
Priority: 1
NZMS 260 ref: Y16 584384
Total area: 185 ha
Percent primary: 75%
Altitudinal range: 260-460 m
Bioclimatic zone: lowland

This and the following three RAPs are closely similar in character, all consisting of forest mostly dominated by podocarps growing on alluvial terraces and lower hillslopes in the middle reaches of the Mata River. This area contains a sequence of eight very similar blocks, grouped together because of their proximity and similarity, stretching from approximately 2 km to 8 km upstream from the junction of the Mata and Waitahaia rivers. Alluvial terraces are the most common landform, but some blocks run up onto adjacent hillslopes. They contain a mixture of primary and secondary forest, generally dominated by tall podocarps emergent over a canopy of various mixtures of broadleaved trees. Podocarp densities are generally highest on the terraces, declining on the hillslopes, where broadleaved trees become more prominent. None of the blocks are fenced, and grazing by domestic stock is causing sometimes severe effects.

In part (a) the lower terraces support forest in which kahikatea, rimu, matai, and occasional totara are emergent over a canopy of tawa, titoki, and pukatea. On the adjacent, locally steep hillslopes scattered miro, totara, and tanekaha are emergent over a canopy which includes tawa, mahoe, tarata, and mapou. A small area of secondary vegetation on alluvial terrace in the centre of the block is dominated by manuka with young conifers. Totara have been selectively removed for fence posts. Part (b) and (c) are smaller, and contain mostly primary forest with high densities of podocarps, growing on alluvial terraces adjacent to the river. Part (d) is similar to (b) and (c) although larger, and with ribbons of pasture fringed by regenerating kahikatea separating blocks of more intact primary forest. Part (e) contains the largest area of alluvial terrace forest, including older forest dominated by matai, kahikatea, and totara and younger forest with very high densities of even-aged kahikatea, totara and/or matai, regenerating after clearance or inundation by sediment/

alluvium. A central swampy area contains kahikatea scattered across pasture. This and other nearby remnants have probably the greatest number of divaricate species (about 15) recorded in the district. Part (f) contains terrace forest dominated by totara, rimu, and matai, emergent over a canopy of tawa, titoki, and kowhai, with parts of the area reverting to forest after clearance. Part (g) is probably the most variable, with matai, kahikatea, and tanekaha dominant on alluvial terraces near the river, but with forest dominated by tawa with scattered emergent kahikatea on adjacent gentle to moderate hillslopes. Black beech form small enclaves on more sharply defined spurs. Part (h) contains a remnant of primary forest comprising kahikatea and totara emergent over tawa and tanekaha with marginal kowhai, and a smaller area of secondary forest with totara, kowhai, kohuhu, putaputaweta, and lancewood. Exotic pine plantation has been established adjacent to parts (d), (e), and (g).

This RAP contains some of the most valuable surviving lowland forest remnants in the entire Ecological District. They are outstanding not only for their extent, diversity, and relative intactness but also for the manner in which a full sequence survives from podocarp-dominant forest of a range of ages on alluvial terraces, through to tawa-dominant forest on adjacent hillslopes, and including black beech and tanekaha on sites with more severe conditions. Most of the area has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including kereru and weka. Open space covenants over parts (e), (f), and (g) are being negotiated between the owners and the Queen Elizabeth the Second National Trust.

RAP 130:	Mata River, Ruangarehu (Map 33)
Priority:	2
NZMS 260 ref:	Y16 594364
Total area:	30 ha
Percent primary:	78%
Altitudinal range:	280-360 m
Bioclimatic zone:	lowland

This is one of three RAPs situated on the middle reaches of the Mata River - see No. 129 for details. It is centred on a small, isolated hill beside the Mata River with gentle slopes encompassing a full range of aspects; a small area of alluvial terrace lies between the hill and the river. In the primary forest which predominates, totara, matai, and rimu are emergent over a canopy of tawa, titoki, and kowhai. Other species include black beech, mahoe, putaputaweta, heketara, lacebark, and cabbage tree. One small area of secondary forest dominated by kahikatea is located on an alluvial terrace adjacent to the river. Totara have been selectively removed in the past.

This RAP has some similarities to parts of No. 129, but is generally more modified, and accordingly has been ranked lower. It is unfenced and subject to modification by both domestic stock and feral goats.

RAP 131: **Mata River, Owetea Station (Map 33)**
Priority: 3
NZMS 260 ref: Y16 539353
Total area: 16 ha
Percent primary: 100%
Altitudinal range: 310-360 m
Bioclimatic zone: lowland

This is one of three RAPs situated on the middle reaches of the Mata River - see No. 129 for details. It encompasses an area of gentle lower hillslopes and alluvial terrace of southeasterly aspect adjacent to the Mata River. The small remnant of modified but essentially primary forest it contains is dominated by matai, kahikatea, and occasional black beech emergent over a lower tier of tawa, titoki, and rewarewa. Understorey species include mahoe, mapou, and putaputaweta.

This RAP is similar in character to No. 129 but lacks its diversity. The area is unfenced and is suffering severe degradation through grazing and trampling by domestic stock.

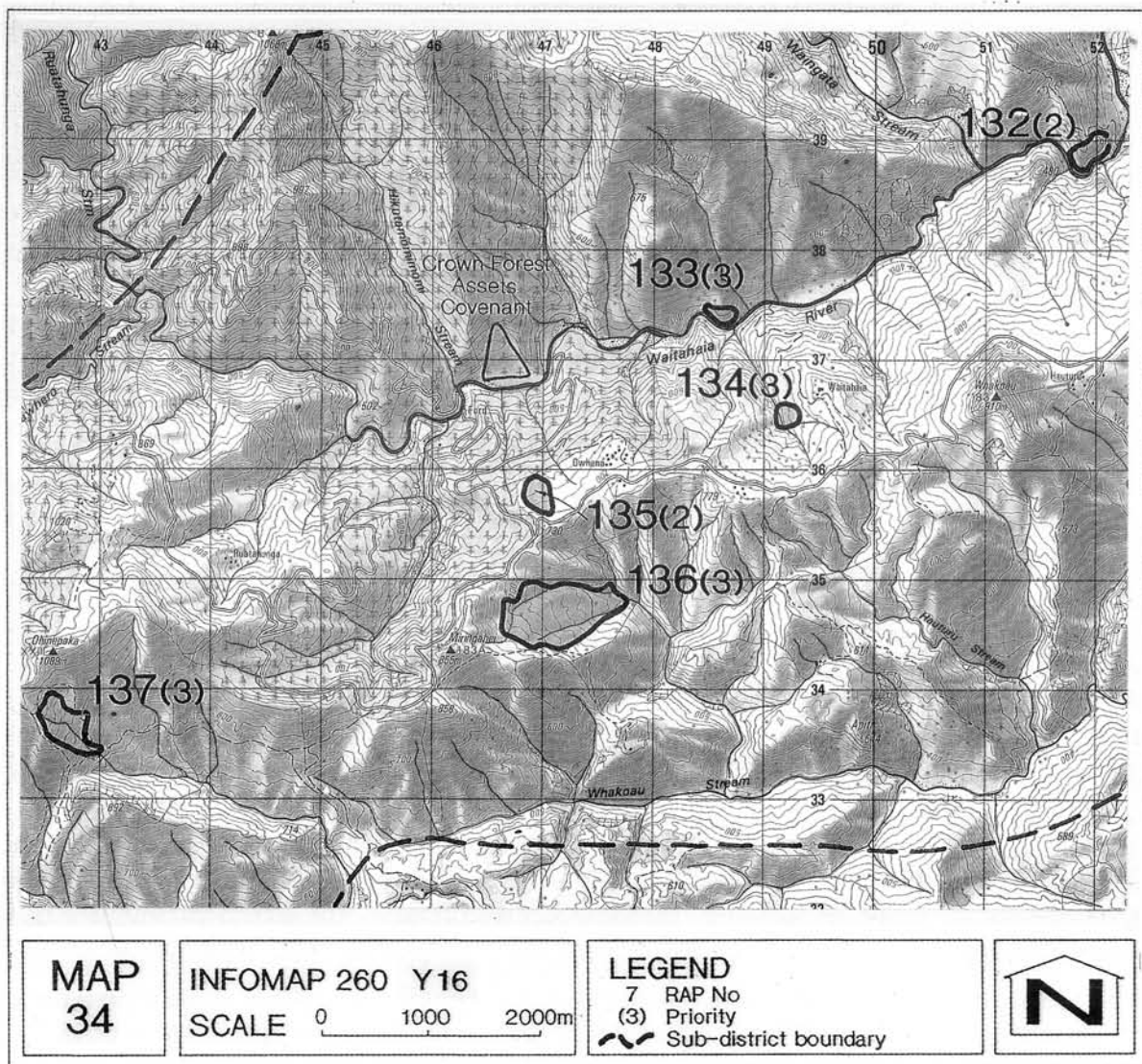
RAP 132: **Waitahaia River (East) (Map 34)**
Priority: 2
NZMS 260 ref: Y16 520388
Total area: 8 ha
Percent primary: 100%
Altitudinal range: 320-410 m
Bioclimatic zone: lowland

This is one of four RAPs containing small, isolated remnants of primary forest in the middle reaches of the Waitahaia River (see also Nos 133-135). It is located on a steep lower hillslope of predominantly southerly aspect, and contains a small, isolated remnant of primary forest which consists of kahikatea, matai and rimu emergent over a canopy of tawa. Other species present include kowhai, pukatea, tarata, cabbage tree, and rewarewa. It includes some small areas of kowhai growing on steep river banks.

Although both small and isolated, the RAP is valuable for its representation of the forest which once occurred at lower altitudes along the Waitahaia River (cf. Nos 126 and 127). It is unfenced, and subject to heavy modification by grazing.

RAP 133: **Waitahaia River (West) (Map 34)**
Priority: 3
NZMS 260 ref: Y16 486374
Total area: 4 ha
Percent primary: 100%
Altitudinal range: 380-420 m
Bioclimatic zone: lowland

This is one of four RAPs containing small, isolated remnants of primary forest in the middle reaches of the Waitahaia River (see also Nos 132, 134, and 135). Situated on a moderate lower hillslope and a very small area of alluvial terrace approximately 4 km upstream from No. 132, it contains a small remnant of primary forest in which scattered kahikatea, matai, and rimu are emergent over a canopy of tawa, titoki, rewarewa, and lacebark. Kahikatea are more prominent on the lower margins of the terrace. Mahoe, tarata, mamaku, and manuka are also present. The area is currently grazed throughout. It has been ranked lower than No. 132 because of its smaller size and greater degree of modification.



RAP 134: Waitahaia Station (Map 34)
Priority: 3
NZMS 260 ref: Y16 493365
Total area: 4 ha
Percent primary: 100%
Altitudinal range: 520-580 m
Bioclimatic zone: lowland

This is one of four RAPs containing small, isolated remnants of primary forest in the middle reaches of the Waitahaia River (see also Nos 133, 134, and 136). It is located on a west-facing, moderately steep midslope above the Waitahaia River approximately 1 km southeast of No. 133. The primary forest it contains consists of scattered pukatea, rimu, and matai emergent over a canopy of tawa, titoki, and rewarewa. Pigeonwood and mahoe are common in the understorey. The area is unfenced and is grazed throughout. The forest of this RAP is typical of the small isolated remnants, now largely surrounded by pasture or exotic plantation, which are all that remain of the hillcountry forests that were once extensive in this part of the Waitahaia catchment.

RAP 135: **Owhena/Waitahaia (Map 34)**
Priority: 2
NZMS 260 ref: Y16 469357
Total area: 6 ha
Percent primary: 100%
Altitudinal range: 620-700 m
Bioclimatic zone: lowland

This RAP, which is very similar in ecological character to No. 134, contains a small remnant of primary forest on a moderate upper hillslope of northerly aspect. It consists of scattered rimu emergent over a canopy dominated by tawa and rewarewa; other species present include mahoe, lacebark, kaikomako, heketara, putaputaweta, pigeonwood, and ongaonga.

This RAP is broadly representative of the hillslope forests which were once widespread in this subdistrict. It is unfenced, and subject to heavy modification by grazing.

RAP 136: **Miringahei (Map 34)**
Priority: 3
NZMS 260 ref: Y16 472346
Total area: 46 ha
Percent primary: nil
Altitudinal range: 540-740 m
Bioclimatic zone: lowland

This RAP is located on a long, gentle hillslope of easterly aspect below the high point Miringahei in the catchment of the Whakoau Stream, a tributary of the Mata River. It contains an area of secondary forest and scrub which is dominated by lancewood, lacebark, and kohuhu growing up through a dense layer of bracken, manuka, and mingimingi. Other species present include putaputaweta, pigeonwood, and mahoe. The area is surrounded by plantation forest.

The vegetation of this RAP is unusual in the context of both the subdistrict and the wider Ecological District for the absence of kanuka, which is generally the dominant species in secondary communities such as this.

RAP 137: **Ohinepaka (Map 34)**
Priority: 3
NZMS 260 ref: Y16 427332
Total area: 17 ha
Percent primary: nil
Altitudinal range: 830-970 m
Bioclimatic zone: montane

This RAP is located south of the high point Ohinepaka on a steep hillslope of southeasterly aspect. It contains a remnant of secondary forest in which silver and red beech are the main canopy dominants. As with RAP 139, the original forest was felled a long time ago but the area was not successfully burnt, allowing saplings and seedlings on the forest floor to reconstitute a forest of similar composition to the original. Other species include horopito, heketara, putaputaweta, broadleaf, lancewood, Hall's totara, tawari, pate, and kamahi. The area is unfenced and subject to grazing.

Although secondary in a strict sense, the forest in this RAP is probably quite similar in composition to that which once occurred at these altitudes before clearance. Along with Nos 98 and 138 it forms a series of small outliers from the more extensive beech-dominant

forests of the Raukumara Range, and which are generally restricted to sites above about 700-750 m.

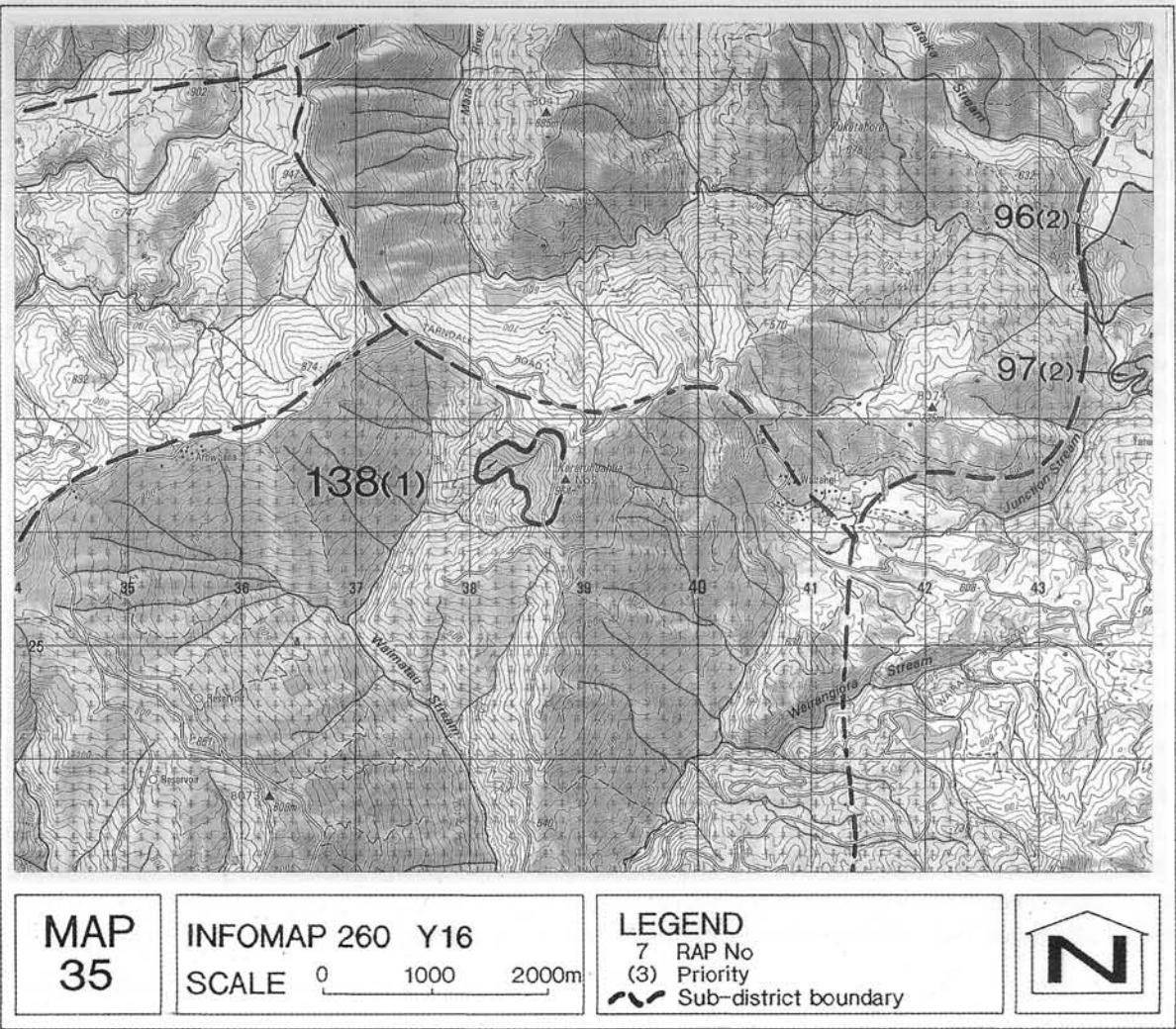
6.16 Mangatu RAPs

The Mangatu subdistrict has been largely cleared of indigenous vegetation, and only two study sites were identified, both containing beech-dominant forests at intermediate to higher altitudes (above approx. 550-600 m). No significant areas of natural vegetation remain at lower altitudes, other than a few very small stands of tawa-dominant forest, most of which consist of only a few trees at most. The majority of the subdistrict is now in exotic plantation.

RAP 138:	Kereruhuahua Bush (Map 35)
Priority:	1
NZMS 260 ref:	Y16 386265
Total area:	37 ha
Percent primary:	100%
Altitudinal range:	620-960 m
Bioclimatic zone:	lowland-montane

This RAP is located on a steep, upper hillslope on the southwestern side of Kereruhuahua, a high point at the northern end of Mangatu Forest. It contains a remnant of little modified primary forest now almost surrounded by plantation forest. Silver beech, tawari, and kamahi are dominant in the canopy along with Hall's totara, red beech, fuchsia, broadleaf, *Dracophyllum traversii*, and mountain cabbage tree.

This and RAP 98 are the two substantial remnants of primary red/silver beech-dominant forest most distant from the main tract on the Raukumara Range to the west. The area may be subject to some ongoing modification by domestic stock, and probably also goats.

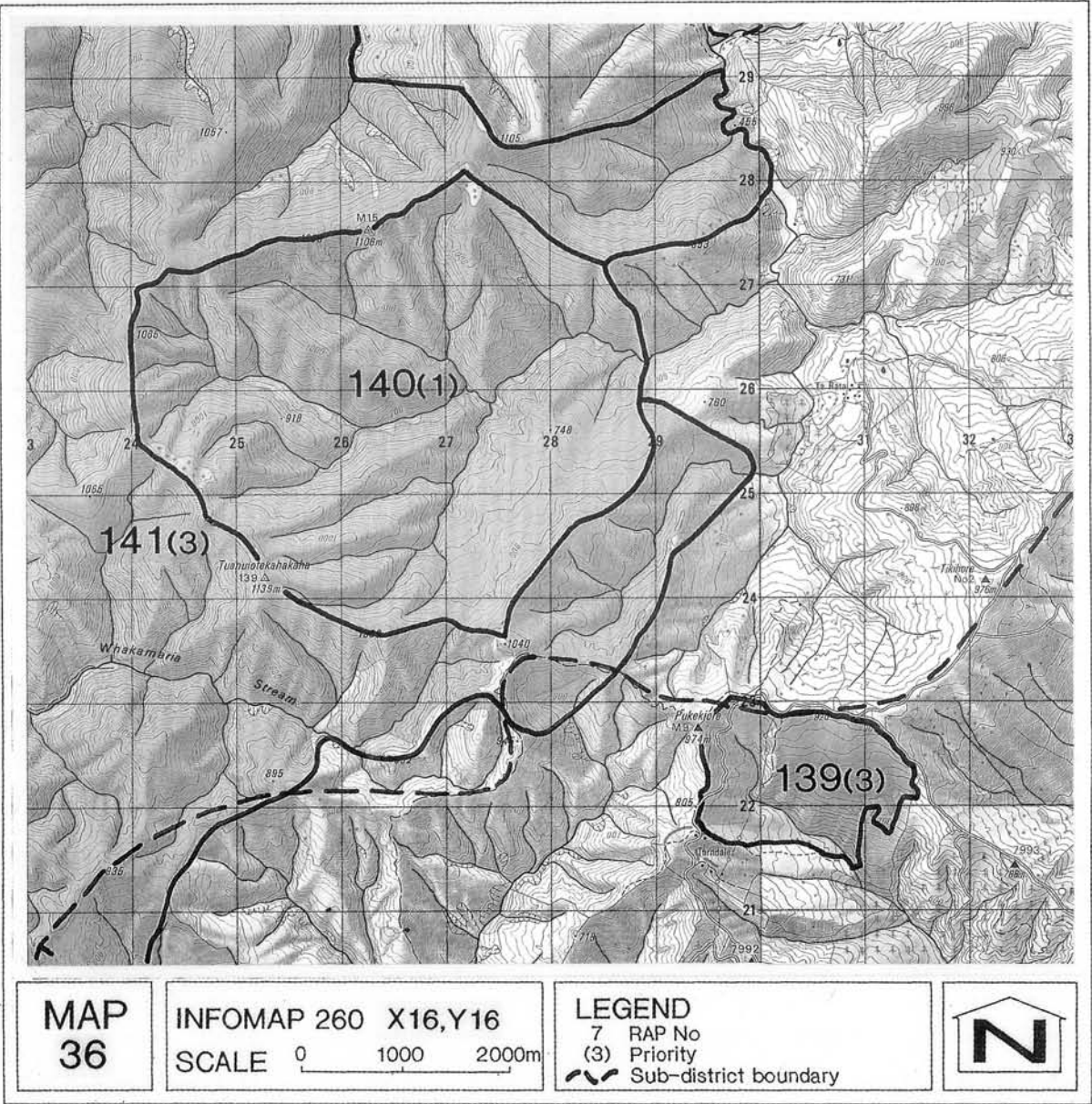


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RAP 139:	Tarndale secondary beech forest (Map 36)
Priority:	3
NZMS 260 ref:	Y16 307227
Total area:	240 ha
Percent primary:	nil
Altitudinal range:	560-920 m
Bioclimatic zone:	lowland-montane

This RAP is located on an area of moderately steep upper slopes and steep lower slopes of southerly to easterly aspect below Tarndale Road, on the northwest margins of Mangatu Forest. It consists of a piece of secondary forest in which it appears that the original cover of red and silver beech was felled, but because of its southeasterly aspect was not successfully burnt. It has now regenerated predominantly in silver beech, forming an almost complete forest cover over most of the area except around the lower margins, where a woodland with lower densities of trees has resulted. Other species present include red beech and rimu at lower altitudes and broadleaf, quintinia, and kamahi at higher altitudes.

This RAP remains significant despite its degree of modification, because of the extent to which the subdistrict has been so thoroughly cleared. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including rifleman.



6.17 Mangaothane RAPs

The Mangaothane subdistrict, in contrast to the majority of the other subdistricts, is notable for the extent of its primary forest cover. Although large areas at lower altitudes in the northeast have been cleared for agriculture, the original forest cover remains intact over more than 50% of the subdistrict, forming the southeastern boundary of what remains of the original Raukumara forest tract. Although selective removal mainly of podocarps has occurred in some of these forests at lower altitudes, the montane beech-dominant forests have remained relatively intact.

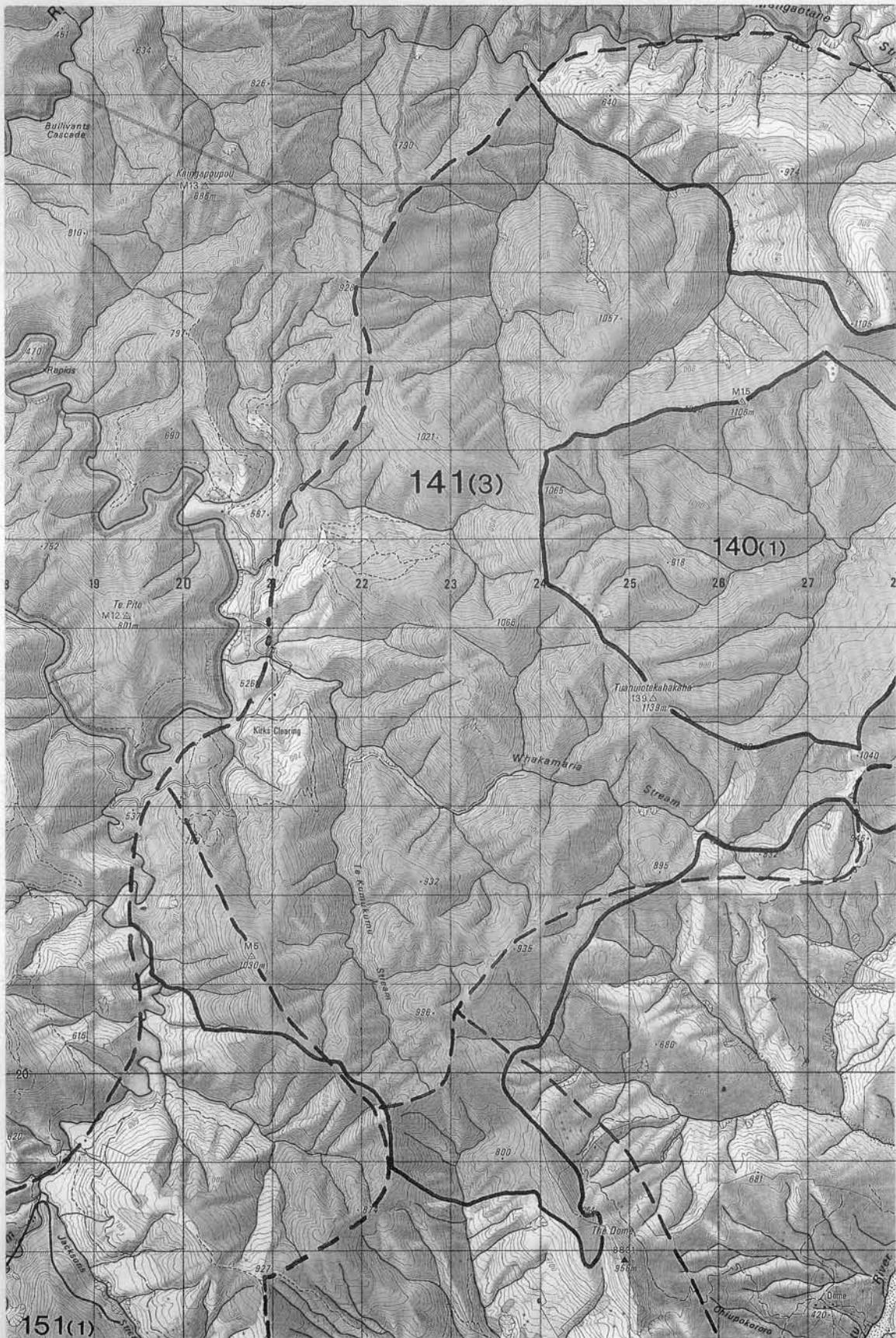
RAP 140: **Tuanuiotekahakaha Part One (Map 36)**
Priority: 1
NZMS 260 ref: X16 275260
Total area: 1561 ha
Percent primary: 100%
Altitudinal range: 520-1139 m
Bioclimatic zone: lowland-montane

This and the next RAP, which are contiguous, together contain the most extensive block of unlogged native forest left in freehold ownership in the study area, totalling over 7000 ha. This RAP encompasses the catchment of the main western tributary of the Mangaotane River. Although the lower slopes are generally steep, the upper faces and ridge crests are much more gentle and rounded. The block covers a wide altitudinal gradient, along which there is a gradual transition from forest dominated by rimu and tawa at low altitudes, through mixed rimu-red beech-silver beech-tawari forest with occasional hard beech and toatoa at mid-altitudes, to red beech-silver beech-tawari forest with scattered Hall's totara at high altitudes. Mountain toatoa and kaikawaka occur locally on poorly drained areas on the main ridge crests. Some partial logging has been carried out on an area of more gentle slope below 900 m in the south of the block.

This, the more highly ranked of these two RAPs, contains a catchment representative of the wider area which, because of its wide altitudinal range, good representation of forest sequences, and clearly defined catchment boundaries, is recommended at the highest priority for protection. Together with No. 141 it has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate-high', with a range of common bush birds recorded, including kereru, pied tit, rifleman, and weka, and reports of kaka and falcon.

RAP 141: **Tuanuiotekahakaha Part Two (Maps 36, 37)**
Priority: 3
NZMS 260 ref: X16 250250
Total area: 5406 ha
Percent primary: 96%
Altitudinal range: 400-1140 m
Bioclimatic zone: lowland-montane

This RAP is very similar in ecological character to No. 140, with which it is contiguous (see details above). It contains an extensive area of predominantly primary forest over a wide altitudinal range, most of which falls within the catchments of the Whakamaria Stream draining west into the Motu River and a north-flowing, lower tributary of the Mangaotane Stream. Small cleared or cutover areas occur in the west, with access from Kirk's clearing on the Motu River, and in the southeast in the headwaters of the Whakamaria Stream. Although noteworthy for the extent and relatively unmodified nature of the forest it contains, it has been ranked lower than No. 140, reflecting the greater degree of modification around its margins and its less clearly defined catchment boundaries.



MAP
37

INFOMAP 260 X16

SCALE 0 1000 2000m

LEGEND

- 7 RAP No
- (3) Priority
- Sub-district boundary



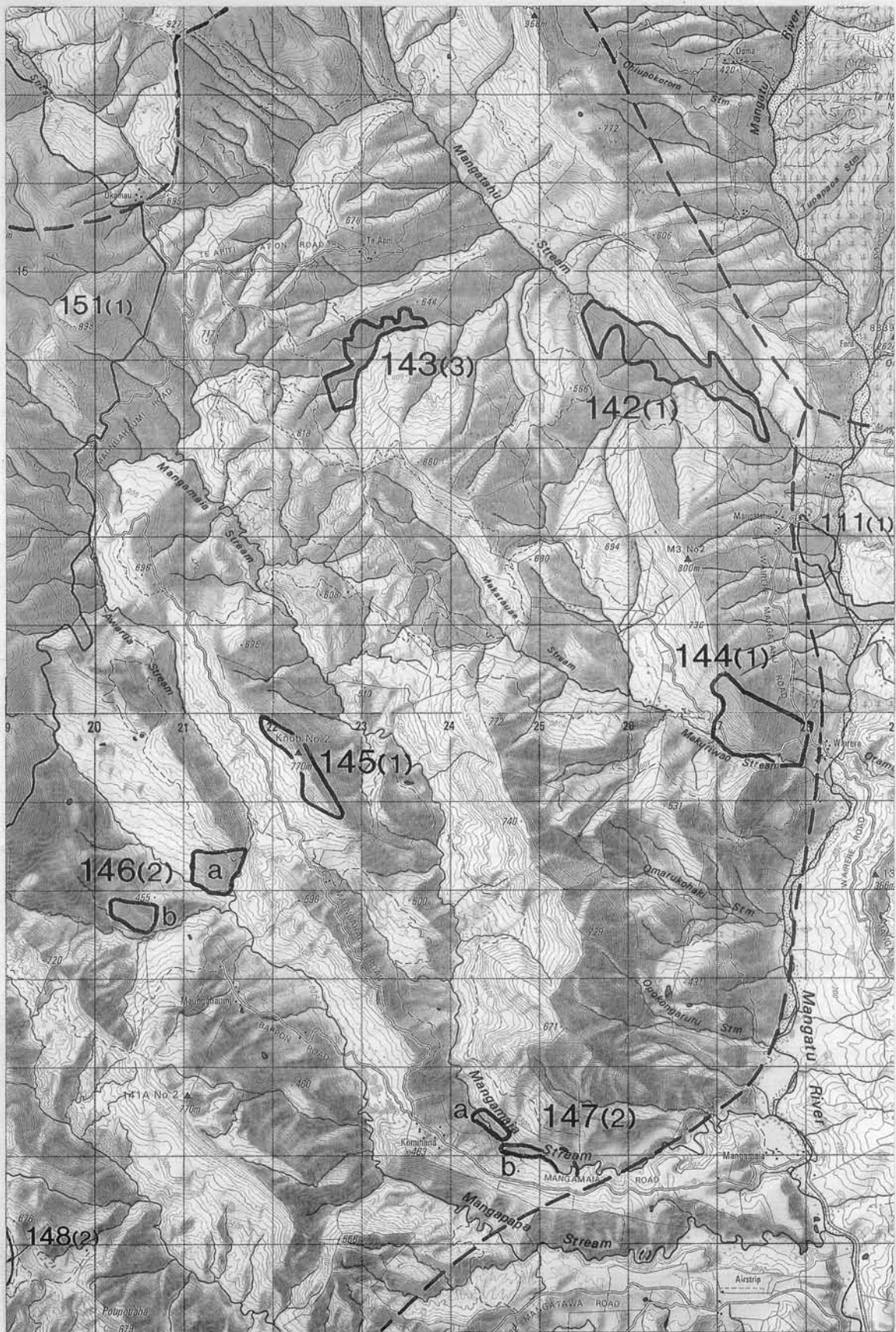
6.18 Maungahaumi RAPs

This subdistrict, in common with the other two subdistricts in the southwest, contains extensive forested areas, mostly at higher altitudes, and extending up to the treeline on Maungahaumi (included in RAP 151 Maungahaumi, in the Waitangirua subdistrict). Tawa and titoki are the most widespread forest dominants at lower altitudes, but beech species along with kamahi and tawari become important as altitude increases. Forest clearance has been much more extensive at lower altitudes, where only scattered remnants mostly of tawa-dominant forest survive; podocarps have been selectively removed for their timber in many of these. Secondary communities are generally more diverse than further east in the subdistrict, with kanuka much less prominent; bracken and manuka are more abundant in younger stands, and kamahi in older stands. The widespread presence of limestone results in the local occurrence of distinctive communities.

RAP 142:	Mangatahu Stream Bush (Map 38)
Priority:	1
NZMS 260 ref:	X16 265140
Total area:	72 ha
Percent primary:	20%
Altitudinal range:	220-440 m
Bioclimatic zone:	lowland

This RAP is located along the lower reaches of the Mangatahu Stream, where the stream cuts through a northwest to southeast-trending limestone ridge. In the upstream half of the area steep lower hillslopes of southwesterly aspect lie to the north of the stream, but moderate slopes of northeasterly aspect lie to the south. Further downstream a gorge is sharply incised into the underlying limestone, and slopes on both sides of the stream are steep to very steep. The area contains a diverse mixture of both primary forest and secondary forest and scrub, with the latter mostly located in the downstream part. Tawa, pukatea, and rewarewa are dominant in the primary forest, with young totara, kahikatea, and kowhai around the margins. Younger secondary communities are dominated by manuka with scattered totara and kohuhu on moderately sloping sites, and by *Pittosporum ralphii*, kohuhu, and wharariki on steeper sites and cliffs.

Although somewhat modified, this RAP is significant for its combination of primary and secondary communities on limestone. The dominance of manuka in younger secondary stands but with invading totara, elsewhere found mostly on fertile soils formed on younger mudstones (e.g., RAP 40, Pakarae subdistrict), is unusual in the context of the Ecological District. Although the RAP is surrounded by plantation forest, it is subject to modification by stock.



MAP
38

INFOMAP 260 X16,X17

SCALE 0 1000 2000m

LEGEND

7 RAP No
(3) Priority
Sub-district boundary



RAP 143: Te Apiti Station Bush (Map 38)

Priority: 3
NZMS 260 ref: X16 230140
Total area: 36 ha
Percent primary: ≈50%
Altitudinal range: 460-630 m
Bioclimatic zone: lowland

This RAP is located in one of the upper catchments of the Mangatahu Stream, approximately 3 km west of No. 143. It consists of a moderate-sized remnant of modified primary hillslope forest dominated by scattered tawa, but with gaps - perhaps a consequence of old disturbances - occupied by mahoe, supplejack, and wheki. Podocarps such as rimu and totara were presumably once also present, but have probably been selectively removed for timber.

The RAP is broadly representative of the lower-altitude forest once extensive in this subdistrict. It is unfenced and grazed by domestic stock.

RAP 144: Makuriwao Stream (Map 38)

Priority: 1
NZMS 260 ref: X17 275098
Total area: 69 ha
Percent primary: 58%
Altitudinal range: 180-660 m
Bioclimatic zone: lowland

This RAP is located on steep faces at the southern end of a sharply defined limestone ridge adjacent to the Mangatu River, and is bounded along the southern margins by the Makuriwao Stream. Slopes of predominantly southeasterly to southwesterly aspect are steep at higher altitudes, but gentler toeslopes and small areas of alluvial terrace occur at lower altitude in the east. The primary hillslope forest which is dominant over most of the area has been locally modified by burning, grazing, and selective removal of podocarps. On the steeper slopes it consists of a mosaic of taller forest patches dominated by pukatea, tawa, rewarewa, and titoki interspersed with areas of lower canopy dominated by mahoe, with kohuhu, lancewood, mapou, ngaio, putaputaweta, and kawakawa. Smaller areas of forest on an alluvial terrace are dominated by titoki along with tawa, tarata, kowhai, pukatea, akeake, rewarewa, lancewood, and kohuhu. An area of shrubland growing on steep cliffs is dominated by *Hebe* spp., *Pittosporum ralphii*, ngaio, kohuhu, and wharariki.

The RAP, although modified, contains one of the most extensive forest remnants left at lower altitudes in this part of the study area. It has an SSWI (Site of Special Wildlife Interest) ranking of 'moderate', with a range of common bush birds recorded, including kereru. The area is unfenced and subject to ongoing modification by domestic stock, and probably also goats; severe damage by possums was noted.

RAP 145: **Knob No. 2 (Map 38)**
 Priority: 1
 NZMS 260 ref: X17 223096
 Total area: 26 ha
 Percent primary: nil
 Altitudinal range: 640-770 m
 Bioclimatic zone: lowland-montane

This RAP is centred on a limestone outcrop and cliff-face running along a high ridge aligned northwest to southeast above the Maungahaumi road. It supports mainly scrub and shrubland, but with pockets of secondary broadleaved forest at the base of the cliffs. Vegetation of the cliffs is variously dominated by *Chionochloa flavicans*, *Hebe* sp. unnamed (*Hebe* sp. n of Eagle 1982), *Hebe* sp. (b) (*Veronica arborea*), and wharariki, with prickly mingimingi, *Pittosporum ralphii*, *Craspedia viscosa*, and *Pimelea longifolia* also present. Some indication of the original forest cover can be gained from the presence of one black beech tree and scattered matai logs.

This RAP has very high significance given its combination of limestone substrate and an assemblage of mainly cliff-dwelling plant species of restricted distribution. It has been severely damaged by sheep and feral goats wherever they have had access, but the vegetation on steeper sites remains more intact.

RAP 146: **Komihana Bush (Map 38)**
 Priority: 2
 NZMS 260 ref: X17 213082, 205078
 Total area: 38 ha
 Percent primary: 100%
 Altitudinal range: 340-460 m
 Bioclimatic zone: lowland

This RAP consists of two blocks located approximately 1 km apart on areas of gentle lower hillslopes of southerly aspect below the southern end of the Maungahaumi massif. Both contain small remnants of primary forest in which tawa is strongly dominant, but with occasional pukatea, rewarewa, and/or hinau; mahoe and mamaku occur in areas with a more open canopy. Podocarps have probably been selectively removed for their timber.

This RAP is strongly complementary to the adjacent Maungahaumi RAP (No. 151), which although large is predominantly above about 700 m in altitude, and contains only small areas of lower-altitude forest such as occurs here. Both blocks are unfenced and subject to heavy modification by both domestic stock and feral goats.

RAP 147: **Mangamaia Stream (Map 38)**
 Priority: 2
 NZMS 260 ref: X17 245052
 Total area: 22 ha
 Percent primary: 58%
 Altitudinal range: 180-260 m
 Bioclimatic zone: lowland

This RAP is situated on lower hillslopes and alluvial terraces along the lower reaches of the Mangamaia Stream, a tributary of the Mangatu River. It consists of several fragments of natural vegetation, containing both primary and secondary elements. Primary forests on the hillslopes are dominated by titoki and tawa, with occasional totara, pukatea, nikau, and

kowhai. Podocarps dominate the alluvial terraces, with both younger and more mature stands present; totara, matai, and kahikatea vary in relative abundance from site to site. Secondary communities are dominated by manuka and totara.

The RAP is significant for its remnants of podocarp-dominant forest on alluvial terraces, little of which survives in this subdistrict. Although the forest is modified, a wide range of species remain and substantial regeneration has already occurred. It has recently been partly fenced, but parts are still grazed, particularly the alluvial flats.

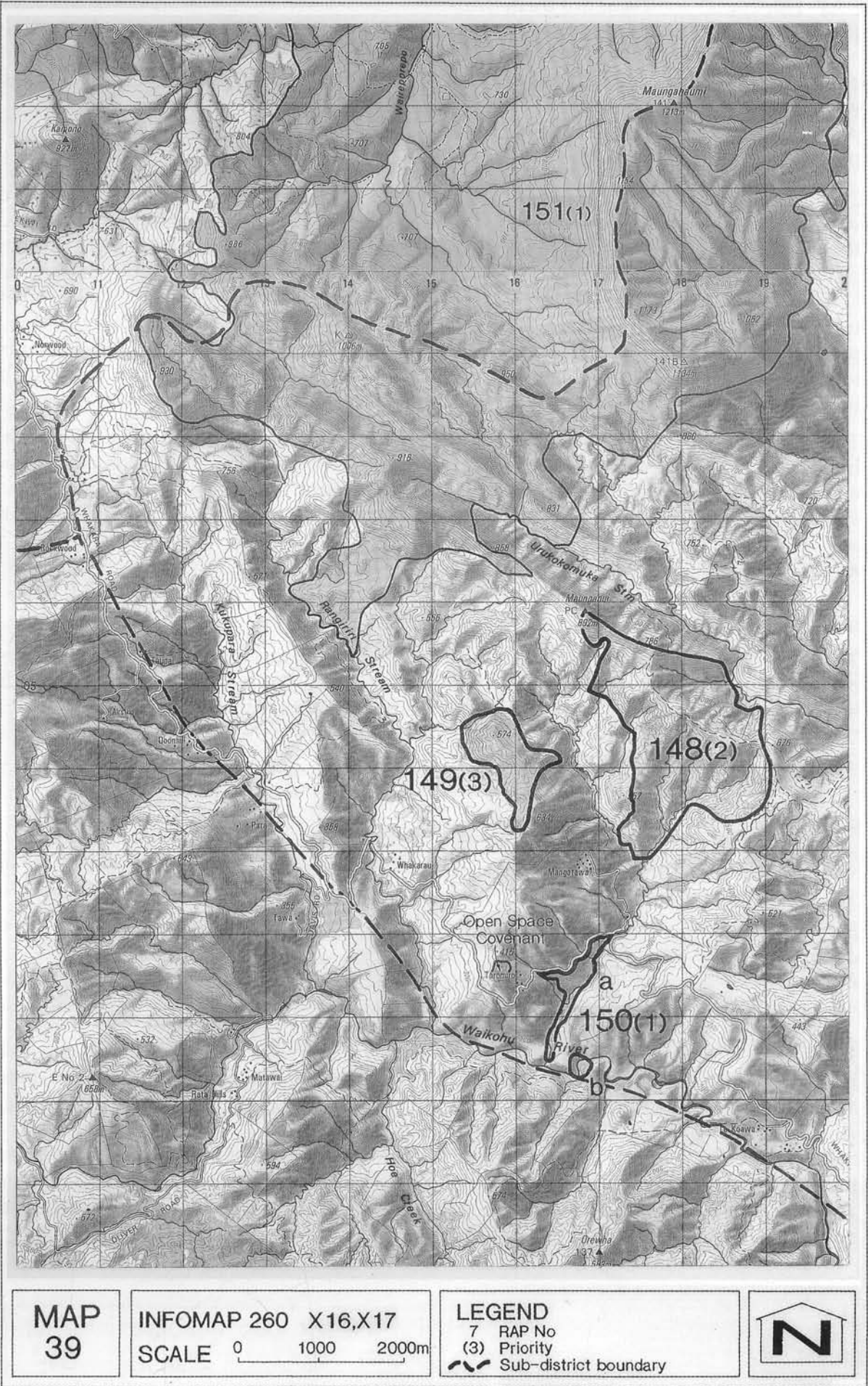
RAP 148: **Mangatawa Scrub and Shrublands (Map 39)**
 Priority: 2
 NZMS 260 ref: X17 180040
 Total area: 324 ha
 Percent primary: nil
 Altitudinal range: 240-700 m
 Bioclimatic zone: lowland

This large RAP encompasses an area of steep hillslopes centred along a mudstone ridge approximately 2 km southeast of the high point Maunganui, and extending over a wide altitudinal range. The central ridge separates one catchment system of predominantly southwesterly aspect from a smaller northeast-facing catchment. Secondary hillslope communities predominate, and cover a range of successional stages from fernland and young manuka-kanuka scrub developing over pasture, through manuka-mingimingi-kanuka scrub, to tall kanuka-dominant scrub in which species such as kohuhu, putaputaweta, mamaku, and mahoe are becoming abundant.

The significance of the RAP stems from the diversity of its secondary communities, which are unusual in the context of the Ecological District for the dominance in early stages of succession by species other than kanuka, such as bracken and manuka. The area is unfenced and subject to grazing and browsing.

RAP 149: **Mangatawa Bush (Map 39)**
 Priority: 3
 NZMS 260 ref: X17 160040
 Total area: 73 ha
 Percent primary: 10%
 Altitudinal range: 380-620 m
 Bioclimatic zone: lowland

This RAP is located approximately 1 km to the west of No. 148, to which it is broadly similar in ecological character. Most of the area consists of moderate to steep slopes of predominantly southwesterly aspect, but it also extends over the main ridge to include small areas of northeasterly aspect. Secondary vegetation is dominant over most of the area, but one remnant of primary forest has survived in a small basin in the west. Younger secondary communities are dominated by kanuka with scattered rewarewa, but rewarewa and kamahi are dominant in older stands over an understorey of silver fern, wheki, putaputaweta, kohuhu, and mingimingi. The small area of primary forest consists of tawa and mahoe, with scattered pukatea and hinau. Although the most significant feature of the RAP is its advanced secondary forest with rewarewa and kamahi, the small primary remnant is also valuable, given the general clearance of primary forest at lower altitudes in this subdistrict. The area is subject to modification by goats.



RAP 150:	Toromiro Bush (Map 39)
Priority:	1
NZMS 260 ref:	X17 167015
Total area:	43 ha
Percent primary:	51%
Altitudinal range:	140-280 m
Bioclimatic zone:	lowland

This RAP, located on the southwestern boundary of the study area, consists of two pieces of vegetation on alluvial terraces and moderate to steep lower hillslopes along the Waikohu River and the lower reaches of one of its tributaries. Part (a) contains a mixture of primary and secondary communities. Primary forest on terraces in the valley bottom contains tall kahikatea, pukatea, and matai, with kiekie and frequent pole matai and kahikatea in the understorey. On the adjacent hillslopes primary forest is composed of titoki, tawa, and pukatea along with rewarewa and mamaku. Areas of secondary scrub are dominated by kanuka, kohuhu, five finger, tutu, putaputaweta, and *Pittosporum ralphii*. Part (b) contains forest of similar composition to the hillslope forest in part (a).

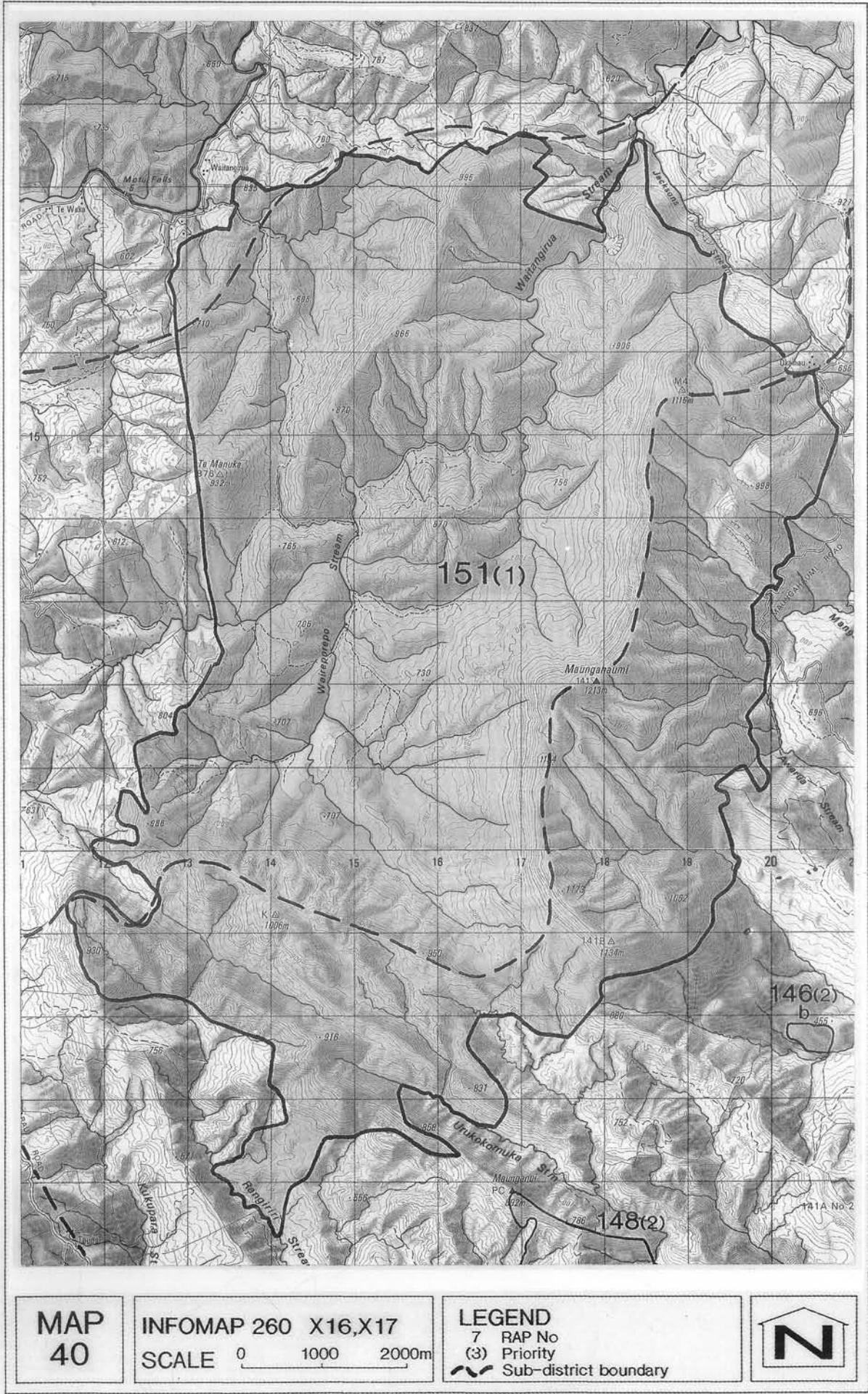
The RAP complements the adjacent small Open Space Covenant area behind the Toromiro homestead, containing both a representative example of lowland podocarp-dominant forest and secondary communities with regenerating podocarps. Although domestic stock has free access to part of the RAP, the Whakarau road and a tributary of the Waikohu River appear to discourage their entry to much of the area. As a consequence, the degree of modification of the understorey is variable.

6.19 Waitangirua RAPs

The Waitangirua subdistrict contains two RAPs of strongly contrasting character. The first contains an extensive diverse area of forest over a wide altitudinal range, and contains the high point Maungahaumi, one of the highest conservation priorities in the entire Ecological District. The second contains a small remnant of primary hillslope forest at intermediate altitude in the west of the subdistrict.

RAP 151:	Maungahaumi (Map 40)
Priority:	1
NZMS 260 ref:	X16 179121
Total area:	7452 ha
Percent primary:	96%
Altitudinal range:	500-1213m
Bioclimatic zone:	lowland-subalpine

The diverse landforms contained in this RAP are dominated in the north by two bold ridges, one the steeply upthrust spine running north and south from the high point Maungahaumi at an altitude of 1213 m, and the second a parallel ridge to the northwest which reaches nearly 1000 m in altitude. Slopes in the extensive basin between these two ridges and in the far northwest are generally gentle to moderate. To the south of these, and in the Maungahaumi subdistrict, a series of bold limestone and sandstone ridges at lower altitude trend northwest to southeast, separating perched open valleys with steep-sided gorges where streams cut through the ridges.



MAP
40

INFOMAP 260 X16,X17
SCALE 0 1000 2000m

LEGEND
7 RAP No
(3) Priority
Sub-district boundary



Although extensive removal of timber trees has occurred throughout the area at lower altitudes and where the terrain has allowed access, the selective nature of these operations has left relatively intact forest over most of the area below treeline. At lower altitudes, before logging the forest was generally dominated by scattered rimu emergent over tawa and/or red beech, but with increasing altitude a transition occurred, first to red beech-silver beech-tawari forest, then to silver beech-red beech forest, and finally to silver beech-tawari forest. Hard beech and toatoa occur locally at lower altitudes, particularly on more sharply defined ridges. Virgin stands still remain in parts of the upper Waireporepo Stream, including kahikatea-dominant stands on areas of flat terrace-like topography, and in some valleys in the south. Not all the forest at high altitude is dominated by beech species. South of the summit of Maungahaumi the montane forest consists of kaikawaka and pink pine emergent over both divaricate and broadleaved shrubs and small trees. Small areas of fuchsia-dominant forest occur at high altitudes on limestone substrates. Subalpine scrub dominated by tupare occurs in small pockets on and immediately north of the summit.

It would be difficult to overstate the significance of this RAP, which is the largest and perhaps the most diverse in the entire Ecological District. It must also be considered significant in a national context for its high-altitude forest and subalpine scrub communities on Tertiary substrates. It has an SSWI (Site of Special Wildlife Interest) ranking of 'outstanding', with a range of common bush birds recorded, including kereru, whitehead, rifleman, and weka, and with reports of kaka and falcon.

RAP 152:	Reg's Bush (Map 41)
Priority:	2
NZMS 260 ref:	X17 80085
Total area:	73 ha
Percent primary:	100%
Altitudinal range:	600-770 m
Bioclimatic zone:	lowland-montane

This RAP, which lies 3 km north of Matawai on the western fringes of the area surveyed, contains an area of moderate to steep hillslopes on both sides of the main ridge between the Motu River and the Whakarau road. The vegetation consists of a moderate-sized block of primary forest in excellent condition and dominated by silver beech, tawari, and tawa, with scattered emergent rimu. Although a full range of other forest species is present, some modification has occurred around the margins through both past logging and ongoing grazing, particularly by cattle.

Although reasonably close to the extensive and very highly rated Maungahaumi RAP (No. 151), this is one of few larger forest remnants left at lower altitude in an area now largely cleared for agriculture.

7. Postscript

Although the identification of RAPs described here has been a large undertaking, in many respects the hard work of conserving Waiapu Ecological District's natural communities is still to come. Long-term protection of what remains will require more than the identification of these values in a published report, even if supported by actions of central and local Government and lobbying by public pressure groups. Rather, the future protection of these remnants will depend on the development of an agreement among the people who live in the district that they want to keep some of the forest, scrub, wetlands, and dunelands that surround them for their future generations to treasure and enjoy.

Development of such an agreement will require the overcoming of a number of obstacles. Perhaps of most immediate concern, changing land use patterns, particularly increasing exotic afforestation, have increased pressure for 'development' of marginal farmland to more 'productive' uses, and in such circumstances ecological values are easily overlooked.

In the longer term the more difficult issues are probably those centred around compensation of owners of private land of high conservation value for their foregoing of income from other land uses such as farming or afforestation. In economically depressed areas the setting aside of land for conservation purposes is generally viewed from a local perspective as a luxury which not only can be ill afforded but which may even jeopardise long-term ownership through reducing the owner's ability to pay rates. If owners are to forego tangible income in order to provide intangible benefits for the wider community, then the wider community must be prepared to offer some compensation, with remittance of rates and payment for fencing probably a minimum starting point. Otherwise the required recognition of conservation as a legitimate rather than 'left-over' land use will never be achieved.

Finally, in a region with a large Maori population with extensive land holdings, the maintenance of a continuing consensus on the conservation of Waiapu's resources will require a journey of ongoing dialogue and growth in understanding between New Zealanders of Maori and European descent. As two races we have sometimes markedly different approaches to land, reflecting the differences in our respective cultural roots, and these were unavoidably apparent - at times even an obstacle - during the carrying out of this survey. Given these differences, protection of conservation values on Maori Land will only be achieved where the Maori world-view, with its distinctive attitudes to land, is given equal status and recognition alongside European attitudes to conservation.

Acknowledgments

A large number of people have contributed to the smooth conduct of this survey, including Dale Williams, Corry Regnier, and Barry Spring-Rice, who spent many long days in the field. Staff of the Gisborne office of the Department of Conservation provided much assistance: Chris Ward proved a mine of information on the district, as well as providing the bulk of the ongoing liaison and contract supervision; Dave Para was an invaluable help in establishing contact with some landowners; and Dave King shared his local knowledge in the field on several occasions. But greatest thanks must go to the large number of landowners who granted permission for us to visit their particular patches - without their cooperation this survey would not have been possible. In this regard, particular acknowledgment must be made of the role played by Mr Tom Fox of Pahi Station, who gave generously of his time and knowledge in assisting us to make contact with Maori landowners in the north of the District. C. Ward, G. Walls, and T. Duval helped immeasurably with their comments on earlier drafts of this report. Staff of the Department of Survey and Land Information (Gisborne) drafted the maps.

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Appendix I - Checklist of native vascular plants in Waiapu Ecological District

The following list of 619 taxa was compiled from the Waiapu Ecological District PNAP survey, vegetation surveys by Druce (1973, 1983a, 1983b), and the Landcare Research Lincoln herbarium (NZCHR) computer database. Nomenclature follows Allan (1961), Moore and Edgar (1976), Healy and Edgar (1980), Brownsey and Smith-Dodsworth (1989), and Webb *et al.* (1988).

Abbreviations used are as follows:

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)
ssp.	subspecies
s.s.	sensu stricto, in the narrow sense
X	hybrid
var.	variety

<u>Botanical name</u>	<u>Common name(s)</u>
<i>Acaena anserinifolia</i>	piripiri
<i>A. novae-zelandiae</i>	piripiri
<i>A. sp.</i> (cf. <i>A. hirsutula</i> and <i>A. anserinifolia</i> var. <i>paucidens</i>)	piripiri
<i>Aciphylla colensoi</i>	
<i>A. squarrosa</i> var.	
<i>A. colensoi</i> X <i>A. squarrosa</i>	
<i>Adenochilis gracilis</i>	
<i>Adiantum cunninghamii</i>	maidenhair fern
<i>A. hispidulum</i>	
<i>Agrostis dyeri</i>	
<i>A. sp.</i> (a) (cf. <i>A. perennans</i>)	
<i>A. sp.</i> (b) (cf. <i>A. alpina</i>)	
<i>Anisotome aromatica</i>	
<i>A. a.</i> X <i>Aciphylla squarrosa</i> var.	
<i>Alectryon excelsus</i> var. <i>excelsus</i>	titoki
<i>Alseuosmia macrophylla</i>	
<i>A. pusilla</i>	
<i>Anaphalis keriense</i>	
<i>Anarthropteris lanceolata</i>	
<i>Apium prostratum</i> ssp. <i>prostratum</i>	native celery
<i>Adenochilis gracilis</i>	
<i>Aporostylis bifolia</i>	

<i>Archeria racemosa</i>	
<i>Aristotelia fruticosa</i> var. <i>microphylla</i>	
<i>A. serrata</i>	wineberry, makomako
<i>Arthropodium candidum</i>	
<i>A. cirrhatum</i>	
<i>Arthropteris tenella</i>	
<i>Asplenium bulbiferum</i> s.s.	hen and chickens fern
<i>A. flaccidum</i> ssp. <i>flaccidum</i>	hanging spleenwort
<i>A. gracillimum</i>	
<i>A. hookerianum</i>	
<i>A. richardii</i>	
<i>A. oblongifolium</i>	shining spleenwort
<i>A. polyodon</i>	sickle spleenwort
<i>A. sp. unnamed</i> ('limestone')	
<i>Astelia fragrans</i>	
<i>A. linearis</i> var. <i>novae-zelandiae</i>	
<i>A. solandri</i>	
<i>A. trinervia</i>	
<i>A. sp. (unnamed; aff. A. nervosa)</i> (leaves not conspicuously white adaxially as in <i>A. nervosa</i>)	
<i>Australina pusilla</i>	
<i>Austrofestuca littoralis</i>	
<i>Avicennia Azolla filiculoides</i>	
<i>Baumea articulata</i>	
<i>B. juncea</i>	
<i>B. rubiginosa</i>	
<i>B. tenax</i>	
<i>Beilschmiedia tazwa</i>	tawa
<i>Blechnum chambersii</i>	
<i>B. colensoi</i>	
<i>B. discolor</i>	crown fern
<i>B. filiforme</i>	
<i>B. fluviatile</i>	
<i>B. membranaceum</i>	
<i>B. minus</i>	swamp kiokio
<i>B. penna-marina</i>	
<i>B. procerum</i>	
<i>B. vulcanicum</i>	
<i>B. sp. unnamed</i> ('black spot')	kiokio
<i>B. sp. unnamed</i> ('Green Bay')	cliff kiokio
<i>Bolboschoenus fluviatilis</i>	
<i>Brachyglottis bidwillii</i> var. <i>bidwillii</i>	
<i>B. elaeagnifolia</i>	
<i>B. kirkii</i> var. <i>kirkii</i>	
<i>B. perdicioides</i> var. <i>perdicioides</i>	raukumara
<i>B. repanda</i> s.s.	rangiora
<i>B. bidwillii</i> var. <i>bidwillii</i> X <i>B. elaeagnifolia</i>	
<i>Callitriche muelleri</i>	
<i>Calystegia sepium</i> agg.	pink bindweed
<i>C. soldanella</i>	shore bindweed

<i>C. tuguriorum</i>	
<i>Cardamine</i> sp. (a) (<i>C. debilis</i> agg.; "narrow petal" of Pritchard 1957)	
<i>C.</i> sp. (b) (<i>C. debilis</i> agg.) ("long style" of Pritchard 1957)	
<i>C.</i> sp. (c) ("tussock race" of Pritchard 1957)	
<i>C.</i> sp. (d) ("scree race" of Pritchard 1957)	
<i>Carex acicularis</i>	
<i>C. breviculmis</i>	
<i>C. comans</i>	
<i>C. dissita</i>	
<i>C. flagellifera</i>	
<i>C. forsteri</i>	
<i>C. geminata</i> s.s.	
<i>C. inversa</i>	
<i>C. lambertiana</i>	
<i>C. maorica</i>	
<i>C. pumila</i>	sand sedge
<i>C. raoulii</i>	
<i>C. secta</i> var. <i>secta</i>	trunked sedge
<i>C. solandri</i>	
<i>C. spinirostris</i>	
<i>C. testacea</i>	
<i>C. virgata</i>	swamp sedge
<i>C.</i> sp. (unnamed; aff. <i>C. geminata</i>) (much larger than <i>C. geminata</i> ; leaves up to 2.5 cm wide)	
<i>Carmichaelia arborea</i> var. (<i>C. flagelliformis</i>) (inc. <i>C. hookeri</i>)	New Zealand broom
<i>Carpha alpina</i>	
<i>Carpodetus serratus</i>	putaputaweta, marbleleaf
<i>Cassinia leptophylla</i> var. <i>leptophylla</i> (incl. <i>C. l.</i> var. <i>spathulata</i> , <i>C. fulvida</i> var. <i>fulvida</i> , and <i>C. retorta</i>)	tauhinu
<i>C. vauvilliersii</i>	
<i>Celmisia gracilentia</i> var.	
<i>C. incana</i> (incl. <i>C. discolor</i>)	
<i>C. spectabilis</i> var. <i>spectabilis</i>	
<i>Centella uniflora</i>	
<i>Cheilanthes</i> sp. (cf. <i>C. distans</i> and <i>C. humilis</i>)	
<i>Chiloglottis cornuta</i>	
<i>Chionochloa conspicua</i> ssp. <i>cunninghamii</i>	
<i>C. pallens</i> var. (leaves broader than in <i>C. p.</i> var. <i>pallens</i>)	
<i>C. flavicans</i>	
<i>C. conspicua</i> ssp. <i>cunninghamii</i> X <i>C. pallens</i> var.	
<i>Clematis cunninghamii</i>	clematis
<i>C. foetida</i>	clematis
<i>C. forsteri</i> (incl. <i>C. australis</i> , <i>C. hookeriana</i> , and <i>C. petriei</i>)	clematis
<i>C. paniculata</i>	puawhananga, clematis

<i>Clanthus puniceus</i> (incl. <i>C. p.</i> var. <i>maximus</i>)	kowhai ngutukaka, kakabeak
<i>Collospermum hastatum</i>	
<i>C. microspermum</i>	
<i>Colobanthus apetalus</i> (incl. <i>C. a.</i> var. <i>alpinus</i>)	
<i>C. sp.</i> (unnamed; aff. <i>C. canaliculatus</i> and <i>C. buehnerianii</i>) (discussed by Moore 1961, p. 212)	
<i>Coprosma acerosa</i>	
<i>C. areolata</i>	kahakaha
<i>C. colensoi</i> (incl. <i>C. banksii</i>)	
<i>C. depressa</i>	
<i>C. foetidissima</i>	hupiro
<i>C. grandifolia</i>	raurekau
<i>C. lucida</i>	
<i>C. propinqua</i> var. <i>propinqua</i>	
<i>C. pseudocuneata</i> s.s.	
<i>C. pumila</i>	
<i>C. repens</i>	taupata
<i>C. rhamnoides</i> ssp. <i>rhamnoides</i> (incl. <i>C. polymorpha</i>)	
<i>C. rigida</i>	
<i>C. robusta</i>	karamu
<i>C. rotundifolia</i>	
<i>C. rugosa</i> ssp. <i>rugosa</i>	
<i>C. spathulata</i> ssp. <i>spathulata</i>	
<i>C. tenuicaulis</i>	
<i>C. tenuifolia</i>	
<i>C. sp.</i> (t) of Eagle (1982)	
<i>C. sp.</i> (unnamed; aff. <i>C. cheesemanni</i> (leaves broader than in <i>C. cheesemanni</i>))	
<i>C. propinqua</i> var. <i>propinqua</i> X <i>C. robusta</i>	
<i>C. robusta</i> X <i>C. tenuifolia</i>	
<i>Cordyline australis</i>	cabbage tree, ti kouka
<i>C. banksii</i>	ti ngahere
<i>C. indivisa</i>	mountain cabbage tree
<i>Coriaria arborea</i> var. <i>arborea</i>	tutu
<i>C. plumosa</i>	
<i>C. pottsiana</i>	
<i>C. arborea</i> var. <i>arborea</i> X <i>C. plumosa</i>	
<i>Corokia cotoneaster</i>	korokio
<i>Cortaderia fulvida</i>	toetoe
<i>C. toetoe</i>	toetoe
<i>Corybas macranthus</i>	
<i>C. oblongus</i>	
<i>C. orbiculatus</i>	
<i>C. rivularis</i>	
<i>C. trilobus</i>	
<i>Corynocarpus laevigatus</i>	karaka
<i>Cotula coronopifolia</i>	batchelor's button
<i>Craspedia uniflora</i> var.	
<i>C. viscosa</i>	
<i>Crassula sieberiana</i>	

<i>Ctenopteris heterophylla</i>	
<i>Cyathea colensoi</i>	
<i>C. cunninghamii</i>	gully tree fern
<i>C. dealbata</i>	silver fern, ponga
<i>C. medullaris</i>	mamaku
<i>C. smithii</i>	
<i>Cyathodes empetrifolia</i>	
<i>C. juniperina</i>	prickly mingimingi
<i>Cyperus ustulatus</i>	giant umbrella sedge
<i>Cystopteris fragilis</i>	
<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Dacrydium cupressinum</i>	rimu
<i>Dactylanthus taylorii</i>	wood rose
<i>Dendrobium cunninghamii</i>	
<i>Deschampia tenella</i>	
<i>Deyeuxia aucklandica</i>	
<i>D. avenoides</i>	
<i>D. billardieri</i>	
<i>Dianella nigra</i>	turutu
<i>Dichelachne crinita</i>	plume grass
<i>Dichondra repens</i>	
<i>D. sp. unnamed (D. 'slender')</i>	
<i>Dicksonia lanata</i>	
<i>D. fibrosa</i>	wheki-ponga
<i>D. squarrosa</i>	wheki
<i>Diplazium australe</i>	
<i>Disphyma australe ssp. australe</i>	ice plant
<i>Dodonaea viscosa</i>	akeake
<i>Doodia media ssp. australis</i>	
<i>D. mollis</i>	
<i>Dracophyllum adamsii</i>	
<i>D. latifolium</i>	neinei
<i>D. recurvum</i>	
<i>D. traversii (incl. D. pyramidale)</i>	
<i>D. adamsii</i> X <i>D. recurvum</i>	
<i>Drapetes dieffenbachii</i>	
<i>Drosera arcturi</i>	sundew
<i>D. binata</i>	sundew
<i>D. peltata ssp. auriculata</i>	sundew
<i>Drymoanthus adversus</i>	
<i>Dysoxylum spectabile</i>	kohekohe
<i>Earina autumnalis</i>	Easter orchid
<i>E. mucronata</i>	
<i>Echinopogon ovatus</i>	
<i>Elaeocarpus dentatus (incl. E. d. var. obovatus)</i>	hinau
<i>E. hookerianus</i>	pokaka
<i>Eleocharis acuta</i>	
<i>E. gracilis</i>	
<i>E. sphacelata</i>	
<i>Elymus multiflorus</i>	

<i>Entelea arborescens</i>	whau
<i>Epilobium alsinoides</i> s.s.	
<i>E. astonii</i>	
<i>E. brunnescens</i> s.s.	
<i>E. chlorifolium</i>	
<i>E. cinereum</i>	
<i>E. cockaynianum</i>	
<i>E. glabellum</i>	
<i>E. insulare</i>	
<i>E. microphyllum</i>	
<i>E. nerteroides</i>	
<i>E. nummularifolium</i>	
<i>E. pallidiflorum</i>	
<i>E. pedunculare</i>	
<i>E. pernitens</i>	
<i>E. pubens</i>	
<i>E. rotundifolium</i>	
<i>E. sp.</i> (unnamed; included in <i>E. brunnescens</i> as ssp. <i>minutiflorum</i> by Raven and Englehorn 1971)	
<i>E. astonii</i> X <i>E. glabellum</i> s.s.	
<i>Erythranthera australis</i>	
<i>Euphrasia cuneata</i>	
<i>E. zelandica</i>	
<i>Festuca sp.</i> (cf. <i>F. multinodis</i>)	
<i>Forstera tenella</i>	
<i>Freycinetia baueriana</i> ssp. <i>banksii</i>	kiekie
<i>Fuchsia excorticata</i>	fuchsia, kotukutuku
<i>F. perscandens</i>	
<i>F. excorticata</i> X <i>F. perscandens</i>	
<i>Gahnia lacera</i>	
<i>G. pauciflora</i>	
<i>G. procera</i>	
<i>G. setifolia</i>	
<i>Galium perpusillum</i>	
<i>G. propinquum</i>	
<i>G. trilobum</i>	
<i>Gaultheria antipoda</i>	
<i>G. paniculata</i>	
<i>G. sp.</i> (unnamed; included in <i>G. depressa</i> as var. <i>novae-zelandiae</i> by Franklin 1962)	
<i>G. antipoda</i> X <i>G. paniculata</i>	
<i>G. antipoda</i> X <i>G. sp.</i> (unnamed)	
<i>G. paniculata</i> X <i>G. sp.</i> (unnamed)	
<i>Geniostoma rupestre</i> var. <i>ligustrifolium</i>	hangehange
<i>Gentiana bellidifolia</i> s.s.	
<i>G. sp.</i> (cf. <i>G. montana</i> and <i>G. patula</i>)	
<i>Geranium microphyllum</i>	
<i>G. potentilloides</i> var. <i>potentilloides</i>	
<i>G. sessiliflorum</i> var. <i>novae-zelandiae</i>	
<i>Geum sp.</i> (<i>G. parviflorum</i> agg.)	

<i>Gnaphalium audax</i> ssp. <i>audax</i>	
<i>G. gymnocephalum</i>	
<i>G. involucreatum</i>	
<i>G. limosum</i>	
<i>G. sphaericum</i>	
<i>G. sp.</i> (unnamed; included in <i>G. audax</i> as var. <i>ruahenicum</i> by Drury 1972)	
<i>Gonocarpus micranthus</i> ssp. <i>micranthus</i>	
<i>Grammitis armstrongii</i>	
<i>G. billardiarei</i>	
<i>G. givenii</i>	
<i>G. magellanica</i> ssp. <i>nothofageti</i>	
<i>G. patagonica</i>	
<i>Griselinia littoralis</i>	broadleaf
<i>G. lucida</i>	puka
<i>Gunnera monoica</i> (incl. <i>G. albocarpa</i> and <i>G. strigosa</i>)	
<i>Halocarpus biformis</i>	pink pine
<i>Haloragis erecta</i> ssp. <i>erecta</i>	
<i>Hebe corriganii</i>	
<i>H. odora</i> s.s.	
<i>H. stricta</i> var. <i>macroura</i>	
<i>H. stricta</i> var. <i>stricta</i>	
<i>H. tetragona</i> var. <i>tetragona</i>	
<i>H. venustula</i> (incl. <i>H. brachysiphon</i>)	koromiko
<i>H. sp.</i> (a) (unnamed; <i>H. sp.</i> n of Eagle 1982, or <i>H. 'Wairoa'</i>)	
<i>H. sp.</i> (b) (<i>Veronica arborea</i>)	
<i>H. sp.</i> (c) (unnamed; included in <i>H. stricta</i> as vars <i>egmontiana</i> and <i>lata</i> by Moore 1961)	
<i>H. venustula</i> X <i>H. sp.</i> (c)	
<i>Hedycarya arborea</i>	pigeonwood
<i>Helichrysum aggregatum</i> var. <i>aggregatum</i>	
<i>H. filicaule</i>	
<i>H. sp.</i> (unnamed; aff. <i>H. bellidioides</i>) (" <i>H.</i> <i>alpinum</i> " of Cockayne 1928)	
<i>Hierochloa redolens</i>	
<i>H. recurvata</i>	
<i>Histiopteris incisa</i>	water fern
<i>Hoheria angustifolia</i>	
<i>H. populnea</i> var. <i>lanceolata</i> (<i>H. sexstylosa</i>)	lacebark, houhere
<i>Hydrocotyle dissecta</i>	
<i>H. elongata</i>	
<i>H. heteromeria</i>	
<i>H. microphylla</i>	
<i>H. moschata</i>	
<i>H. novae-zeelandiae</i> s.s.	
<i>H. pterocarpa</i>	
<i>Hymenophyllum bivalve</i>	
<i>H. demissum</i>	
<i>H. dilatatum</i>	

<i>H. ferrugineum</i>	
<i>H. flabellatum</i>	
<i>H. flexuosum</i>	
<i>H. malingii</i>	
<i>H. multifidum</i>	
<i>H. peltatum</i>	
<i>H. pulcherrimum</i>	
<i>H. rarum</i>	
<i>H. revolutum</i>	
<i>H. rufescens</i>	
<i>H. sanguinolentum</i> (incl. <i>H. villosum</i>)	
<i>H. scabrum</i>	
<i>Hypericum japonicum</i>	
<i>Hypolepis ambigua</i>	
<i>H. lactea</i>	
<i>H. millefolium</i>	
<i>H. rufobarbata</i>	
<i>Ileostylus micranthus</i>	mistletoe
<i>Isachne globosa</i>	
<i>Isolepis cernua</i>	
<i>I. distigmatica</i>	
<i>I. habra</i>	
<i>I. inundata</i>	
<i>I. nodosa</i>	
<i>I. pottsii</i>	
<i>I. reticularis</i>	
<i>Ixerba brexioides</i>	tawari
<i>Jovellana sinclairii</i>	
<i>Juncus australis</i>	
<i>J. gregiflorus</i>	
<i>J. maritimus</i> var. <i>australiensis</i>	sea rush
<i>J. novae-zelandiae</i>	
<i>J. planifolius</i>	
<i>J. sarophorus</i>	
<i>Knightia excelsa</i>	rewarewa
<i>Koeleria cheesemanii</i>	
<i>Kunzea ericoides</i> var. <i>ericoides</i>	kanuka
<i>Lachnagrostis filiformis</i> agg.	
<i>Lagenifera pumila</i>	
<i>Lastreopsis glabella</i>	
<i>L. hispida</i>	
<i>L. microsora</i> ssp. <i>pentangularis</i>	
<i>L. velutina</i>	
<i>Laurelia novae-zelandiae</i>	pukatea
<i>Lemna minor</i>	duckweed
<i>Lepidosperma australe</i>	
<i>Lepidothamnus laxifolius</i>	pygmy pine
<i>L. intermedius</i> X <i>L. laxifolius</i>	
<i>Leptinella squalida</i> ssp. <i>squalida</i>	
<i>Leptocarpus similis</i>	oioi, jointed rush
<i>Leptolepia novae-zelandiae</i>	

<i>Leptopteris hymenophylloides</i>	
<i>L. superba</i>	Prince of Wales feathers
<i>Leptospermum scoparium</i>	manuka
<i>Leucogenes leontopodium</i>	
<i>Leucopogon fasciculatus</i>	mingimingi
<i>L. fraseri</i> s.s.	patotara
<i>Libertia grandiflora</i>	
<i>L. pulchella</i>	
<i>Libocedrus bidwillii</i>	kaikawaka, mountain cedar
<i>Lilaeopsis novae-zelandiae</i>	
<i>Limosella lineata</i>	
<i>Lindsaea trichomanoides</i>	
<i>Linum monogynum</i>	
<i>Litsea calicaris</i>	mangeao
<i>Lobelia anceps</i>	
<i>Lophomyrtus obcordata</i>	rohutu
<i>Luzula migrata</i>	
<i>L. picta</i> s.s.	
<i>L. sp.</i> (unnamed; included in <i>L. picta</i> as var. <i>limosa</i> by Edgar 1966)	
<i>Luzuriaga parviflora</i>	
<i>Lycopodium australianum</i>	
<i>L. deuterodensum</i>	
<i>L. fastigiatum</i>	
<i>L. scariosum</i>	
<i>L. varium</i> (incl. <i>L. billardieri</i> and <i>L.</i> <i>novae-zelandicum</i>)	
<i>L. volubile</i>	
<i>Machaerina sinclairii</i>	
<i>Macropiper excelsum</i> var. <i>excelsum</i>	kawakawa
<i>Melicope simplex</i>	
<i>M. ternata</i>	wharangi
<i>Melicytus alpinus</i>	
<i>M. lanceolatus</i> (incl. <i>M. lanceolatus</i> var. <i>latior</i>)	
<i>M. micranthus</i>	
<i>M. ramiflorus</i> ssp. <i>ramiflorus</i>	mahoe
<i>Mentha cunninghamii</i>	New Zealand mint
<i>Metrosideros colensoi</i> (incl. <i>M. c.</i> var. <i>pendens</i>)	
<i>M. diffusa</i>	
<i>M. excelsa</i>	pohutukawa
<i>M. fulgens</i>	
<i>M. perforata</i>	
<i>M. robusta</i>	northern rata
<i>Microlaena avenacea</i>	
<i>M. polynoda</i>	
<i>M. stipoides</i>	
<i>Microtis unifolia</i>	
<i>Mida salicifolia</i> (incl. <i>M. s.</i> var. <i>myrtifolia</i>)	willow-leaved maire
<i>Mimulus repens</i>	
<i>Montia fontana</i> s.s.	
<i>Morelotia affinis</i>	

<i>Muehlenbeckia australis</i>	pohuehue
<i>M. complexa</i>	
<i>Myoporum laetum</i> var. <i>laetum</i>	ngaio
<i>Myosotis saxosa</i> (incl. <i>M. amabilis</i>)	
<i>M. sp.</i> (a) (unnamed; included in <i>M. pygmaea</i> as var. <i>drucei</i> by Moore 1961)	
<i>M. sp.</i> (b) (<i>M. forsteri</i> agg.)	
<i>Myriophyllum propinquum</i>	
<i>Myrsine australis</i>	mapou
<i>M. divaricata</i> s.s.	
<i>M. nummularia</i>	
<i>M. salicina</i>	toro
<i>Neomyrtus pedunculata</i>	
<i>Nertera ciliata</i>	
<i>N. depressa</i> (incl. <i>N. cunninghamii</i>)	
<i>N. sp.</i> unnamed (aff. <i>N. dichondrifolia</i>)	
<i>Nestegis cunninghamii</i>	black maire
<i>N. lanceolata</i>	white maire
<i>N. montana</i>	narrow-leaved maire
<i>Nothofagus fusca</i>	red beech
<i>N. menziesii</i>	silver beech
<i>N. solandri</i> var. <i>cliffortioides</i>	mountain beech
<i>N. solandri</i> var. <i>solandri</i>	black beech
<i>N. truncata</i>	hard beech
<i>N. fusca</i> X <i>N. truncata</i>	
<i>Olearia arborescens</i>	
<i>O. colensoi</i> var. <i>colensoi</i>	tupare
<i>O. furfuracea</i> s.s. (incl. <i>O. f.</i> var. <i>angustata</i>)	akepiro
<i>O. ilicifolia</i>	
<i>O. nummularifolia</i> var. <i>nummularifolia</i>	
<i>O. paniculata</i>	
<i>O. rani</i>	heketara
<i>O. solandri</i>	
<i>O. arborescens</i> X <i>O. furfuracea</i>	
<i>O. arborescens</i> X <i>O. ilicifolia</i>	
<i>Ophioglossum sp.</i> (cf. <i>O. coriaceum</i>)	
<i>Oplismenus imbecillus</i>	
<i>Oreobolus pectinatus</i>	
<i>Oreomyrrhis colensoi</i> s.s. (incl. <i>O. c.</i> var. <i>hispida</i> and <i>O. c.</i> var. <i>multifida</i>)	
<i>Orthoceras strictum</i>	
<i>Ourisia caespitosa</i> (incl. <i>O. c.</i> var. <i>gracilis</i>)	
<i>O. macrophylla</i> ssp. <i>robusta</i>	
<i>Oxalis exilis</i>	
<i>O. lactea</i>	
<i>O. sp.</i> (stems very slender; flowers yellow, c. 7 mm diameter)	
<i>Paesia scaberula</i>	hard fern
<i>Parahebe olsenii</i>	
<i>Parietaria debilis</i>	

<i>Parsonsia capsularis</i> var. <i>capsularis</i>	New Zealand jasmine
<i>P. heterophylla</i>	New Zealand jasmine
<i>Passiflora tetrandra</i>	kohia
<i>Pelargonium inodorum</i>	
<i>Pellaea rotundifolia</i>	
<i>Pennantia corymbosa</i>	kaikomako
<i>Pentachondra pumila</i>	
<i>Peperomia tetraphylla</i>	
<i>P. urvilleana</i>	
<i>Peraxilla tetrapetala</i>	mistletoe
<i>Phormium cookianum</i>	wharariki
<i>P. tenax</i>	harakeke, New Zealand flax
<i>Phyllachne colensoi</i>	
<i>Phyllocladus alpinus</i>	mountain toatoa
<i>P. glaucus</i>	toatoa
<i>P. trichomanoides</i> var. <i>trichomanoides</i>	tanekaha
<i>Phymatosorus diversifolius</i>	houndstongue
<i>P. novae-zelandiae</i>	
<i>P. scandens</i>	fragrant fern
<i>Pimelea buxifolia</i>	
<i>P. longifolia</i>	
<i>P. oreophila</i>	
<i>P. prostrata</i> s.s.	pinatoro
<i>Pittosporum cornifolium</i>	
<i>P. crassifolium</i>	karo
<i>P. ellipticum</i>	
<i>P. eugenioides</i>	tarata, lemonwood
<i>P. ralphii</i>	
<i>P. rigidum</i> var. <i>rigidum</i> (incl. <i>P. rigidum</i> var. <i>majus</i>)	
<i>P. tenuifolium</i> ssp. <i>huttonianum</i>	
<i>P. tenuifolium</i> ssp. <i>tenuifolium</i>	kohuhu
<i>Plagianthus divaricatus</i>	marsh ribbonwood
<i>P. regius</i>	ribbonwood
<i>Planchonella costata</i>	tawapou
<i>Plantago novae-zelandiae</i>	
<i>P. raoulii</i>	
<i>P. spathulata</i> ssp. <i>picta</i>	
<i>Pneumatopteris pennigera</i>	
<i>Poa anceps</i> ssp. <i>anceps</i>	
<i>P. breviglumis</i> s.s.	
<i>P. colensoi</i> (incl. <i>P. c.</i> var. <i>breviligulata</i>)	
<i>P. mackayi</i>	
<i>P. novae-zelandiae</i> var.	
<i>P. pusilla</i>	
<i>Podocarpus hallii</i>	Hall's totara, thin-barked totara
<i>P. nivalis</i>	snow totara
<i>P. totara</i>	totara
<i>P. hallii</i> X <i>P. nivalis</i>	
<i>Polystichum richardii</i>	

<i>P. silvaticum</i>	
<i>P. vestitum</i>	
<i>Pomaderris ericifolia</i>	
<i>Potamogeton cheesemanii</i>	
<i>Prasophyllum colensoi</i>	
<i>Pratia angulata</i>	
<i>Prumnopitys ferruginea</i>	miro
<i>P. taxifolia</i>	matai
<i>Pseudognaphalium</i> sp. (<i>Gnaphalium luteo-album</i> agg.)	
<i>Pseudopanax anomalus</i>	
<i>P. arboreus</i> var. <i>arboreus</i>	five finger
<i>P. colensoi</i>	
<i>P. crassifolius</i>	lancewood
<i>P. edgerleyi</i>	raukawa
<i>P. laetus</i>	
<i>P. lessonii</i>	houpara
<i>P. simplex</i> var. <i>sinclairii</i>	haumakaroa
<i>Pseudowintera axillaris</i>	horopito
<i>P. colorata</i>	horopito
<i>Pteridium esculentum</i>	bracken
<i>Pteris macilenta</i> s.s.	
<i>P. saxatilis</i>	
<i>P. tremula</i>	
<i>Pterostylis banksii</i>	
<i>P. humilis</i>	
<i>P. venosa</i>	
<i>P. sp.</i> (cf. <i>P. australis</i>)	
<i>P. sp.</i> (cf. <i>P. graminea</i> and <i>P. montana</i>)	
<i>Pyrrosia eleagnifolia</i>	leather-leaf fern
<i>Quintinia serrata</i> (incl. <i>Q. acutifolia</i> and <i>Q. elliptica</i>)	quintinia
<i>Ranunculus insignis</i>	
<i>R. macropus</i>	
<i>R. nivicola</i>	
<i>R. reflexus</i>	
<i>Raoulia glabra</i>	
<i>R. grandiflora</i>	
<i>R. tenuicaulis</i> (incl. <i>R.t.</i> var. <i>dimorpha</i> and <i>R.t.</i> var. <i>pusilla</i>)	
<i>Rhabdothamnus solandri</i>	
<i>Rhopalostylis sapida</i>	nikau
<i>Ripogonum scandens</i>	supplejack
<i>Rubus australis</i>	
<i>R. cissoides</i> var. <i>cissoides</i>	bush lawyer
<i>R. schmidelioides</i> var. <i>schmidelioides</i>	
<i>R. squarrosus</i>	
<i>Rumohra adiantiformis</i>	
<i>Rytidosperma clavatum</i>	
<i>R. gracile</i>	
<i>R. racemosum</i>	

<i>R. setifolium</i>	
<i>R. viride</i>	
<i>Samolus repens</i> var. <i>repens</i>	sea primrose
<i>Sarcocornia quinqueflora</i>	glasswort
<i>Scandia rosifolia</i>	New Zealand aniseed
<i>Schefflera digitata</i>	pate
<i>Schizeilema allanii</i>	
<i>S. trifoliatum</i>	
<i>Schoenoplectus pungens</i>	three square sedge
<i>S. validus</i>	
<i>Schoenus maschalinus</i>	
<i>S. pauciflorus</i>	
<i>S. tendo</i>	
<i>Selliera radicans</i>	
<i>Senecio banksii</i>	
<i>S. lautus</i> ssp. <i>lautus</i>	
<i>S. minimus</i>	
<i>S. quadridentatus</i>	
<i>S. rufiglandulosus</i>	
<i>S. scaberulus</i>	
<i>S. wairauensis</i>	
<i>Solanum americanum</i>	
<i>S. aviculare</i> var. <i>aviculare</i> (incl. <i>S. a.</i> var. <i>albiflorum</i> & <i>S. cheesemanii</i>)	poroporo
<i>Sophora microphylla</i>	kowhai
<i>S. tetraptera</i>	kowhai
<i>Sparganium subglobosum</i>	burr reed
<i>Spinifex sericeus</i>	spinifex
<i>Spirodela punctata</i>	spirodela
<i>Sticherus cunninghamii</i>	umbrella fern
<i>Stellaria decipiens</i>	
<i>S. gracilentia</i>	
<i>Streblus banksii</i>	
<i>S. heterophyllus</i>	turepo
<i>Thelymitra hatchii</i>	
<i>T. longifolia</i>	
<i>T. pauciflora</i>	
<i>Toronia toru</i>	toru
<i>Tmesipteris elongata</i>	
<i>T. tannensis</i>	
<i>Trichomanes reniforme</i>	kidney fern
<i>T. venosum</i>	
<i>Triglochin striata</i>	arrow grass
<i>Trisetum youngii</i>	
<i>T. sp.</i> (a) (unnamed; included in <i>T. antarcticum</i> as var. <i>lasiorachis</i> by Hackel ex Cheeseman 1906)	
<i>T. sp.</i> (b) (unnamed; aff. <i>T. antarcticum</i>) (leaf sheath distinctly hairy)	
<i>T. sp.</i> (c) (unnamed; aff. <i>T. antarcticum</i>)	
<i>Typha orientalis</i>	raupo

<i>Uncinia banksii</i>	
<i>U. caespitosa</i>	
<i>U. clavata</i>	
<i>U. divaricata</i>	
<i>U. ferruginea</i>	
<i>U. filiformis</i>	
<i>U. gracilentata</i>	
<i>U. rupestris</i>	
<i>U. silvestris</i>	
<i>U. scabra</i>	
<i>U. uncinata</i>	
<i>U. viridis</i>	
<i>U. zotovii</i>	
<i>Urtica ferox</i>	ongaonga, nettle
<i>U. incisa</i>	
<i>Viola cunninghamii</i>	
<i>V. filicaulis</i>	
<i>Vittadinia australis</i> var.	
<i>Vitex lucens</i>	puriri
<i>Wahlenbergia colensoi</i>	
<i>W. gracilis</i> agg.	
<i>Weinmannia racemosa</i>	kamahi
<i>Zoysia minima</i>	
<i>Z. pauciflora</i>	

Appendix II - Common Plant Names used in the text

The following list gives the corresponding botanical names for common names used in the text. Adventive species are indicated by an asterisk.

<u>Common name</u>	<u>Botanical name</u>
akepiro	<i>Olearia furfuracea</i>
arrow grass	<i>Triglochin striata</i>
*batchelor's button	<i>Cotula coronopifolia</i>
black beech	<i>Nothofagus solandri</i> var. <i>solandri</i>
*blackberry	<i>Rubus fruticosus</i> agg.
*boxthorn	<i>Lycium ferocissimum</i>
bracken	<i>Pteridium esculentum</i>
broadleaf	<i>Griselinia littoralis</i>
*brush wattle	<i>Paraserianthes lophantha</i>
cabbage tree	<i>Cordyline australis</i>
*catsear	<i>Hypochoeris radicata</i>
five finger	<i>Pseudopanax arboreus</i>
fuchsia	<i>Fuchsia excorticata</i>
gorse	<i>Ulex europaeus</i>
Hall's totara	<i>Podocarpus hallii</i>
hangehange	<i>Geniostoma rupestre</i> var. <i>ligustrifolium</i>
harakeke	<i>Phormium tenax</i>
*harestail	<i>Lagarus ovatus</i>
haumakaroa	<i>Pseudopanax simplex</i> var. <i>sinclairii</i>
*hawthorn	<i>Crataegus monogyna</i>
heketara	<i>Olearia rani</i>
hinau	<i>Elaeocarpus dentatus</i>
*Indian doab	<i>Cynodon dactylon</i>
kahikatea	<i>Dacrycarpus dacrydioides</i>
kaikawaka	<i>Libocedrus bidwillii</i>
kaikomako	<i>Pennantia corymbosa</i>
kamahi	<i>Weinmannia racemosa</i>
kanuka	<i>Kunzea ericoides</i> var. <i>ericoides</i>
karaka	<i>Corynocarpus laevigatus</i>
karo	<i>Pittosporum crassifolium</i>
kawakawa	<i>Macropiper excelsum</i>
kiekie	<i>Freycinetia baueriana</i> ssp. <i>banksii</i>
kiokio	<i>Blechnum</i> sp. unnamed ('black spot')
kohekohe	<i>Dysoxylum spectabile</i>
kohuhu	<i>Pittosporum tenuifolium</i> ssp. <i>tenuifolium</i>
kowhai	<i>Sophora microphylla</i> , <i>S. tetraptera</i>
kowhai ngutukaka	<i>Clianthus puniceus</i>
lacebark	<i>Hoheria populnea</i> var. <i>lanceolata</i> (<i>H. sexstylosa</i>)
lancewood	<i>Pseudopanax crassifolius</i>
mahoe	<i>Melicytus ramiflorus</i>
mamaku	<i>Cyathea medullaris</i>
mangrove	<i>Avicennia resinifera</i>

manuka	<i>Leptospermum scoparium</i>
mapou	<i>Myrsine australis</i>
*marram	<i>Ammophila arenaria</i>
marsh ribbonwood	<i>Plagianthus divaricatus</i>
matai	<i>Prumnopitys taxifolia</i>
mawhai	<i>Sicyos angulata</i>
mid-ribbed snow tussock	<i>Chionochloa pallens</i> var.
miro	<i>Prumnopitys ferruginea</i>
mountain beech	<i>Nothofagus solandri</i> var. <i>cliffortioides</i>
mountain cabbage tree	<i>Cordyline indivisa</i>
native dock	<i>Rumex flexuosus</i>
narrow-leaved maire	<i>Nestegis montana</i>
nau	<i>Lepidium oleraceum</i>
ngaio	<i>Myoporum laetum</i>
nikau	<i>Rhopalostylis sapida</i>
northern rata	<i>Metrosideros robusta</i>
oioi	<i>Leptocarpus similis</i>
ongaonga	<i>Urtica ferox</i>
*pampas	<i>Cortaderia selloana</i>
pate	<i>Schefflera digitata</i>
pigeonwood	<i>Hedycarya arborea</i>
pingao	<i>Desmoschoenus spiralis</i>
pink pine	<i>Halocarpus biformis</i>
pohutukawa	<i>Metrosideros excelsa</i>
pokaka	<i>Elaeocarpus hookerianus</i>
prickly mingimingi	<i>Cyathodes juniperina</i>
pukatea	<i>Laurelia novae-zealandiae</i>
puriri	<i>Vitex lucens</i>
putaputaweta	<i>Carpodetus serratus</i>
quintinia	<i>Quintinia serrata</i>
rangiora	<i>Brachyglottis repanda</i>
*ratstail	<i>Sporobolus africanus</i>
raukumara	<i>Brachyglottis perdicioides</i> var. <i>perdicioides</i>
raupo	<i>Typha orientalis</i>
red beech	<i>Nothofagus fusca</i>
*redwood	<i>Sequoia sempervirens</i>
rewarewa	<i>Knightia excelsa</i>
ribbonwood	<i>Plagianthus regius</i>
rimu	<i>Dacrydium cupressinum</i>
sand daphne	<i>Pimelea arenaria</i>
*silk tree	<i>Paraserianthus lophantha</i>
silver beech	<i>Nothofagus menziesii</i>
spinifex	<i>Spinifex sericeus</i>
supplejack	<i>Ripogonum scandens</i>
*sweet briar	<i>Rosa rubiginosa</i>
tanekaha	<i>Phyllocladus trichomanoides</i>
tarata	<i>Pittosporum eugenioides</i>
tauhinu	<i>Cassinia leptophylla</i> var. <i>leptophylla</i>
tawa	<i>Beilschmiedia tawa</i>
tawapou	<i>Planchonella costata</i>
tawari	<i>Ixerba brexioides</i>

titoki	<i>Alectryon excelsus</i> var. <i>excelsus</i>
toro	<i>Myrsine salicina</i>
totara	<i>Podocarpus totara</i>
tupare	<i>Olearia colensoi</i>
turepo	<i>Streblus heterophyllus</i>
tutu	<i>Coriaria arborea</i> var. <i>arborea</i>
wharariki	<i>Phormium cookianum</i>
wheki	<i>Dicksonia squarrosa</i>
white maire	<i>Nestegis lanceolata</i>
wineberry	<i>Aristotelia serrata</i>
woodrose	<i>Dactylanthus taylorii</i>

Appendix III - Bird species recorded in Waiapu Ecological District

The following bird species, listed in checklist order (Ornithological Society of New Zealand 1990), have been recorded as currently occurring in the study area. The list is based on records from the NZ Atlas (Bull *et al.* 1985), with additional records from Rasch (1989).

The NZ Atlas presents information on bird distributions collected between September 1969 and December 1979 by OSNZ, the former Ecology Division of DSIR, and the former New Zealand Wildlife Service, Department of Internal Affairs. Birds were mapped on 10,000 yard squares of the NZMS 1 map series. Detailed information on each square (observation dates; observers, relative abundance and breeding status of species; number of times each species recorded) is available on a microfiche, kept inside the rear cover of the atlas.

Species of special status are identified by letters as follows: (e) = endangered, (t) = threatened, or (r) = regionally threatened.

Common name	Scientific name
North Island brown kiwi (t)	<i>Apteryx australis mantelli</i>
N.Z. dabchick (t)	<i>Poliocephalus rufopectus</i>
blue penguin	<i>Eudyptula minor</i>
Australasian gannet	<i>Morus serrator</i>
black shag	<i>Phalacrocorax carbo</i>
pied shag	<i>P. v. varius</i>
little black shag	<i>P. sulcirostris</i>
little shag	<i>P. melanoleucos</i>
white-faced heron	<i>Ardea n. novaehollandiae</i>
white heron (e)	<i>Egretta alba modesta</i>
little egret	<i>E. garzetta nigripes</i>
reef heron (t)	<i>E. s. sacra</i>
Australasian bittern (t)	<i>Botaurus poiciloptilus</i>
black swan	<i>Cygnus atratus</i>
paradise shelduck	<i>Tadorna variegata</i>
mallard	<i>Anas p. platyrhynchos</i>
grey duck	<i>A. s. superciliosa</i>
grey teal	<i>A. gracilis</i>
N.Z. shoveler	<i>A. rhynchotis variegata</i>
Australasian harrier	<i>Circus approximans</i>
N.Z. falcon (t)	<i>Falco novaeseelandiae</i>
California quail	<i>Callipepla californica brunnescens</i>
brown quail	<i>Synoicus ypsilophorus</i>
ring-necked pheasant	<i>Phasianus colchicus</i>
wild turkey	<i>Meleagris gallopavo</i>
banded rail (t)	<i>Rallus philippensis assimilis</i>
North Island weka (t)	<i>Gallirallus australis greyi</i>
spotless crane	<i>Porzana tabuensis plumbea</i>
pukeko	<i>Porphyrio p. melanotus</i>
variable oystercatcher	<i>Haematopus unicolor</i>
pied stilt	<i>Himantopus h. leucocephalus</i>
N.Z. dotterel (t)	<i>Charadrius obscurus</i>
banded dotterel (t)	<i>C. b. bicinctus</i>
spur-winged plover	<i>Vanellus miles novaehollandiae</i>

lesser knot
eastern bar-tailed godwit
southern black-backed gull
red-billed gull
black-billed gull
black-fronted tern
Caspian tern (t)
white-fronted tern
kereru, N.Z. pigeon
rock pigeon
North Island kaka (t)
shining cuckoo
long-tailed cuckoo
morepork
N.Z. kingfisher
skylark
welcome swallow
N.Z. pipit
hedge sparrow
blackbird
song thrush
North Island fernbird (t)
whitehead
grey warbler
North Island fantail
North Island tomtit
silvereye
bellbird
tui
yellowhammer
chaffinch
greenfinch
goldfinch
redpoll
house sparrow
starling
common myna
Australian magpie
rook

Calidris c. canutus
Limosa lapponica baueri
Larus d. dominicanus
L. novaehollandiae scopulinus
L. bulleri
Sterna albostrata
S. caspia
S. striata
Hemiphaga n. novaeseelandiae
Columba livia
Nestor meridionalis
Chrysococcyx l. lucidus
Eudynamis taitensis
Ninox n. novaeseelandiae
Halcyon sancta vagans
Alauda arvensis
Hirundo tahitica neoxena
Anthus n. novaeseelandiae
Prunella modularis
Turdus merula
T. philomelos
Bowdleria punctata vealeae
Mohoua albicilla
Gerygone igata
Rhipidura fuliginosa placabilis
Petroica macrocephala toitoi
Zosterops l. lateralis
Anthornis m. melanura
Prothemadera n. novaeseelandiae
Emberiza citrinella
Fringilla coelebs
Carduelis chloris
C. carduelis
C. flammea
Passer domesticus
Sturnus vulgaris
Acridotheres tristis
Gymnorhina tibicen
Corvus frugilegus

Appendix IV - Survey methods

Collection of field data

Most Protected Natural Areas Programme surveys carried out in New Zealand follow a standard plot-based method for description of vegetation (Myers *et al.* 1987). Use of this approach in its entirety was not possible for this survey, given the time constraints placed on completion. Instead, a subset of the standard methods was followed, with ecological units identified in each study site using the approach of Myers *et al.* (1987), but with subsequent description of the units made qualitatively rather than using semi-quantitative plots as in the standard approach.

For each study site we recorded:

- physical location, using NZMS 260 grid references;
- ownership;
- bioclimatic zone;
- land systems;
- canopy height;
- spatial distribution of ecological units, mapped at 1:50 000;
- ecological pattern;
- nature of the surrounding landscape and the degree to which it buffered the ecological values of the study site;
- other conservation values, e.g., rare plant species, birds, etc.;
- threats to and modification of the study site.

For each ecological unit within the study site we recorded:

- a floristic and structural description of the canopy;
- the landform(s);
- a list of other significant plant species, e.g., dominant understorey species.

Initially, forest was categorised as primary or secondary using the definitions listed in the glossary (Appendix VI). With time, it became apparent that these categories were inadequate to deal with all situations, particularly given the long history of forest disturbance in the Ecological District. A third category of "Advanced secondary forest" was therefore introduced to cover situations where forest was obviously not primary in a strict sense, but in which successional development had led to a community with substantial mature forest elements. The most obvious examples are sites where species such as rewarewa and/or kamahi had invaded kanuka or manuka-dominant stands on hillslopes, or where there had been substantial regeneration of podocarps such as totara and kahikatea on more fertile alluvial or colluvial sites.

GIS Analysis of field data

Study site and ecological unit boundaries, delineated on 1:50 000 maps during field survey, were digitised using Terrasoft (Digital Resource Systems 1992), a proprietary Geographic Information System (GIS). Field data relevant to each study site were concurrently entered

into a database linked to the GIS. Additional information relevant to the study area was also incorporated, as follows:

- New Zealand Land Resource Inventory data;
- a digital elevation model (DEM) with 100 metre resolution;
- data on mean annual temperature and rainfall;
- cross-linking of study sites with the Sites of Special Wildlife Interest (SSWI) identified by Rasch (1989);
- information on the distribution and composition of Queen Elizabeth the Second National Trust open space covenants.

All the various information sources were then incorporated into separate Terrasoft 'themes' or coverages, each containing data relevant at different scales, i.e., the Ecological District (DEM and climate data), study site (ownership, ecological pattern, etc.), or ecological unit (vegetation description, landform, other species).

Once completed, the resulting database was used in a number of ways. For example, at the most basic level it was used to explore the spatial distribution of survey information, e.g., to compare the distributions of primary and secondary forest. More detailed analyses included:

- determination of mean, maximum, and minimum values for slope and altitude, along with any bias in aspect, for each study site;
- analysis of the current distribution of different types of vegetation in relation to subdistrict, altitude, and Land Use Capability classes;
- analysis of the current distribution of Protected Natural Areas in relation to subdistrict, altitude, and Land Use Capability classes;
- evaluation of the spatial and environmental distribution of proposed Recommended Areas for Protection.

Appendix V - Selection of Recommended Areas for Protection

Selection of RAPs was carried out using a two-stage process. In the first stage an approximate initial ranking of conservation values was made using a mathematical index calculated using study site attributes. Attributes contributing to this index were as follows.

1. **Area** - the total area of the study site. Raw values ranged from 0.7 ha (a small wetland study site) to over 7000 ha (a large tract of forest in the west of the study area). Because of this wide variation, values were log-transformed so that, for example, an increase from 10 to 20 ha is given more significance than an increase from 1010 to 1020 ha. Log-transformed values ranged from -0.15 to 3.87.
2. **Primary** - the percentage of primary forest in the study site. Values ranged from nil to 100%.
3. **Diversity** - vegetation community diversity was calculated using the index $e^{H'}$ (Peet 1974), which takes account of both the number of different vegetation types and the evenness with which they occupied the total study site area. For example, three vegetation communities each occupying a study site in the ratio of 0.33 : 0.33 : 0.33 would give a higher score (3.0) than three communities occurring in the ratio of 0.90 : 0.05 : 0.05 (score = 1.48), but five evenly distributed communities would give an even higher score (5.0). Actual values ranged from 1.0 to 12.86.
4. **Edge** - this was calculated by comparing the actual perimeter of each study site with its minimum potential perimeter, i.e., that needed to contain a circular patch of equivalent area. Values close to 1 indicate study sites of compact shape with minimal edge effects, requiring minimum fencing. High values generally indicate either elongated or fragmented study sites, prone to weed invasion and more expensive to fence. Raw values ranged from 1.03 to 4.06, but because low values are more desirable than high, values were reversed by subtraction from the maximum raw value.
5. **Fragments** - number of fragments making up the study site. Raw values ranged from 1 to 10, but because study sites consisting of a single fragment are generally a better prospect for conservation than separate fragments, values were reversed by subtraction from the maximum raw value, i.e., 10.

The total score for each study site was then calculated by standardising each of these factors into the range from 0 to 1, and summing them with weights reflecting a subjective ranking of their relative importance, as follows:

$$\text{Score} = (1.0 * \text{Area}) + (1.0 * \text{Primary}) + (1.0 * \text{Diversity}) + (0.25 * \text{Edge}) + (0.20 * \text{Fragments})$$

In theory final scores could range from 0 to 3.45 (the maximum for each component times the sum of the weights), but in practice they ranged from 0.36 to 3.43, with the highest scores gained by study sites containing a high proportion of primary forest with a high diversity of different forest types, and consisting of one block roughly circular in shape. Lowest scores were generally gained by small, fragmented areas of secondary vegetation with elongated or convoluted margins.

Once this initial ranking had been carried out, Recommended Areas for Protection (RAPs) were selected using these scores in conjunction with information on other factors not easily

amenable to numerical analysis, e.g., the significance of the various vegetation types contained in each study area as representative of the wider subdistrict and district, and special features such as the presence of rare species or communities. The eligibility of study sites for RAP status was assessed by comparing study sites in the context of both the subdistrict and the wider Ecological District. That is, final selection took into account not only the score of each individual study site, but also that of adjacent study sites, while attempting to encompass most of the range of vegetation and landform diversity occurring in each subdistrict, and noting instances where some aspects of a subdistrict's character might be better represented in adjoining similar subdistricts. Criteria used in this process were those outlined by Myers *et al.* (1987), as follows.

representativeness	The extent to which an area represents or exemplifies the components of the natural diversity of a larger reference area, e.g., representation in reserves of the current natural diversity of an ecological district, or representation of the original natural landscape. The identification and evaluation of the key representative natural areas in all Ecological Districts is the principal objective of the PNA Programme.
natural diversity	The range of the natural physical and biotic components in the landscape, including species, plant and animal communities, ecosystems, landforms, soil sequences, and dynamic systems and processes.
pattern	An ecological term describing the arrangement of species, communities, and habitats according to spatial and environmental gradients.
rarity	A measure of the paucity of numbers or occurrences of elements of natural diversity (e.g., species, communities).
naturalness	Involves assessment of the degree to which an area (e.g., vegetation ecosystem) has been free from the effects of human disturbance and intervention. It is also an assessment of the indigenous content of the area.
viability	The ability of an area's plant communities (or in some instances a particular species) to maintain themselves in the long term, in the absence of any <u>special</u> effort to perpetuate them. Regeneration and vigour of a particular species, and the size and stability of communities are important factors for evaluation.
buffering	Protection of an area (or a particular community) from outside modifying influences, given by natural features (catchment boundaries, rock barriers, surrounding vegetation) or, in some instances, by fences or other artificial structures.
surrounding landscape	The land which surrounds and influences a particular natural area, and is influenced by the same set of physical parameters as the natural area.

Appendix VI - Glossary of terms used in the text

ADVANCED SECONDARY	Vegetation which shows clear evidence of disturbance, but in which there has been significant recovery by species typical of the original vegetation (cf. secondary).
ADVENTIVE	Arriving from outside (cf. native).
BIOCLIMATIC ZONES	One of the categories used in classifying natural ecosystems in the PNA Programme. It refers to the broad distribution of vegetational zones along both altitudinal and coastal to inland gradients where a particular climatic regime dictates the character of the natural ecosystem. Bioclimatic zones used in this survey were as follows.
coastal	A narrow zone extending up to 1 km inland from the coast, where the vegetation is often exposed to salt-laden winds, and frosts are mostly absent. It is characterised by estuarine, sand dune, or sea-cliff species, or on forested sites by pohutukawa and karaka.
semi-coastal	This zone extends approximately 10 km inland from the coast, and generally to an altitude of approximately 200 m. Although abundant kohekohe in the canopy was used as an indicator of the upper limit of this zone in the adjacent Turanga Ecological District survey (Clarkson and Clarkson 1991), puriri appeared to better reflect the limits of significant coastal influence in the Waiapu Ecological District.
lowland	Inland from the semi-coastal zone, this zone extends up to around 700-750 m a.s.l. and is typified by dominance of tawa, often with emergent podocarps on hillslopes, and by kahikatea, matai, and/or totara on alluvial terraces.
montane	This zone extends from around 700-750 m up to the treeline at around 1200 m. It is typified by the dominance of beech species, with red beech more abundant at lower altitudes and silver beech at higher altitudes.
alpine	This zone extends from the treeline upwards, occurring only on Mt Hikurangi. Scrub extends up to about 1500 m, gradually giving way to tussockland (approx. 1500-1675 m), then to herbfield (approx. 1675-1710 m), and finally to fellfield (above about 1700 m).
CANOPY	The layer or layers formed by the uppermost crown or their parts. The concept is applicable to any kind of vegetation. In forests it includes lianes and epiphytes.

COMMUNITY	A collection of populations of animals and plants that occur naturally together in a common environment of any size.
ECOLOGICAL CHARACTER	The distinguishing features of a particular place, definable in terms of biotic composition plus climatic, edaphic, and topographical information.
ECOLOGICAL DISTRICT	A local part of New Zealand where geological, topographical, climatic, and biological features and processes, including the broad cultural pattern, interrelate to produce a characteristic landscape and range of biological communities. It represents the level for assessing the representativeness of major ecosystem types in the national network of Protected Natural Areas. New Zealand has been subdivided into 268 such districts.
ECOLOGICAL REGION	A group of adjacent ecological districts with very closely related ecological characteristics, or, in some instances, a single very distinctive ecological district. New Zealand has been subdivided into 85 such regions.
ECOLOGICAL UNIT	Any combination of vegetation types (or suite of interrelated types) plus the landform it occurs on, e.g., kahikatea forest on alluvial river terraces, narrow-leaved snow tussock - hard tussock tussockland on alluvial terraces. Other important attributes of the unit such as the bioclimatic zone (e.g., montane, coastal) may be added to the name.
EXOTIC	Introduced from abroad.
FERNLAND	Vegetation in which the cover of ferns in the canopy is 20-100% and in which the fern cover exceeds that of any other growth form or bare ground. Treeferns with stems >10 cm diameter are excluded as trees (cf. forest).
FOREST	Woody vegetation in which the cover of trees and shrubs in the canopy is >80% and in which tree cover exceeds that of shrubs. Trees are woody plants with stems >10 cm diameter.
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	Vegetation in which the cover of herbs in the canopy is 20-100% and in which the herb cover exceeds that of any other growth form or bare ground. Herbs include all herbaceous and low-growing semi-woody plants that are not separated as shrubs, ferns, tussocks, grasses, sedges, rushes, reeds, cushion plants, mosses, or lichens.

ESTUARY	An environment of salt or brackish water, partially enclosed but permanently open to the sea, with diurnal or less frequent inundation.
INDIGENOUS	Native to and occurring naturally in New Zealand. All those features which in aggregate originally gave New Zealand its own distinctive character. Important at the regional, district, and species level.
LANDFORM	A recognisable, naturally formed physical feature of the land having a characteristic shape, e.g., hill, valley, alluvial fan. In the PNA Programme, classification of a landform emphasises its ecological significance rather than its geomorphological or geological significance. Definitions used in the PNA Programme include the following.
alluvial terrace	Flat to gently sloping area of alluvium of variable height above river level. May be periodically flooded.
cliff	Very steeply sloping to vertical rock face.
foredune	Coastal dune parallel to the shoreline at the landward margin of the beach.
hillslope	Slope unit on which drainage lines are predominantly parallel.
rear dune	Coastal dune parallel to the shoreline and to landward of the foredune (q.v.).
tidal flat	Flat area around river mouth regularly inundated and exposed by the tides.
NATIVE	Not known to have been introduced by human agency.
NATURAL AREA	Self-explanatory. 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.
NATURE CONSERVATION VALUE	A 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.
PRIMARY	Vegetation which is essentially original in composition and structure, i.e., which obviously has escaped human disturbance.
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.

RECOMMENDED AREA FOR PROTECTION (RAP)	An area identified as having priority for protection because it contains representative examples of its type or class of natural ecosystem and/or landscape in an ecological district. An RAP is intended to be the basis for a proposal for a new protected natural area that would supplement the existing system of protected natural areas, making it more fully representative of New Zealand's ecological diversity.
REEDLAND	Vegetation in which the cover of reeds in the canopy is 20-80% and in which the reed cover exceeds that of any other growth form or bare ground. Reeds are herbaceous plants growing in standing or slowly running water that have tall, slender, erect, unbranched leaves or culms that are either hollow or have a very spongy pith. Examples include raupo, <i>Scirpus lacustris</i> , and <i>Eleocharis sphacelata</i> .
SCRUB	Woody vegetation in which the cover of shrubs and trees in the canopy exceeds 80% and in which shrub cover exceeds that of trees. Shrubs are woody plants with stems <10 cm diameter (cf. forest).
SECONDARY	Vegetation which has established after destruction or disturbance of the previous cover, and which is essentially different from the original vegetation, e.g., kanuka scrub and forest (cf. advanced secondary).
SEDGELAND	Vegetation in which the cover of sedges in the canopy is 20-80% and in which the sedge cover exceeds that of any other growth form or bare ground. Included in the sedge growth form are many species of <i>Carex</i> , <i>Uncinia</i> , and <i>Scirpus</i> .
SHRUBLAND	Vegetation in which the cover of shrubs in the canopy is 20-80% and in which the shrub cover exceeds that of any other growth form or bare ground.
SITE	An area of land surface for which a specific statement can be made as to 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.
STUDY SITE	A tract of land with indigenous vegetation delineated as suitable for survey by rapid field inventory in order to identify the ecological patterns and the natural diversity of an Ecological District. An arbitrary unit, empirically defined - perhaps by the boundary of a remnant forest stand, a catchment, a legal title, or in largely undifferentiated environments by grid squares or other manageable, arbitrarily bounded areas.

SUCCESSION	The process of change in the appearance, composition, and structure of a community, usually over a number of years. Change may be due to biotic (intrinsic) factors, or state (extrinsic) factors, or both.
TUSSOCKLAND	Vegetation in which the cover of tussocks in the canopy is 20-80% and in which the tussock cover exceeds that of any other growth form or bare ground.

Appendix VII - Major vegetation communities by subdistrict

The distribution of major vegetation communities in RAPs, by subdistrict; numbers of Priority 1 RAPs are in bold type.

Subdistrict	Coastal forest - most dominated by pohutukawa, karaka, and/or puriri	Semi-coastal - mostly tawa, with kohekohe and puriri	Lowland broadleaved, mostly tawa with kohekohe, pukatea, titoki, rewarewa, and/or hinau	Podocarp-dominant - mostly kahikatea, matai, and/or totara, some secondary, much on alluvial terraces	Beech forests, mostly montane - red beech more common at lower altitudes, silver beech at higher	Subalpine-alpine scrub and tussockland
1. Mangaoporo		4, 5	1, 3	2		
2. Waipiro	6, 8, 16	7-9, 12, 13, 14, 15, 17, 18				
3. Tokomaru	19, 22	19, 21	19, 23, 26, 27	23, 24, 25		
4. Tolaga	38	31, 35		28, 29, 30, 33		
5. Pakarac			40, 41, 42, 44, 45, 46	39, 40, 43, 45		
6. Whangara		48, 51, 52, 53, 54, 57, 59, 60				
7. Waimata			61, 62, 63, 64	63		
8. Ihungia			65, 66-70	65		
9. Waiau			71, 72, 74, 75	72		
10. Hokoroa			76-78, 80			
11. Mata Plateau			81-85, 87, 88, 94, 95, 96	83-86, 88, 89, 90, 92, 93, 94, 97	93, 94, 97, 98, 99	
12. Waingaromia			100, 101, 102, 103, 104, 105	102, 104, 105, 108		
13. Waipaoa			109, 110, 111, 112-114, 115, 116, 118, 119	113, 116, 117, 118		
14. Tapuaeroa			120, 121, 122-124, 125		125	125
15. Waitahaia			126, 127-128, 129, 130-135	129, 130, 131, 133	137	
16. Mangatu					138, 139	
17. Mangaotane			140, 141		140, 141	
18. Maungahaumi			142, 143, 144, 146, 147, 149, 150	147, 150		
19. Waitangirua			151, 152		151, 152	151

Advanced secondary forest - mostly dominated by kanuka, tree ferns, and/or rewarewa	Secondary kanuka - almost pure kanuka canopy, over pasture species or divaricate shrubs	Other secondary - variable, incl. manuka and tauhinu on coast, and mixed broad-leaved species where no grazing	Freshwater wetland - including raupo, and <i>Carex</i> and <i>Scirpus</i> spp.	Estuarine/duneland - saltmarsh and sedgeland (estuaries) and mostly spinifex and marram on dunes	Cliff - diverse: wharariki, <i>Hebe</i> spp., tutu, and <i>Pittosporum ralphii</i> common, kowhai ngutukaka local
	1, 3, 4, 5	1			
16	7-9, 12, 14, 15, 16, 17, 18	8, 16	10, 11, 16		
19, 20	19, 20, 23, 25, 26, 27	19, 20	20		23, 25, 26
	31	32, 37	31, 34, 37	36	
	46	46			
			47-49, 50	55, 56, 58	
	61, 62, 64,				
	66, 68, 69	66, 68, 69			
73	71, 72				
76, 79	76-77, 78	76			
91, 93, 94, 95	84, 86, 89, 90, 93, 94, 95	86, 90, 93, 94, 95, 96, 99	83		
	106, 107	102, 104-105, 106, 107			106, 107
112	113, 117-118, 119	113, 116, 117			
124	120	120, 122, 124			122, 124
		136			
	141				
148, 149	148, 149, 150	142, 144, 147, 148, 150			142, 144, 145
					151

