Motu Ecological District

Survey Report for the
Protected Natural Areas Programme

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SUMMARY

The coastal and lowland zones of the Motu Ecological District were surveyed and mapped, as a pilot study for the New Zealand Protected Natural Areas Programme, testing a rapid ecological survey method. Thirty-nine vegetation-landform combinations (Ecological Super-Units) were recognised and used as the main basis for assessing the representativeness of the existing Protected Natural Areas. Several special features of high conservation significance were also considered, for example, the presence of threatened plant and animal species. Twenty Priority Natural Areas containing the best remaining examples of Ecological Super-Units either poorly or not represented, and as many special features as possible, were identified. In total, these cover approximately ~~12~~ 17,100 ha and are mainly grouped in three forested corridors: "Whanarua-Kereu", "Motu" and "Torere", which link with proposed Ecological Areas and the proposed Wilderness Area in Raukumara State Forest Park. The remaining priority areas include small offshore islands and small remnants of former common vegetation types, such as kahikatea forest.

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1. INTRODUCTION

This report describes a PILOT ecological survey undertaken between November 1983 and April 1984 in Motu Ecological District in the eastern Bay of Plenty, as part of the New Zealand Protected Natural Areas (PNA) Programme.

The survey's primary, inter-related objectives were:

1. To document the natural vegetation and landforms of the Motu Ecological District and to evaluate their value for nature conservation, in the context of the PNA Programme's principal objective of protecting representative samples of the full range of New Zealand's natural ecological diversity.

   The lowland and coastal zones were preferentially selected for survey because large scale land use changes (including horticultural and exotic forest development) have recently begun in these areas, and formal nature conservation designation is limited to three very small scenic reserves. In contrast, the upland and mountain zones of the District lie mostly in the Raukumara State Forest Park. They are well represented in proposed Protected Natural Areas, have been subject to considerable ecological survey by the N.Z. Forest Service and no utilisation is planned in the Forest Park for the period of the current management plan up to 1993 (N.Z. Forest Service, 1983). Five scenic reserves of moderate size also lie in these zones.

2. To test the feasibility of rapid ecological surveys for nature conservation evaluation purposes in New Zealand, and specifically the methodology proposed in Rapid Ecological Survey of Natural Areas (Park, 1983), in a large area of predominantly natural or near natural forest.

   This methodology was devised to provide a national "coarse filter" survey of the natural diversity of New Zealand, especially in areas such as the Motu Ecological District which, comparatively, are scientifically poorly known.

The Motu Ecological District is approximately 260 000 ha in area. The target coastal and lowland areas of the district totalled about 50 000 ha. Of this about 35 000 ha were surveyed; permission for access could not be gained to the remaining 15 000 ha (Figure 1).

2. CHARACTER OF MOTU ECOLOGICAL DISTRICT

2.1 Ecological Districts

An ecological district is a geographic area with a recognisably distinctive pattern of characteristic natural ecosystems. It is distinguished from other areas on the basis of homogeneity in patterns of geology, landform, climate, soil, flora and the extent and nature of indigenous vegetation (Simpson, 1982). New Zealand has been mapped at a scale of 1:500,000 into 268 such Districts. The concept of Ecological District provides a tool to be used in organising and assessing ecological information. It may also enhance understanding of, and identity with, local ecological characteristics and so promote awareness of landscape values and stewardship of heritage (ibid.).

2.2 Boundaries of Motu Ecological District

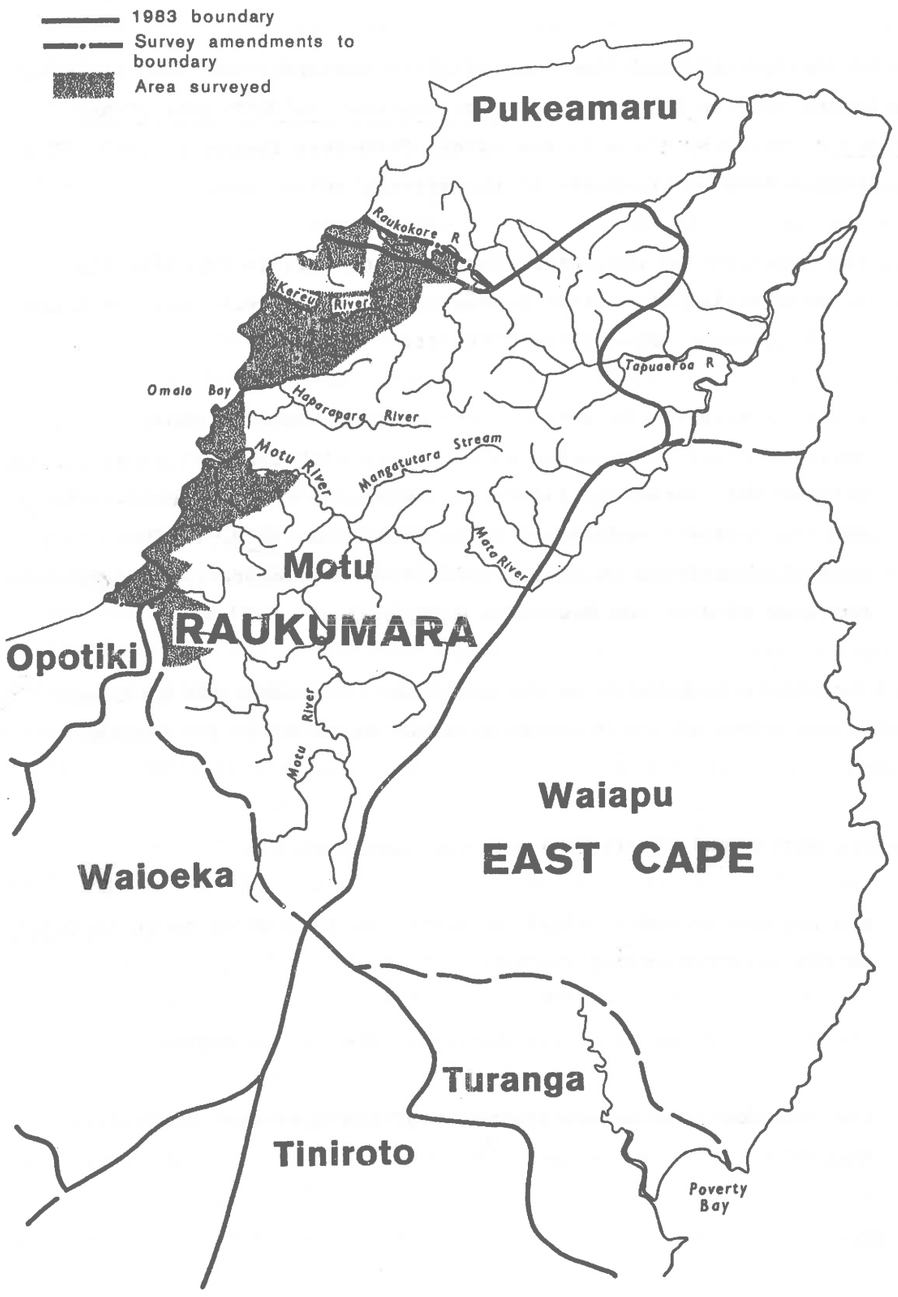
The Motu Ecological District is part of the wider Raukumara Ecological Region, and extends from the tops and eastern flanks of the Raukumara Range to the Bay of Plenty coastline (Figure 1). As considered at the time of survey, the district was bounded:

- in the west, south and southeast, by the catchment boundaries of the Torere, middle Motu and upper Waiaua Rivers; and thence to the Raukumara Range by a line excluding the atypically wide valley of the uppermost Motu catchment;

- in the east and northeast, by the Raukumara Range and the upper headwaters of east and northward-flowing rivers of the East Cape region (Waikohu, Mata, Waiapu, Awatere, Whangaparaoa, and Waikura Rivers). The boundary here is well defined by climatic and geological features i.e. rainshadow effect and softer Tertiary rocks of East Cape region respectively;

- in the north, by the geological boundary between Cretaceous greywackes and Tertiary sandstones and siltstones, roughly the northwesterly trending lowest reach of the Raukokore River, and the northern end of the Raukumara Range (see Kingma, 1965);

Figure 1 - The Motu Ecological District



- in the northwest, by the coastline of the eastern Bay of Plenty.

The boundaries outlined above are slightly amended from those shown on the second edition maps of Ecological Regions and Districts of New Zealand prepared by the N.Z. Biological Resources Centre in 1983. The two changes made on the basis of the present survey were:

- the inclusion of the entire Torere catchment, to complete the representation of coastal headlands and embayments that are features of the coastal edge of the District.

- the extension of the northeastern coastal boundary about 2.5 km northeastwards to coincide more closely with the geological boundary between the Cretaceous indurated sandstones of the Raukumara Range and the Tertiary sediments of the East Cape (ibid.). There is a zone of transition in geology, landform and vegetation on the northern side of the Raukokore River.

The broad scale boundaries on the southwest, southeast and northeast mountainous edges of the District were not examined in the present survey.

The Motu Ecological District shares boundaries with:

- the Waioeka District, which is sufficiently similar to be included in the same ecological region;

- the Opotiki District of the Whakatane Ecological Region;

- the Pukeamaru and Waiapu Districts of the East Cape Ecological Region.

2.3 Geology

The dominating landform of the District is the Raukumara Range. This fold mountain system trends north-northeastward and is the northernmost continuation of the Urewera, Huiarau and other North Island axial mountain ranges (Kingma, 1965). Landforms (e.g. river and coastal terraces) derived from Quaternary erosion and deposition complement the Range and occur primarily in coastal and lowland zones.

The Range consists of hard sedimentary rocks, loosely termed "greywackes", of dark grey-green, silty to gritty sandstone and dark blue-grey mudstone laid down as deep water sediments in Permian to Cretaceous time (280-130 million years B.P.). Speden (1972) included these rocks in the Torlesse Supergroup. They are generally unfossiliferous, and have been intensely compressed, folded, faulted, shattered and lightly metamorphosed to render them highly jointed and fractured (Healy, 1983). In the far northeast of the District, a more simple anticlinal dome of similar though partly younger, fossiliferous and Late Cretaceous rocks forms the northern end of the Range. A narrow band of these younger rock formations occurs along the southwest boundary of the District (Speden, 1973).

Although the rocks themselves are geologically old, uplift here (Kaikoura Orogeny) has occurred only during late Tertiary and Quaternary times. The Raukumara peninsula is being uplifted in titled blocks by compressional forces resulting from the subduction of the Pacific tectonic plate. Uplift rates are 2-3 mm per year along the northern and eastern coasts, decreasing to the west to about 0.5 mm per year along the coast at the Motu River mouth (Berryman, 1982). Although very few active faults are mapped anywhere in the Raukumara region, it is one of the most geologically active parts of the country. Uplift is apparently episodic in up to 3-4 m steps along the north and east coasts, with proportionately smaller uplift steps to the west, at approximately 1000 year intervals and associated with large earthquakes approaching 8 on the Richter Scale (ibid.). The District lies within a region which has a mean return period (years) for intensity MMVI earthquakes of 5 years (Smith and Berryman, 1983).

Between headlands where the greywacke basement rocks reach the coast, there is a series of narrow seaward-sloping marine terraces which were cut during Pleistocene higher sea-level periods and have subsequently been uplifted[1]. Quaternary aggradation features include the alluvial terraces

1. Evidence of marine gravels up to 130m a.s.l. was seen in recently exposed road cuttings in Houpoto forest (G.R. N70: 005306). These appear to represent remnants of considerably older marine terraces.

of the rivers, sand and gravel dune and beach systems, and small swamps. The major rivers of the District carry large amounts of sediment from their eroding headwaters and form narrow valley flats and alluvial plains in their lower reaches. Large tributaries of the Motu River are also locally bordered by alluvial flats in its major tributaries (Rawea, Takaputahi, Whitikau and Mangatutara streams).

A further major influence has been a succession of tephra deposits from major volcanic eruptions in the Rotorua-Taupo region, 80-150km to the southwest. The late Pleistocene and Holocene sequence has been traced and recorded over the central North Island, Bay of Plenty and Gisborne areas by Healy, Vucetich and Pullar (1964) and Vucetich and Pullar (1969), and mapped by Pullar (1973).

At Maraenui, near the centre of the Motu District's coastal zone, the following sequence has been described (Pullar, 1973):

(a)	less than 5 cm,	Tarawera Ash, 1886 eruption
(b)	less than 10cm,	Taupo Pumice, c 1800 yrs BP
(c)	less than 10cm,	Whakatane Ash, c 5180 yrs BP
(d)	less than 20cm,	Mamaku Ash, c 7050 yrs BP
(e)	less than 10cm,	Waiohau Ash, c 11 250 yrs BP
(f)	41 cm,	Rotorua Ash, c 13 450 yrs BP
(g)	30 cm,	Okareka Ash, c 17 000 yrs BP
(h)	25 cm,	Kawakawa Tephra, c 20 000 yrs BP
(i)	107 cm,	Mangaone Lapilli, c 32 000 yrs BP
(j)	132 cm,	Rotoehu Ash, c 42 000 yrs BP

The few road-cuts seen during the present ecological survey, primarily in Houpoto exotic forest, indicated considerable variation in tephra layer thicknesses. Some broad ridges showed layers up to three metres deep, and others had only thin ash lying on weathered greywacke. The District pattern is likely to be one of thick deposits on flat and gently sloping land, with colluvial deposits locally on hillslopes and at hill bases, and comparatively thin deposits on narrow ridges and steep hill slopes where tephra has been washed off. Thicknesses also decrease steadily to the northeast with increasing distance from the eruption centres.

No commercially significant occurrences of metallic minerals are known in the Motu Ecological District (Speden, 1982).

2.4 Landforms and Topography

The Raukumara Range forms a rugged and somewhat irregular mountain spine along the southeast side of the District. The range separates the catchments of the eastern Bay of Plenty from those of the East Cape region. Its altitude varies from about 1000 m in the south to its highest point, Mt Hikurangi (1764 m), in the northeast. Other high points include Mts Arowhana (1439 m), Whanokao (1618 m), Aorangi (1272 m) and Raukumara (1413 m).

From the central mountain range there is a series of generally west to north trending ridge systems and deep river valleys which extend more or less to the Bay of Plenty coast. This general relief has been fashioned by high mean annual rainfall and a relatively high incidence of intense rainfalls acting on a fairly erodible substrate, especially the crush zones. The high rates of tectonic uplift are matched by current erosion processes (Healy, 1983), resulting in a typical youthful landscape still undergoing active fluvial erosion. River down-cutting has produced a dendritic drainage pattern with steepened or over-steepened deeply incised v-shaped valleys. Slopes are susceptible to debris sliding and debris avalanching. However, possibly because the primary forest cover is still largely intact, actual active erosion is at present far less extensive than in the cleared hill country of the adjacent East Cape region.

Landforms are generally more subdued towards the coast. In places, major spurs reach the coast, to end in steep, rugged headlands shelved by rock platforms. The greywacke rocks offer high resistance to marine erosion and the coastline is eroding only very slowly (Tortell, 1981).

Between the headlands are narrow low alluvial terraces and higher old coastal terraces up to 10-50 m a.s.l. (more or less continuous between Omaio and Whanarua Bay). They usually have a small scarp

where they meet the sea. The coast between headlands is indented, with gravel beaches on the long exposed reaches, as at Torere, Hawai, Maraenui, Omaio and Raukokore, and finer sand and pebbles in the numerous little secluded bays. No significant coastal erosion is occurring (East Coast Regional Development Council, 1979).

There are a number of very small islands lying within 100-200 metres off the coast which are generally connected to the mainland by the surrounding wave-cut platforms at low tide.

A notable landform feature is the Houpoto Basin which, during Pleistocene higher sea-level periods, contained an arm of the sea behind the Maraenui Hills. This basin contains a proportionately high extent of low-lying, gently rolling land.

From southwest to northeast the major rivers of the District are the Torere, Hawai, Motu, Haparapara/Waikakariki, Kereu, Maraehako and Raukokore. The Torere, Hawai and Maraehako have relatively small catchments not extending to the central Range; the Waikakariki-Haparapara and Kereu are intermediate in length and catchment size; and the Raukokore and Motu have substantial catchments and flows. These rivers have a substantial degree of fall, especially in the upper reaches, a further consequence of rapid geological uplift (Healy, 1983). Waterfalls are common on small tributaries. The southeast and northeast sides of the District are drained by the headwaters of the Waipaoa, Mata, Tapuaeroa, Awatere and Whangaparaoa Rivers.

There are no lakes and only one known lakelet (G.R. N71:306314) in the Motu Ecological District.

2.5 Soils

Soil survey of the Motu District has been restricted to reconnaissance level (1:250,000), reported in General Survey of the Soils of North Island, New Zealand (D.S.I.R., 1954).

The soils of the District are mainly derived from layers of volcanic ash or tephra deposited during periodic volcanic eruptions in the central North Island during geologically very recent time. Pumice from the Taupo eruption (121 A.D.), is the predominant soil-forming tephra in the eastern Bay of Plenty (Pullar and Birrell, 1973). On recently formed river flats, peat swamps and sand dunes, the mineral constituents of soils are derived chiefly from the volcanic material eroded off the hills. Only on the sharper ridges and steep slopes of the hill and mountain country has the ash and pumice mantle been washed away completely and skeletal soils formed on the exposed greywacke bedrock.

The predominant soils of the District are steepland skeletal soils derived from weathering of the underlying indurated sandstones and modified by varying thicknesses of tephra. Because of slope steepness these soils are relatively unstable and are periodically rejuvenated by erosion. A characteristic soil profile is 15-22 cm of brown to yellowish brown sandy loam derived from mixed ash overlying sandstone rocks (Gibbs and Pullar, 1961). These soils are relatively well-drained and fertile. Where the tephra is thin the underlying sandstone and argillite rocks have weathered to produce a 15-30 cm layer of infertile stony loam between the hard rocks and tephra. Deep tephra deposits and associated soils occur in some shallow valleys and on exceptionally broad ridges.

On the terrace, rolling and hilly lands near the coast are light, friable, well-drained and moderately fertile yellow-brown pumice soils and yellow-brown loams. Soils formed in deep Taupo pumice have visible pieces of unweathered pumice and are classed as yellow-brown pumice soils, whereas soils formed in older tephras are more weathered and classed as yellow-brown loams. Where the tephra is thick, previous soils (palaeosols) formed in older tephra beds may be buried underneath the recent soils.

The tephra parent materials have a great effect on the water-retention, erosion resistance and chemical character of the derived soils. They tend to have a high allophane clay content which binds up organic matter and phosphate. Tephra soils may be naturally deficient in trace elements such as cobalt, selenium and boron.

2.6 Climate

The only climate station in the District at Te Kaha was established in 1982. Knowledge of the climate is based mainly on extrapolations from the East Cape and Opotiki stations (data courtesy of the N.Z. Meteorological Service), and from experience of the district.

The climatic patterns of the District are strongly related to its position as part of New Zealand in the southern oceans, and to its mostly hilly and mountainous character. The Raukumara Range provides a barrier to the prevailing moisture-laden winds approaching across the Bay of Plenty, and from the east and north. It also creates a strong climatic gradient from the coast to the mountains. The area generally has a mild, humid, near sub-tropical climate on the coast, changing to a harsh mountainous climate in the Raukumara Ranges. The climate of the whole District, except the high peaks of the range, favours forest.

The rainfall isohyet map shows that mean annual rainfall is lowest along the narrow coastal strip, from 1025 mm at Omaio up to 1600 mm at Raukokore. This rises to 2400-2800 mm over the southern part of the main divide, and to over 4000 mm on the highest peaks of the Raukumara Range to the northeast. There is a rapid drop in rainfall on the eastern side of the range. The highest monthly rainfalls occur from May to August inclusive.

Snow falls, some moderate to heavy, occur occasionally in winter on the higher slopes of the main range. Frosts occur occasionally at Opotiki between May and September, but increase in frequency and severity with increasing altitude and distance from the coast. Frosts are rare in some coastal areas, such as Te Kaha and Whanarua Bay.

The predominant wind direction at Opotiki is from the south to west quarter. Wind speeds are not recorded. Total average annual sunshine is a comparatively high 2169 hours. Average daily maximum temperatures range between 14.3° C in July and 23.1° C in February. Wind speed increases and sunshine hours and temperature decrease in the hill and mountain parts of the District.

Average relative humidity at Opotiki ranges from a very high 88% in June and July, down to 75-76% in October through to January. Fog, thunder and hail are infrequent, occurring on an average of 7.0, 3.3 and 0.4 days per year respectively.

An exceptionally violent cyclone (Cyclone Bernie) at Easter 1982 caused major windthrow in the forests of the District especially beech forest below 900m. It is apparent that although such extreme climatic events occur infrequently, they must have a major impact on the forest patterns.

A notable climatic feature is the lack of coastal winds. Compared with the North Island west coast, there is very little observable wind impact on the structure of the coastal forests, and many coastal species extend to higher altitudes.

2.7 Vegetation and flora

From the extant native vegetation it can be assumed that, prior to Maori occupation beginning about 1000 A.D. or earlier (Wellman, 1962), the steep rugged landscape of the Motu Ecological District was characterised by a dense forest cover. Non-forest vegetation was restricted to coastal scrub, small wetlands, open riverbeds, and substantial subalpine scrub and alpine grassland zones. The vegetation was in a dynamic relationship with a landscape being moulded by rapid geological uplift and erosion, periodic volcanic deposition, and climatic and associated sea-level changes.

The warm coastal climate supported a narrow belt up to two or three kilometres wide of luxuriant vegetation dominated by pohutukawa (*Metrosideros excelsa*), tawa (*Beilschmiedia tawa s.l.*), puriri (*Vitex lucens*), kohekohe (*Dysoxylum spectabile*) and taraire (*B. tarairi*). Elsewhere in New Zealand this species assemblage occurs only in eastern Northland and Coromandel.

On lowland hills were mosaic forest patterns in which hard beech (*Nothofagus truncata*), tanekaha (*Phyllocladus trichomanoides*), rewarewa

(Knightia excelsa), hinau (Elaeocarpus dentatus) and northern rata (M. robusta) predominated on ridges and spurs, with tawa, puriri, kohekohe and pukatea (Laurelia novae-zelandiae) predominant on the lower slopes and in gullies. There was a scattering of podocarps, principally rimu (Dacrydium cupressinum). In high altitude forests these species were progressively displaced by cooler climate trees including tawari (Ixerba brexioides), toatoa (Phyllocladus glaucus), kamahi (Weinmannia racemosa), quintinia (Quintinia serrata) and in the uppermost forests, red beech (N. fusca) and silver beech (N. menziesii).

The impact of human settlement has been confined mainly to flat and moderately sloping land on the coast, and hill country of the immediate hinterland. During Maori times much of this was cleared by fire, for cultivation of taro (Calocasia esculenta) and kumara (Ipomoea batatus), and inducing bracken (Pteridium esculentum) fernland, a staple crop (Nicholls, 1980). The East Cape region was historically a major centre of Maori population, (Wellman, 1962).

This pattern was consolidated during the European period when these lands were used for new crops (such as potato (Solanum tuberosum)), sheep farming and dairying, and, in the last decade, horticulture. Considerable areas of steeper hill country abandoned by European sheep farmers in the 1930's and 1950's subsequently reverted to scrub and young forest, and have recently been widely planted in exotic pines.

Today about 70% of the ecological district is covered by indigenous forest (Nicholls, 1983a). Human occupation is concentrated on the coastal flats and forest occurs there as small remnants or secondary stands. Forest elsewhere in the coastal zone has also been modified. Reverting communities range from bracken and manuka (Leptospermum scoparium) to tall secondary forest which shows imbalances in age structure and species composition compared to primary forest. The lower altitude hills have a mixture of reverting scrub dominated by manuka, kanuka (L. ericoides), tree ferns and young broadleaved trees, and of secondary forest and small areas of primary forest. The remaining higher altitude forest communities, above about 400 m a.s.l., are largely unmodified, except for the depredations of introduced browsing animals, widespread windthrow caused by Cyclone Bernie, clearing in some river valleys, and past logging of an area downstream of Motu township.

The native vascular flora of the Motu Ecological District comprises more than 630 species (Druce, 1978, 1980; Heginbotham, 1979; B.D. Clarkson and B.R. Clarkson herbarium records; PNA survey herbarium records) and the adventive vascular flora exceeds 460 species (Heginbotham, 1979). The extent of the non-vascular flora is unknown. The areas of subalpine scrub and shrubland, and alpine tussockland, herbfield and fellfield are the most northern substantial occurrences of such vegetation in the North Island. Other notable features of the District are: the hard beech dominated forest on the Bay of Plenty side, which is the largest tract in New Zealand and reaches exceptionally high altitudes; the common occurrence in upper forests of kaikawaka (Libocedrus bidwillii); local occurrence of mountain beech (Nothofagus solandri var. cliffortioides), at its northern limit in the normally silver beech dominated uppermost forest; and an anomalous absence of beeches at the northernmost end of the Raukumara Range (Nicholls, 1983a).

Two species, taraire, and Carmichaelia williamsii, reach their southern limits in the District. Many species, predominantly alpine and subalpine, reach their northern limits.

Rare and endangered species of the District include: Olearia pachyphylla, which is almost wholly restricted to the District; Carmichaelia williamsii, at two of its four known mainland sites; Metrosideros carminea, which is sporadically distributed; and Coriaria pottsiana, a scree-slope shrub on Mt Hikurangi and Mt Arowhana.

The Haparapara River also has high density and species richness of native fish (C.J.Richmond, pers. comm.). Shortjawed kokopu and giant kokopu (G. argenteus) are present, and the invertebrate fauna is generally species rich and abundant in comparison with other stream systems in the region. The river is unusual in that it lacks introduced fish species and its aquatic ecology is likely to be in a near-pristine state.

The terrestrial invertebrate fauna is virtually unknown (e.g. see Watt, 1976). High forest invertebrate species richness is indicated by a small litter sample from near Opape containing 36 mollusc species (D.J. Roscoe, cited in Daniel, 1983), and the presence in other northern North Island of high numbers of small mollusc species (Solem, Climo and Roscoe, 1981) and Coleoptera (Watt, 1979).

Fauna introduced to New Zealand and occurring in the wild in the District include birds, fish, frogs, weasel, stoat, rats, mice, hare, rabbit, deer, goat, pig, possum, cat and hedgehog (Appendix IV). These have had considerable impact on the native fauna (e.g. see Williams, 1973; Dingwall, Atkinson and Hay, 1978; Diamond and Veitch, 1981) and flora (e.g. see Atkinson, 1972; Jane, 1979, cited in N.Z. Forest Service, 1983). Possums have yet to colonise some areas, including that between the Maungatutara River and the sea (Jane, ibid.) and parts of Houpoto forest (N. D'Anvers, pers. comm.). Feral goats are widely, patchily distributed. They are in high numbers in the Takaputahi catchment where they have heavily browsed understorey vegetation. Rooting by wild pigs is widespread in low altitude forests. Red deer, which colonised the Raukumara Range between 1950 and 1970 (Gibb and Flux, 1973), are present in low numbers only, and wild cattle are common in some high altitude forests.

3. SURVEY METHODOLOGY

The methodology used in this survey is described fully in Rapid Ecological Survey of Natural Areas (Park, 1983), including the December 1983 amendments. In this section key features of the standard methodology are outlined and adaptations based on the experience of this survey are noted.

3.1 Determination of Priority Ecological Classes for survey

The ecological classes chosen as priorities for survey in the Motu Ecological District were all those in the coastal and lowland zones. These were selected by the scientific leaders before the survey began, on the basis of the rapidly changing land use patterns in the coastal and lowland zones, their very inadequate representation in protected natural areas, and the lack of information on the distribution of key coastal species. Furthermore the montane and subalpine zones have already been subject to a broad ecological survey, and they are well represented in proposed ecological areas and an approved-in-principle wilderness area in Raukumara S.F.P. The procedures for determining survey priorities outlined by Park (ibid.) were thus greatly shortened.

The targeted priority areas of the District were surveyed from the southwest to the northeast. There was some variation, resulting from the inadequate time available before survey to gain permission for access from landowners.

3.2 Delineation of Survey Areas

An area was surveyed if it was characterised by indigenous species, and/or dominated by natural processes.

A total of 47 survey areas were defined; 18 large forest blocks and 29 other vegetation remnants (see Figure 4).

The large forest blocks mostly adjoin or are connected to the Raukumara S.F.P., and account for the bulk of the area surveyed. Natural boundaries such as rivers or catchments were inadequate to subdivide these blocks into manageable survey areas. The approach taken instead was to

These concepts were readily understood in the field by team members, except for 'degenerating'. This was occasionally ascribed on field cards to windthrown forest (which is deteriorating condition) rather than in the successional sense of a post-climax ecosystem, characterised by reduced productivity, stature and available nutrients. Degenerating communities in this sense were not noted by the present survey.

(ii) Quality, Trend and Modifiers

Interpretation of these factors was restricted to what was observable rather than inferrable. This was essential to prevent confusion resulting from past history of ecological units, especially in secondary stands which had been induced by modifying agents such as fire at some time in the past.

Trend was interpreted in terms of changes in plant abundance, species richness, and vegetation structure.

In the case of modifiers, the modifying factor (eg possum, Lotus pedunculatus, fire) was noted on the card.

(iii) Not Known Category

An additional category, not known, was used for occasions where survey members were unable to determine an appropriate category. It was felt this option would greatly reduce the frequency of inappropriate selections.

(iv) Canopy Definition

The definition of canopy by Atkinson in Owen and Park (1983) was used. Some interpretation difficulty arose in "treeland" and "shrubland" where the middle and ground tier cover classes could be interpreted in relation to percentage cover under the emergent trees and shrubs only, or over the whole non-area plot. The latter was chosen in this survey.

(v) Tier Heights

The estimated average height of each tier was recorded on the ecological unit card. The estimated average height of the leading dominant(s) in each tier, and emergent(s) if present, was recorded in the extended notes section (see vii).

(vi) Listing of Species Names

On the reverse side of the ecological unit card, the species were listed by their common or scientific names rather than the computer or six-letter codes listed on the card. This enabled direct use of the card by any person involved in analysis, and easy checking of team member's species identifications both as they were being recorded and subsequently. It will also enable subsequent easy reference to the ecological unit data by any person requesting such data.

(vii) Extended Notes

The blank reverse side of the blue fauna card was used as an extended notes section to cater for information not listed on the ecological unit card (eg emergent species in the canopy, and past successional history), and to summarise the key vegetation, landform and other features of the unit. This summary provided a useful, readily understood description of the unit, which was frequently used to resolve questions of interpretation subsequently arising from the field card data.

The space was also used to note any fauna observations, especially the native Hochstetter's frog and other features useful for conservation evaluation.

(viii) Other Information

For easy subsequent reference, team members were encouraged to write an appropriate Atkinson - type ecological unit name, site locality, observers' names or initials, and date on the top right-hand corner of each ecological unit card.

3.5 Definition of Bioclimatic Zones

Bioclimatic zones were not precisely defined prior to the survey. With the survey data in hand it was decided to use certain indicator species

or assemblages of species to define bioclimatic zone boundaries, and so merge the bioclimatic zone concept with the vegetation classification. The upper limits of the bioclimatic zones thus selected are:

(i) coastal: the upper limit of pohutukawa as a physiognomically prominent forest canopy species. Generally the coastal zone extends to the ridge of the frontal seaward-facing hill slopes of the District, up to 250-300 m a.s.l. and 2-3 km from the coast.

(ii) lowland: the transition to forest with an abundance of montane species such as tawari, quintinia, kamahi, raukawa, broadleaf, and toatoa. The upper limit is at about 600 m a.s.l. on coastal hills, and falls to about 400-500 m a.s.l. inland.

(iii) montane: the upper limit of forest vegetation (treeline) at about 1370 m a.s.l. Dwarfed forms of mountain and silver beech are included in the subalpine zone.

(iv) subalpine: the upper limit of erect woody vegetation (scrubline), principally the upper limit of Olearia colensoi, at about 1520 m a.s.l. Includes herb dominated communities edaphically controlled or induced by fire.

(v) alpine: includes alpine tussockland, herbfield and fellfield on the summits of Mt Hikurangi and Whanokao.

3.6 Landform

Because of the lack of adequate large-scale resource data, and insufficient pre-survey time to develop a full understanding of landform and geomorphic processes in the District, landform has not been integrated into the present survey as fully as it might have been.

The Ministry of Works and Development Land Resource Information (L.R.I.) 1:63360 worksheets were found not to represent adequately the landform character of the Motu Ecological District. For instance, the coastal headlands were not separated from the hinterland, riverbeds were not mapped, and some boundaries followed vegetation rather than landform

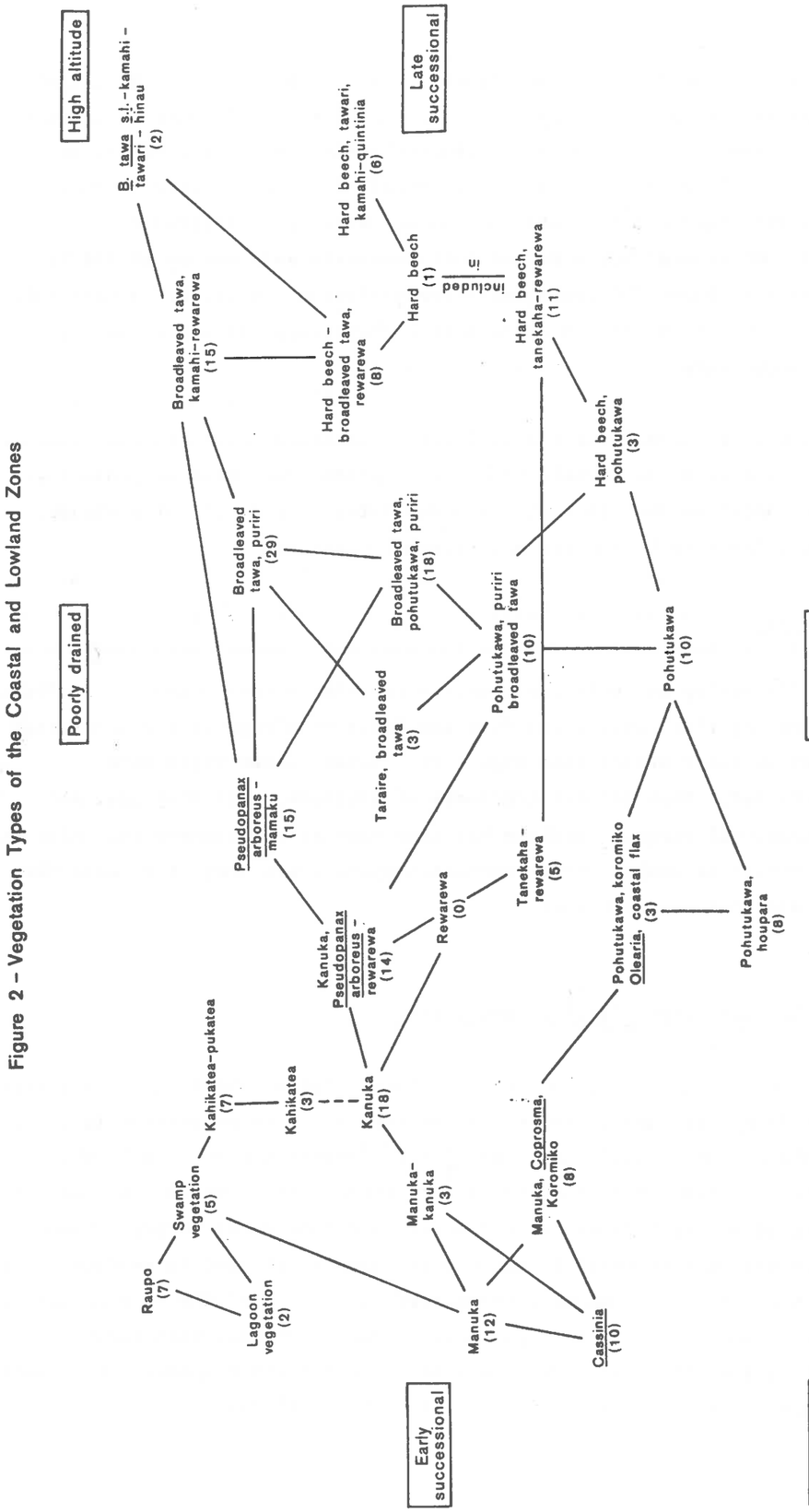


Figure 2 - Vegetation Types of the Coastal and Lowland Zones

NB the number in brackets indicates the number of ecological unit cards assigned to each type
the lines link types with the most similar composition

features. The terrain classification maps prepared by the Department of Lands and Survey to accompany Crozier and Owen (1983) were based on the L.R.I. maps. They were not substantially used for the same reason although the terrain units were recorded on the field card. Other available landform data (in a broad sense) were restricted to the 1:250 000 general North Island soil reconnaissance survey (D.S.I.R., 1954), the 1:250 000 geological survey (Kingma, 1965), and a near full set of 1980-81 black and white aerial photographs of approximately 1:28 000 scale.

Data were collected for the full set of landform variables specified on the field card and as well brief descriptions were made of ecological unit landforms. Of this data use was later made mainly of altitude, slope, landform assemblage and catenary position.

3.7 Analysis

The 236 ecological unit cards were hand-ordered into types, on the basis of the top tier cover class data and field knowledge of the vegetation types in the District (see Figure 2). Twenty-seven types were identified. They reflect gradients of altitude, soil drainage, and successional stage. Landform has been used as a secondary criterion to differentiate within these vegetation types where they cover more than one distinct landform unit.

3.8 New Zealand Forest Service survey data

New Zealand Forest Service National Forest Survey and Ecological Survey plot data were used to delineate the vegetation types present in the middle and upper altitude zones of the District not covered by the present survey. More than 500 plots between 450 m and 1420 m were measured by the National Forest Survey and Ecological Survey. These plots were hand-ordered in the manner already outlined in section 3.7 and the types thus defined were integrated with those of the present survey. This ordination produced types more or less identical with those described by Nicholls (1971), and the descriptions presented in Appendix II are expanded versions of those in Nicholls (1971).

3.9 Other survey data

The vegetation types described for the subalpine and alpine zones follow those of Druce (1961) and Mt Hikurangi and Mt Arowhana field notes of B.D. Clarkson. These types are broad in comparison to the others described but, as nearly all the subalpine and alpine zones are already protected, they are considered adequate for the purposes of this account.

The data for the proposed Opape Lands reserve ("Nukutere Scenic Reserve") are taken from Daniel (1983).

The vegetation types outlined by Clarkson and Regnier (1983, 1984) for the scenic reserves in the study area have also been used.

A wildlife survey of the District was carried out by the N.Z. Wildlife Service Fauna Survey Unit in October-November 1983, as part of a survey of the East Cape region. The data collected have been used in this study.

4. VEGETATION AND LANDFORM

4.1 Description of vegetation types

The vegetation types of the District identified (see 3.7, 3.8 and 3.9) are listed and described in Appendix I.

Each type is named according to the leading dominants in the top tier, and the structural class follows Atkinson (1983). For wetlands, where possible, national wetland classification terms (proposed in Environmental Council of New Zealand, 1983) are incorporated into the type name or description. This facilitates direct comparison of the types of wetland present in the District with those elsewhere in New Zealand. For convenience, seven wetland types, each represented by a single occurrence, have been grouped into two blanket types. Similarly a blanket type has also been used to describe the many subalpine scrub and shrubland types.

Each description includes, as appropriate: successional status; emergent and canopy dominants in order of decreasing frequency, canopy height range, landform(s) and altitude; middle and ground tier dominants, epiphytes and lianes; and extent and type of modification in each tier, including browsing, trampling and flooding. The successional status of a type in relation to others is also noted where known, as are any other features of note such as rarely occurring canopy species.

Checklists of indigenous and adventive vascular plants recorded by the present survey are included as Appendices II and III respectively.

4.2 Checklist of Ecological Super-Units

As noted in section 3.7, some of the vegetation types identified occur on more than one landform. The vegetation - landform combination has therefore been chosen as the basis of the subsequent assessment of representativeness in the coastal and lowland zones of Motu Ecological District (see chapter 6). The vegetation-landform units so formed have been termed Ecological Super-Units (ESU's), to distinguish them from the ecological class concept of Park (1983). These Ecological Super-Units are listed in Table 1 along with information on the extent and conservation status of each.

4.3 Vegetation map

A vegetation map of the coastal and lowland zones was also produced from the data collected. However only the portions covering the Priority Natural Areas are given in this report. Copies of the complete vegetation map are available for purchase at the Gisborne office of the Department of Lands and Survey. In order to map at at 1:50,000 scale the 39 ESU's were reduced to 27 mapping units. The concordance between the ESU's and the mapping units is given on the map legends (Figure 5).

4.4 Rare and endangered plants

Four rare and endangered species (Given, 1981), *Carmichaelia williamsii*, *Olearia pachyphylla*, *Metrosideros carminea* and *Coriaria pottsiana*, occur in the District.

Carmichaelia williamsii is found in the north of the District at two coastal localities, both on the edge of open pohutukawa canopies. One site has eight robust juveniles growing amongst *Libertia grandiflora* on skeletal soils below the ridge of a rocky coastal hillslope. A narrow walking track runs beside the population and track users have caused minor damage to some plants. There is no stock access and no evidence of browsing.

The other site is near the type locality for the species. There are only two mature individuals, growing with hangehange, tutu, kanuka, *Corokia cotoneaster* and *Leucopogon fasciculatus*, on a steep unstable hillslope in dry compacted soil. Both plants are unhealthy and perhaps senescent. Die-back along stem margins, and black manuka blight is evident on both plants. A stock track runs through this site and stock have damaged the base of one plant and broken branches on the other.

At least two other populations occur on the mainland. Both are north of the District. Other populations occur on Alderman, Great Barrier, Little Barrier and Poor Knights Islands.

Olearia pachyphylla is found on the coastal margins of Opape and Haurere headlands. Mature plants and seedlings are abundant on disturbed sites

(e.g. the old military track) and are a major canopy or understorey component in some areas. Associated species here include hangehange, Phormium cookianum and manuka. There is no evidence of browsing and the locations are not of easy access. The only other location from which this species has been recently recorded is in a similar habitat on the east coast of Coromandel Peninsula where only a few plants exist (Heginbotham, 1979).

Metrosideros carminea is found in several localities in the District, mainly confined to riparian forest along the lower reaches of the Raukokore and Kereu Rivers, and along the Manuriki and Otangihia Streams. The plants are either rupestral or arboreal lianes on a wide range of tree species, and often growing with M. perforata and M. diffusa. Mature plants were rarely found, and less than 50 plants were found in total. Due to the nature of the survey the search was not comprehensive and it is likely that many more plants remain undiscovered. M. carminea is found outside the District at several sites in Northland, Coromandel Peninsula, Waikato, Kaimai Range and Taranaki, as well as on Great Mercury and Great Barrier Islands.

Coriaria pottsiana is common on the subalpine scree slopes of Mt Hikurangi. It is also recorded from Mts Arowhana and Parikanapa (Druce, 1980), the latter being outside the District. The species is regarded as rare because of its restricted distribution. On Mt Hikurangi plant numbers appear to be stable despite disturbance by stock trampling.

4.5 Limits of distribution

The known southern limit of taraire (Beilschmiedia tarairi) was extended six small trees being noted on a hillslope in broadleaved tawa-pohutukawa-puriri forest, lat. 37°57', Torere. Libocedrus plumosa reaches its southern limit in the North Island at lat. 38°15', Whinray Scenic Reserve, (Clarkson and Regnier, 1984); Archeria racemosa is approaching its southern limit at 38°10' (Druce, 1980), and Carmichaelia williamsii reaches its southern limit at 37° 45' (Druce, 1980).

More than 40 species, mainly alpine and subalpine, reach their northern limit in the District on Mts Hikurangi, Whanokao and Raukumara (Appendix II). These include Cassinia vauvilliersii, Coprosma pseudocuneata,

Euphrasia zelandica, Forstera tenella, Hebe odora, Hymenanthera alpina, mountain beech, Olearia colensoi and Peraxilla colensoi, (Druce, 1980). Coprosma rubra reaches its northern limit near Toatoa Scenic Reserve (Clarkson and Regnier, 1983).

4.6 Tawa or tawaroa?

It has long been known that a broadleaved form of Beilschmiedia tawa sensu lato exists (Allan, 1961; Knowles and Beveridge, 1982). Wright (1984) recently described this form as a new species, B. tawaroa (tawaroa). He states that B. tawaroa differs from B. tawa sensu stricto in its dense spreading crown, larger width-length leaf ratio, dark green leaf colouration, and drip tip. The high width-length leaf ratio is the critical diagnostic feature (A.E. Wright, pers. comm.).

On the basis of herbarium specimen data and field work in the northern North Island, B. tawaroa is described by Wright (1984) as being coastally distributed (near sea-level to 250 m a.s.l.), along the east coast of the North Island, including offshore islands, from Mangonui in Northland to Raukokore in the eastern Bay of Plenty. It exceeds 250 m a.s.l. only on Little Barrier Island where it occurs up to 600 m a.s.l.

As a result of the present survey, it was found that B. tawa s.s., and a range of broadleaved forms approaching and including B. tawaroa occur as a major canopy tree in the District. The latter tawaroa-like forms do not always reach the leaf width-length ratios determined by Wright for B. tawaroa. On some individual trees a wide range of leaf width-length ratios is present. Wright (1984) has collected B. tawaroa from Raukokore in the far north of the District, and has other records from the East Cape vicinity.

On the basis of accumulated field observations over the summer and a wide-ranging collection[1] of the different B. tawa s.l. forms, it is now considered that tawaroa-like forms are predominant in the coastal and lowland zones. They were also found in the Waioeka valley south of the District, on low altitude alluvium on the Motu River 22 km inland, and in the montane zone up to 800 m a.s.l. and 15 km inland.

1. Specimens have been lodged with the Auckland Institute and Museum.

B. tawa s.s. forms the montane component of B. tawa s.l., and also occurs occasionally in the coastal and lowland zones. At the lower part of its altitudinal range, B. tawa s.s. occurs in association with tawaroa-like forms. The relationships between the different forms here are not well understood.

The taxonomic status of the broadleaved B. tawa s.l. forms in the District is unresolved. Although forms keying to B. tawa s.s. and B. tawaroa both occur in the District, many tawaroa-like forms could not be attributed confidently to either taxon. As well, clear differences in habitat preference were not distinguished by the survey. As the District

and adjacent areas appears to be the only place in New Zealand where the distribution of these forms substantially overlaps, further work is required here to resolve these problems. At present we remain unconvinced that the taxonomic differences are inter-specific.

Problems have arisen in the survey in recognising and interpreting the different forms. In the field there were differences in taxon recognition amongst individual team members, and at different times of the survey. Consequently, field card records alone were not sufficient to distinguish relative proportions of B. tawa s.s. and tawaroa-like forms and so derive vegetation types and ecological units.

In this report, where tawaroa and tawaroa-like forms predominate the name broadleaved tawa is used. B. tawa s.s. forms are referred to as tawa. Where both broadleaved tawa and tawa are present the name B. tawa s.l is used.

5. WILDLIFE

This preliminary account[1] of wildlife values identifies the key features to be considered in wildlife conservation and the definition of priority natural areas in the District (Chapter 6). Wildlife data at the detailed level of the vegetation and landform components of the present survey are not available.

5.1 Assemblages of species

A rich species assemblage is one indicator of good wildlife habitat[2] (Thomas, 1979). Such assemblages distinctive in the District are:

- the full range of extant North Island forest bird species, except red-crowned parakeet, in the large forest blocks and Raukumara S.F.P.;
- breeding and feeding concentrations of coastal and river bird species at mouths and on lower braided portions of rivers.
- high densities and species richness of native fish and invertebrates in the comparatively unmodified Haparapara River (C.J. Richmond, pers. comm.).

5.2 Rare, endangered and uncommon species

Five rare and endangered species listed in The Red Data Book of New Zealand (Williams and Given, 1981) occur in the District, and several other uncommon species are of concern. Habitats supporting these species are of high or outstanding wildlife value.

N.I. kokako is described as vulnerable, declining in numbers and threatened by habitat modification and food competition with possums. It is now exceedingly rare in the District.

Hochstetter's frog is described as a rare species. The N.Z. Wildlife Service survey, Daniel (1983) and the present survey have shown Hochstetter's frog is

1. The N.Z. Wildlife Service is preparing a report on the wildlife and wildlife habitats of the Bay of Plenty region.
2. Others are the number of individuals present (i.e. density), and demographic health of population.

fauna and flora they contain (Kelly, 1980). Within the Motu Ecological District, current PNAs are gazetted Scenic Reserves (Reserves Act 1977) and the Motu River (Water and Soil Conservation Act 1967). Proposed PNAs include State Forest ecological and wilderness areas (Forests Act 1949) and a scenic reserve (Reserves Act 1977).

There are also a number of existing reserves containing indigenous vegetation which have been established for specific purposes other than nature conservation.

There are no covenanted areas in the District.

(i) Gazetted Protected Natural Areas (see Appendix VI, Part A)

There are seven gazetted scenic reserves in the Motu Ecological District: Two are very small (less than 20 ha) both in the coastal zone. The others are all in the lowland and montane zones. Two, Meremere Hill and Toatoa, are only partly in the District. In total these reserves cover 6286 ha; excluding those portions of Meremere Hill and Toatoa Reserves not in the District the total is approximately 4500 ha.

In February 1984, a National Water Conservation Order (under section 20b of the Water and Soil Conservation Order) was declared on the Motu River and its major tributaries (except the upper Takaputahi) between Motu Falls and the State Highway 35 Bridge. The Order specifies that the river shall be preserved as far as possible in its natural state. The Order recognises the outstanding wilderness scenic, natural and recreational values of these parts of the river. It applies only to the river and not to the surrounding land (Planning Tribunal, 1984).

(ii) Proposed Protected Natural Areas (see Appendix VI, Part B)

There are seven Ecological Areas totalling about 20 550 ha, one Wilderness Area of 39 000 ha, and one Scenic Reserve (only partly in district) of 3950 ha, proposed in the Motu Ecological District.

The seven Ecological Areas and the Wilderness Area are all contained within Raukumara State Forest Park. The Ecological Areas were recommended by the State Forest Scientific Reserves Advisory Committee (SFSRAC) in May 1983 and await approval. The Wilderness Area has been approved in principle by the Minister of Forests, and an appraisal is now underway.

The proposed "Nukutere Scenic Reserve" (Daniel, 1983) has been approved in principle both by the Minister of Lands and the Whakatohea Trust Board.

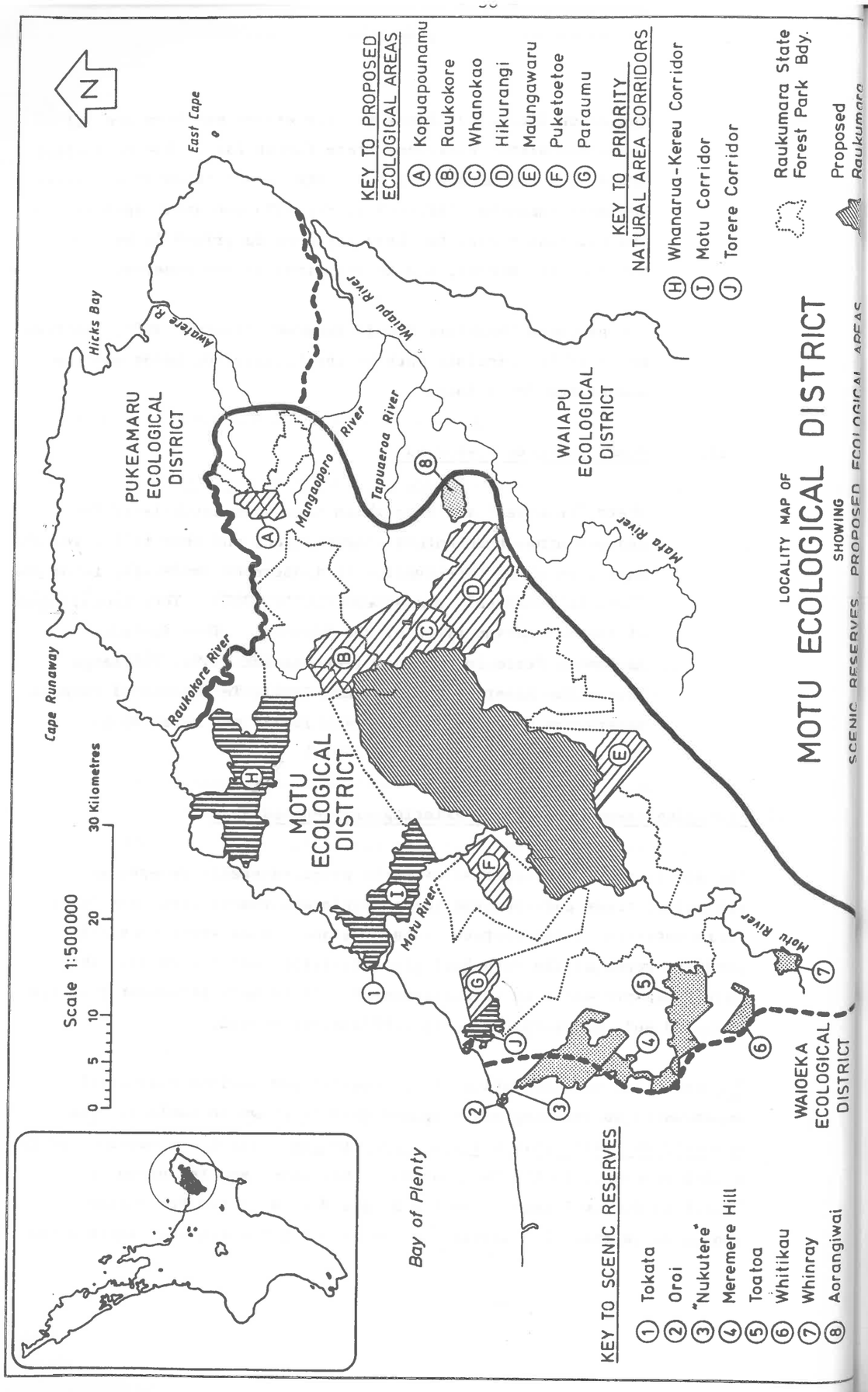
(iii) Other gazetted "reserves"

These "reserves" are ones which have been established for reasons other than nature conservation, and they fall below the base line where preservation of indigenous landscape, fauna and flora is reasonably guaranteed (Kelly 1980). They contain many of the vegetation types of the District. They include Raukumara State Forest Park (Forests Act 1949), Whitianga Recreation Reserve (Reserves Act 1977), Te Kaha Local Purpose Waterworks Reserve (Reserves Act 1977), and seven Maori Reserves (Maori Affairs Act 1953.)

6.4 Ecological resources not in existing or proposed PNAs

The scenic reserves, together with the proposed scenic reserve and ecological areas and approved-in-principle wilderness area, are fully representative of the montane, subalpine and alpine vegetation and landform types of the Motu Ecological District (see Figure 3). This survey has proceeded on this assessment. It is very important that the proposed and approved-in-principle PNAs are gazetted.

The extent of representation of all coastal and lowland ecological super-units in existing and proposed PNAs is shown in Table 1. The majority of these E.S.U.s are not represented. Eight are represented to a limited extent in the two coastal scenic reserves, the proposed "Nukutere Scenic Reserve" and the proposed Paraumu and Puketoetoe ecological areas. Two lowland and montane E.S.U.s are well represented



in the wilderness area, and proposed ecological areas and "Nukutere Scenic Reserve".

Of the rare and endangered plant species (see Table 2), Olearia pachyphylla, Carmichaelia williamsii, and Metrosideros carminea are not included in PNAs; the plant species at their distribution limits in the coastal and lowland zones are not included either (see Tables 2).

Conservation of wildlife requires protection of their habitats, which may be extensive for wide-ranging species. Of the key wildlife values and habitats in the District (Chapter 5), the following are not protected:

- coastal and riverbed bird species on the rivermouths and lower braided portions of rivers;
- fish and invertebrate species assemblages in Haparapara River, including the rare giant kokopu;
- N.Z. dotterel breeding habitat on Haparapara River estuary.

The following key wildlife values and habitats are partly protected:

- the North Island forest bird species assemblage, for which the wilderness area and proposed ecological areas would provide a core reserve;
- shortjawed kokopu (Motu River only);
- Hochstetter's frog ("Nukutere Scenic Reserve", wilderness area, some proposed ecological areas).

Insufficient is known of the distribution of the short tailed bat to determine how much of its habitat is protected.

Knowledge of invertebrate populations in New Zealand is currently such that the best strategy for invertebrate conservation is protection of representative samples of vegetation and landform (Watt, 1979). Full representation of the ecological super-units in the coastal and lowland zones is therefore required.

TABLE 1 CHECKLIST OF ECOLOGICAL SUPER-UNITS OF THE COASTAL AND LOWLAND ZONES

Abbreviations and explanatory notes

/ Demarcates tiers.

- Links species of approximately equal cover class.

, Separates species in order of decreasing cover class.

n.v. Not vegetated or not vegetation type described.

a Because of exotic species present, cannot be considered to be part of 1840 vegetation datum. Both instances however are the only semi-natural remnant of their vegetation - landform type.

b Recent induced successional units which in the past may have been major units after natural disturbances such as windthrow, lightning, fires, volcanic eruption, or slipping.

c Induced successional units which have increased in relation to their former extent.

d Former major ecological super-unit ("major ecological unit" in Park, 1983) has been interpreted as one which was formerly a significant component of the landscape at about 1840 A.D. The 1840 datum was selected in order that the present study be comparable with representativeness assessments carried out by the Biological Survey of Reserves. As well, the long history of Polynesian modification in the coastal zone of the district makes it difficult to assess the pre-Polynesian vegetation.

e All non-major ecological units however would have contributed to the recognisable original character of the landscape, except for two with a substantial adventive plant component.

f Although there are still numerous areas of greatly modified pohutukawa forest and treeland, intact pohutukawa coastal cliff forest is very rare.

g In cases where the Olearia present is O. pachyphylla, this unit is practically confined to the district.

h Number of extent in district refers to the number of plots measured in each super-unit. This gives only an approximate indication of the extent of the super-unit in the lowland and coastal zones.

i Protection is considered adequate where approximately 10% or more of E.S.U.'s original extent is protected, and poor for between 0 and 10%.

j Proposed Protected Natural Area only.

k The length of river protected under the Motu River National Water Conservation Order.

TABLE 1 CHECKLIST OF ECOLOGICAL SUPER-UNITS OF THE COASTAL AND LOWLAND ZONES

Unit no. (veg) (type)	Bioclimatic zone	Natural community type and class	Landform	Number or extent in district[h]	Former major ecological super-unit[d]	Greatly reduced from former extent	Confined to district	Protected Area Status: Total area (ha)	No. of areas	Adequacy of protection[(i)]
A HYDROECOLOGICAL CLASSES										
1 (1)	coastal	Ruppia polycarpa, Limosella lineata aquatic herbfield	lagoon mudflat	1	No	Yes	No	0	0	Nil
2 (1)	coastal	Juncus microcephalus, Aster subulata rushland	lagoon mudflat	1	No[a]	No	No	0	0	Nil
3 (1)	coastal	Plagianthus divaricatus - Cyperus ustulatus shrubland	old lagoon	1	No	Yes	No	0	0	Nil
4 (2)	coastal	cabbage tree treeland swamp	alluvial terrace	1	No	No	No	0	0	Nil
5 (2)	coastal	Phormium tenax flax swamp	dried stream course	1	No	No	No	0	0	Nil
6 (5)	lowland coastal	raupo reedland	infilled gullies, poorly drained terrace sites, beach strand depressions	7	No	No	No	0	0	Nil
7 (n.v.)	lowland coastal	bare riverbeds and flowing waters	major river valleys	-	Yes	Yes	No	95 km[k]	1	Adequate
8 (2)	lowland	Carex geminata sedge swamp	peaty infilled gully impeded drainage	1	No	No	No	0	0	Nil
9 (2)	lowland	Isachne globosa grass swamp	peaty infilled gully	1	No	No	No	0	0	Nil
10 (4)	lowland	manuka scrub bog	poorly drained peat in valley bottoms	2	No	No	No	0	0	Nil
11 (5)	lowland	kahikatea swamp forest and treeland and kahikatea forest	alluvial valleys	3	No	Yes	No	69 ha	1	Poor

TABLE 2: Special features of high conservation priority

(i)	Rare and endangered species[a]	Survey Areas or Habitats
	Carmichaelia williamsii	Raukokore River, Motuaruhe
	Olearia pachyphylla Metrosideros carminea	Haurere and Opape Headlands
		Raukokore Reserve, Pohueroro
		Maungaroa North, Houpoto A,
		Houpoto D.
	Giant kokopu	Haparapara River
	N.Z. dotterel	Haparapara River mouth
	Shortjawed kokopu	Haparapara River
	Hochstetter's frog	Torere 64/65, Torere Stm, Manuriki Stm, Orini Stm, Waiorore Stm, Whanarua Stm, Te Aruhe Ahika, Mangahatoto Stm, Waihueroro Stm, Mangaikakorea Stm, Raukokore R tributary (GR N62: 298559); probably other streams.
(ii)	Limits of distribution	
	Beilschmiedia tarairi southern limit	Torere Bush[b]
	Carmichaelia williamsii " "	Whanarua
	Coprosma rubra northern limit	Toatoa
(iii)	Special habitats	
	Haparapara/Waikakariki Rivers[c]	

a. Advice on protection of specific sites of rare and endangered species may be sought from Department of Lands and Survey Gisborne, N.Z. Wildlife Service Wellington, and Botany Division D.S.I.R. Lincoln.

b. The gully behind Hawai Marae is the next taraire site north of the southern limit.

c. These rivers are some of the largest lacking introduced salmonids. It is the policy of the N.Z. wildlife Service to retain these rivers in their natural state as far as possible and to exclude introduced fish species (C.J. Richmond, pers. comm.).

6.5 Selection of Priority Natural Areas

Having carried out the steps listed at the outset of this chapter, priority natural areas were selected. The aim was to achieve, where possible, large viable corridors from sea coast to mountain top, with a complete altitudinal sequence of ecological super-units and incorporating as many special features (Table 2) as possible.

Only three localities exist where it is still possible to achieve such large representative reserves: Whanarua-Kereu, Motu and Torere.

Ecological super-units which were under-represented or unrepresented in these corridors , because they are generally outliers surrounded by highly modified vegetation or developed land (e.g. kahikatea-pukatea forest), were then considered. The best three examples (if three existed) of each, based on size and condition, were selected as outlier Priority Natural Areas.

The Priority Natural Areas so determined are listed and their values briefly described below (section 6.6.). They are shown on Figures 3 and Figures 4 to 10.

To summarise, three corridors and associated outliers have been selected and a priority order indicated. Two of the proposed corridors (Whanarua-Kereu and Motu) contain a representative sample of most of the ecological super-units of the district and the third (Torere) has an incomplete sample of ecological super-units.

In the second and third priority corridors, the core areas of importance are indicated by a first priority rating so that should negotiation for protection of a complete corridor fail the area of greatest importance might still be sought. However, in this event, it would be essential that those associated with the original survey be involved in any re-assessment of priorities.

Although the corridors have been listed in a priority order it should be noted that the reservation of at least the two best corridors (Whanarua-Kereu and Motu) and all the first priority outliers would be necessary to represent adequately the latitudinal variation of vegetation and associated biological and landscape features of the district.

This conclusion rests on the proviso that the already proposed Opape Lands corridor (Daniel, 1983) comes to fruition. If the Opape Lands corridor does not eventuate the Torere corridor would assume much greater importance.

6.6 Priority Natural Areas

Brief descriptions of the Priority Natural Areas are given below. More complete information on the survey areas in each Priority Natural Area can be found in Appendix V and the survey area numbers cited can also be used to refer to the survey area cards which are held at the Gisborne office of the Department of the Lands and Survey. The area (ha) given for each Priority Natural Area is approximate only. The grid reference indicates the approximate centre of the Priority Natural Area. The location of each of the Priority Natural Areas is shown on Figures 4 to 10.

PRIORITY ONE AREAS

1:1 Whanarua-Kereu corridor (Figure 8)

Area: 9552ha

Altitude: 0-883m

Grid reference: N62 280510

Survey Areas: 5355-0001 Puhoeroro block, 5155-0005 Maungaroa North and part Waikawa (access not granted), 5255-0001 part Motuaruhe, 5204-0001 Kereu River, 5155-0002 part Te Kaha.

Description: A complete altitudinal sequence from coastal pohutukawa forest to montane hard beech, tawari, kamahi, quintinia forest. The great majority of the corridor comprises a mosaic of lowland (steepland) broadleaved tawa, kamahi, rewarewa forest-hard beech, broadleaved tawa, rewarewa forest-hard beech, tanekaha, rewarewa forest. Links with the proposed Raukumara Wilderness Area and the proposed Raukokore Ecological Area. Includes the greatest range of ESU's and most of the best examples in the District. "These blocks are of outstanding wildlife value... including animals with limited distributions such as Hochstetter's frog and kaka" (Saunders, 1984).

Other special features include the presence of the threatened native broom, Carmichaelia williamsii, and the threatened carmine rata, Metrosideros carminea, (in substantial numbers), pockets of taraire and the only kahikatea-matai forest in the District.

1:2 Raukokore River kahikatea-pukatea forest (Figure 10)

Area: 12.5ha

Altitude: 75-120m

Grid reference: N62 373519

Survey area: 5355-0001 Puhoeroro block

Descriptions: An unmodified kahikatea-pukatea forest on an alluvial terrace beside the Raukokore River. Surrounded by tawa forest, on the hillslopes, and black beech-rimu forest, on the ridges. This area will be discussed more fully by the forthcoming Pukeamaru PNA Survey report.

1:3 Raukokore (Figure 9)

Area: 115ha

Altitude: 15m

Grid reference: N62 280595

Survey areas: 5255-0007 Raukokore Beach, 5255-0008 Kapongaro, 5255-0004 lower Raukokore River.

Description: Tauhinu scrub and shrubland, raupo reedland, lagoon vegetation (Plagianthus divaricatus, Juncus microcephalus, Ruppia polycarpa), cabbage tree swamp and remnant taraire forest at Raukokore Beach, rivermouth and vicinity. The only example of lagoon vegetation in the District and the only intact landform of its type. A special feature is the presence of the threatened shrub, Carmichaelia williamsii.

The taraire forest is all that remains of what was presumably a more widespread type in this locality. Broadleaved tawa (in this instance a form which keys to tawaroa) occurs with the taraire. A breeding colony of southern black backed gulls is present at the Raukokore River mouth.

1:4 Haparapara and Waikakariki Rivers (Figure 7)

Area: 187.5ha

Altitude: 0-610m

Grid reference: N70 123425

Survey area: 5054-0003 Haparapara and Waikakariki Rivers

Description: An area of special wildlife interest (C.J.Richmond pers. comm.); the only salmonid free river in the District and one of the few such rivers in New Zealand (D.Rowe pers. comm.). Supports populations of two threatened fish species, short jawed kokopu and giant kokopu. Includes small areas of manuka scrub, pohutukawa, houpara forest, kanuka scrub and forest and broadleaved tawa, puriri forest.

1:5 Opape Headland (Figure 5)

Area: 25ha

Altitude: 0-45m

Grid reference: N70 850230

Survey area: 4852-0001 Opape Headland

Description: Pohutukawa, koromiko, olearia, whaririki scrub on coastal cliffs with large numbers of the threatened shrub, Olearia pachyphylla. This is probably the most substantial population of the species in New Zealand.

1:6 Torere 64 kahikatea forest (Figure 4)

Area: 20ha

Altitude: 335m

Grid reference: N79 955155

Survey area: 4951-0002 Torere 64/65 Lands

Description: A remnant of now uncommon kahikatea forest and associated wetland. Modified by cattle browsing and trampling but with the potential to recover if managed appropriately.

1:7 Te Uritukituki (Figure 6)

Area: 12.5ha

Altitude: 0-120-m

Grid reference: N70 982333

Survey area: 4953-0001 Te Uritukituki

Description: One of the three best examples of pohutukawa, puriri forest, a type much reduced from its former extent. Occurs on a low marine terrace above Te Uritukituki Beach.

1:8 Houpoto Swamp (Figure 6)

Area: 177.5ha

Altitude: 30m

Grid reference: N 70 005325

Survey area: 4953-0003 Houpoto Swamp E

Description: The largest intact fertile palustrine wetland in the District. Occurs in a valley floor of the Houpoto Stream. Vegetation types represented include raupo reedland, Isachne globosa swamp and Carex geminata swamp. A belt of manuka grows on some peaty mariginal sites. Several wetland species found here are unknown

elsewhere in the District including the nationally uncommon monocotyledonous herb, Sparganium subglobosum. Spotless crake are found here.

1:9 Torere Bush (Figure 6)

Area: 32.5ha

Altitude: 60-213m

Grid reference: N70 935258

Survey area: 4952-0008 Torere Bush

Description: A first priority core area in the Torere corridor. Here taraire occurs at its known southern limit. The forest is broadleaved tawa, pohutukawa, puriri.

1:10 Whitianga (Figure 7a)

Area: 102.5

Altitude: 30-275m

Grid reference: N70 035385

Survey area: 5053-0002 part Whitianga block

Description: A first priority core area in the Motu corridor. One of the three best examples of coastal pohutukawa, puriri, broadleaved tawa and broadleaved tawa, pohutukawa, puriri forest in the District. Occurs on marine terrace and low hills above Whitianga Bay.

1:11 Motu Kaimeanui Island (Figure 8a)

Area: 1.5ha

Altitude: 0-15m

Grid reference: N61 218587

Survey area: 5255-0006 Motu Kaimeanui Island

Description: One of the three best examples of an island in the District. The vegetation is mainly pohutukawa-Pseudopanax lessonii and Pseudopanax lessonii-Pittosporum tenuifolium forest. Exhibits the complete zonation from Leptocarpus and sea rush to coastal scrub and forest. A nesting colony of black backed gulls is present and white fronted terns roost here.

1:12 Motu Papuku Islands (Figure 8a)

Area: 2ha

Altitude: 0-15m

Grid reference: N61 213580

Survey area: 5255-0005 Motu Papaku Island

Description: Two of the best three examples of islands in the District. Covered with Pseudopanax lessonii-rewarewa-mangeao-puriri forest.

1:13 Kereu River pukatea-kahikatea forest (Figure 8a)

Area: 12ha

Altitude: 120m

Grid reference: N70 212487

Survey area: 5254-0001 Maungaroa South

Description: A modified remnant of pukatea-kahikatea forest on an alluvial terrace of the Kereu River. Has the potential to recover if managed appropriately.

PRIORITY TWO AREAS

2:1 Motu corridor (Figure 7)

Area: 5463ha

Altitude: 0-870m

Grid reference: N70 120340

Survey areas: 5053-0002 Whitianga block, 5053-0003 Omaio block, 5054-0001 part Wharawhara block, Mangaroa (access not granted), Ohutu (access not granted)

Description: A complete altitudinal sequence from coastal pohutukawa forest and treeland, and pohutukawa, puriri, broadleaved tawa forest to montane hard beech, tawari, kamahi, quintinia forest. The great majority of the corridor comprises a mosaic of lowland (steepland) broadleaved tawa, kamahi, rewarewa and hard beech, tanekaha, rewarewa forest. Also included are minor areas of cassinia shrubland, cassinia-kanuka scrub and kahikatea-pukatea forest with kowhai. Links with the proposed Raukumara Wilderness Area and incorporates the lower reaches of the Motu River and Tokata Scenic Reserve. An area of special wildlife interest (C.J.Richmond pers. comm.); and a roosting site for gulls and white fronted terns (Motu River mouth).

2:2 Tokaroa Rock (Figure 6)

Area: 0.3ha

Altitude: 0-30m

Grid reference: N70 967316

Description: A rock stack, near Te Uritukituki Beach, which supports breeding colonies of white fronted terns and red billed gulls.

2:3 Torere kahikatea forest and manuka scrub swamp (Figure 4)

Area: 3.7ha

Altitude: 213m

Grid reference: N79 974145

Survey area: 4951-0002 part Torere 64/65 Lands

Description: A very small remnant of now uncommon kahikatea swamp forest and adjoining manuka scrub swamp.

PRIORITY THREE AREAS

3:1 Torere corridor (Figure 6)

Area: 1095ha

Altitude: 0-579m

Grid reference: N70 912202

Survey areas: 4952-0001 Pehitairi Headland, 4952-0002 part Te Waiti, 4952-0008 Torere Bush

Description: A sequence from coastal pohutukawa forest and treeland and induced scrub to moderately and highly modified lowland (steepland) forest. Provides the shortest link to a proposed Ecological Area (Paraumu), and buffers the pohutukawa, puriri, broadleaved tawa forest containing the southernmost known taraire.

3:2 Awanui Pied Shag Colony (Figure 7a)

Area: 17.5ha

Altitude: 0-20m

Grid reference: N70 074443

Survey area: 5054-0002 part Awanui-Haparapara

Description: Pohutukawa forest and treeland with a pied shag colony. An area of special wildlife interest (C.J.Richmond pers. comm.)

3:3 Opape Headland (Figure 5)

Area: 139ha

Altitude: 0-161m

Grid reference: N70 845225

Survey area: 4852-0001 Opape Headland

Description: Broadleaved tawa, pohutukawa, puriri forest; manuka, Coprosma spp., koromiko scrub, and Pseudopanax arboreus-mamaku scrub and forest which forms the buffer to a first priority area containing the threatened shrub, Olearia pachyphylla. Also includes the best example of raupo reedland in the District. Links with Oroi Scenic Reserve and the Opape Lands proposed reserve (Daniel, 1983).

3:4 Haurere Headland (Figure 5)

Area: 50ha

Altitude: 0-167m

Grid reference: N70 867237

Survey area: 4852-0002 Haurere Headland

Description: Manuka scrub, broadleaved tawa-puriri-karaka forest, and pohutukawa treeland. The threatened shrub, Olearia pachyphylla, is common on the steep coastal cliffs and there is a gannet colony near the bay on the headland.

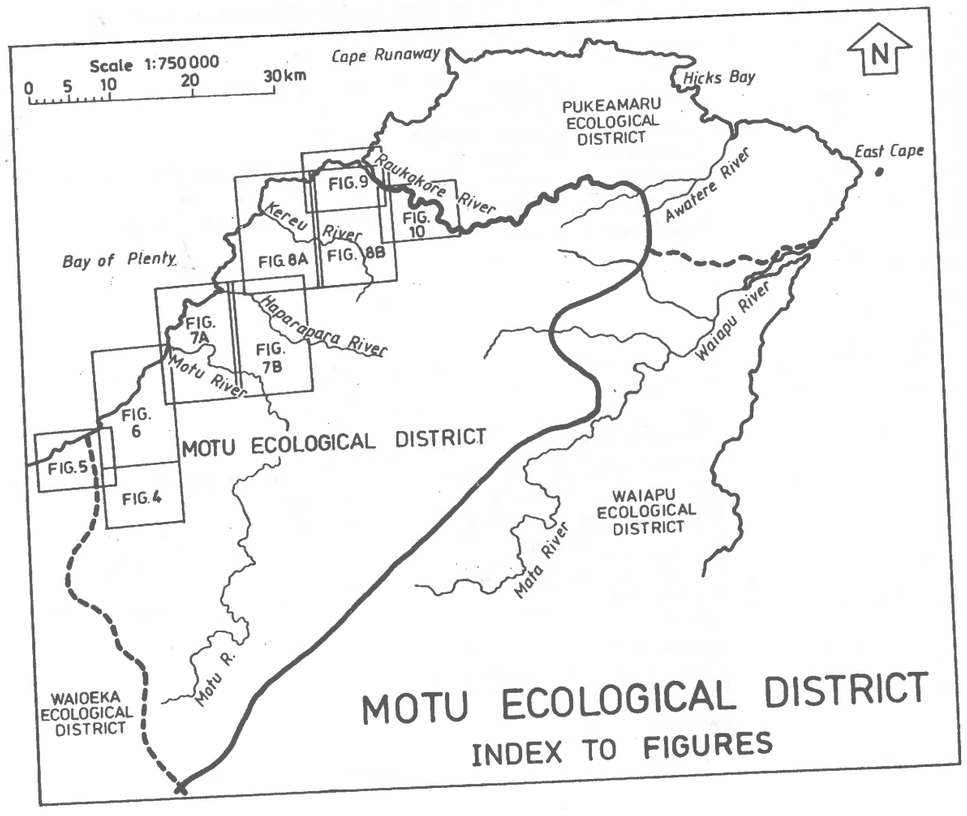
PRIORITY NATURAL AREA MAPS

KEY :

PRIORITY 1

PRIORITY 2

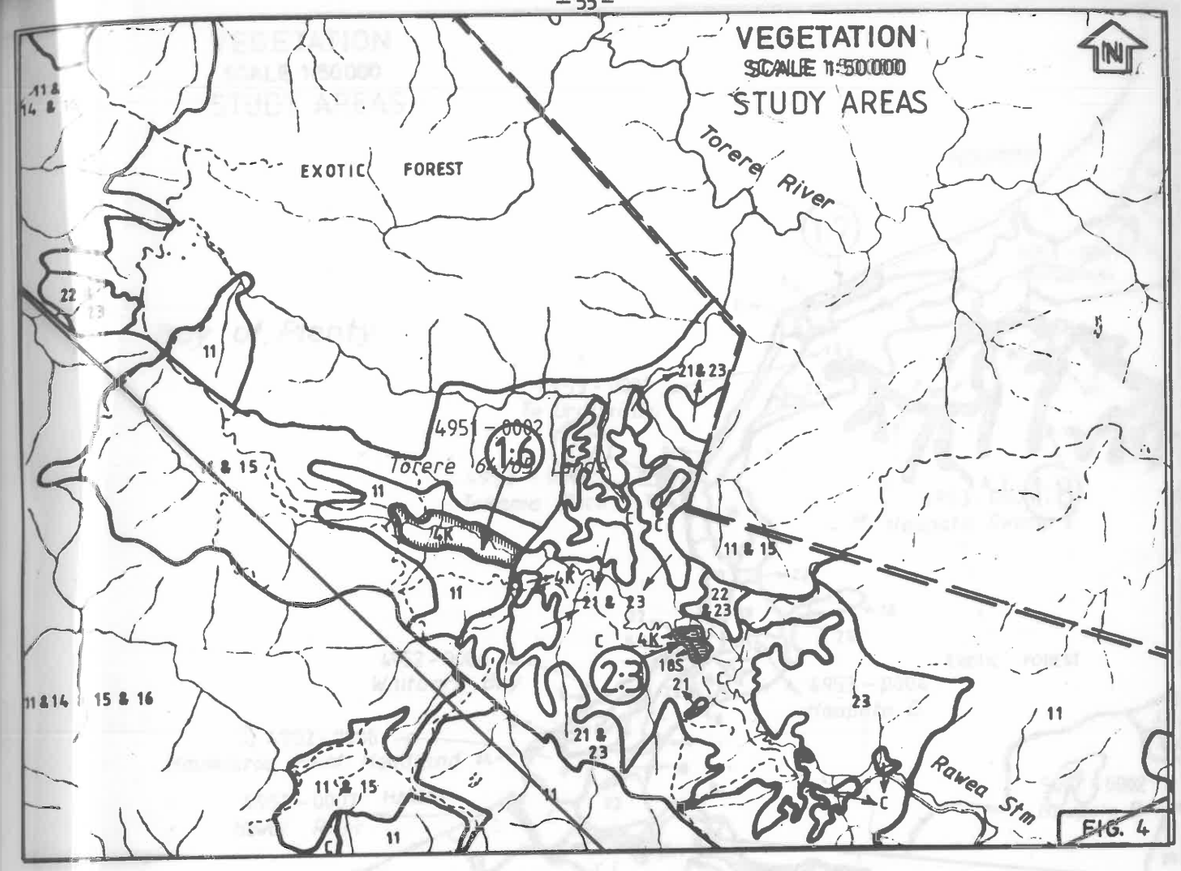
PRIORITY 3

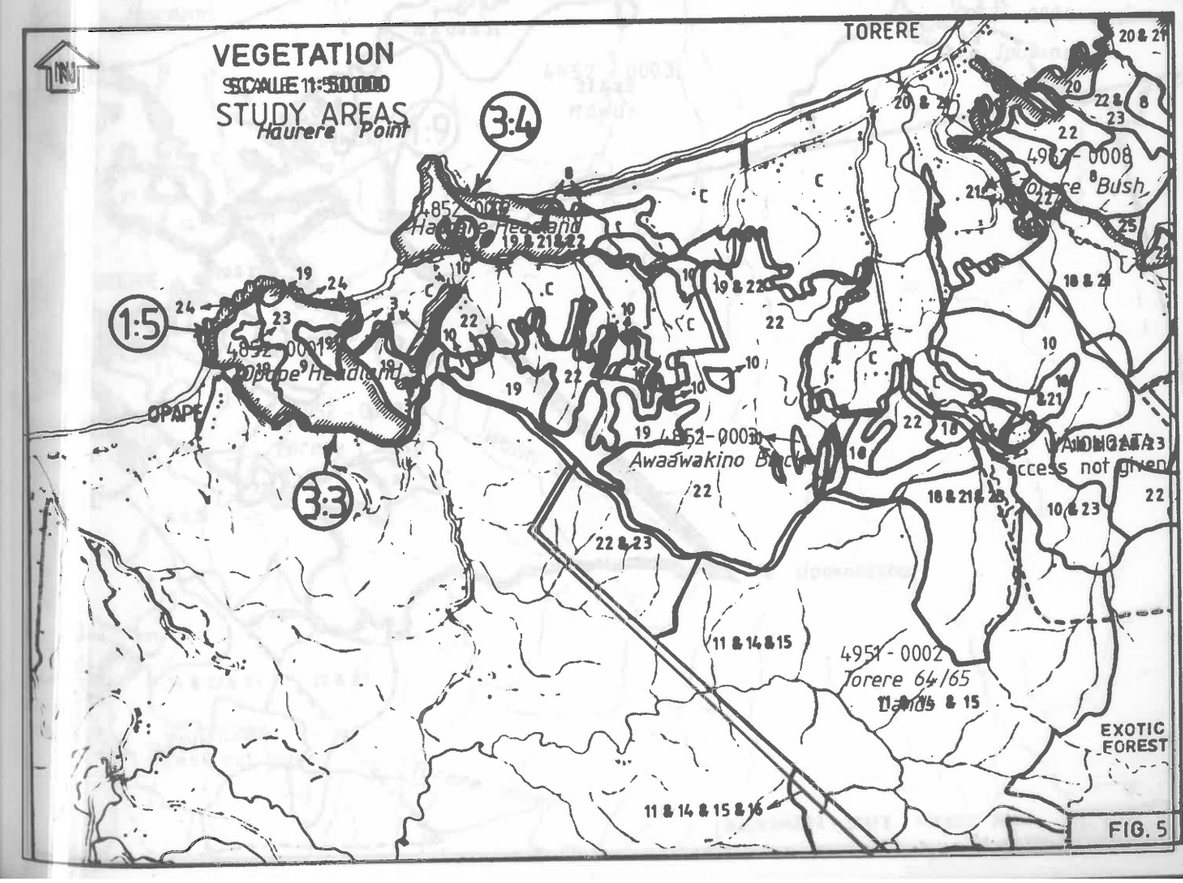


VEGETATION LEGEND

Mapping unit number	ESU's	Name
1	1,2,3	lagoon vegetation
2	4,5,8,9	swamp vegetation
3	6	raupo reedland
4	11,12,31	kahikatea-pukatea forest and treeland
5	15	taraire, broadleaved tawa forest
6	16	pohutukawa forest and treeland
7	18	pohutukawa, houpara forest
8	19,20	pohutukawa, puriri, broadleaved tawa forest
9	21	broadleaved tawa, pohutukawa, puriri forest
10	32,33	broadleaved tawa, puriri forest
11	36	broadleaved tawa, kamahi, rewarewa forest
12	38	B. tawa s.l. kamahi, tawari, hinau forest
13	22	hard beech, pohutukawa forest
14	34	hard beech, broadleaved tawa, rewarewa forest
15	35	hard beech, tanekaha, rewarewa forest
16	39	hard beech, tawari, kamahi, quintinia forest
17	14,26	tauhinu scrub and shrubland
18	10,29	manuka scrub
19	25	manuka, Coprosma spp., koromiko scrub
20	23	manuka-kanuka scrub
21	24,27	kanuka scrub and forest
22	28	kanuka-Pseudopanax arboreus-rewarewa scrub and forest
23	30	Pseudopanax arboreus-mamaku scrub and forest
24	17	pohutukawa, koromiko, olearia, whahariki scrub
25	37	rewarewa-tanekaha forest

Code		
B	7,13	bare riverbed (includes water)
C		farmland
Ca		Carex geminata
Cb		cabbage tree (Cordyline australis)
E		exotic forest (in some places includes small pockets of indigenous forest)
F		flax (Phormium tenax)
I		Isachne globosa
J		Juncus microcephalus
K		kahikatea
M		matai
P		pukatea
PL		Plagianthus divaricatus
R		Ruppia polycarpa
S		swamp





VEGETATION LEGEND

Mapping unit number	ESU's	Name
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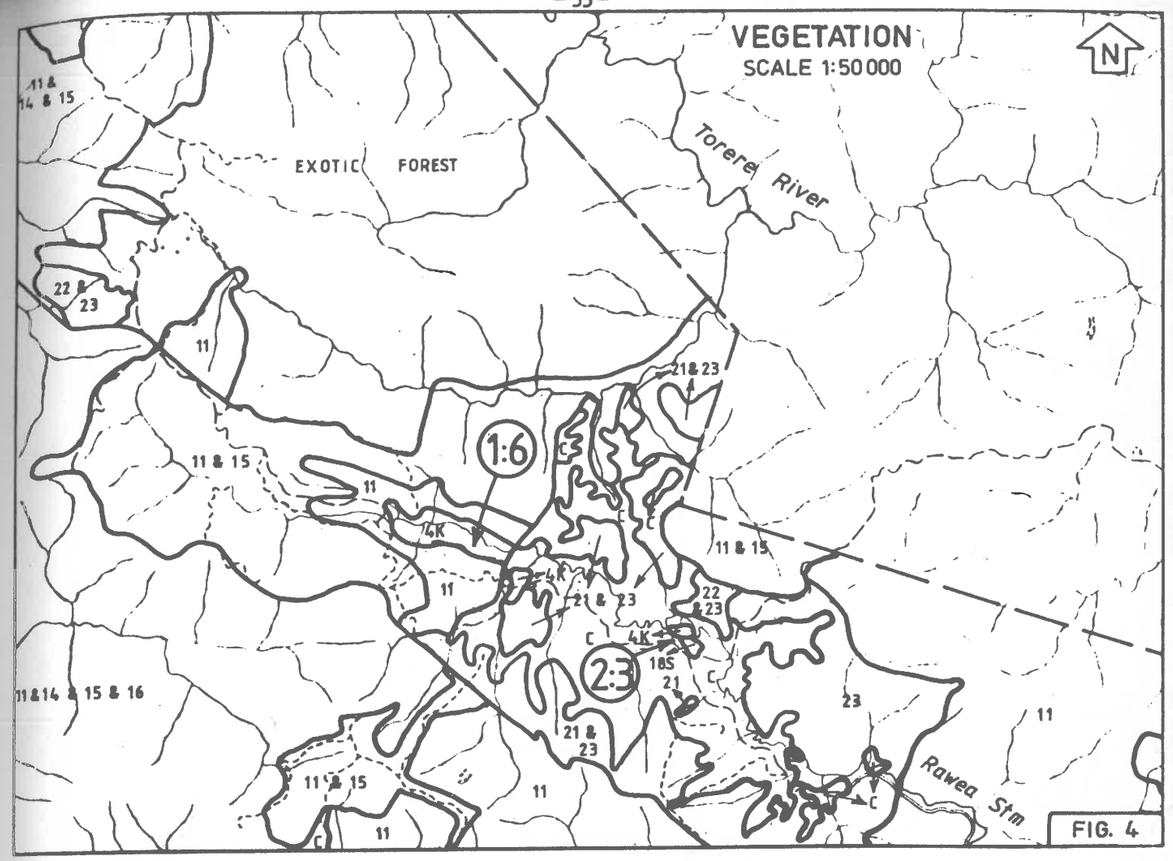
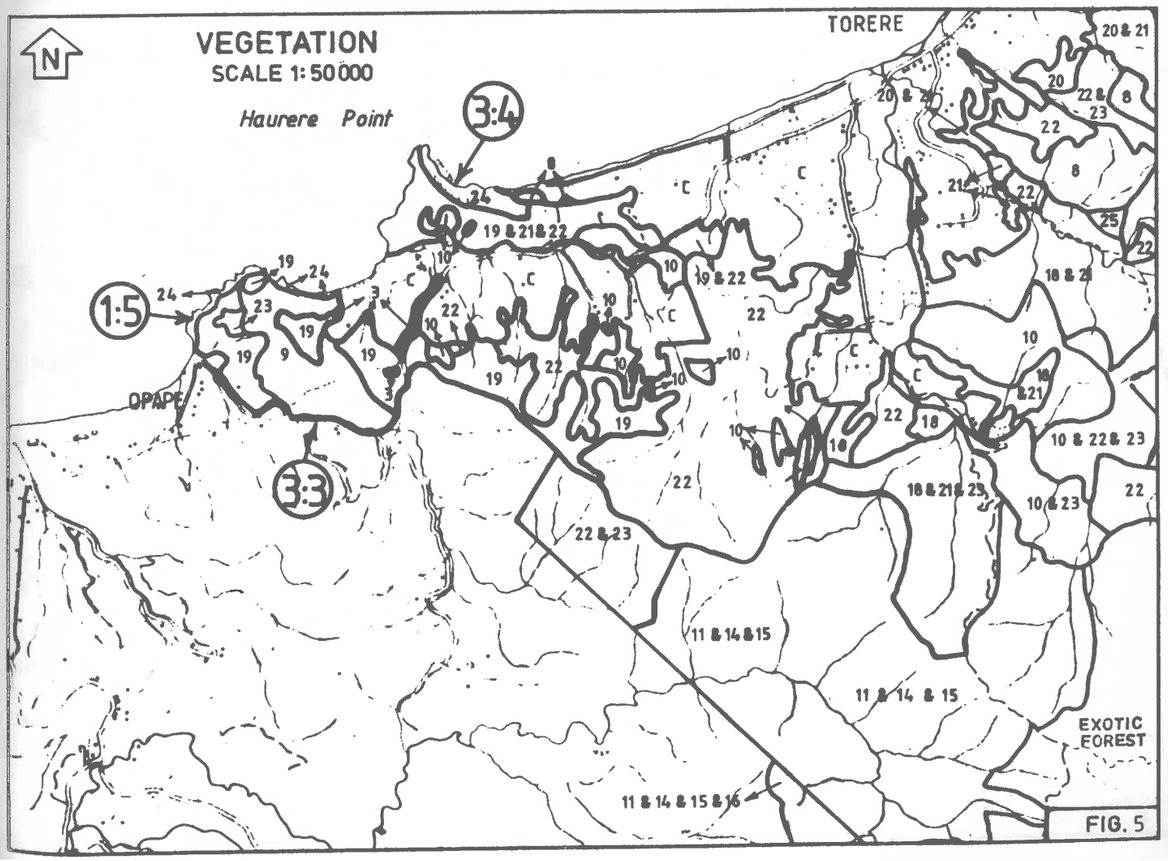
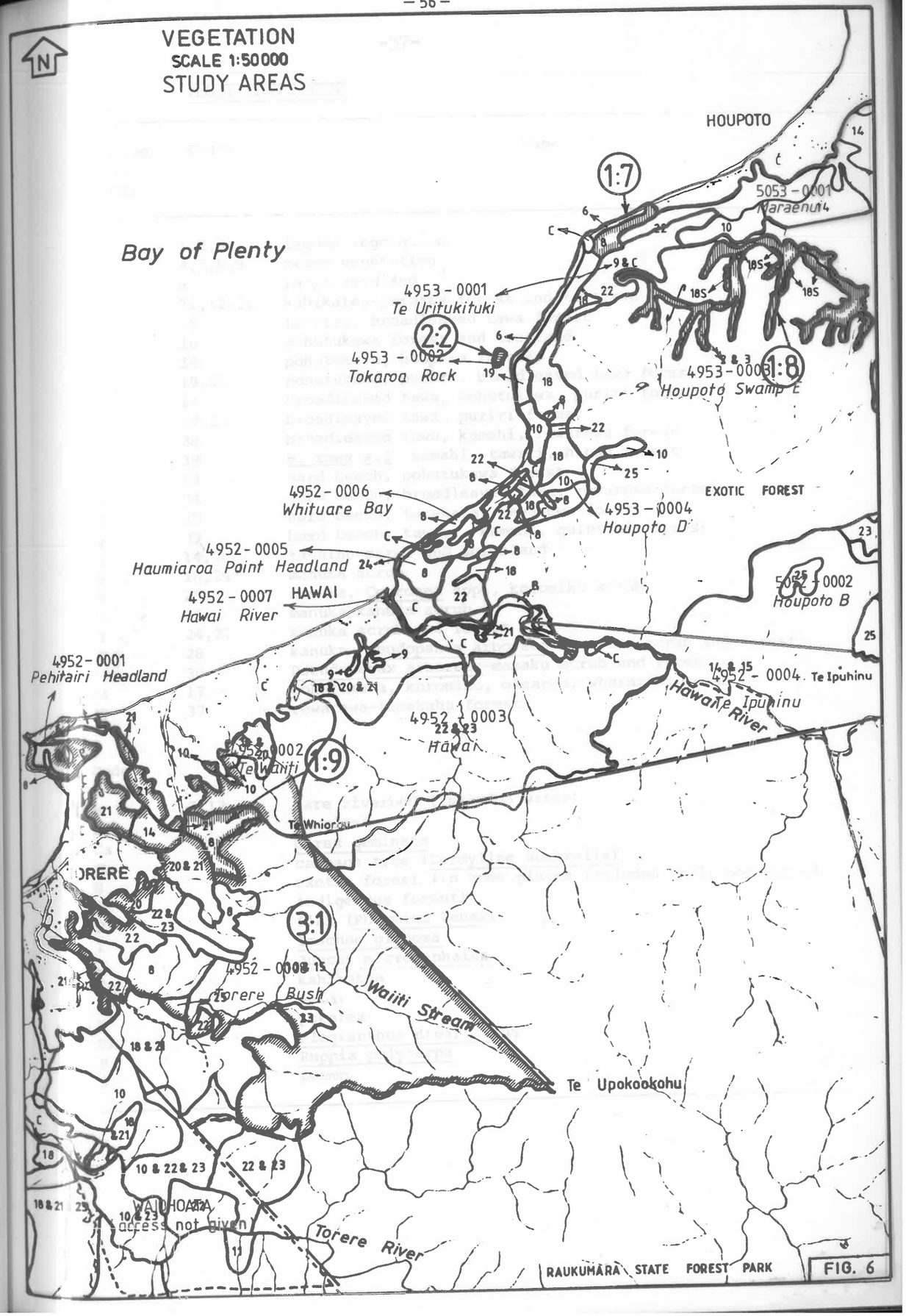
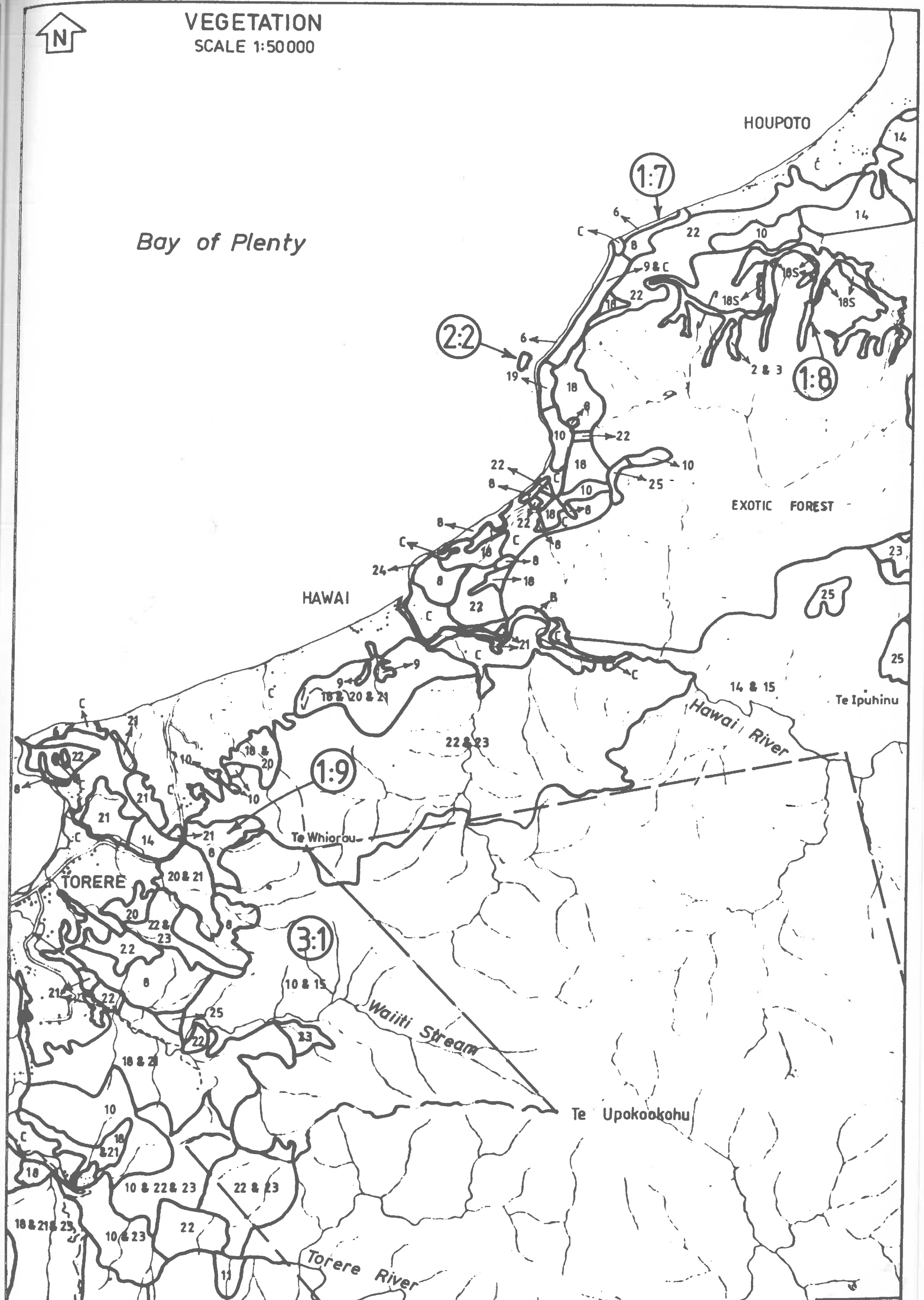
2	4,5,8,9	swamp vegetation
3	6	raupo reedland
4	11,12,31	kahikatea-pukatea forest and treeland
5	15	taraire, broadleaved tawa forest
6	16	pohutukawa forest and treeland
7	18	pohutukawa, houpara forest
8	19,20	pohutukawa, puriri, broadleaved tawa forest
9	21	broadleaved tawa, pohutukawa, puriri forest
10	32,33	broadleaved tawa, puriri forest
11	36	broadleaved tawa, kamahi, rewarewa forest
12	38	B. tawa s.l. kamahi, tawari, hinau forest
13	22	hard beech, pohutukawa forest
14	34	hard beech, broadleaved tawa, rewarewa forest
15	35	hard beech, tanekaha, rewarewa forest
16	39	hard beech, tawari, kamahi, quintinia forest
17	14,26	tauhinu scrub and shrubland
18	10,29	manuka scrub
19	25	manuka, Coprosma spp., koromiko scrub
20	23	manuka-kanuka scrub
21	24,27	kanuka scrub and forest
22	28	kanuka-Pseudopanax arboreus-rewarewa scrub and forest
23	30	Pseudopanax arboreus-mamaku scrub and forest
24	17	pohutukawa, koromiko, olearia, whahariki scrub
25	37	rewarewa-tanekaha forest

Code		
B	7,13	bare riverbed (includes water)
C		farmland
Ca		Carex geminata
Cb		cabbage tree (Cordyline australis)
E		exotic forest (in some places includes small pockets of indigenous forest)
F		flax (Phormium tenax)
I		Isachne globosa
J		Juncus microcephalus
K		kahikatea
M		matai
P		pukatea
PL		Plagianthus divaricatus
R		Ruppia polycarpa
S		swamp






VEGETATION
SCALE 1:50000
STUDY AREAS
N
Bay of Plenty
HOUPOTO
1:7
5053 – 0001
Maraenui 4
4953 – 0001
Te Urituki tuki
2:2
4953 – 0002
Tokaroa Rock
4953 – 0003
Houpoto Swamp E
1:8
EXOTIC FOREST
4952 – 0006
Whituare Bay
4953 – 0004
Houpoto D
4952 – 0005
Haumiaroa Point Headland
4952 – 0007
Hawai River
HAWAI
5052 – 0002
Houpoto B
4952 – 0001
Pehitairi Headland
4952 – 0004 Te Ipuhinu
Hawai Te Ipuhinu River
4952 – 0003
Hawai
4952 – 0002
Te Waiiti
1:9
Te Whiorau
TORERE
3:1
4952 – 0008
Torere Bush
Waiiti Stream
Te Upokookohu
WAIHOATA
access not given
Torere River
RAUKUMARA STATE FOREST PARK
FIG. 6


VEGETATION
SCALE 1:50000
N
Bay of Plenty
HOUPOTO
HAWAI
TORERE
EXOTIC FOREST
Te Ipuhinu
Hawai River
Te Whiorau
Waiiti Stream
Te Upokookohu
Torere River
RAUKUMARA STATE FOREST PARK
1:7
1:8
2:2
1:9
3:1
FIG. 6

VEGETATION LEGEND

Mapping unit number	ESU's	Name
1	1,2,3	lagoon vegetation
2	4,5,8,9	swamp vegetation
3	6	raupo reedland
4	11,12,31	kahikatea-pukatea forest and treeland
5	15	taraire, broadleaved tawa forest
6	16	pohutukawa forest and treeland
7	18	pohutukawa, houpara forest
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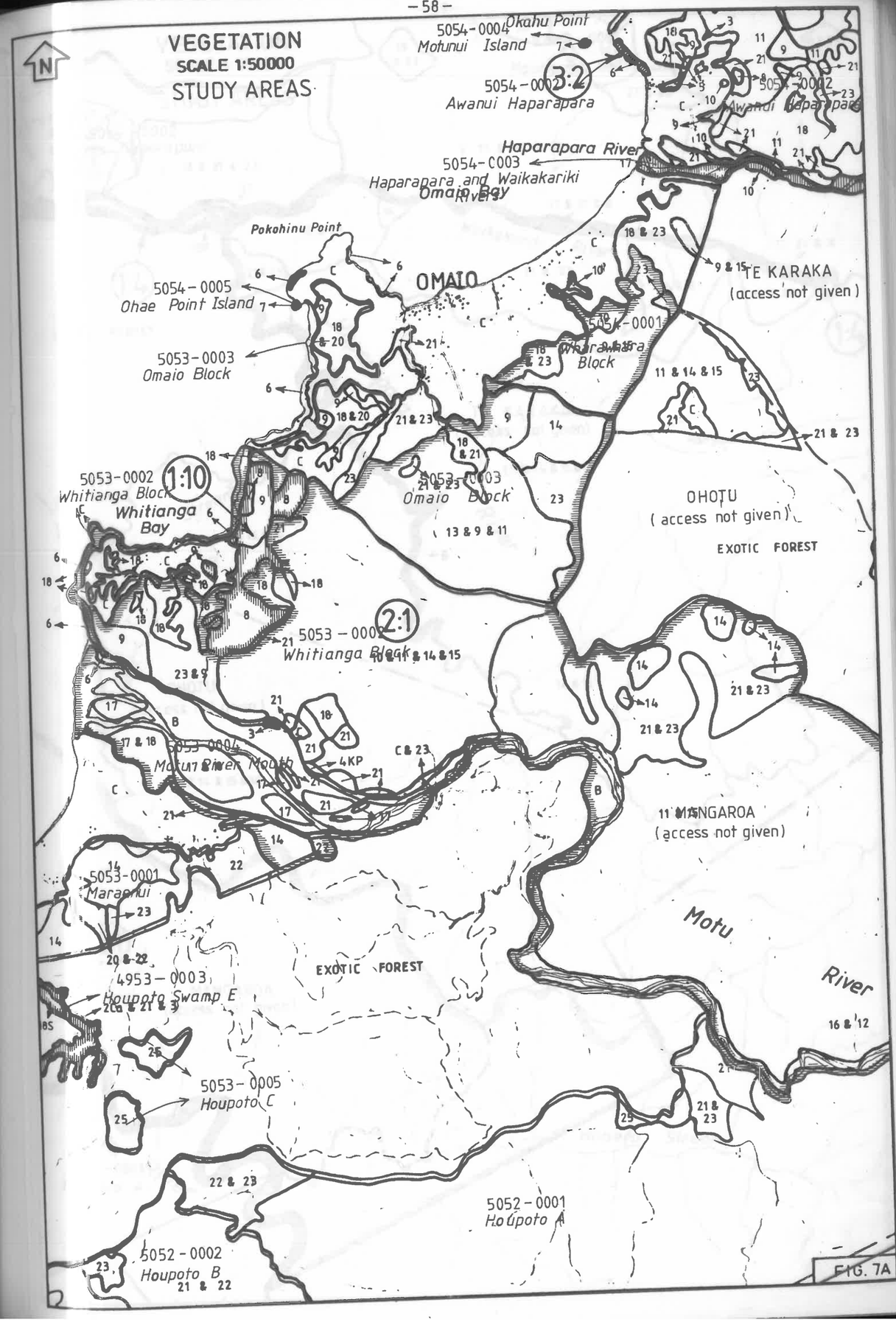
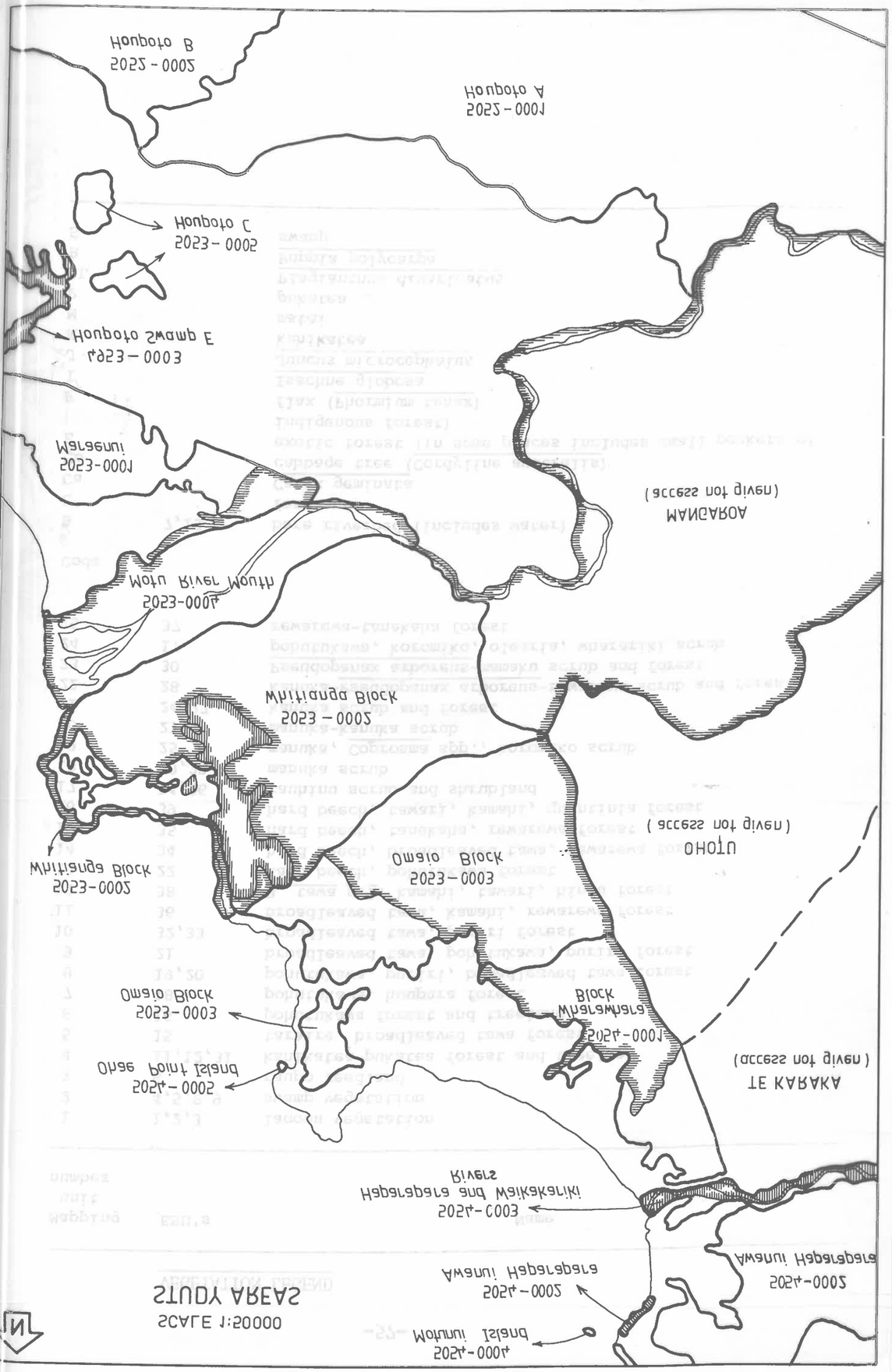
9	21	broadleaved tawa, pohutukawa, puriri forest
10	32,33	broadleaved tawa, puriri forest
11	36	broadleaved tawa, kamahi, rewarewa forest
12	38	*B. tawa s.l.* kamahi, tawari, hinau forest
13	22	hard beech, pohutukawa forest
14	34	hard beech, broadleaved tawa, rewarewa forest
15	35	hard beech, tanekaha, rewarewa forest
16	39	hard beech, tawari, kamahi, quintinia forest
17	14,26	tauhinu scrub and shrubland
18	10,29	manuka scrub
19	25	manuka, *Coprosma* spp., koromiko scrub
20	23	manuka-kanuka scrub
21	24,27	kanuka scrub and forest
22	28	kanuka-*Pseudopanax arboreus*-rewarewa scrub and forest
23	30	*Pseudopanax arboreus*-mamaku scrub and forest
24	17	pohutukawa, koromiko, olearia, whaririki scrub
25	37	rewarewa-tanekaha forest
Code		
B	7,13	bare riverbed (includes water)
C		farmland
Ca		*Carex geminata*
Cb		cabbage tree (*Cordyline australis*)
E		exotic forest (in some places includes small pockets of indigenous forest)
F		flax (*Phormium tenax*)
I		*Isachne globosa*
J		*Juncus microcephalus*
K		kahikatea
M		matai
P		pukatea
PL		*Plagianthus divaricatus*
R		*Ruppia polycarpa*
S		swamp


VEGETATION
SCALE 1:50000
STUDY AREAS
N
5054-0004
Motunui Island
Okahu Point
3:2
5054-0002
Awanui Haparapara
Haparapara River
5054-0003
Haparapara and Waikakariki
Omaio Bay
Pokohinu Point
OMAIO
5054-0005
Ohae Point Island
5053-0003
Omaio Block
TE KARAKA
(access not given)
5054-0001
Wharawhara Block
1:10
5053-0002
Whitianga Block
Whitianga Bay
5053-0003
Omaio Block
OHOTU
(access not given)
EXOTIC FOREST
2:1
5053-0002
Whitianga Block
5053-0004
Motu River Mouth
4KP
MANGAROA
(access not given)
5053-0001
Maraenui
Motu River
EXOTIC FOREST
4953-0003
Houpoto Swamp E
5053-0005
Houpoto C
5052-0001
Houpoto A
5052-0002
Houpoto B
FIG. 7A


Honoroto B
2025 - 5000
Honoroto A
2025 - 7000
Honoroto C
2023 - 5000
Honoroto Swamp E
2023 - 6000
Mangauni
2023 - 7000
Wairoa River Mouth
2023-10000
MANGAROA
(access not given)
Whitianga Block
2023 - 5000
Omaio Block
2023 - 6000
Whitingia Block
2023-5000
OTOKO
(access not given)
Omaio Block
2023-6000
Orea point Island
2024 - 7000
TE KARAKA
(access not given)
Mangamangaro Block
2024 - 7000
Hahangahanga and Waikakariki Rivers
2024 - 6000
Motuhuni Island
2024 - 4000
Awauni Hahangahanga
2024 - 5000
Awauni Hahangahanga
2024 - 5000
SCALE 1:20000
STUDY AREAS
N

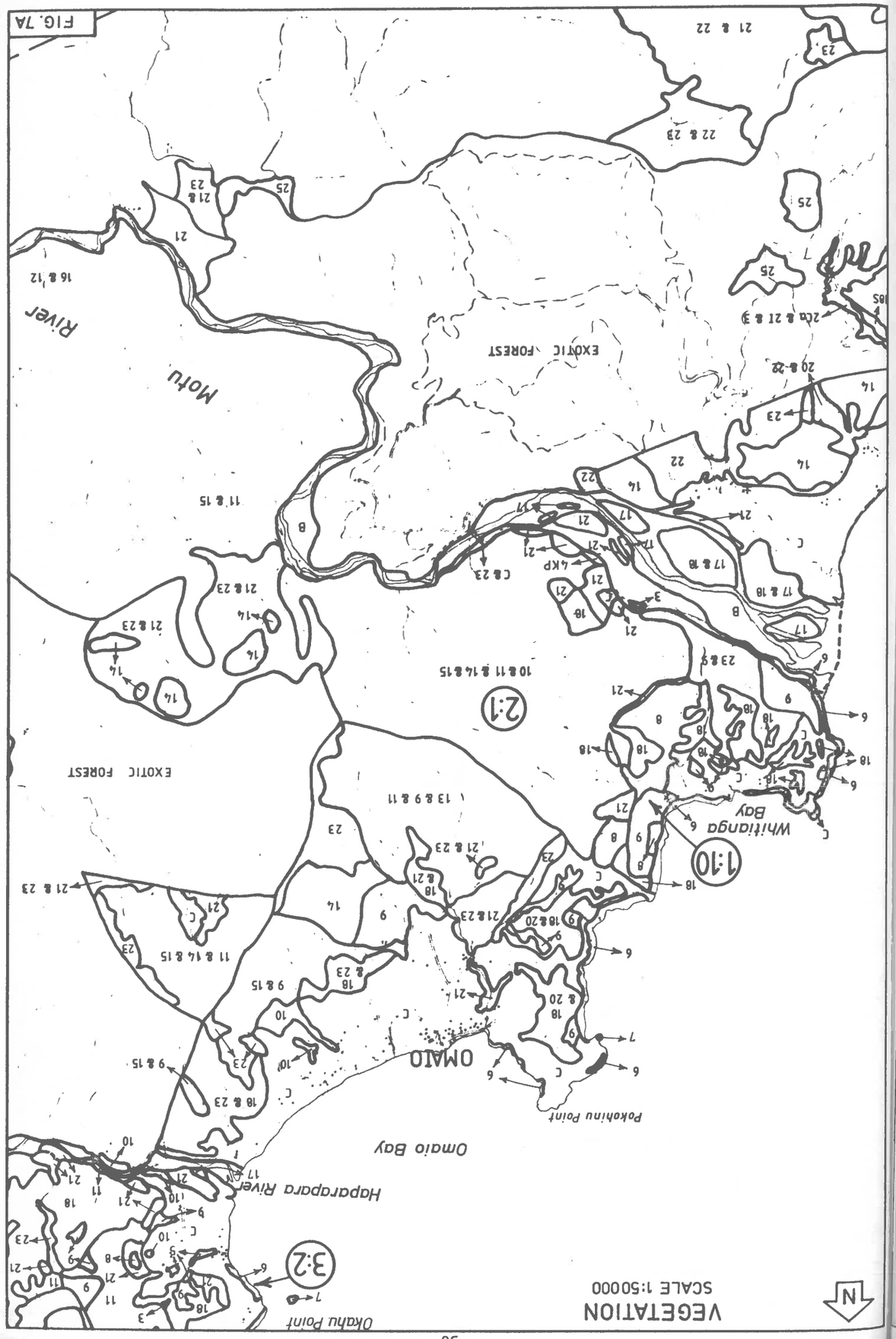
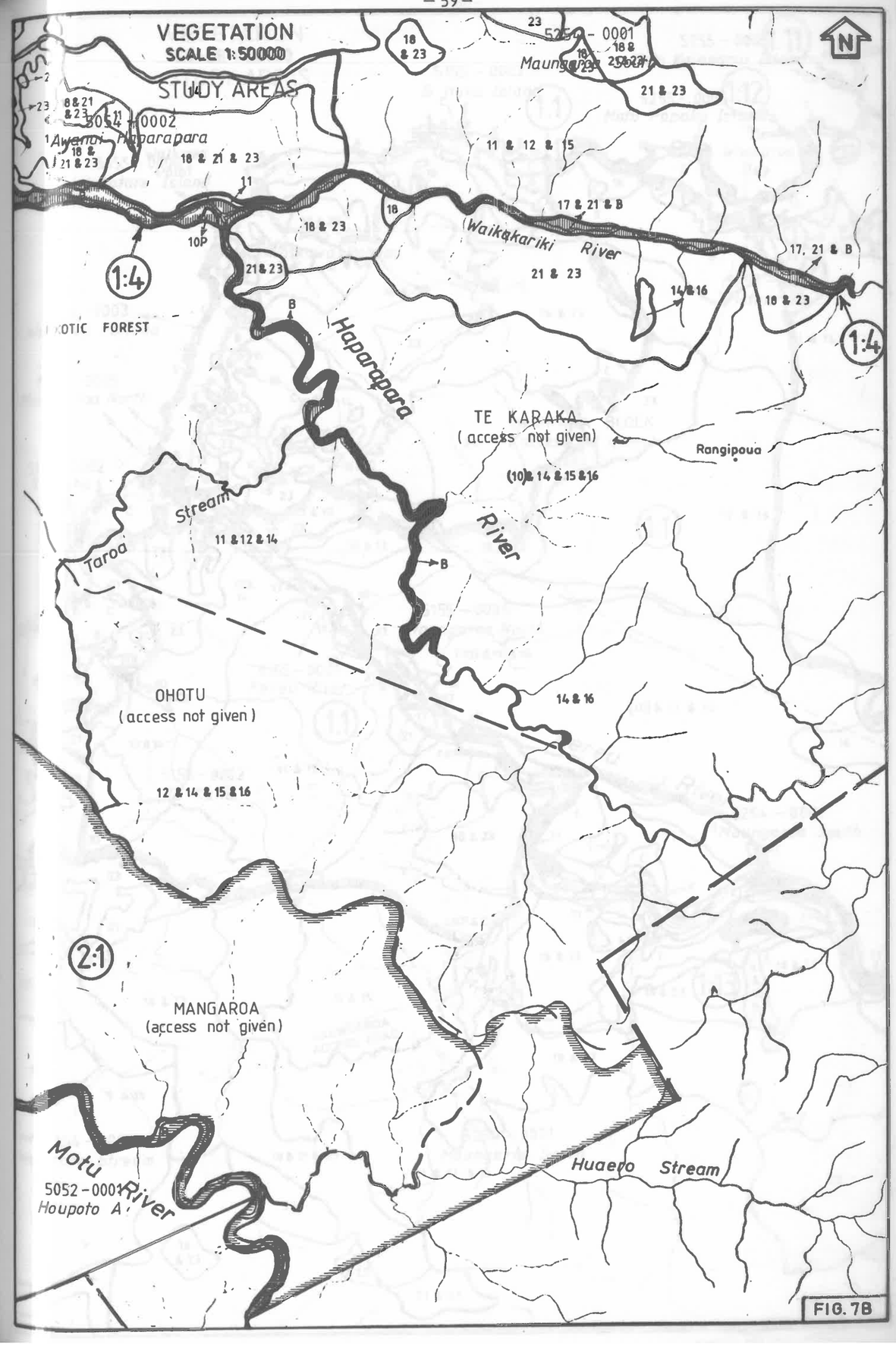
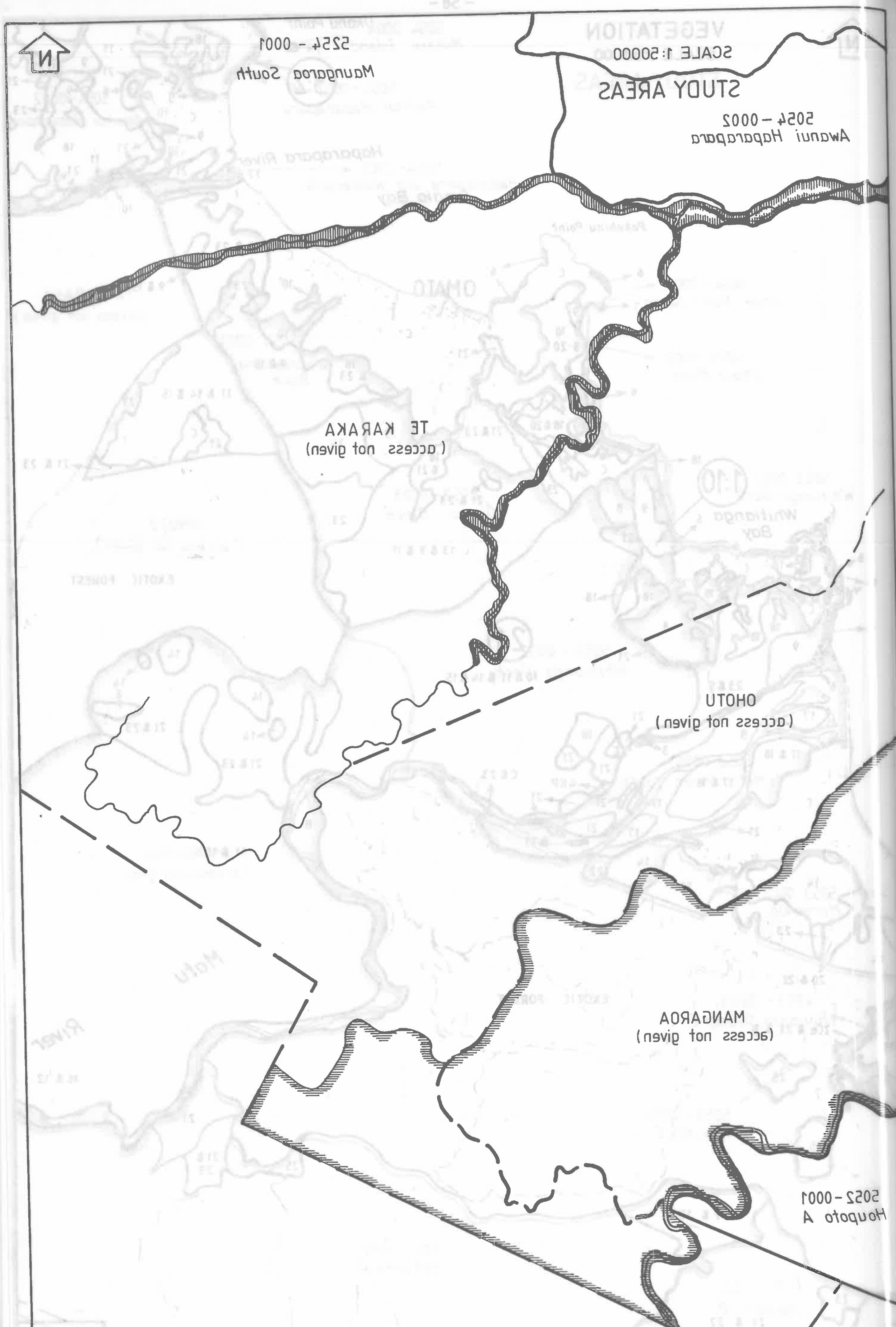


FIG. 7A
EXOTIC FOREST
Motu River
Omaio Bay
Pokohinu Point
Happarapara River
Okahu Point
Whitianga Bay
EXOTIC FOREST
OMAIO
2:1
1:10
3:2
SCALE 1:50000
VEGETATION
N


VEGETATION
SCALE 1:50000
STUDY AREAS
5054 – 0002
Awamoi
Haparapara
18 & 21 & 23
11 & 12 & 15
17 & 21 & B
Waikakariki River
21 & 23
14 & 16
18 & 23
17, 21 & B
1:4
EXOTIC FOREST
Haparapara
TE KARAKA
(access not given)
Rangipoua
(10) & 14 & 15 & 16
Taroa Stream
11 & 12 & 14
River
OHOTU
(access not given)
12 & 14 & 15 & 16
2:1
MANGAROA
(access not given)
Motu River
5052 – 0001
Houpoto A
Huaero Stream
FIG. 78



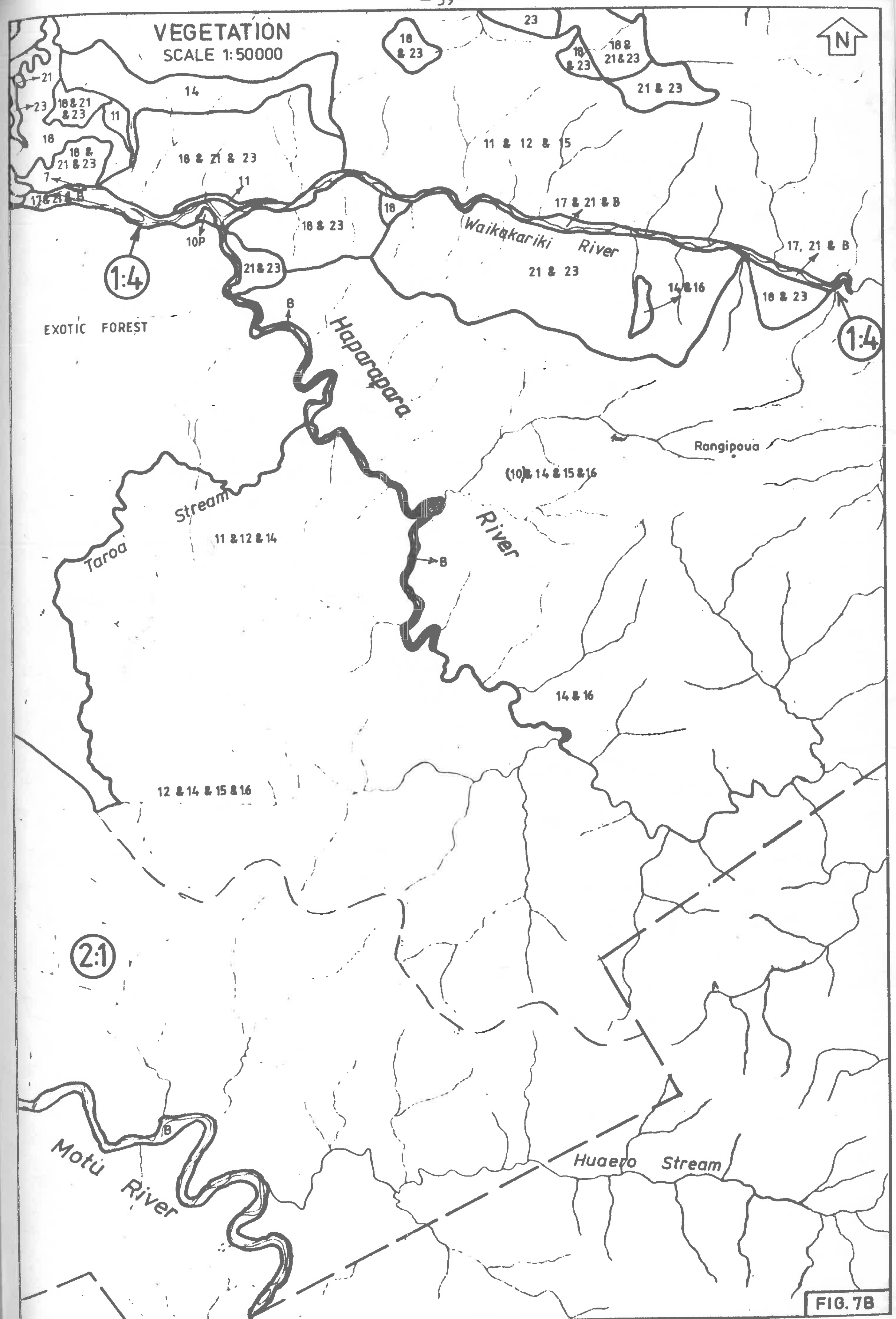
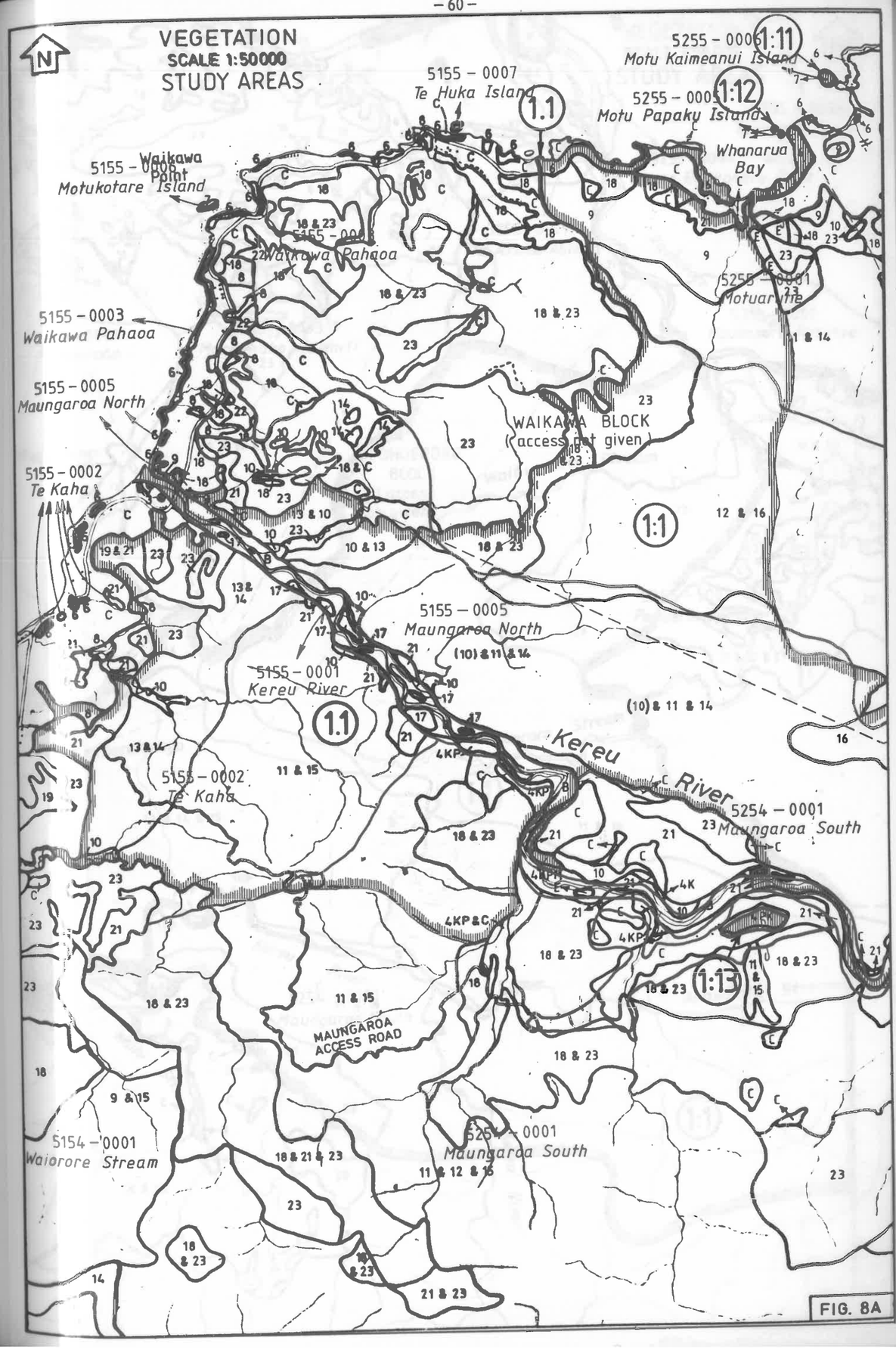
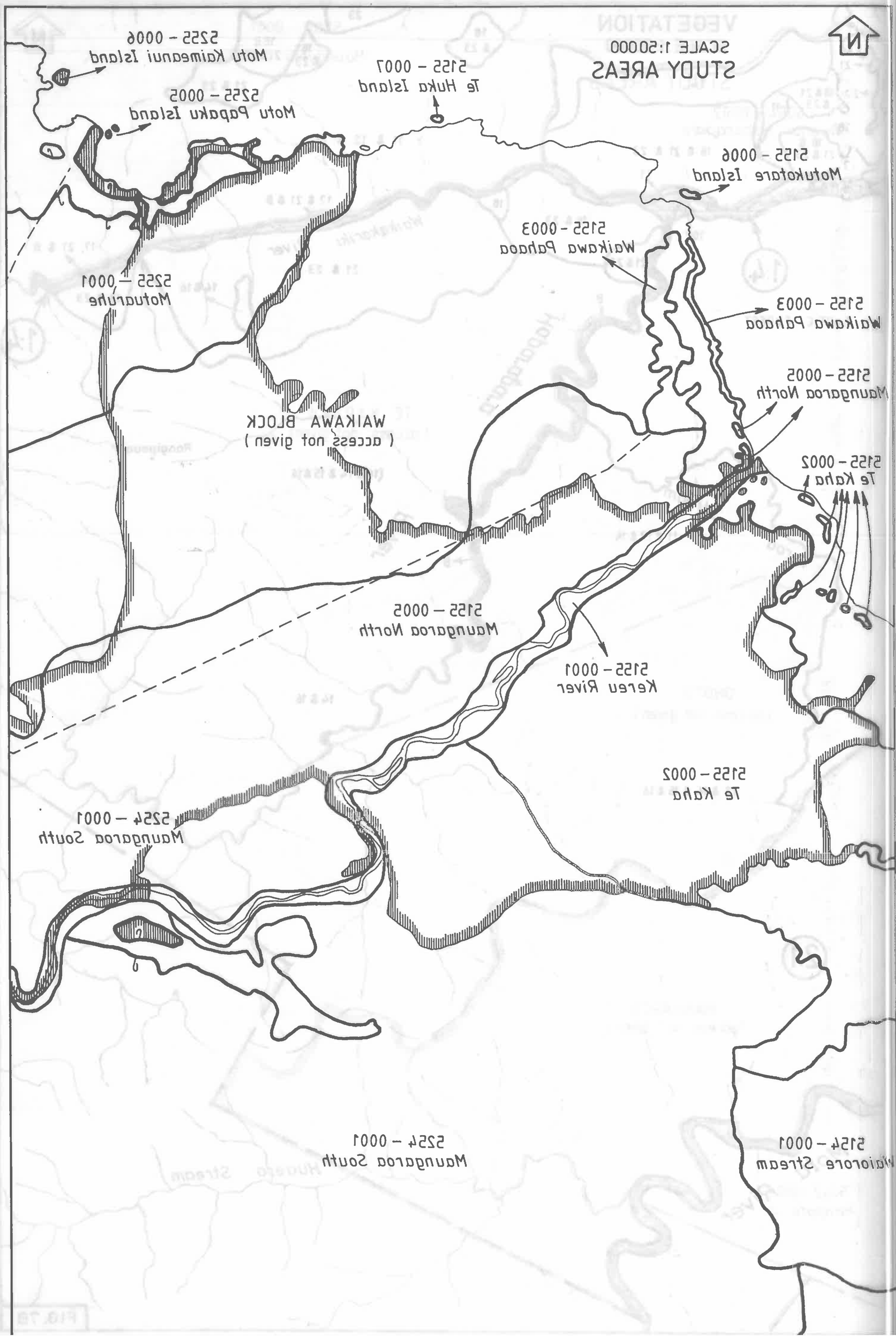

VEGETATION
SCALE 1:50000
N
EXOTIC FOREST
Haparapara River
Waikakariki River
Taroa Stream
Rangipoua
Motu River
Huaero Stream
1:4
2:1
14
11
18 & 21 & 23
18 & 23
21 & 23
11 & 12 & 15
17 & 21 & B
17, 21 & B
21 & 23
18 & 23
14 & 16
(10) & 14 & 15 & 16
11 & 12 & 14
12 & 14 & 15 & 16
10P
B
23

FIG. 7B


N
VEGETATION
SCALE 1:50000
STUDY AREAS
5155 – 0007
Te Huka Island
1.1
5255 – 0006
Motu Kaimeanui Island
1:11
5255 – 0005
Motu Papaku Island
1:12
Whanarua Bay
5155 – 0006
Motukotare Island
Waikawa Point
5155 – 0004
Waikawa Pahaoa
5255 – 0001
Motuarute
5155 – 0003
Waikawa Pahaoa
5155 – 0005
Maungaroa North
WAIKAWA BLOCK
(access not given)
5155 – 0002
Te Kaha
1:1
5155 – 0001
Kereu River
Kereu River
5254 – 0001
Maungaroa South
1:13
MAUNGAROA ACCESS ROAD
5154 – 0001
Waiorore Stream
FIG. 8A



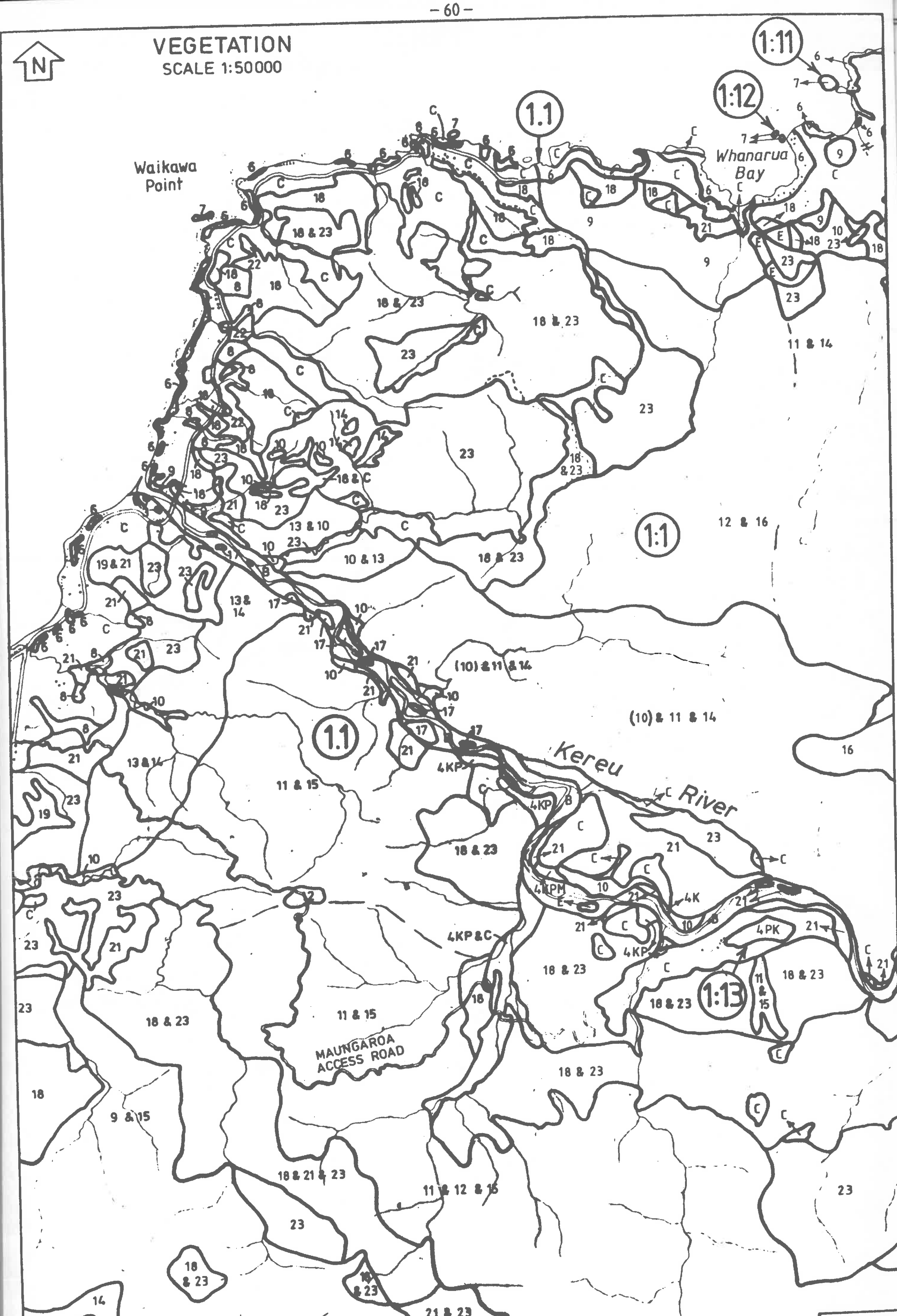
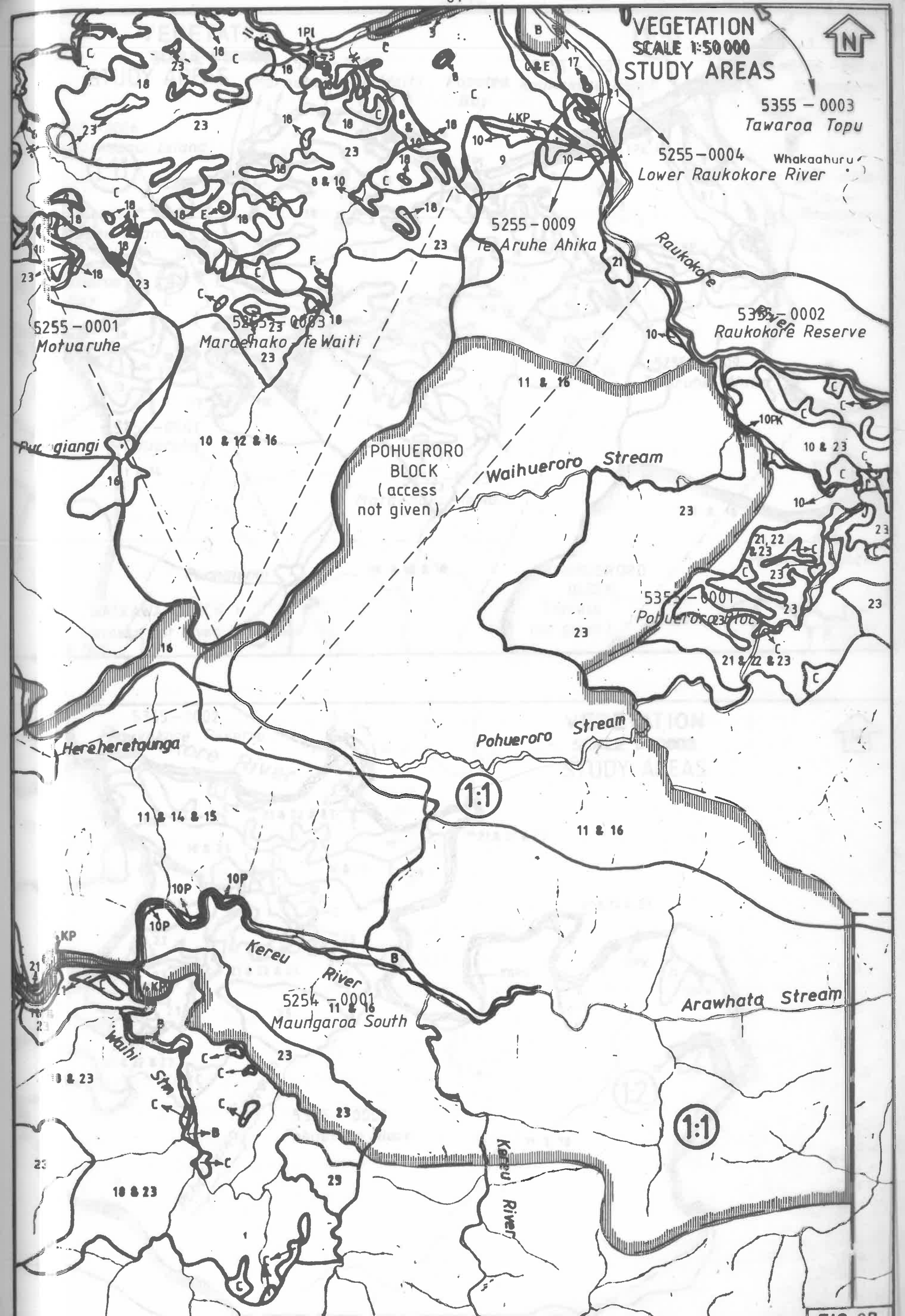
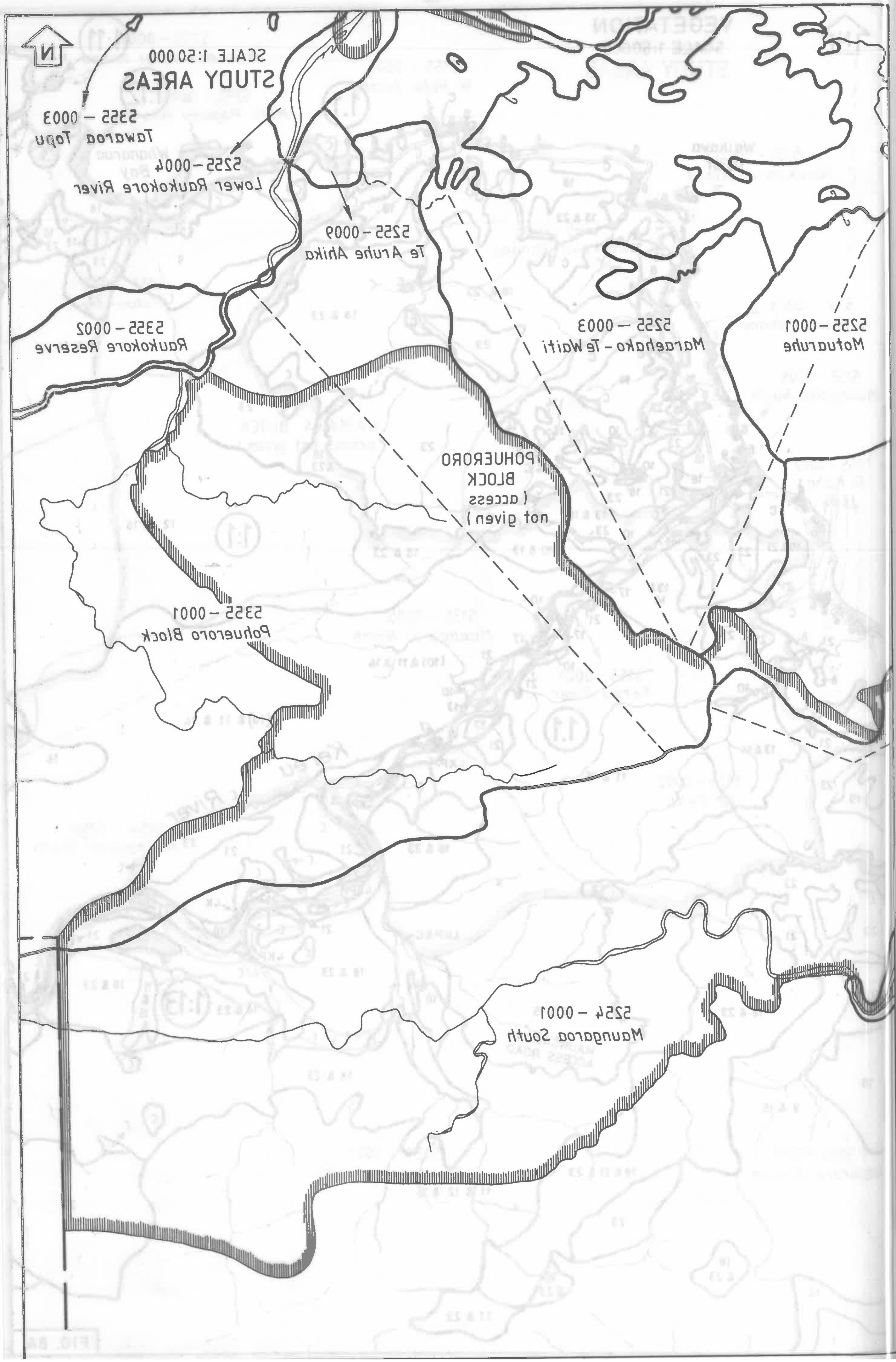
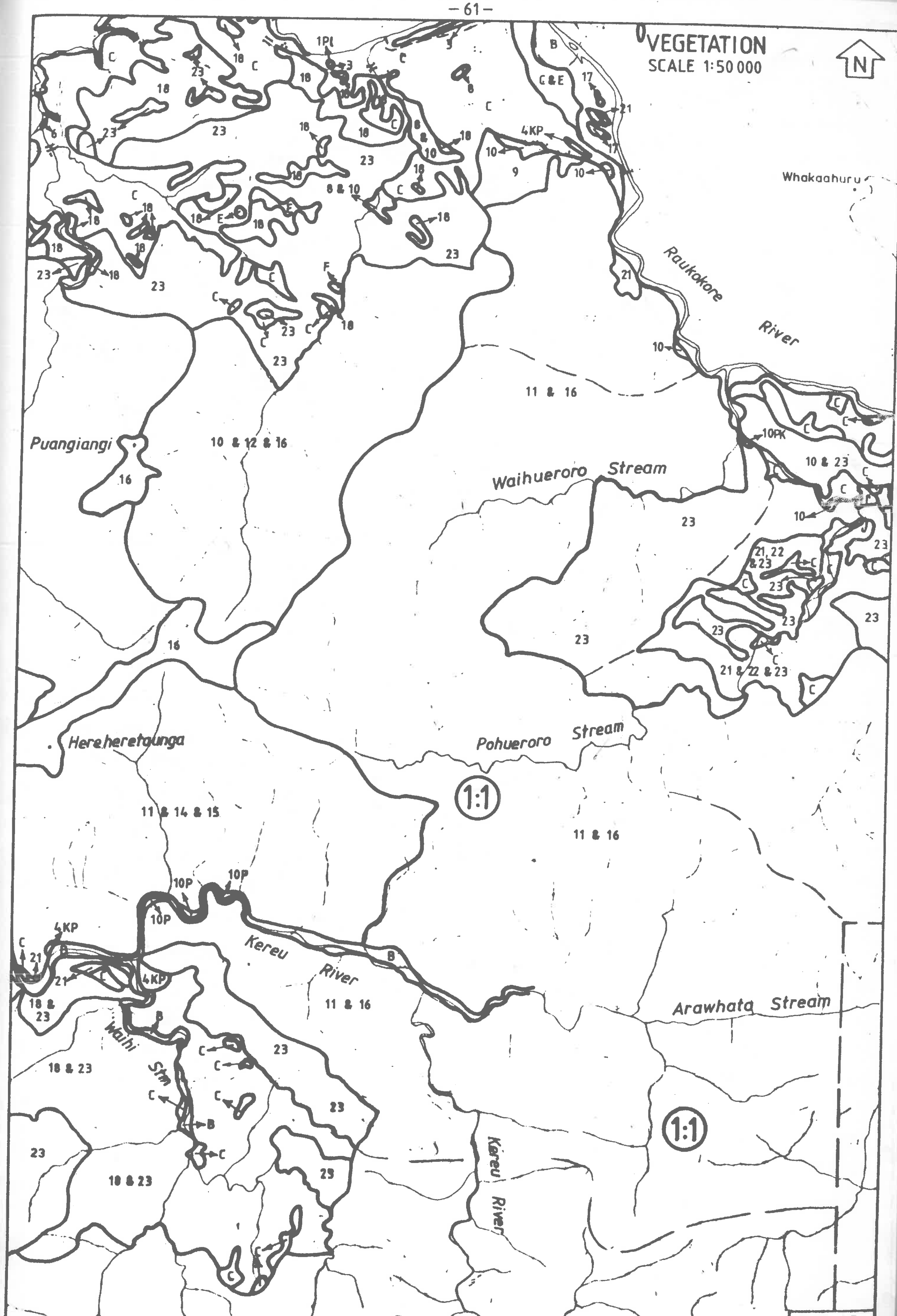

N
VEGETATION
SCALE 1:50000
Waikawa Point
Whanarua Bay
Kereu River
MAUNGAROA ACCESS ROAD
1:1
1.1
1:11
1:12
1:13

FIG. 8A


VEGETATION
SCALE 1:50 000
STUDY AREAS
N
5355 – 0003
Tawaroa Topu
5255–0004
Lower Raukokore River
Whakaahuru
5255 – 0009
Te Aruhe Ahika
Raukokore River
5355 – 0002
Raukokore Reserve
5255 – 0001
Motuaruhe
5255 – 0003
Maraehako – Te Waiti
POHUERORO
BLOCK
(access
not given)
Waihueroro Stream
5355 – 0001
Pohueroro Block
Hereheretaunga
Pohueroro Stream
1:1
11 & 16
11 & 14 & 15
10 & 12 & 16
Kereu River
5254 – 0001
Maungaroa South
Arawhata Stream
Waihi Stm
Kereu River
18 & 23
1:1
FIG. 8B

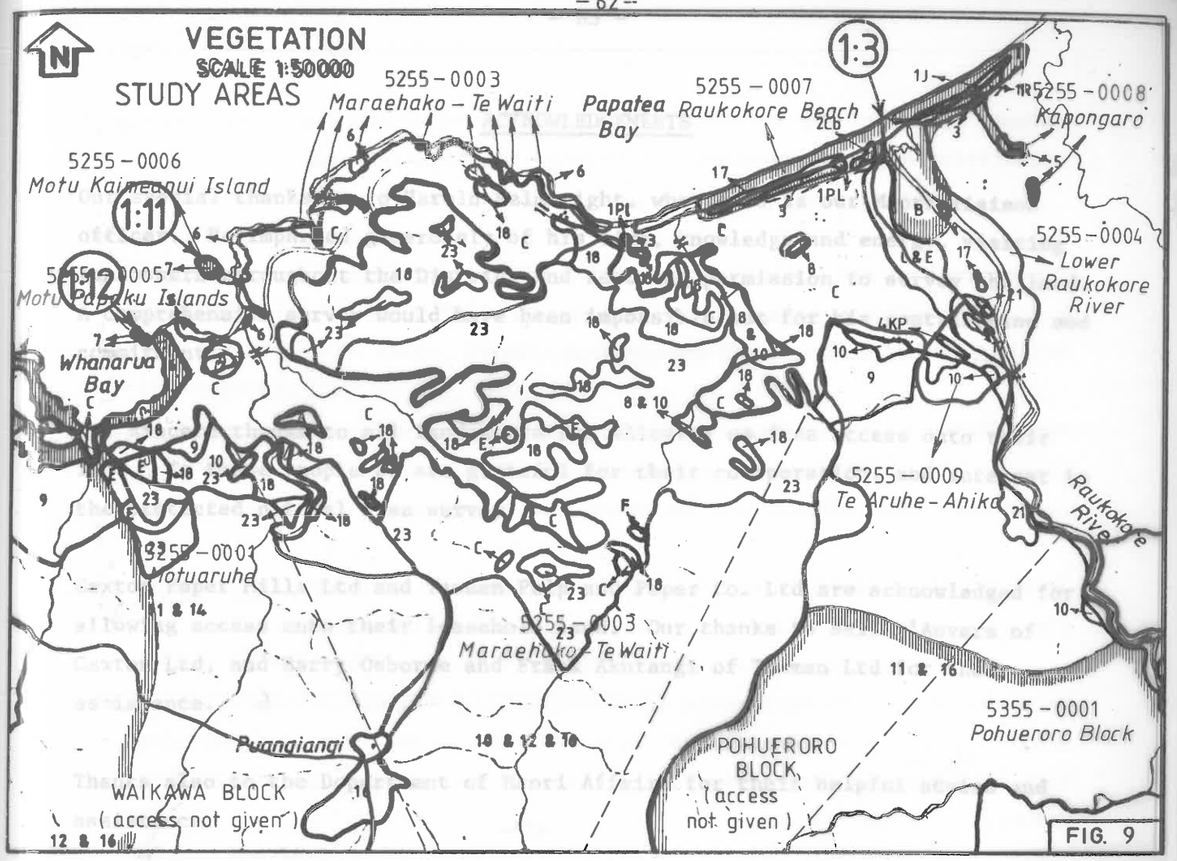


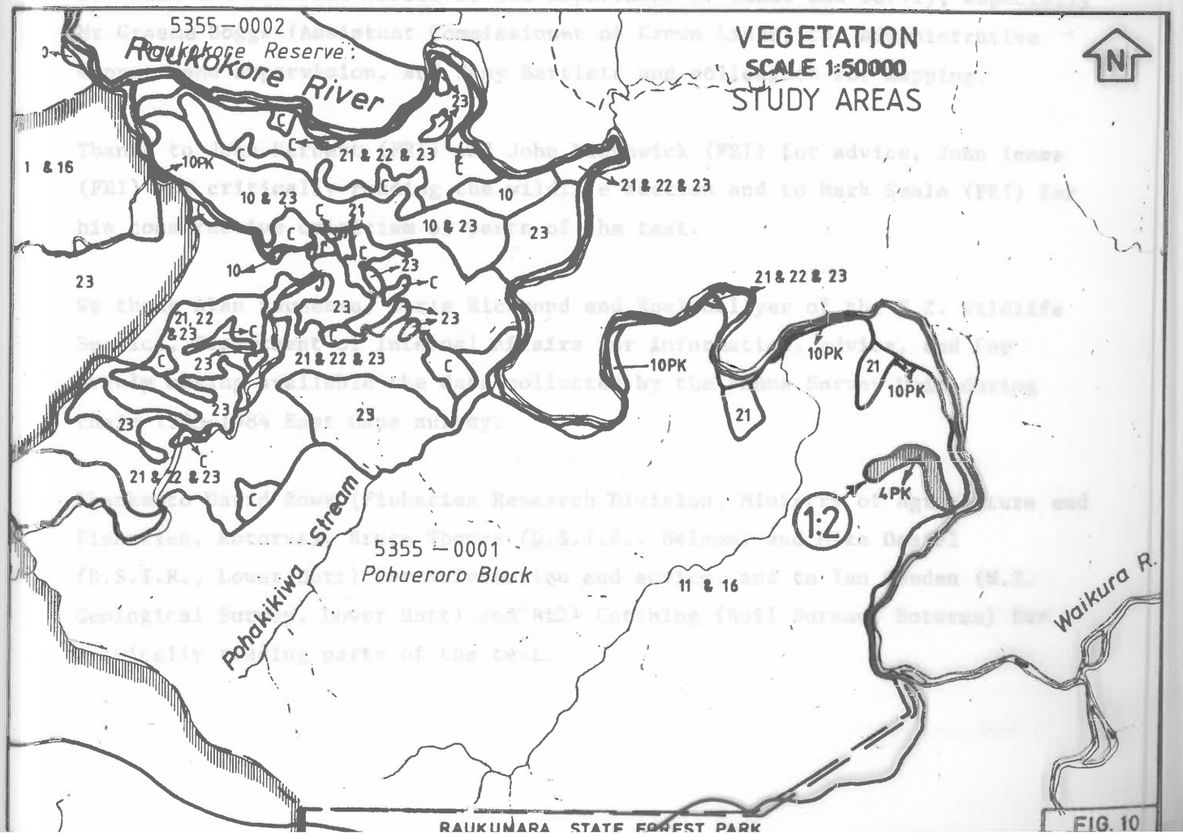
N
SCALE 1:50 000
STUDY AREAS
5355 — 0003
Tawaroa Topu
5255 — 0004
Lower Raukokore River
5255 — 0009
Te Aruhe Ahika
5355 — 0002
Raukokore Reserve
5255 — 0003
Maraehako - Te Waiti
5255 — 0001
Motuaruhe
POHUERORO
BLOCK
(access
not given)
5355 — 0001
Pohueroro Block
5254 — 0001
Maungaroa South

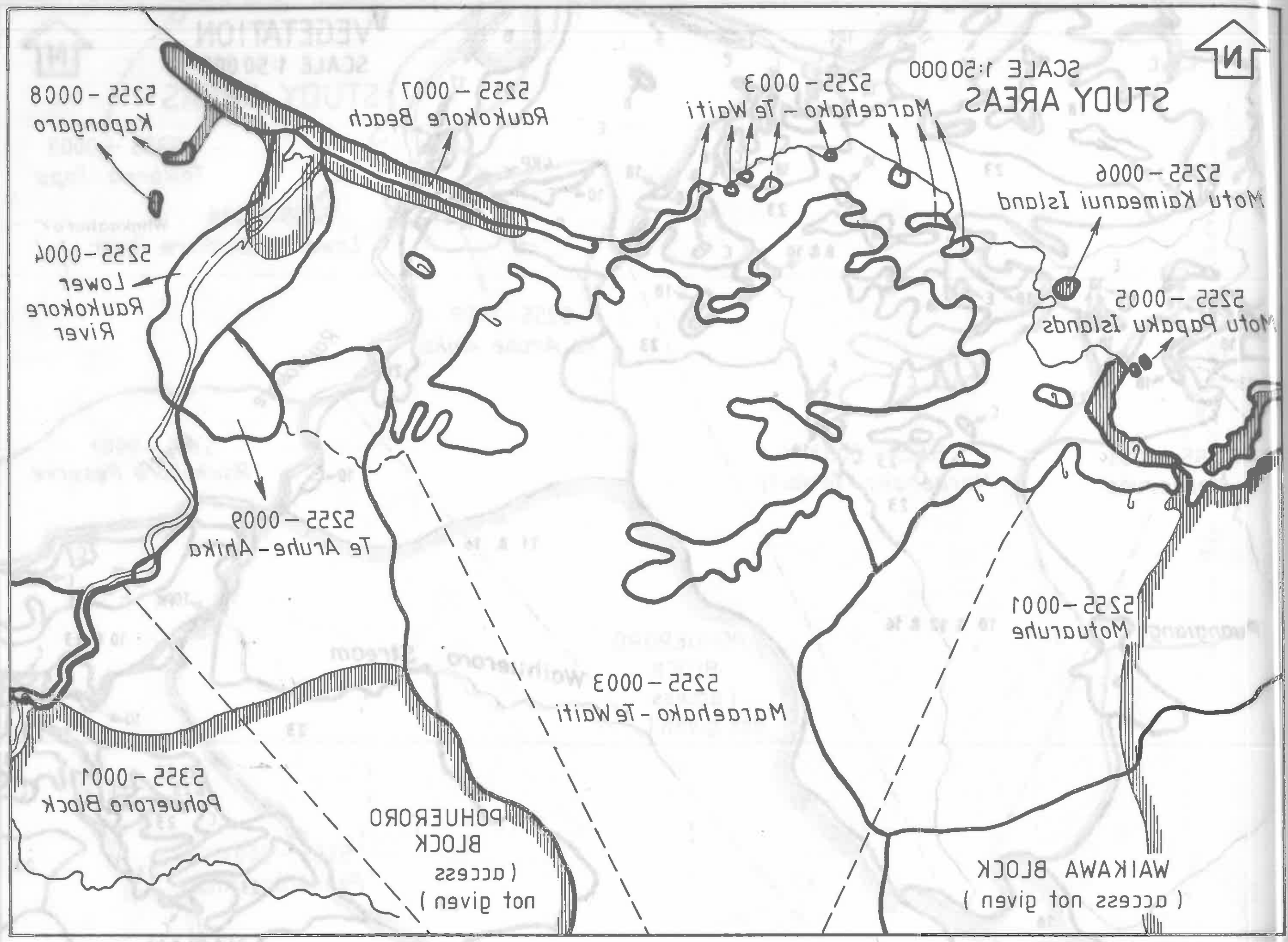


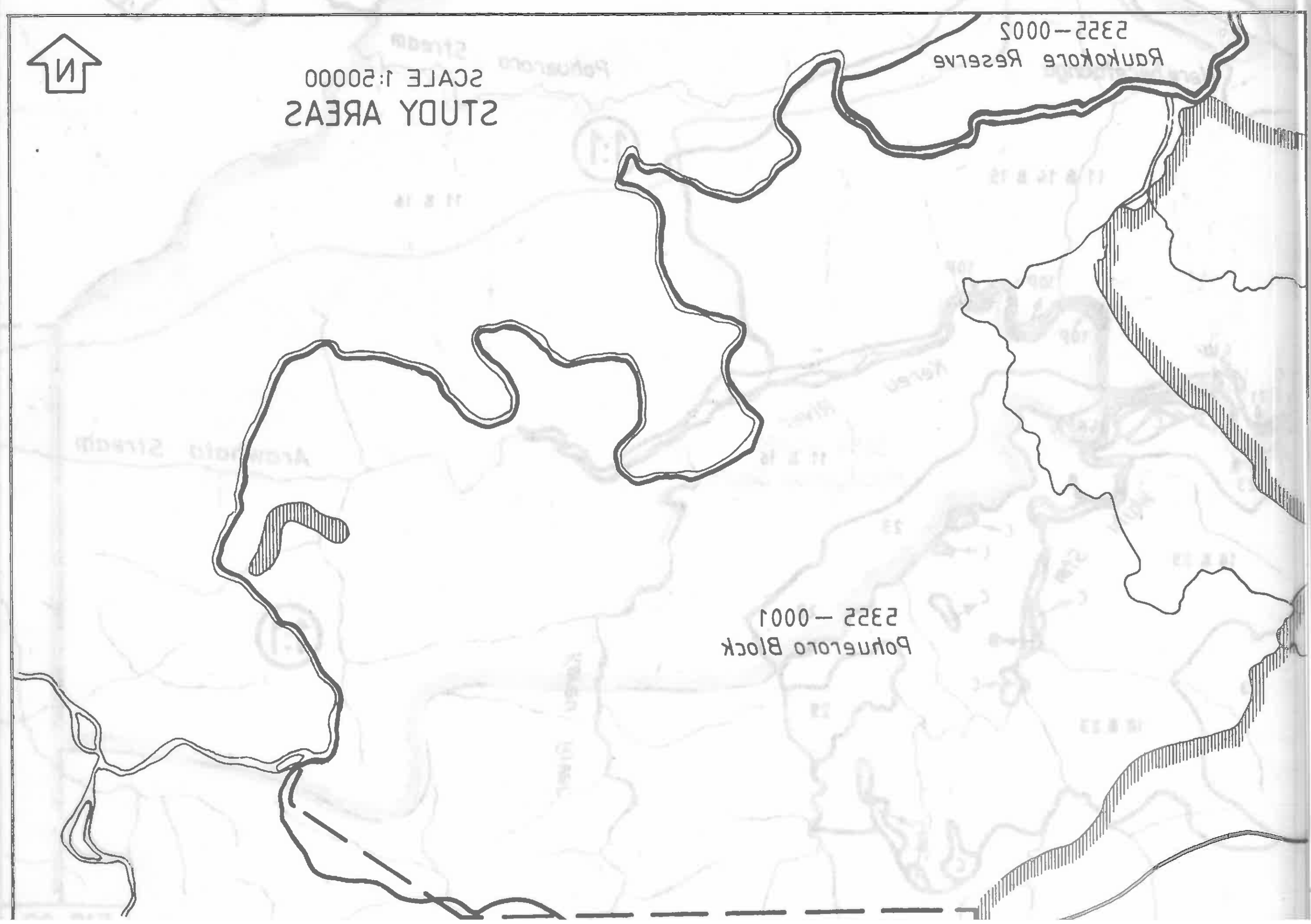
VEGETATION
SCALE 1:50 000
N
Whakaahuru
Raukokore River
Puangiangi
Waihueroro Stream
Hereheretaunga
Pohueroro Stream
Kereu River
Arawhata Stream
Waihi Stm
Kereu River
11 & 16
10 & 12 & 16
11 & 14 & 15
18 & 23
1:1

FIG. 8B


VEGETATION
SCALE 1:50000
STUDY AREAS
5255 – 0003
Maraehako – Te Waiti
Papatea Bay
5255 – 0007
Raukokore Beach
5255 – 0008
Kanongaro
5255 – 0006
Motu Kaimeamui Island
5255 – 0004
Lower Raukokore River
Whanarua Bay
5255 – 0009
Te Aruhe – Ahika
Raukokore River
5255 – 0001
Motuaruhe
5255 – 0003
Maraehako – Te Waiti
Puangiangi
WAIKAWA BLOCK
(access not given)
POHUERORO BLOCK
(access not given)
5355 – 0001
Pohueroro Block
1:3
1:11
1:12
FIG. 9


5355 – 0002
Raukokore Reserve
Raukokore River
VEGETATION
SCALE 1:50000
STUDY AREAS
5355 – 0001
Pohueroro Block
Pohakikiwa Stream
Waikura R.
RAUKUMARA STATE FOREST PARK
1:2
FIG. 10





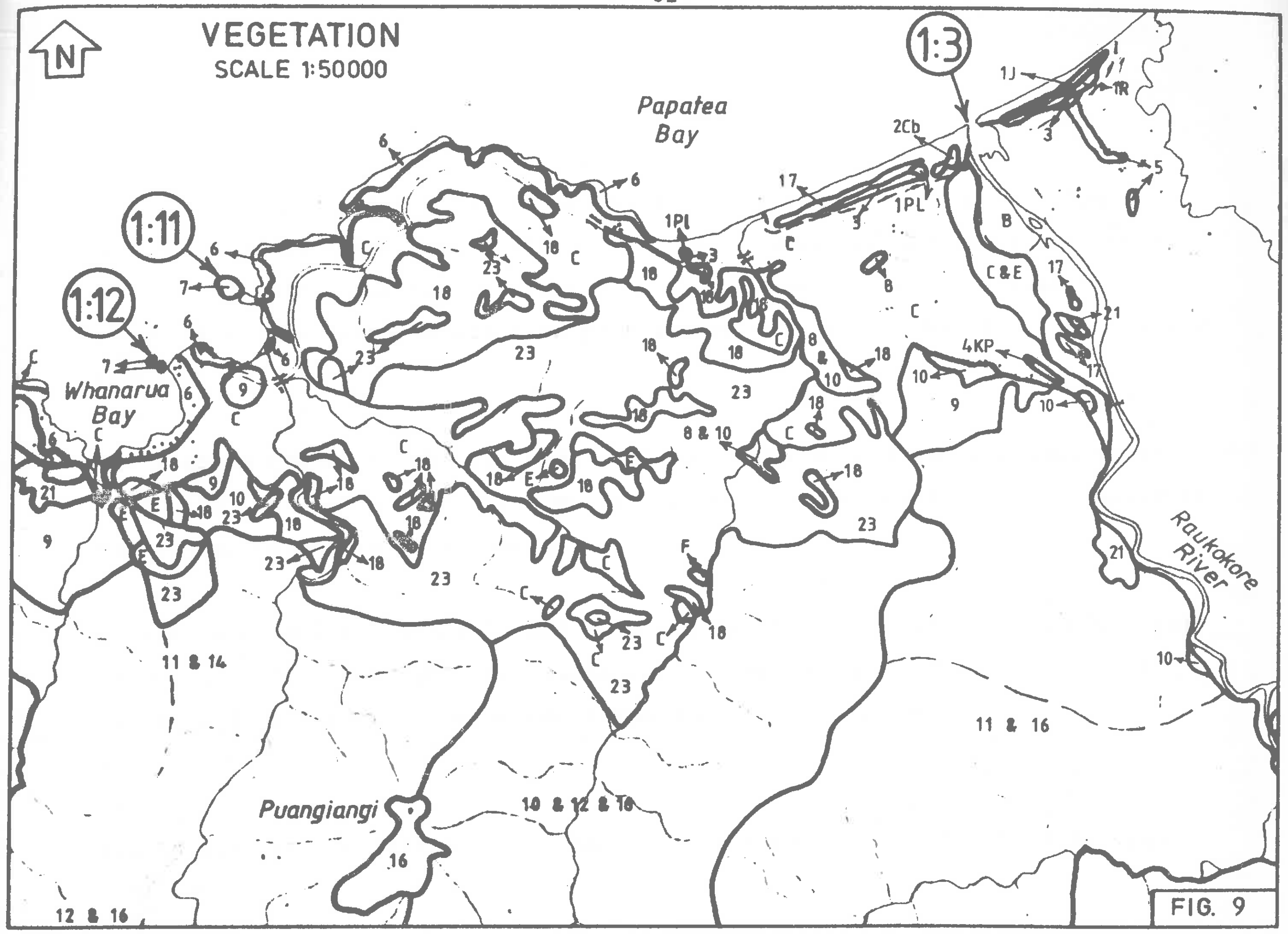
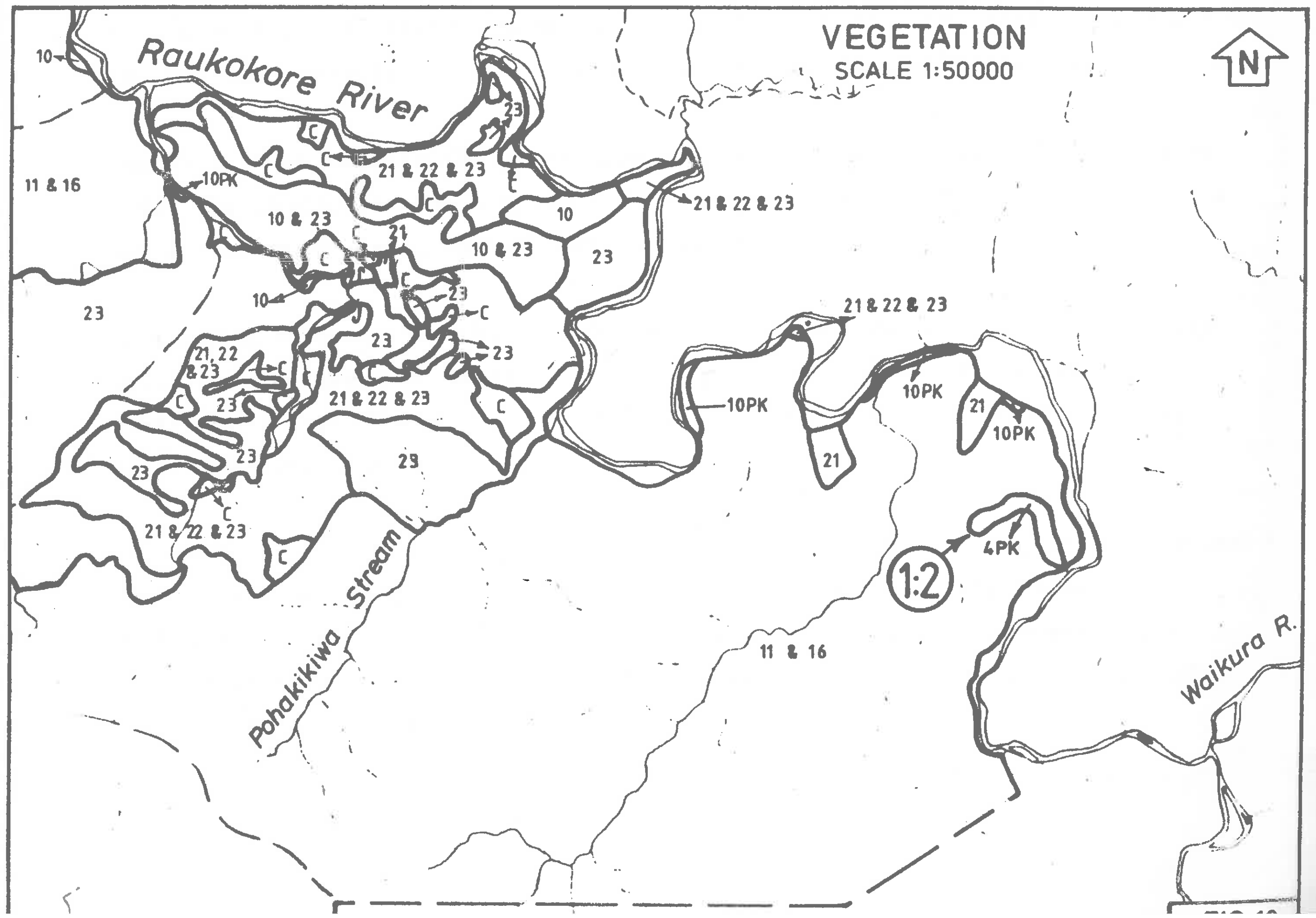

N
VEGETATION
SCALE 1:50000
Papatea Bay
1:3
1:11
1:12
Whanarua Bay
Raukokore River
Puangiangi
11 & 14
11 & 16
12 & 16
10 & 12 & 16

FIG. 9


VEGETATION
SCALE 1:50000
N
Raukokore River
11 & 16
10 & 23
21 & 22 & 23
10PK
4PK
1:2
Pohakikiwa Stream
Waikura R.

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APPENDIX I Descriptions of the Vegetation Types of the District

Abbreviations

, separates species listed in order of decreasing class cover and
- links species of approximately equal cover

1. Lagoon and Estuary vegetation

A blanket type for three vegetation types recorded on or near the small lagoon at the Raukokore River mouth respectively dominated by Juncus microcephalus, Ruppia polycarpa and coastal ribbonwood/Cyperus ustulatus. Other species present include Limosella lineata, Triglochin striatum, Scirpus fluviatilus, Cotula coronopifolia, Aster subulata, Eleocharis acuta, and Carex virgata.

Under the proposed national wetlands classification, the Juncus microcephalus and Ruppia polycarpa types correspond to salt rush and reed swamp, and mudflat respectively. The coastal ribbonwood/Cyperus ustulatus type corresponds to non-tidal shrub-swamp.

2. Swamp vegetation

A blanket type, distinct from raupo reedland, incorporating four freshwater wetland communities dominated by cabbage tree, Isachne globosa, Phormium tenax and Carex geminata respectively. Occurs between 5 and 300 ft (1.5-90 m) a.s.l. in flood channels and at stream sides scattered through the District. All of this vegetation is characteristic of relatively fertile swamps. It is probable that some was induced following stream siltation or clearance of swamp forest.

The communities correspond respectively to Cabbage tree swamp, Grass swamp, Flax swamp and Sedge swamp, under the proposed national wetlands classification.

3. Raupo reedland

Reedland swamp dominated by raupo up to 3 m tall. Occurs from 6-350 ft (2-110 m) a.s.l. on infilled gullies (e.g. Houpoto Swamp), poorly drained

terraces (near mouths of the Motu and Kereu Rivers), and behind Papatea Bay gravel beach. Frequent canopy associates, when raupo is not an exclusive dominant, are Carex virgata, Isachne globosa, Scirpus lacustris, Carex geminata and Baumea rubiginosa. A variety of exotic and native species is represented in the ground layer including Ranunculus repens, Myosotis caespitosa, Lotus pedunculatus, Polygonum spp., Isachne globosa and Juncus articulatus. In most cases this vegetation was induced after clearance of swamp forest but at a few sites it is probably primary vegetation. Cattle browsing and trampling was evident at most sites.

4. Manuka bog scrub

Mature, two-tiered, manuka dominant scrub 2-3 m tall found in the Houpoto and Rawea valleys, 200 and 1100 ft (60-335 m) a.s.l. respectively, on wet, infertile, peaty soils. Ground layer dominants are Gleichenia dicarpa and bracken in the lowland stand, and Sphagnum cristatum, Eleocharis gracilis and Blechnum minus in the upland stand.

5. Kahikatea swamp forest and treeland and kahikatea forest

Primary and secondary swamp forest, forest and treeland in which kahikatea, 5-25 m tall, is the leading dominant. Where the canopy is not predominantly kahikatea, rimu, kamahi, wheki, tawari, and hinau are canopy associates. Occurs in poorly drained valley bottoms and river terraces between 1000-1700 ft (300-510 m) a.s.l. Present in Whinray SR and as small remnants of second growth forest along Rawea Stream. Understorey dominants are kahikatea, lacebark, wheki and Metrosideros diffusa. Ground layer variable, with Metrosideros diffusa, Uncinia spp., wheki, sphagnum and other assorted mosses as the leading dominants. Blechnum minus, Pseudopanax anomalus and Lophomyrtus bullata are nearly always present. Whinray SR excepted, trampling and grazing by stock common.

6. Kahikatea - pukatea forest and swamp forest

Seral and mature kahikatea and pukatea forest, 8-30 m tall. Found on mid and lower valley alluvial terraces along the Kereu, Raukokore and Motu Rivers, between 60 and 150 ft (18-45 m) a.s.l. Kahikatea, and occasionally rimu, is most common on well drained alluvium closest to the river

while pukatea occurs on wetter sites usually where the terrace adjoins surrounding hillslopes. Other common canopy associates are kanuka, broadleaved tawa, and, in lower valley sites, puriri. Matai is present at one site on the Kereu River. Middle tier dominants are mahoe, kahikatea, supplejack, pukatea and broadleaved tawa. The ground tier is usually sparse and variously dominated by kahikatea seedlings, Blechnum filiforme, Oplismenus imbecillus, Carex virgata, C. dissita, C. solandri and numerous exotic grasses and herbs. Puka and Collospermum hastatum are common epiphytes. In most areas the understorey is severely modified by cattle browsing and trampling. Silt deposition from river flooding is also evident in some areas.

7. Taraire, broadleaved tawa forest

Mature secondary forest dominated by taraire and broadleaved tawa, 12-15 m tall, found on coastal valley bottoms between 150 and 350 ft (50-110 m) a.s.l. Occurs only in three localities: Orini Stream, Kereu River and north of the Raukokore River. Other major canopy components are puriri, pohutukawa and kohekohe, and there are many minor species. Middle tier dominants are taraire, hangehange, broadleaved tawa and ponga. The ground layer is dominated by Coprosma rhamnoides, hangehange, ferns and sedges in some areas, litter and tree seedlings in others. The main lianes and epiphytes are supplejack, Collospermum hastatum, Blechnum filiforme and Phymatosorus scandens. The understorey in all of these remnants is modified by stock browsing.

8. Pohutukawa forest and treeland

Remnant mature secondary pohutukawa dominant forest and treeland, 10-18 m tall, restricted to a narrow strip on and above coastal cliffs within the coastal spray and subaerial zones between 5 and 50 ft (1.5-15 m) a.s.l. The major canopy subdominant is karaka. Taupata, karo, houpara, pohutukawa, karaka and kawakawa are the middle tier dominants. In most cases the ground layer vegetation is highly modified as a result of past clearance and grazing. Where ground vegetation exists the main species are taupata, Arthropodium cirratum, introduced pasture grasses (cocksfoot, Yorkshire fog), kawakawa, houpara, Scirpus nodosus and Asplenium oblongifolium.

Forests on coastal rocky cliffs at Maraenui, Tokata, Whitianga Bay and Whanarua are relatively unmodified and support, beneath the forest canopy, a wide range of coastal, mostly herbaceous ground plants, including (though not always together): Apium prostratum, Arthropodium cirratum, Asplenium flaccidum ssp. haurakiense, Dichondra repens, Disphyma australe, Lagenifera pumila, Lobelia anceps, Oxalis exilis, Peperomia urvilleana, Plantago raoulii, Poa anceps, Sarcocornia quinqueflora, Samolus repens, Scirpus cernuus, S. nodosus, Selliera radicans and Senecio lautus.

9. Pohutukawa, houpara forest

Secondary seral pohutukawa dominant forest, 5-15 m tall, in the coastal subaerial zone, on inshore stacks and islands, from 8-50 ft (2.5-15 m) a.s.l. Houpara is commonly the canopy subdominant and occasionally is dominant. Common middle tier species are houpara, hangehange and kawakawa. Ground tier dominants include Uncinia uncinata, Oplismenus imbecillus, Asplenium oblongifolium and kawakawa. Older forest has a mangeao, tawaroa, puriri and rewarewa component. Little modification by browsers (usually possums only). Evidence of past Maori occupation on most islands.

10. Pohutukawa, puriri, broadleaved tawa forest

Mature secondary pohutukawa dominant forest, 12-20 m tall, with subdominant (or occasionally dominant) puriri, and broadleaved tawa, kohekohe, rewarewa and karaka. Two landform variants may be distinguished: one primarily on mid and upper coastal hillslopes between 100 and 700 ft (30-210 m) a.s.l.; the other, in which puriri is often dominant and broadleaved tawa not as common, on marine terraces and colluvial basal hillslopes between 20 and 150 ft (6-50 m) a.s.l. The middle tier dominants include ponga, kohekohe, karaka, broadleaved tawa, mahoe and supplejack. The ground layer dominants are Coprosma rhamnoides, kawakawa, Blechnum filiforme, Gahnia lacera, Oplismenus imbecillus and Asplenium oblongifolium. The understorey is sparse in many areas due to stock browsing.

11. Broadleaved tawa, pohutukawa, puriri forest

Mature secondary broadleaved tawa dominant forest, with subdominant pohutukawa (occasionally dominant) and puriri, 11-17 m tall, widespread on basal to upper coastal hillslopes, 20-600 ft (6-180 m) a.s.l. Other important canopy associates are rewarewa, kohekohe and karaka. Pohutukawa are usually very large and scattered, and puriri tend to be in gullies. Mangeao is a rare component. The middle tier is characteristically diverse. Dominants include ponga, kohekohe, supplejack, rangiora, broadleaved tawa, raurekau, mahoe and heketara. Ground layer dominants are Blechnum filiforme, Adiantum cunninghamii, Gahnia lacera, hangehange, and a wide variety of broadleaved seedlings. Evidence of possum browsing in most plots, and the understorey of some areas is highly modified by stock browsing.

12. Broadleaved tawa, puriri forest

Mature secondary broadleaved tawa dominant forest, usually with associated and occasionally dominant puriri, 12-22 m tall. Occurs as remnant pockets on coastal colluvial basal hillslopes; and it is widespread up to 8 km inland in gullies and on alluvial flats and basal - mid hillslopes, between 20 and 850 ft (6-260 m) a.s.l. The alluvial terraces form a distinct landform variant, in which puriri is sometimes absent and is replaced by pukatea. Puriri is also absent from better drained hillslopes. Other important canopy associates are kohekohe, rewarewa and karaka. Taraire and mangeao are rare coastal components. Middle tier dominants are kohekohe, ponga, mahoe, broadleaved tawa, kawakawa, supplejack and hangehange. The ground layer vegetation is sparse. Dominants include Blechnum filiforme, hangehange, Blechnum chambersii and Oplismenus imbecillus. Many species of broadleaved tree seedlings and ferns occur in low numbers. Collospermum hastatum is a common epiphyte. Most of the remnants have a highly modified understorey because of stock browsing.

13. Broadleaved tawa, kamahi-rewarewa forest

Mainly mature largely unmodified broadleaved tawa forest with subdominant kamahi, between 12 and 20 m tall. Found between 150 and 2250 ft (45-690 m) a.s.l. but mostly between 800 and 1500 ft (245-460 m). Occurs throughout the District mainly on mid and upper hillslopes. Other commonly occurring

canopy associates are rewarewa, northern rata, hinau, rimu, mamaku and mahoe. Broadleaved tawa, mahoe, kamahi, wheki, rangiora and heketara are prominent in the diverse understorey. Crown fern, kiokio, hen and chicken fern, Blechnum chambersii, Leptopteris hymenophylloides and Hymenophyllum demissum were each noted as ground layer dominants. The lianes, supplejack and kiekie, and the perching lilies, Collospermum hastatum and Astelia solandri are nearly always present.

14. B. tawa s.l. - kamahi - tawari - hinau forest

Mature primary forest on broad ridges and upper hillslopes between 1450 and 2000 ft (440-610 m) a.s.l. Dominant canopy species are B. tawa s.l. kamahi, tawari and hinau. The main subdominant associates are rewarewa, miro, rimu, toro and quintinia. B. tawa s.l., raukawa, mapou, pigeonwood and heketara are the middle tier dominants and the main ground layer species are Blechnum discolor and Uncinia uncinata. Windthrow common.

15. Hard beech, pohutukawa forest

Secondary forest dominated by hard beech, 15-18 m tall, with a subdominant pohutukawa component. Other important canopy associates are broadleaved tawa and rewarewa. Occurs scattered through the district on coastal ridges between 250 and 750 ft (75-230 m) a.s.l. The understorey comprises a variable, diverse mixture of species including hard beech, broadleaved tawa, heketara, ponga, Cyathodes juniperina, Coprosma spathulata, Pseudopanax arboreus, Olearia furfuracea and Nestegis lanceolata. Gahnia lacera, G. pauciflora, kiokio and Coprosma spathulata are the ground layer dominants.

A transitional type at the upper limit of the coastal zone.

16. Hard beech - broadleaved tawa, rewarewa forest

Primary and secondary hard beech and broadleaved tawa forest, one or other dominant, 12-20 m tall, found mostly on mid and upper hillslopes, between 200 and 1500 ft (60-460 m) a.s.l. Rewarewa is the most frequent canopy associate, and kamahi and northern rata occur occasionally. Middle tier dominants are hard beech, ponga, broadleaved tawa, heketara, Pseudopanax arboreus, supplejack and putaputaweta. Kiokio, rangiora,

hangehange, kiekie and Asplenium oblongifolium are the main ground layer species. Windthrow is common, and in some areas the understorey is modified by stock.

17. Hard beech, tanekaha-rewarewa forest

Mostly unmodified forest dominated by hard beech, 14-25 m tall, on ridges, knolls and spurs between 750 and 1600 ft (230-490 m) a.s.l. Occasionally the canopy is exclusively hard beech. Usually tanekaha and rewarewa are minor canopy associates. Dominants in the fairly diverse middle tier are hard beech, heketara, kamahi, Dracophyllum latifolium and tanekaha. Umbrella fern, Gahnia pauciflora, Leucopogon fasciculatus, Astelia solandri and Uncinia uncinata are the most common ground layer plants. Lianes present are Metrosideros fulgens and M. diffusa. Goat browse damage and windthrow were noted in several areas.

18. Hard beech, tawari, kamahi-quintinia forest

Mature primary forest dominated by hard beech, 14 - 20 m tall. It is widespread on ridges, knolls spurs and upper hillslopes between 1000 and 2700 ft (300-820 m) a.s.l., mostly from 1500-1800 ft (460-550 m) a.s.l. The most frequent canopy subdominants are tawari, quintinia and kamahi. The main middle tier dominants are quintinia, kamahi, hard beech, Dracophyllum latifolium, Archeria racemosa and heketara. Ground layer dominants are Astelia solandri, kidney fern, umbrella fern and filmy ferns (Hymenophyllum spp.). The perching lily Collospermum microspermum and the shrub epiphyte Pittosporum cornifolium were commonly noted. Other species which characterise the montane nature of this vegetation type and which are common at higher altitudes include toatoa, Hall's totara, toro and raukawa. Large miro and rimu are scattered throughout. Windthrow common.

19. Kamahi - tawari forest

Primary, stunted, dense kamahi and tawari dominant forest between 1500 and 3200 ft (460-975 m) a.s.l., mainly confined to hillslopes of the Raukumara Range north of Mt Raukumara. Other canopy associates are tawa, red beech, Alsophila smithii, rimu, miro and Hall's totara. Kamahi,

tawari and toro constitute the main middle tier species. Pseudowintera axillaris, Blechnum discolor, kamahi and mosses are the dominant ground cover species.

20. Hard beech - silver beech forest

Primary hard and silver beech dominant forest confined mainly to hillslopes about Mt Puketoetoe, 2500-3000 ft (760-915 m) a.s.l., with subdominants of tawari, kamahi and rimu. Kaikawaka, Hall's totara and toatoa are locally common. Dominant middle tier species include hard beech, toatoa and tawari. Pseudopanax colensoi, Astelia spp., Gahnia spp. and mosses are the main ground layer plants.

21. Red beech - silver beech forest

Primary red and silver beech forest in the vicinity of Mts Maungihaumi, Ahiapurua and Raukumara, between 2000 and 3700 ft (610-1130 m) a.s.l. Main subcanopy dominants are kamahi, tawari, Griselinia littoralis and Pseudopanax colensoi, with locally frequent miro, Hall's totara and kaikawaka. Middle tier dominants are tawari, kamahi and silver beech. Common ground layer species are mosses, Microlaena avenacea, Pseudowintera colorata, Blechnum discolor, B. fluviatile, Coprosma foetidissima and Polystichum vestitum. Much cattle trampling and browsing on rdiges south of Mt. Hikurangi.

Between 2100 and 2800 ft (640-850 m) a.s.l. on Te Pakera No. 1 Trig and Te Pakera No. 2 Trig is forest containing frequent hard beech, red and silver beech with frequent emergent rimu over a dense understorey of kamahi, tawari and scattered rimu, miro and Hall's totara.

22. Silver beech, kaikawaka forest

Primary silver beech dominant forest with a subdominant kaikawaka component, limited to a few areas between 3100 and 4000 ft (950-1220 m) a.s.l. in the vicinity of Mts Whanokao, Hikurangi, Maungawaru and Rangipoua. Other common associates are toatoa, pink pine, red beech and tawari. Very locally mountain beech is also present. Silver beech, tawari and mountain toatoa are middle tier dominants. Pseudopanax

colensoi, Gahnia spp., mosses and kidney fern are the major ground layer species. Much cattle damage in the vicinity of Mt Hikurangi.

23. Subalpine scrub and shrubland

A blanket type incorporating many different scrub and shrubland types. The main type, Olearia colensoi scrub, occurs on all the high peaks of the Raukumara Range between 4500 and 5000 ft (1370-1525 m) especially on moderate slopes. Canopy associates include Brachyglottis rotundifolia, pink pine, Coprosma pseudocuneata, mountain toatoa, Pseudopanax simplex and P. colensoi.

Other types represented are pink pine scrub, particularly on rocky ridges and knolls, and shrubland dominated by mountain toatoa, pink pine and the yellow-silver pine X pygmy pine hybrid, on poorly drained areas such as Maungawaru Plateau and the summit of Mt Arowhana. In this latter type mid-ribbed snow tussock and many different small shrubs (e.g. Dracophyllum adamsii, Pimelea buxifolia, Myrsine divaricata, Cyathodes empetrifolia, pygmy pine and Coprosma depressa) are also present.

Substantial areas dominated by herbs occur within this blanket type. For example, on Mt Arowhana seral herbfield dominated by Celmisia spectabilis covers burnt-off land formerly occupied by Olearia colensoi, and on the Maungawaru Plateau and Mt Arowhana very poorly drained sites have cushion bogs dominated by Oreobolus pectinatus.

24. Alpine tussockland

Occurs on Mts Hikurangi and Whanokao between 5000 ft and 5500 ft (1525-1675 m) a.s.l. Mid-ribbed snow tussock almost completely dominates the canopy in places, and the herbs Ranunculus insignis and Aciphylla colensoi are prominent between the tussocks. Shrubs represented in the canopy include Hebe odora, H. venustula and H. sp. unnamed (H. stricta var. lata).

25. Alpine herbfield

Occurs on Mt Hikurangi above 5500 ft (1675 m). Mid-ribbed snow tussock gives way to herbfield dominated by Celmisia spectabilis, C. incana and

Ranunculus insignis. Also present are North Island edelweiss, Hebe tetragona, Brachyglottis bidwillii and Coriaria plumosa. The scree slopes within this zone support scattered colonies of plants such as Epilobium astonii, Helichrysum "alpinum", Parahebe olsenii and Coriaria pottsiana. Cattle browsing and trampling common.

26. Alpine fellfield

Occurs on Mt Hikurangi above 5600 ft (1710 m). The plant cover is very patchy. Species present include Pentachondra pumila, Geum sp. (G. parvifolium agg.), Coprosma pumila, Parahebe olsenii, Epilobium glabellum, Lycopodium fastigiatum, L. australianum, Podocarpus nivalis, Oreomyrrhis colensoi, Gaultheria "novae-zelandiae", Dracophyllum adamsii, D. recurvum, North Island edelweiss, Poa novae-zelandiae, P. colensoi, Myosotis amabilis, Anisotome aromatica and Racomitrium lanuginosum.

27. Tauhinu shrubland and scrub

Primary, pioneer and seral, tauhinu dominant shrubland and scrub, 0.5-4 m high, on low alluvial terraces and floodplains of the Motu, Haparapara-Waikakariki, Kereu and Raukokore Rivers, between 0 and 150 ft (0-45 m) a.s.l. Also occurs on narrow gravel beach at the Raukokore River mouth. The main canopy associates are manuka, tutu, buddleia (in Haparapara-Waikakariki), tree lupin and kanuka. The common ground cover plants include many exotic grasses (especially Agrostis stolonifera and Yorkshire fog) and herbs (ragwort, Lotus spp.). Usnea sp. is epiphytic on tauhinu, manuka and kanuka. Young tauhinu stands are characterised by few other canopy species, considerable bare ground, smaller stature and greater spacing of individual shrubs, and the presence of scabweed (Raoulia tenuicaulis).

28. Manuka scrub

Dense seral scrub vegetation found on coastal and lowland hillslopes throughout the District between 40 and 1200 ft (12-365 m) a.s.l., following burning and forest clearance. Generally occurs on mid to crest catenary positions in seral vegetation complexes. Mostly a two-tiered structure 1.5-4 m tall, with almost complete manuka dominance of the

canopy. The most common canopy associates are bracken fern, kamahi, kanuka, kohuhu, and pohutukawa. The ground layer is a variable, often sparse mixture of exotic grasses and herbs, especially Lotus pedunculatus, catsear, and browntop, and usually there are few tree seedlings. Some taller manuka scrub has secondary broadleaved shrubs and trees (rewarewa, kohuhu, Olearia furfuracea, Pseudopanax arboreus, tutu and hangehange) becoming established which will replace the manuka in time.

29. Manuka, coprosma, koromiko scrub

Seral, generally two-tiered scrub nearly always dominated by manuka 2-8 m high, and rarely by gorse. It has a substantial canopy component of broadleaved shrubs especially karamu (Coprosma robusta and C. macrocarpa), koromiko (Hebe stricta var. stricta or var. macroura), hangehange and emerging pohutukawa. Occurs on coastal hillslopes and headlands between 150 and 400 ft (45-120 m) a.s.l. Has developed following clearing or burning. Ground layer dominance varies considerably from stand to stand with Coprosma rhamnoides, Gaultheria antipoda, bracken fern, Gahnia lacera, Lepidosperma australe and Lycopodium deuterodensum each noted as leading dominants and associates. In some taller, older scrub the broadleaved shrubs are beginning to overtop the manuka.

30. Manuka-kanuka scrub

Seral scrub characterised by the co-dominance of manuka and kanuka, 1.5-8 m tall. Found on mid and basal hillslopes between 100 and 350 ft (30-110 m) a.s.l., and has developed following forest clearance or as a result of burning. The understorey, where present, is dominated by manuka, kanuka, broadleaved shrubs and tree ferns (mamaku and ponga). Ground cover dominants vary considerably from area to area and include exotic grasses and herbs, bracken, Morelotia affinis and Carex longebrachiata.

31. Kanuka forest and scrub

Seral kanuka, 4-12 m tall, almost completely dominates. There are two landform variants: one, resulting from primary succession, on fresh alluvial terraces between 10 and 150 ft (3-45 m) a.s.l. and usually

APPENDIX II

CHECKLIST OF INDIGENOUS VASCULAR PLANTS

Below is a checklist of indigenous vacular plants recorded, collected or observed during the present survey of the Motu Ecological District. Nomenclature follows that of Druce (1978, 1980, 1983). Common names used on the field cards or in the text are also given.

Abbreviations and symbols used:

aff.	:	affinities with
agg.	:	aggregate, comprising more than one species
cf.	:	compare with
incl.	:	including
s.l.	:	sensu lato, in the broad sense
sp.	:	species
spp.	:	more than one species
ssp.	:	subspecies
s.s.	:	sensu stricto, in the narrow sense
X	:	hybrid
var.	:	variety
H	:	found in Houpoto Swamp
S	:	southern limit in district
N	:	northern limit in district
*	:	rare in district
**	:	rare or endangered nationally (see Given, 1981)
o	:	previously not recorded from district

Acaena anserinifolia	bidibidi
A. novae-zelandiae	bidibidi
A. sp. (cf. A. hirsutula and A. anserinifolia var. paucidens)	
Aciphylla colensoi	
A. squarrosa var.*	
Adiantum cunninghamii	
A. fulvum	
A. hispidulum	
Alectryon excelsus var. excelsus	titoki
Alseuosmia macrophylla	
A. pusilla	
Alsophila colensoi[N]	
A. cunninghamii	
A. smithii	
A. tricolor	ponga, silver fern
Anarthropteris lanceolata	
Anisotome aromatica	
Apium prostratum ssp. prostratum	native celery
Archeria racemosa	
Aristotelia fruticosa var. microphylla[N]	
A. serrata	makomako, wineberry
Arthropodium cirratum	rengarenga lily
Arthropteris tenella	
Ascarina lucida var. lucida	hutu
Asplenium bulbiferum s.s.	hen and chicken fern
A. flaccidum ssp. flaccidum	
A. flaccidum ssp. haurakiense	

A. hookerianum	
A. oblongifolium	
A. polyodon	
A. richardii[N]*	
Astelia fragrans	
A. linearis var. novae-zelandiae[N]	
A. solandri	
Athyrium australe	
A. japonicum	
Baumea rubiginosa*[H]	
B. tenax *[H]	
Beilschmiedia tarairi[S]*	taraire
B. tawa s.l. (incl. broadleaved tawa)	see Section 4.6
B. tawaroa	tawaroa
Blechnum chambersii	
B. discolor	crown fern
B. filiforme	
B. fluviatile	
B. membranaceum	
B. minus	blechnum "swamp"
B. penna-marina	
B. sp. (Lomaria latifolia)	
B. sp. (B. capense agg., "reduced pinnae")	kiokio, blechnum "reduced pinnae"
Brachyglottis bidwillii var. bidwillii[N]*	
B. repanda var. repanda	rangiora

B. rotundifolia var. (B. elaeagnifolia)[N]	
Bulbophyllum pygmaeum	
Callitriche muelleri	
Calystegia sepium agg.[H]	
C. soldanella	
C. tuguriorum	
Cardamine debilis agg.	
Cardiomanes reniforme	kidney fern
Carex breviculmis	
C. dissita	
C. flagellifera	
C. geminata agg.[H]	
C. lessoniana	
C. maorica	
C. pumila	
C. secta[H]	
C. solandri	
C. virgata[H]	
Carmichaelia arborea var. (= C. flagelliformis)	
C. williamsii**[S]	
Carpodetus serratus	putaputaweta, marbleleaf
Cassinia leptophylla var. leptophylla	tauhinu
C. vauvilliersii[N]	
Celmisia incana	
C. spectabilis var. spectabilis[N]	
Centella uniflora	

Cheilanthes sieberi	
Chionochloa conspicua ssp. cunninghamii	
C. flavicans*	
C. pallens var. (broad leaves)[N]	mid-ribbed snow tussock
Clematis foetida	
C. forsteri[H]	
C. paniculata	
C. parviflora	
Collospermum hastatum	
C. microspermum	
Coprosma areolata	
C. colensoi (incl. C. banksii)	
C. crassifolia[O]*	
C. depressa	
C. foetidissima	
C. grandifolia	raurekau
C. lucida	
C. macrocarpa ssp. "minor"	
C. "oreophila" (aff. C. cheesemanii)[N]	
C. pseudocuneata[N]	
C. pumila[N]	
C. repens	taupata
C. rhamnoides ssp. rhamnoides	
C. robusta[H]	karamu
C. rubra[N]	
C. rugosa ssp. rugosa[N]	
C. spathulata	

C. "taylorae" (= C. parviflora var. dumosa Cheeseman 1906)[N]	
C. tenuifolia[N]	
Cordyline australis	cabbage tree
C. australis x banksii	
C. banksii	
C. indivisa	
Coriaria arborea	tutu
C. plumosa[N]	
C. pottsiana[N**]	
Corokia cotoneaster var. (larger leaves)*	
Cortaderia fulvida[H]	toetoe
C. toetoe	
Corynocarpus laevigatus	karaka
Cotula australis	
C. coronopifolia*	
Craspedia "Hikurangi" (incl. in C. uniflora)	
Crassula sieberiana	
Ctenopteris heterophylla	
Cyathodes juniperina	narrow-leaved mingimingi
Cyperus ustulatus	
Dacrycarpus dacrydioides	kahikatea
Dacrydium cupressinum	rimu
Dendrobium cunninghamii	
Deyeuxia billardieri	
Dianella nigra	
Dichelachne crinita	plume grass

Dichondra repens	
Dicksonia squarrosa	wheki
Disphyma australe	New Zealand ice plant
Dodonaea viscosa var.	akeake
Doodia media	
Dracophyllum adamsii	
D. latifolium	neinei
D. recurvum[N]	
D. sinclairii[S]*	
D. strictum	
D. traversii	
Drapetes dieffenbachii	
Drosera arcturi[N]*	
D. binata[H]	
Drymoanthus adversus	
Dysoxylum spectabile	kohekohe
Earina autumnalis	
E. mucronata	
Elaeocarpus dentatus	hinau
E. hookerianus	pokaka
Eleocharis acuta[H]	
E. gracilis[H]	
E. sphacelata	
Entelea arborescens	whau
Epilobium astonii[N]*	
E. brunnescens s.s.	
E. nerteroides	
E. nummularifolium	

E. pallidiflorum[O*H]	
E. pedunculare	
E. rotundifolium	
Euphrasia cuneata	
E. zelandica[N]	
Freycinetia baueriana ssp. banksii	kiekie
Fuchsia excorticata	fuchsia
Gahnia lacera	
G. pauciflora	
G. procera	
G. setifolia	
Galium perpusillum	
G. propinquum	
Gaultheria antipoda	
G. sp. (G. depressa var. novae-zelandiae)	G. "novae-zelandiae"
Geniostoma ligustrifolium var. ligustrifolium	hangehange
Gentiana sp. (cf. G. montana and G. patula)	
Geranium microphyllum	
G. potentilloides var. potentilloides	
Gleichenia dicarpa[H]	
G. microphylla	
Gnaphalium audax s.s.	
G. gymnocephalum	
G. keriense	
G. luteo-album agg.	
G. sphaericum	

Gonocarpus micranthus ssp. micranthus	
G. sp. (cf. G. incanus and G. montanus)	
Grammitis billardierii	
G. magellanica ssp. nothofageti	
Griselinia littoralis	broadleaf
G. lucida	puka
Gunnera monoica	
Halocarpus biformis	pink pine
Haloragis erecta ssp. erecta	
Hebe odora s.s.[N]	
H. stricta var. stricta[H]	
H. s. var. macroura	
H. tetragona var. tetragona[N]	
H. venustula[N]	
H. sp. (Veronica arborea)[N]	Hebe parviflora var. arborea
H. sp. (Hebe stricta var. lata)	
H. sp. "Motu" (Veronica salicifolia var. angustissima)[N]	
H. sp. "Wairoa"[N]	
Hedycarya arborea	pigeonwood
Helichrysum aggregatum	
H. sp. unnamed aff. H. bellidioides	H. "alpinum"
H. lanceolatum	
Histiopteris incisa	
Hoheria populnea var. lanceolata	lacebark
Hydrocotyle americana	
H. elongata	
H. microphylla	

H. moschata	
H. novae-zelandiae agg.	
Hymenophyllum bivalve	
H. demissum	
H. dilatatum	
H. flabellatum	
H. flexuosum	
H. malingii	
H. multifidum	
H. rarum	
H. revolutum	
H. sanguinolentum	
H. scabrum	
Hypericum japonicum	
Hypolepis ambigua	
H. millefolium*	
H. rufobarbata	
H. tenuifolia	
Isachne globosa[H]	
Ixerba brexioides	tawari
Jovellana repens	
J. sinclairii	
Juncus gregiflorus	
J. maritimus var. australiensis	sea rush
J. planifolius[H]	
J. prismatocarpus[O*H]	
J. sarophorus	
Knightia excelsa	rewarewa

Lachnagrostis filiformis agg.	
Lagenifera pumila	
Lastreopsis glabella	
L. hispida	
L. microsora ssp. pentangularis	
Laurelia novae-zelandiae	pukatea
Lemna minor	
Lepidosperma australe	
Leptocarpus similis	oioi, jointed rush
Leptopteris hymenophylloides	
L. superba	
Leptospermum ericoides var. ericoides	kanuka
L. scoparium[H]	manuka
Leucogenes leontopodium[N]*	N.I. edelweiss
Leucopogon fasciculatus	mingimingi
L. fraseri	patotara
Libertia grandiflora	
L. pulchella	
Libocedrus bidwillii	kaikawaka
L. plumosa[S]*	kawaka
Limosella lineata*	
Lindsaea trichomanoides	
Litsea calicaris*	mangeao
Lobelia anceps	
Lophomyrtus bullata	ramarama
Luzula picta s.s.	
Luzuriaga parviflora	
Lycopodium australianum	

L. cernuum	
L. deuterodensum	
L. fastigiatum	
L. scariosum	
L. varium	
L. volubile	
Lygodium articulatum*	mangemange
Machaerina sinclairii	
Macropiper excelsum var. excelsum	kawakawa
Melicope simplex	poataniwha
M. ternata	wharangi
Melicytus lanceolatus	mahoe-wao
M. ramiflorus ssp. ramiflorus	mahoe
Mentha cunninghamii*	
Metrosideros carminea**	
M. colensoi*	
M. diffusa	
M. excelsa	pohutukawa
M. excelsa x robusta	
M. fulgens	
M. perforata	
M. robusta	northern rata
Muehlenbeckia australis	
M. australis x complexa	
M. complexa	
Microlaena avenacea	
M. stipoides	
Microtis unifolia	

Mida salicifolia	
Montia fontana	
Morelotia affinis	
Myoporum laetum	ngaio
Myosotis saxosa (incl. M. amabilis)[N]*	
Myriophyllum propinquum	
Myrsine australis	mapou
M. divaricata	
M. nummularia[N]	
M. salicina	toro
Neomyrtus pedunculata	
Nertera depressa	
N. sp. unnamed aff. N. dichondraefolia	
Nestegis lanceolata	white maire
Nothofagus fusca	red beech
N. menziesii	silver beech
N. solandri var. cliffortioides[N]	mountain beech
N. s. var. solandri*	black beech
N. truncata	hard beech
Olearia albida	
O. arborescens[N]	
O. colensoi[N]	
O. furfuracea	
O. ilicifolia[N]	
O. nummularifolia var. nummularifolia[N]	
O. pachyphylla**	
O. rani	heketara
Oplismenus imbecillus	bamboo grass

Oreobolus pectinatus	
Oreomyrrhis colensoi s.s.	
Orthoceras strictum	
Ourisia caespitosa[N]	
O. macrophylla var.	
Oxalis exilis	
O. lactea	
Paesia scaberula	
Parahebe catarractae ssp. diffusa	
P. olsenii[N]	
Paratrophis microphylla	
Parsonsia capsularis var. capsularis	
P. heterophylla	
Passiflora tetrandra	
Pellaea rotundifolia	
Pennantia corymbosa	kaikomako
Pentachondra pumila*	
Peperomia tetraphylla	
P. urvilleana	
Phormium cookianum	coastal flax, whaririki
P. tenax[H]	swamp flax
Phyllachne colensoi[N]*	
Phyllocladus aspleniifolius var. alpinus	mountain toatoa
P. glaucus	toatoa
P. trichomanoides	tanekaha
Phymatosorus diversifolius	houndstongue
P. novae-zelandiae	
P. scandens	fragrant fern

Pimelea buxifolia[N]*	
P. longifolia*	
P. oreophila[N]*	
P. prostrata var. quadrifaria*	
P. tomentosa*	
Pittosporum cornifolium	
P. crassifolium var. crassifolium	karo
P. eugenioides	lemonwood
P. rigidum var. rigidum[N]	
P. tenuifolium ssp. tenuifolium	kohuhu
P. sp. (P. ellipticum?)	
P. sp. (P. huttonianum?)	
Plagianthus divaricatus*	coastal ribbonwood
Plantago novae-zelandiae*	
P. raoulii	
Pneumatopteris pennigera	Thelypteris pennigera
Poa anceps agg.	
Podocarpus hallii	Hall's totara
P. hallii x nivalis	
P. nivalis[N]	snow totara
P. totara var. totara*	totara
Polystichum richardii	
P. vestitum	
Pomaderris ericifolia	
P. kumeraho*	
Potamogeton cheesemanii	
P. suboblongus[O*H]	
Prasophyllum colensoi	

Pratia angulata	
Prumnopitys ferruginea	miro
P. taxifolia	matai
Pseudopanax anomalus	
P. arboreus var. arboreus	five finger
P. colensoi	
P. crassifolius	lancewood
P. crassifolius x lessonii var. lessonii	
P. edgerleyi	raukawa
P. laetus	
P. lessonii var. lessonii	houpara, coastal five finger
P. simplex	
Pseudowintera axillaris	lowland pepperwood
P. colorata	
Pteridium esculentum	bracken
Pteris macilenta	
P. saxatilis	
P. tremula	
Pterostylis banksii	
Pyrrosia serpens	
Quintinia serrata (incl. Q. acutifolia and Q. elliptica)	quintinia
Ranunculus hirtus s.s.	
R. insignis	
R. macropus	
Raoulia glabra	
R. grandiflora[N]*	
R. tenuicaulis	

Rhabdothamnus solandri	
Rhopalostylis sapida	nikau
Ripogonum scandens	supplejack
Rubus australis	
R. cissoides var. cissoides	bush lawyer
R. schmidelioides var. schmidelioides	
Rumohra adiantiformis	
Ruppia polycarpa	
Rytidosperma gracile	
R. racemosum	
R. unarede	
Samolus repens	sea primrose
Sarcocornia quinqueflora ssp. quinqueflora	Salicornia australis, glasswort
Scandia rosaefolia var. "coastal"	
S. r. var. "inland"	
Schefflera digitata	pate
Schizeilema allanii	
Schoenus maschalinus	
S. nitens var. concinnus*	
S. tendo	
Scirpus cernuus	
S. chlorostachyus^{H}	
S. fluviatilis	
S. lacustris^{H}	
S. nodosus	knotted sedge
S. reticularis*^{H}	
S. subtilissimus^{O}*^{H}	

Selliera radicans	
Senecio lautus	
S. minimus	
S. quadridentatus	
S. wairauensis	
Solanum aviculare var. aviculare	
S. nodiflorum	
Sophora tetraptera	kowhai
Sparganium subglobosum^{O}*^{H}	
Sphaeropteris medullaris	mamaku
Stellaria parviflora	N.Z. chickweed
Sticherus cunninghamii	Gleichenia cunninghamii, umbrella fern
Tetragonia tetragonioides*	
Thelymitra longifolia	
Tmesipteris elongata	
T. lanceolata	
T. tannensis	
Triglochin striatum	
Toronia toru	toru
Trichomanes elongatum	
T. venosum	
Typha orientalis^{H}	raupo
Uncinia banksii	
U. scabra	
U. uncinata	hooked sedge
U. zotovii	
Urostemon kirkii	Senecio kirkii, kohurangi

Urtica incisa	
Viola cunninghamii	
V. filicaulis	
Vitex lucens	puriri
Wahlenbergia gracilis agg.	
Weinmannia racemosa	kamahi
Zoysia sp.*	

APPENDIX III

CHECKLIST OF ADVENTIVE VASCULAR PLANTS

Below is a checklist of adventive vascular plants recorded, collected or observed during the present survey of the Motu Ecological District. Common names used on the field cards or in the text are also given. See Appendix II for a key to abbreviations and symbols used.

Acacia mearnsii	black wattle
Achillea millefolium	yarrow
Agrostis stolonifera	
A. tenuis	browntop
Aira caryophyllea	
Anagallis arvensis	scarlet pimpernel
Anthemis cotula	
Anthoxanthum odoratum	sweet vernal
Aster subulatus	
Atriplex hastata	
Bellis perennis	daisy
Berberis sp.	
Briza maxima	
B. minor	
Bromus diandrus	
B. mollis	
B. uniolodes	
Buddleia davidii	buddleia
Cakile edentula	

Callitriche stagnalis	
Calystegia silvatica	bindweed
Campsia sp.	
Canna indica	
Cannabis sativa	Indian hemp
Capsella bursa-pastoris	shepherd's purse
Carduus pycnocephalus	
C. tenuiflorus	
Carex divulsa	
C. longebrachiata	
Centaurium erythraea	
Cerastium fontanum ssp. triviale	mouse-ear chickweed
C. glomeratum	annual mouse-ear chickweed
Chamaecyparis lawsoniana	Lawson's cypress
Chenopodium album	fathen
Chrysanthemum leucanthemum	
Cichorium intybus	chicory
Cirsium arvense	Californian thistle
C. vulgare	Scotch thistle
Colocassia esculenta	taro
Conyza floribunda	fleabane
Cordyline terminalis	
Coronopus didymus	
Cortaderia selloana	
Crataegus monogyna	hawthorn
Crepis capillaris	hawksbeard
Crocosmia x crocosmiiflora	crocosmia
Cupressus macrocarpa	macrocarpa

Cynodon dactylon	
Cyperus congestus	
C. eragrostis	
Cytisus scoparius	broom
Dactylis glomerata	cocksfoot
Datura stramonium	
Daucus carota	wild carrot
Dipsacus fullonum	teasel
Digitalis purpurea	foxglove
Epilobium ciliatum	
Eucalyptus spp.	
Euphorbia peplus	
Festuca arundinacea	
Foeniculum vulgare	fennel
Fumaria muralis	
Galium aparine	
G. divaricatum	
Geranium molle	
G. robertianum	
Gnaphalium spicatum	
Hedychium gardnerianum	wild ginger
Holcus lanatus	Yorkshire fog
Hordeum murinum	
Hypericum androsaemum	tutsan
Hypochoeris radicata	catsear
Ipomoea congesta	blue morning glory
Juncus articulatus	
J. bufonius	

J. effusus	
J. microcephalus	
J. tenuis	
Lapsana communis	nipplewort
Lagurus ovatus	harestail
Leontodon taraxacoides	hawkbit
Leycesteria formosa	Himalayan honeysuckle
Ligustrum lucidum	privet
Linum bienne	
Lolium perenne	Perennial ryegrass
Lonicera japonica	Japanese honeysuckle
Lotus angustissimus	
L. pedunculatus	
L. subbiflorus	
Ludwigia palustris	
Lupinus arboreus	lupin
Lycium ferocissimum	African boxthorn
Lythrum hyssopifolia	
Malva neglecta	
Matricaria maritima	
Medicago lupulina	
M. sativa^{o}	lucerne
Mentha pulegium	pennyroyal
M. spicata	
Miscanthus nepalensis	Himalayan fairygrass
Mycelis muralis	wall lettuce
Myosotis caespitosa	
Nasturtium officinale	watercress

Opuntia vulgaris	
Orobanche minor	
Oxalis latifolia	
Parentucellia viscosa	tarweed
Paspalum dilatatum	paspalum
Phleum pratense	timothy
Phytolacca octandra	inkweed
Plantago coronopus	
P. lanceolata	
P. major	
Pinus radiata	
Poa annua	
Polycarpon tetraphyllum	
Polygonum aviculare	
P. convolvulus	
P. hydropiper	
P. persicaria	
Populus alba	silver poplar
Prunella vulgaris	selfheal
Prunus persicus	peach
Ranunculus repens	buttercup
Rosa chinensis	
R. rubiginosa	sweet briar
Rubus fruticosus agg.	blackberry
R. phoenicolasius	Japanese wineberry
Rumex acetosella	sheep's sorrel
R. crispus	
R. obtusifolius	

Sagina procumbens	
Salix babylonica	weeping willow
S. caprea	goat willow
S. cinerea	pussy willow
S. fragilis	crack willow
Sambucus nigra	elder
Scrophularia auriculata	
Senecio bipinnatisectus	fireweed
S. jacobaea	ragwort
S. vulgaris	
Silene gallica	
Sison amomum	stone parsley
Sisymbrium officinale	
Sisyrinchium iridifolium	blue-eyed grass
Solanum nigrum	
Sonchus asper	prickly sow thistle
S. oleraceus	
Spergula arvensis	
Spergularia rubra	
Sporobolus africanus	ratstail
Stachys arvensis	
Stellaria alsine	
S. graminea	
S. media	chickweed
Taraxacum officinale	dandelion
Trifolium arvense	
T. dubium	
T. glomeratum	

T. pratense	
T. repens	
Ulex europaeus	gorse
Verbascum thapsus	
V. virgatum	
Verbena bonariensis	verbena
V. officinalis	
Veronica anagallis-aquatica	
V. plebeja	
V. serpyllifolia	
Vicia sativa	
Vulpia bromoides	
Wahlenbergia marginata	
Yucca aloifolia	

APPENDIX IV: Checklist of Vertebrate Wildlife Habitats and Distribution

Abbreviations and Notes

a. Distribution refers to population distribution in the habitat in the District.

b. L.J. Daniel, pers. comm.

c. M.J. Daniel, pers. comm.

d. A.M. Davis, pers. comm.

e. C.Richmond, pers. comm.

f. G.A. Taylor, pers. comm.

g. Atkinson (1972)

h. Bull, Gaze and Robertson (1978)

i. Rowe (1981)

j. Roxburgh (1982)

k. Innes (1983)

l. The most recent known kokako records are from Meremere Hill Scenic Reserve in 1978 and (L.J. Daniel, pers. comm). None were recorded in the 1983-84 Fauna Survey Unit survey nor the present survey.

m. Species for which there is a stated concern, principally listing in Williams and Given (1981).

n. All species records other than cited above, based on N.Z. Wildlife Service Fauna Survey Unit survey (September-November, 1983) and present survey.

o. Only confirmed habitat; probably more widespread.

APPENDIX IV: Checklist of Vertebrate Wildlife Habitats and Distribution

Scientific Name	Maori Name	European Name	Habitat	Distribution[a]
A. INDIGENOUS				
Mystacina tuberculata		Short-tailed bat	Forest	Probably present[c,m]
Chalinolobus tuberculatus		Long-tailed bat	Forest	Present
Apteryx australis mantelli	Kiwi	N.I. brown kiwi	Forest and scrub (lowland, montane)	Widespread
Eudyptula minor iredali		Northern blue penguin	Coastal waters; islets and coastal cliffs	Present
Puffinus carneipes hullianus		Flesh-footed shear-water	Coastal offshore waters	Locally common case[f]
P. bulleri		Buller's shearwater	Coastal offshore waters	Locally common[f]
P. gavia gavia	Pakaha	Fluttering shear-water	Coastal offshore waters	Locally common[f]
Sula bassana serrator	Takapu	Australasian gannet	Coastal headlands, offshore waters	Colony on Haurere headland
Phalacrocorax carbo novaehollandiae	Kawau	Black shag	Rivers and river-mouths, coastal headlands	Locally common
P. varius varius	Kahuriruhi	Pied shag	Rivermouths and coastal headlands	Locally common
P. sulcirostris		Little black shag	Rivermouths	Uncommon[h]
P. melanoleucos brevirostris	Kawaupaka	Little shag	Rivers and river-mouths	Locally common

Scientific Name	Maori Name	European Name	Habitat	Distribution[a]
Ardea novaehollandiae novaehollandiae		White-faced heron	Rivers and river-mouths	Locally common
Egretta sacra sacra	Matuku-moana	Reef heron	Rivermouths	Uncommon
Tadorna variegata	Putangitangi	Paradise shelduck	River valleys	Locally common
Anas superciliosa superciliosa	Parera	Grey duck	Rivers and streams	Locally common
Hymenolaimus malacorhynchos	Whio	Blue duck	Rivers	Uncommon[j,m]
Circus approximans gouldi	Kahu	Australasian harrier	River valleys, forest, shrubland, grassland	Widespread
Falco novaeseelandiae	Karearea	N.Z. falcon	Forest	Uncommon
Gallirallus australis greyi	Weka	N.I. weka	Forest, scrub	Present (Motu and Toatoa)
Porzana tabuensis plumbea	Puweto	Spotless crake	Freshwater swamp	Rare[d]
Porphyrio porphyrio melanotus	Pukeko	Swamp-hen	Freshwater swamp	Uncommon
Haematopus unicolor	Torea	Variable oyster-catcher	Rivermouths, beaches	Uncommon
Charadrius obscurus		N.Z. dotterel	Haparapara River mouth	Rare[f,m]
C. bicinctus bicinctus	Tuturiwhatu	Banded dotterel	Lower braided rivers and rivermouths	Uncommon
Himantopus himantopus leucocephalus	Poaka	Pied stilt	Rivermouths	Uncommon
Larus dominicanus	Karoro	Southern black-backed gull	Rivers, rivermouths, offshore	Locally common
L. novaehollandiae scopulinus	Tarapunga	Red-billed gull	River deltas and mouths, islets, offshore	Locally common

Scientific Name	Maori Name	European Name	Habitat	Distribution[a]
L. bulleri		Black-billed gull	River deltas	Rare[f]
Sterna striata	Tara	White-fronted tern	Rivermouths, offshore	Locally common
Hydroprogne caspia	Taranui	Caspian Tern	Rivermouths	Uncommon
Hemiphaga novaeseelandiae novaeseelandiae	Kereru	N.Z. pigeon	Forest (coastal, lowland)	Widespread
Nestor meridionalis meridionalis	Kaka	N.I. kaka	Forest (lowland, montane)	Uncommon[m]
Cyanoramphus auriceps auriceps[b,n]	Kakariki	Yellow-crowned parakeet	Forest (lowland, montane)	Uncommon[m]
Chrysococcyx lucidus lucidus	Pipiwharauroa	Shining cuckoo	Forest and scrub	Widespread
Eudynamis taitensis	Koekoea	Long-tailed cuckoo	Forest	Widespread
Ninox novaeseelandiae novaeseelandiae	Ruru	Morepork	Forest	Widespread
Halcyon sanita vagans	Kotare	N.Z. kingfisher	Forest; streams (lowland)	Widespread
Acanthisitta chloris granti	Titipounamu	N.I. rifleman	Forest (montane)	Locally common
Hirundo tahitica neoxena		Welcome swallow	Ponds, rivers	Uncommon
Anthus novaeseelandiae novaeseelandiae	Pihoihoi	N.Z. pipit	Riverbeds and river-mouths, roadsides, alpine	Locally common
Mohoua albicilla	Popokatea	Whitehead	Forest (lowland, montane)	Widespread
Gerygone igata	Riroriro	Grey warbler	Forest and scrub	Widespread

Scientific Name	Maori Name	European Name	Habitat	Distribution[a]	
Rhipidura fuliginosa placabilis		Piwakawaka	N.I. fantail	Forest and scrub	Widespread
Petrocca macrocephala toitoi		Miro-miro	Pied tit	Forest (lowland, montane)	Locally Common
P. australis longipes		Toutouwai	N.I. robin	Forest	Rare[b,j]
Zosterops lateralis lateralis		Tauhou	Silvereye	Forest and scrub	Widespread
Anthornis melanura melanura		Korimako	Bellbird	Forest	Widespread
Prosthemadera novaeseelandiae novaeseelandiae		Tui	Tui	Forest	Widespread
Callaeas cinerea wilsoni		Kokako	N.I. kokako	Forest	Very rare[l,m]
Hoplodactylus maculatus			Common gecko	Beaches[o]	Uncommon
Leiolopisma smithi			Shore skink	Beaches	Uncommon
Leiopelma hochstetteri			Hochstetter's frog	Forested first and second order streams	Widespread[m]
Arippis trutta	Kahawai	Kahawai	Rivermouths	Locally common[i]	
Anguilla dieffenbachii		Tuna	Longfinned eel	Rivers and streams	Widespread[i]
A. australis schmidtii		Tuna	Shortfinned eel	Lowland rivers	Locally common[i]
Galaxias breuipinnis		Kokopu	Koaro	Streams	Widespread[i]
G. fasciatus	Kokopu	Banded kokopu	Lowland rivers and streams	Locally common?[i]	
G maculatus	Inanga	Inanga	Lowland rivers	Probably present[i]	
G. argenteus	Kokopu	Giant kokopu	Lowland rivers, swamps	Present[e]	

Scientific Name	Maori Name	European Name	Habitat	Distribution[a]	
Gobiomorphus hubbsi			Bluegilled bully	Rivers and streams	Widespread[i]
G. luttoni	Toitoi	Redfinned bully	Lowland rivers	Uncommon[i]	
G. cotidianus	Toitoi	Common bully	Lowland rivers	Widespread[i]	
G. gobioides		Giant bully	Lowland rivers	Probably present[i]	
Cheimarrichthys fosteri			Torrentfish	Rivers and streams	Widespread[i]
Retropinna retropinna		Paraki, porohe	Common smelt	Lowland rivers	Probably present[i]
B. ADVENTIVE					
Mus musculus		Mouse	Forest, habitations	Widespread?[g,k]	
Rattus rattus		Ship rat	Forest	Widespread?[g,k]	
R. norvegicus		Norway rat		Present[g]	
Mustela nivalis		Weasel	Beach[n]	Uncommon?	
M. erminea		Stoat	Forest	Widespread?	
M. putorius		Ferret		Present	
Erinaceus europaeus			Hedgehog		Present
Felis catus		Cat		Present	
Sus scrofa		Pig	Lowland and montane forest	Widespread	
Trichosorus vulpecula			Possum	Forest	Widespread
Oryctolagus cuniculus			Rabbit	Grassland	Widespread
Lepus europaeus		Hare	Grassland, alpine	Widespread?	

Scientific Name	Maori Name	European Name	Habitat	Distribution[a]	
Cervus elaphus		Red deer	Forest	Widespread	
Capra hircus		Goat	Forest	Locally common	
Anas platyrhynchos platyrhynchas			Mallard	Ponds and rivers	Locally common
Synoicis ypsilophorus			Brown quail	Scrub	Rare?
Lophortyx californica brunnesiens			California quail	Scrub, grassland	Locally common
Phasianus colchicus			Pheasant	Scrub, grassland	Locally common
Alauda arvensis arvensis			Skylark	Grassland, scrub	Widespread
Prunella modularis occidentalis			Hedgesparrow	Forest, scrub	Widespread
Turdus philomelos clarkei			Song thrush	Forest, scrub	Widespread
T. merula merula		Blackbird	Forest, scrub	Widespread	
Emberiza citrinella caliginosa			Yellowhammer	Scrub, grassland	Widespread
Fringilla coelebs gengleri			Chaffinch	Forest, scrub	Widespread
Carduelis chloris chloris			Greenfinch	Scrub, grassland	Widespread?
C. carduelis britannica			Goldfinch	Scrub, grassland	Widespread?
Carduelis flammea cabaret			Redpoll	Scrub, grassland	Widespread
Passer domesticus domesticus			House Sparrow	Grassland, scrub, habitations	Locally common
Sturnus vulgaris vulgaris			Starling	Grassland	Widespread

Scientific Name	Maori Name	European Name	Habitat	Abundance	
Acridotheres tristis			Indian Myna	Grassland, scrub, forest	Widespread
Gymnorhina tibicen hypoleuca			White-backed magpie	Grassland	Widespread
Salmo trutta		Brown trout	Rivers and streams	Uncommon[g]	
Litoria aurea		Golden bell frog	Wetlands	Present	
L. raniformis		Golden bell frog	Wetlands	Present	

APPENDIX V: Checklist of survey areas of coastal and lowland zones

Abbreviations and explanatory notes

/	indicates emergent species
-	links species of approximately equal cover classes
,	separates species in order of decreasing cover class
+	links ecological units occurring in mosaic patterns
F.S.U.	Fauna Survey Unit (N.Z. Wildlife Service) survey results
a	Names are derived from Maori legal block names or local topographical features, combined with the most prominent natural characteristic.
( )	no plot

APPENDIX V: Checklist of Survey Areas of Coastal and Lowland Zones

Name	Ecological Super-Unit and Ecological Units; Special Features
Torere 64/65 Lands 4951-0002	10. (Manuka scrub bog on peaty, poorly drained alluvium.)
	11. Kahikatea-rimu-kamahi-wheki-hinau forest on valley bottom alluvium.
	11. Kahikatea forest on poorly drained alluvium.
	11. Kahikatea, rimu-Juncus articulatus-Lotus pedunculatus-wheki - Agrostis tenuis treeland on poorly drained alluvium.
	28. Kanuka-tutu-hangehange- Pseudopanax arboreus - mahoe scrub on hillslopes.
	30. Kamahi, P. arboreus - wheki forest and scrub on inland hillslopes.
	34. Hard beech, broadleaved tawa-rewarewa-tanekaha forest on upper hillslopes.
	+
	35 Hard beech, broad leaved tawa-rewarewa-tanekaha forest on upper hillslopes.
	+
	36. Broadleaved tawa, silver fern, pukatea forest on hillslopes.
	36. B. tawa s.l., rewarewa-mahoe forest on lower hillslopes.
	+
	36. B. tawa s.l., mahoe-rewarewa-raukawa-kamahi forest on upper hillslopes.
	Hochstetter's frog in first and second order streams of Rawea valley; brown kiwi (F.S.U.)

Name	Ecological Super-Unit and Ecological Units; Special Features
Opape headland 4852-0001	6. Raupo, Cyperus ustulatus - Juncus effusus - Carex geminata reedland in small valley bottoms.
	17. Pohutukawa/Phormium cookianum, Olearia pachyphylla-hangehange-manuka scrub on and above coastal cliffs, stacks and marine terrace edge.
	21. Broadleaved tawa, pohutukawa-puriri forest on coastal lower valleys to upper slopes.
	25. Manuka, Myrsine australis-kohuhu-Hebe stricta-Coprosma robusta scrub on coastal hillslopes.
	25. Gorse, Hebe stricta, manuka-Coprosma macrocarpa scrub on seaward facing hillslopes.
	30. Kamahi-kohuhu, rewarewa-manuka-Myrsine australis forest below coastal headland Olearia pachyphylla abundant in 17, less so in 30; gannet roost on rocky cliffs; spotless crake in 6.
Haurere Pt headland 4852-0002	17. Rock, pohutukawa, Olearia pachyphylla treeland on steep coastal cliffs.
	19. Pohutukawa, puriri-karaka-rewarewa treeland on low, gently sloping coastal terrace.
	25. Manuka, Coprosma macrocarpa - rangiora scrub on low and high hillslopes.
	+ 25. Gorse, Hebe stricta, manuka-Coprosma macrocarpa scrub on seaward facing hillslopes.
	+ 27. (Kanuka forest on lower hillslopes).

Name	Ecological Super-Unit and Ecological Units; Special Features
	32. Broadleaved tawa, puriri-karaka forest on inland-facing gullies. O. pachyphylla common in 17; gannet colony on headland.
Awaawakino Block 4852-0003	25. Manuka, Hebe stricta-Coprosma robusta scrub on low and high hills.
	+ 25. (H. stricta, gorse, C. macrocarpa scrub on north facing slopes).
	28. Kanuka, kohuhu forest and scrub on mid and lower hillslopes.
	32. Broadleaved tawa, puriri, kohekohe forest in small gullies and on low hills and marine terrace.
	32. Broadleaved tawa-puriri-kohekohe, pohutukawa-kanuka forest in small gullies and on low hills and marine terrace.
	32. Broadleaved tawa, pukatea-rewarewa-rimu-mamaku-puriri forest on dissected marine terrace.
Torere Bush 4952-0008	20. Pohutukawa-broadleaved tawa-puriri forest on coastal mid and lower hillslopes.
	23. Kanuka, manuka, mamaku scrub on low hills.
	28. Kanuka, rewarewa, pohutukawa-kohuhu-mamaku forest on low-lying ridges.
	32. Broadleaved tawa, kohekohe, puriri-heketara forest in inland gullies and lower gully slopes.
	+ 35. Hard beech, tanekaha forest on inland ridges and spurs.

Name	Ecological Super-Unit and Ecological Unit; Special Features
	37. Rewarewa, kanuka-supplejack-putaputaweta-mahoe forest on knoll and mid slopes. Southern limit of taraire (6 small trees); Hochstetter's frog in Waiiti Stream (F.S.U.); N.Z. falcon.
Pehitairi headland 4952-0001	20. Puriri, pohutukawa-broadleaved tawa-kamahi forest in gullies and on marine terrace edge.
	25. Manuka, bracken-Phormium cookianum, Coprosma robusta,- Hebe stricta var, macroura scrub on exposed steep coastal slope.
	16. Pohutukawa/ngaio/pasture grasses, rock, P. cookianum treeland on exposed steep coastal headland.
	27. Kanuka forest on hillslopes; some Pinus radiata underplanting.
	28. Kanuka, kamahi, broadleaved tawa-houpara-rewarewa forest on low, sheltered coastal hills.
	34. Broadleaved tawa, hard beech-puriri-kamahi forest on hillslopes and gullies.
Te Waiiti 4952-0002	6. (Raupo, Cyperus ustulatus, manuka reedland).
	25. Manuka, tutu, scrub on exposed mid and upper hillslopes.
	+ 27. Kanuka, bracken-Coprosma robusta-hangehange scrub on hillslopes.
	32. Puriri, broadleaved tawa-kohekohe forest on colluvial hillslopes.
Hawai 4952-0003	21. Broadleaved tawa, karaka-puriri-miro, pohutukawa forest in small coastal gullies.
	23. Manuka-kanuka scrub on exposed coastal lower hillslopes.

Name	Ecological Super-Unit and Ecological Units; Special Features
	28. Kanuka, rewarewa-kohuhu forest and scrub on hillslopes. Taraire present near its southern limit; whau plentiful in gully bottom; 23 and 28 being partly cleared.
Te Ipuhinu 4952-0004	34. Broadleaved tawa, hard beech-rewarewa-wheki-tanekaha on forest mid and lower slopes.
	+ 34. Hard beech, broadleaved tawa-tanekaha-rewarewa forest on ridges and spurs.
Hawai River 4952-0007	7. (Bare gravel and flowing water).
	+ 24. (Kanuka scrub on riverbanks). Pair blue ducks; no lagoon.
Haumiaroa Pt headland 4952-0005	17. Pohutukawa-houpara/Hebe stricta var. macroura, manuka-Coprosma macrocarpa scrub on exposed coastal rockface.
	20. Pohutukawa-karaka, kohekohe-puriri-wheki-putaputaweta forest on low coastal hill.
	28. Kanuka-kohekohe, Olearia albida-whau-puriri forest on Polynesian pa site atop hill.
	29. Manuka scrub on exposed coastal hillslopes.
Whituare Bay 4952-0006	19. Pohutukawa-kohekohe, kanuka, puriri-manuka-mamaku forest on marine terrace scarp. Shore skink and weasel

Name	Ecological Super-Unit and Ecological Units; Special Features
Tokaroa Rock 4953-0002	13. Rock,ice plant herbfield on offshore rockstack. White fronted tern and red billed gull breeding colony (F.S.U.)
Te Uritukituki 4953-0001	16. Pohutukawa, karaka forest on very steep rock faces. 19. Pohutukawa, puriri-kohekohe forest on undulating marine terrace. 21. Kohekohe, pohutukawa-broadleaved tawa-houpara-Olearia albida forest on very steep coastal face. 25. Manuka-blackberry-Coprosma robusta scrub on fairly steep coastal hillslopes. 28. (Kanuka, rewarewa-pohutukawa forest on moderately steep hillslopes). 32. Broadleaved tawa, puriri-mamaku-kohekohe-pukatea-Pseudopanax arboreus-mahoe forest on fairly steep coastal hillslopes. Mangeao in 32.
Maraenui forest 5053-0001	28. Kanuka, rewarewa forest on lowland hillslopes and gullies. 28. Kanuka, kohuhu-Pseudopanax arboreus scrub on low hillslopes. 30. (Rewarewa-broadleaved tawa-mamaku forest in gully head). 32. Broadleaved tawa, kamahi-kohekohe forest on mid to upper hillslopes and gullies. 34. Hard beech, broadleaved tawa, rewarewa forest on upper hillslopes.
Houpoto Swamp E 4953-0003	6. Raupo-Baumea rubiginosa, Cortaderia fulvida-Carex virgata-Isachne globosa reedland on infilled valley bottom.

Name	Ecological Super-Unit and Ecological Units; Special Features
	6. Raupo, Isachne globosa, Scirpus lacustris reedland on infilled valley bottom. 8. Carex geminata swamp on peaty, infilled valley bottom above small dam. 9. Isachne globosa Baumea rubiginosa-Yorkshire fog grass swamp on peaty, infilled valley bottom. 10. Manuka-Gleichenia dicarpa scrub bog on peaty infilled valley bottom margins. Many swamp plants, including Sparganium subglobosum; spotless crake.
Houpoto A forest 5052-0001	35. Hard beech, tanekaha-rewarewa-miro forest on low altitude ridges and spurs. + 36. Broadleaved tawa, northern rata-rewarewa-putaputaweta-silver fern-mahoe forest on lower hillslopes. + 36. Broadleaved tawa, rimu-rewarewa-kohuhu-tanekaha-northern rata-kamahi forest on mid hillslopes. + 37. Rewarewa-kanuka-kamahi, tanekaha forest on hillslopes. + 39. Hard beech, miro, Hall's totara-tawari-rimu forest on higher altitude ridges and upper slopes. Single Metrosideros carminea; Hochstetter's frog in Manuriki Stm.

Name	Ecological Super-Unit and Ecological Units; Special Features
Houpoto B 5052-0002	24. (Kanuka scrub and forest on narrow alluvial terrace)
	27. Kanuka forest on lower hillslopes.
	30. Kamahi/silver fern, tanekaha forest on moderate hillslopes.
	35. Hard beech, tanekaha, rewarewa forest on moderate upper hillslopes.
	37. Tanekaha, manuka, hard beech-rewarewa forest and scrub on low and mid hillslopes.
Houpoto C 5053-0005	37. Tanekaha, kanuka forest on lower valley hillslopes and knobs.
	Bats reported (F.S.U.)
Houpoto D 4953-0004	20. (Pohutukawa forest in small gullies on steep coastal hill).
	20. (Puriri-Pohutukawa forest remnant on steep coastal hill).
	28. (Kanuka, broadleaved shrubs on steep coastal hills).
	29. (Bracken and manuka fernland on steep coastal hills).
	29. Manuka scrub on steep coastal hills.
	32. Broadleaved tawa forest in steep coastal hill gully and on upper hillslope.
	37. Tanekaha-rewarewa forest on upper hillslopes.
	Metrosideros carminea in coastal gully.
Motu River Mouth 5053-0004	6. Raupo, Veronica anagallis-aquatica-Rumex crispus-Juncus articulatus-Prunella vulgaris-Polygonum hydropiper reedland on swampy alluvial terrace edge.

Name	Ecological Super-Unit and Ecological Units; Special Features
	7. (Bare ground and flowing water).
	24. Kanuka/Muehlenbeckia australis forest on alluvial terrace.
	26. Gravel, tauhinu, Raoulia tenuicaulis-tutu-grasses shrubland on gravel alluvial floodplain.
	26. Tauhinu-kanuka, bare ground-lupin-grasses scrub on silty alluvial floodplain.
	White-fronted tern and red-billed gull breeding colonies at mouth; three black beech trees on true left river bank above SH35 bridge.
Whitianga block 5053-0002	16. Pohutukawa forest on steep coastal faces.
	16. Pohutukawa, houpara, karo-karaka forest on coastal cliffs.
	19. Puriri, pohutukawa-putaputaweta forest on coastal marine terrace.
	20. Pohutukawa, broadleaved tawa, rewarewa forest on low coastal hills.
	+ 27. Kamahi-kanuka forest and scrub.
	21. Broadleaved tawa-puriri, pohutukawa-rewarewa-mamaku forest on low coastal hills.
	27. Kanuka, Cordyline australis, lacebark-kowhai forest on colluvial basal hillslope.
	27. Kanuka-kamahi, rewarewa-kohuhu-Pseudopanax arboreus-heketara-pohutukawa forest and scrub on low hillslopes.
	29. Manuka scrub on low hill ridges.
	30. Kiokio-rangiora-Gahnia setifolia scrub and fernland on low hills.

Name	Ecological Super-Unit and Ecological Units; Special Features
	+
	30. Pseudopanax arboreus-putaputaweta, mahoe-fuchsia-Coprosma robusta-rangiora-mamaku scrub on low hills.
	+
	30. Mamaku, kamahi-pohutukawa-Metrosideros perforata forest on low hills.
	31. Kahikatea, puriri-pukatea-kanuka forest on alluvial terrace.
	32. Broadleaved tawa forest on higher altitude gullies and hillslopes.
	+
	34. Hard beech, broadleaved tawa-northern rata forest on upper slopes.
	+
	35. Hard beech, rewarewa forest on low altitude ridges and spurs.
	+
	36. Broadleaved tawa, kamahi forest on lower hillslopes and gullies.
	Intact coastal cliff vegetation; bats reported (F.S.U.).
Omaio Block 5053-0003	16. Pohutukawa, houpara-Phormium cookianum-Olearia albida forest on coastal margins.
	21. Broadleaved tawa, pohutukawa-karaka-kohekohe-puriri forest on basal hillslopes and gullies.
	21. Pohutukawa-broadleaved tawa, puriri forest on mid hillslope.

Name	Ecological Super-Unit and Ecological Units; Special Features
	21. Broadleaved tawa, pohutukawa forest on midslopes and gully heads.
	+
	22. Hard beech-pohutukawa, rimu, broadleaved tawa forest on low coastal ridges and upper hillslopes.
	+
	36. Broadleaved tawa, northern rata, kohekohe-hinau forest on upper hillslopes.
	23. Manuka, kanuka scrub on low coastal hillslopes.
	30. Pseudopanax arboreus, manuka-kamahi scrub on upper hillslopes.
	34. Hard beech, broadleaved tawa-Pseudopanax arboreus forest on hillslopes.
Ohae Point Island 5054-0005	18. Houpara, pohutukawa forest on islet.
Wharawhara Block 5054-0001	21. Broadleaved tawa, pohutukawa, puriri forest on coastal hillslopes.
	+
	35. Hard beech, rewarewa, tanekaha-kamahi-toru forest on coastal ridge tops.
	29. Manuka, Pseudopanax arboreus, kanuka-rewarewa-toru-Leucopogon fasciculatus-kohuhu scrub on lower coastal hillslopes.
	30. Mamaku, P. arboreus-kamahi, broadleaved tawa forest on upper catchment slopes and gullies.

Name	Ecological Super-Unit and Ecological Units; Special Features
	32. Broadleaved tawa, puriri, putaputaweta-karaka-rewarewa-hinau rimu-kohekohe forest on marine terrace and basal colluvial hillslopes.
Haparapara/ Waikakariki rivers 5054-0003	7. (Bare ground and flowing water)
	24. Kanuka-manuka, tauhinu-tutu scrub and shrubland on alluvial floodplain.
	26. Tauhinu-tutu-buddleia scrub and shrubland on braid islands.
	+ 26. Buddleia, tutu-manuka-tauhinu scrub on braid islands.
	N.Z. Dotterel breeding at rivermouth; introduced fish absent.
Motunui Island 5054-0004	18. Pohutukawa, karo forest on small offshore island.
Awanui Hapara-para 5054-0002	6. Raupo, Phormium tenax-Hebe stricta reedland along stream course.
	15. Taraire-broadleaved tawa-putaputaweta forest on valley stream banks and lower slopes (Orini Stm).
	16. Pohutukawa treeland on coastal cliffs.
	20. Pohutukawa, broadleaved tawa, rewarewa forest on coastal mid hillslope.
	21. Broadleaved tawa, mamaku-rangiora, puriri-pohutukawa forest on low and high hills.
	21. Broadleaved tawa-puriri, pohutukawa forest on colluvial hillslopes.
	21. Broadleaved tawa, pohutukawa-rewarewa forest on low hills.

Name	Ecological Super-Unit and Ecological Units; Special Features
	27. Kanuka forest on coastal mid and lower hillslopes.
	29. Manuka, Coprosma robusta-kanuka scrub on low hills.
	28. Kanuka-manuka-rangiora-putaputaweta-mahoe-mamaku-Pseudopanax arboreus-tutu forest on low hills.
	+ 30. Mamaku, Pseudopanax arboreus-broadleaved tawa-mahoe fernland on steep low hillslopes.
	32. Broadleaved tawa, kamahi forest on basal hillslopes.
	33. Puriri, broadleaved tawa-rewarewa forest on alluvial terraces and colluvial hillslopes.
	33. Broadleaved tawa-Paesia scaberula, Hoheria populnea-kohekohe-kawakawa-Lotus pedunculatus-Ranunculus repens - Sison amomum forest and treeland on alluvial plain.
	34. Broadleaved tawa, hard beech forest on high hill ridges and upper slopes.
	Hochstetter's frog in upper reaches of Orini Stm, and Waikakariki River in tributaries (F.S.U.); extensive windthrow.
Waiorore Stream 5154-0001	16. Pohutukawa, karaka forest on coastal cliffs.
	21. Broadleaved tawa, pohutukawa, kamahi-rewarewa-Pseudopanax arboreus forest on midslopes and gullies.
	+ 35. Hard beech, kamahi-rewarewa-Pseudopanax arboreus forest on ridges and knolls.
	28. Kanuka, Pseudopanax arboreus-toru-rewarewa-ponga-Leucopogon fasciculatus forest on hillslopes.

Name	Ecological Super-Unit and Ecological Units; Special Features
	29. Manuka, Coprosma lucida-kamahi-toru-Pseudopanax arboreus-tutu-rewarewa-kohuhu-Olearia furfuracea scrub on upper hillslopes and ridges.
	Hochstetter's frog Waiorore Stm tributary; N.Z. falcon (F.S.U.).
Maungaroa South 5254-0001	12. Pukatea-kahikatea swamp forest on poorly drained alluvial terrace edge.
	29. Manuka scrub on steep hillslopes.
	29. (Manuka scrub on steep hillslopes).
	+ 30. Pseudopanax arboreus, manuka, rewarewa-kamahi-tutu-Coprosma robusta-mamaku scrub on steep hillslopes.
	31. Kahikatea, pukatea-kanuka forest on alluvial terraces.
	31. Cyperus ustulatus-blackberry, kanuka-kahikatea-pukatea treeland on valley alluvium.
	35. Hard beech, toro forest on lower ridges.
	+ 36. Broadleaved tawa, rewarewa-kamahi-hinau forest on steep lower slopes.
	+ 36. Broadleaved tawa, rewarewa-kamahi forest on steep lower slopes.

Name	Ecological Super-Unit and Ecological Units; Special Features
	+ 36. Broadleaved tawa, hinau-kamahi-rewarewa forest on steep mid altitude hillslopes.
	+ 36. B. tawa s.l., northern rata-kamahi forest on upper hillslopes.
	+ 36. Broadleaved tawa, heketara-kamahi windthrown forest on mid altitude plateau and gully heads.
	+ 38. Rimu-tawari-hinau-kamahi-wheki-Pseudowintera axillaris windthrown forest on upper hillslopes.
	+ 39. Hard beech, tawari-northern rata-B. tawa s.l. - rewarewa forest on mid altitude ridges.
	+ 39. Hard beech, tawari-toatoa-northern rata forest on high altitude ridges.
	Bat; N.Z. falcon parakeet kaka and rifleman (F.S.U.); extensive windthrow on south to southeast aspects.
Te Kaha 5155-0002	16. Pohutukawa-houpara-taupata-Hypochoeris radicata-Holcus lanatus treeland on and above coastal cliffs.
	15. Taraire - broadleaved tawa - pohutukawa, mamaku-puriri forest on lower valley slopes (Pakaranui Stm).

Name	Ecological Super-Unit and Ecological Units; Special Features
	+
	22. Pohutukawa-hard beech, broadleaved tawa-kamahi-Myrsine australis - northern rata - rewarewa forest on coastal ridges and upper slopes.
	+
	34. Hard beech, broadleaved tawa, heketara-kohuhu forest on coastal ridges and spurs.
	19. Puriri, pohutukawa-pigeonwood forest on colluvial basal hillslope.
	25. Manuka, kohuhu, bracken - toru - Leucopogon fasciculatus - Cordyline banksii - Coprosma robusta scrub on low coastal upper hillslopes.
	+
	27. Kanuka forest on steep coastal mid and basal hillslopes.
	+
	27. Kanuka, pohutukawa - kohuhu forest on coastal upper hillslopes.
	+
	30. Mahoe - kawakawa - houpara, mamaku - tutu - putaputaweta Cordyline banksii forest on steep lower slopes and gullies.
	33. Broadleaved tawa, mahoe, karaka - taraire - ponga-puriri forest on alluvial stream terrace.
	33. Pukatea, nikau, broadleaved tawa - mahoe forest on alluvial flood plain.
	34. Broadleaved tawa, hard beech - rewarewa - kohekohe forest in gullies and on lower hillslopes.
	+
	35. Hard beech, tanekaha - rewarewa forest on ridges.
	36. Broadleaved tawa, northern rata - Pseudopanax arboreus - kohekohe - tawari - ponga - Metrosideros perforata forest on plateau.

Name	Ecological Super-Unit and Ecological Units; Special Features
Kereu River 5155-0001	6. Raupo - blackberry - Juncus effusus reedland on poorly drained alluvial terrace near river mouth.
	7. (Bare gravel and flowing water)
	26. Tauhinu, manuka scrub on alluvial flood plain
	26. Tauhinu, Lotus subbiflorus - Trifolium repens - Plantago lanceolata shrubland on alluvial flood plain
Maungaroa North 5155-0005	16. (Pohutukawa forest on coastal cliffs)
	21. Puriri - pohutukawa - karaka - kohekohe - broadleaved tawa forest on marine and alluvial terraces.
	22. Hard beech, pohutukawa, broadleaved tawa - rewarewa - puriri - kamahi forest on coastal ridges.
	+
	32. (Broadleaved tawa, puriri - kamahi forest on lower hill slopes and gullies).
	32. Broadleaved tawa, puriri-kamahi forest on lower hill slopes and gullies.
	+
	38. Hard beech, tawari - kamahi, rimu - Hall's totara - quintinia - rewarewa forest on ridges and upper hill slopes.
	24. Kanuka, mosses, Salix incana - manuka - blackberry - Plantago lanceolata - Lotus subbiflorus on alluvial terraces.
	27. Kanuka forest and scrub on steep basal hillslopes.
	27. Kanuka, kohuhu scrub and forest on steep coastal and hillslopes.
	29. Manuka scrub on marine terrace and hillslopes.

Name	Ecological Super-Unit and Ecological Units; Special Features
	30. Coprosma robusta - Pseudopanax arboreus, mamaku forest on low and mid hillslopes.
	31. Kahikatea, matai-pukatea forest on alluvial terrace.
	31. Kahikatea, rimu-broadleaved tawa forest on alluvial terraces.
	33. Broadleaved tawa, puriri, rewarewa forest on alluvial fans
	33. Pukatea - broadleaved tawa, rewarewa - northern rata - supplejack - mahoe forest on poorly drained alluvial terrace. Metrosideros carminea at four sites along Kereu River; Lygodium articulatum near Hereheretaunga summit; brown kiwi (F.S.U.); extensive windthrow.
Waikawa Pahaoa 5155-0003	5. Phormium tenax, Prunus persica swamp of old stream course.
	16. Pohutukawa forest on and above coastal cliff faces.
	20. Pohutukawa - puriri - kanuka, broadleaved tawa forest on basal hillslopes and marine terrace.
	28. Pseudopanax arboreus, kanuka, putaputaweta - mamaku - kohuhu scrub and forest on hillslopes and marine terrace.
	29. Manuka scrub on hillslopes, colluvium and marine terrace.
Motukotare Island 5155-0006	18. (Pohutukawa forest on old wave cut platform on small offshore island).
Te Huka Island 5155-0007	18. Pohutukawa - manuka scrub on small offshore island summit and upper slopes.
Motuaruhe forest 5255-0001	16. Pohutukawa, houpara, karaka forest on and above steep coastal cliffs.

Name	Ecological Super-Unit and Ecological Units; Special Features
	21. Broadleaved tawa, pohutukawa - puriri forest on steep coastal hillslopes.
	21. Broadleaved tawa - pohutukawa - puriri forest on colluvial slopes and marine terrace.
	27. Kanuka, Cordyline australis - Coprosma robusta scrub on low coastal hillslopes.
	29. Manuka, tauhinu, bracken - Pseudopanax arboreus scrub on high hills and colluvial slopes.
	30. Pseudopanax arboreus, heketara - wheki, kamahi - broadleaved tawa - miro forest on hillslopes and gullies.
	32. Broadleaved tawa, puriri, karaka - kohekohe - rewarewa forest on steep coastal hillslopes.
	35. Hard beech, rewarewa forest on ridges and spurs.
	+ 36. Broadleaved tawa, kohekohe - kamahi forest on mid and lower slopes and in gullies.
	38. (B. tawa s. l. - tawari - kamahi - northern rata forest on upper hillslopes). Black beech on ridge above Whanarua Stream (N61: 198565); Carmichaelia williamsii; Hochstetter's frog in Whanarua stream tributaries. (F.S.U.)
Maraehako-Te Waiti 5255-0003	18. Poa anceps, Coprosma repens-Scirpus nodosus - Apium prostratum-Samolus repens - houpara grassland and herbfield on coastal stack.

Name	Ecological Super-Unit and Ecological Units; Special Features
	18. Pohutukawa, houpara - Cyathodes juniperina forest on coastal stack.
	21. Broadleaved tawa, puriri-pohutukawa-karaka forest on steep valley slopes.
	29. Manuka, kamahi-Leucopogon fasciculatus-kohuhu-pohutukawa scrub on coastal crests and upper hillslopes.
	30. Mamaku, Pseudopanax arboreus-mahoe, putaputaweta - fuchsia forest on hillslopes.
	32. Broadleaved tawa, karaka-puriri forest in stream gully.
	32. Broadleaved tawa, rewarewa, Myrsine australis - hinau - puka - lancewood - putaputaweta - kohuhu forest on lower slopes and gullies.
	+
	38. B. tawa s.l., tawari-kamahi forest on broad upper ridges.
	+
	39. Hard beech, toru - tanekaha - quintinia - kamahi - tawari - hinau forest on ridges and spurs.
Motu Papaku Island 5255-0005	18. Houpara, mangeao-rewarewa, puriri-Myrsine australis, Cordyline australis forest on small offshore islands.
	Successional forest developed in absence of grazing animals; northern blue penguin.
Motu Kaimeanui Island 5255-0006	18. Pohutukawa, houpara - mangeao, puriri forest on small offshore island.

Name	Ecological Super-Unit and Ecological Units; Special Features
	18. Houpara, kohuhu, Myrsine australis-pohutukawa forest on small offshore island.
	Successional forest developed in absence of grazing animals.
Te Aruhe Ahika 5255-0009	21. Broadleaved tawa, puriri, rewarewa-pohutukawa-karaka-pukatea forest on colluvial basal hillslope.
	21. Broadleaved tawa, pohutukawa, rewarewa forest on hillslopes.
	31. Pukatea-kahikatea, puriri forest on alluvial terrace.
	Hochstetter's frog in unnamed creek (F.S.U.).
Pohueroro Block (no survey area card)	27. Kanuka forest on slip sites.
	27. Kanuka scrub on low hillslopes.
	+
	28. Kanuka, Pseudopanax arboreus-mahoe-mamaku forest on moderate and steep hillslopes.
	+
	28. Kanuka-Ranunculus repens, mamaku - mahoe - putaputaweta - manuka - bracken - Agrostis tenuis-paspalum treeland and shrubland on hillslopes.
	30. Mahoe, broadleaved tawa, wineberry - kamahi - putaputaweta - mamaku - pigeonwood - Coprosma robusta forest on hillslopes and gullies.
	+
	30. Mamaku, Pseudopanax arboreus-kamahi, heketara-mahoe - putaputaweta forest and scrub on hillslopes.

Name	Ecological Super-Unit and Ecological Units; Special Features
	32. Broadleaved tawa, titoki-mahoe-pigeonwood forest on lower hillslopes in gullies.
	+
	36. B. tawa s.l. - kamahi, hinau, rewarewa-rimu on high steep hillslopes.
	+
	39. Hard beech, tawari-broadleaved tawa-kamahi-tanekaha-miro forest on ridges and spurs.
	33. Broadleaved tawa, pukatea-ponga forest on alluvial terrace (partly windthrown).
	33. Broadleaved tawa, rewarewa-puriri-pukatea-kohekohe forest on alluvial terrace.
	Metrosideros carminea at two sites along Raukokore River; Hochstetter's frog on unnamed tributary of Raukokore River (N62:295562); also Waihueroro, Mangaikakorea and Mangahatoto Stms (F.S.U.); kaka, N.Z. falcon and rifleman (F.S.U.); extensive cattle grazing.
Lower Raukokore River 5255-0004	7. (Bare gravel and flowing water).
	24. Kanuka, tauhinu scrub on alluvial floodplain.
	26. Tauhinu-bare ground, lupin, Sporobolus africanus-Agrostis stolonifera shrubland on alluvial floodplain.
	27. (Kanuka scrub on hillslope).
	30. (Rangiora, hangehange, Leucopogon fasciculatus on steep hillslopes).

Name	Ecological Super-Unit and Ecological Units; Special Features
	Carmichaelia williamsii; banded dotterels, and roost of c. 500 white fronted terns near river mouth.
Raukokore Beach 5255-0007	1. Mud, Ruppia megacarpa, Spirogyra (algae), Limosella lineata on lagoonal mudflat.
	2. Juncus microcephalus - Aster subulata - Scirpus cernuus, Eleocharis acuta rushland on lagoonal mudflat edge.
	3. Plagianthus divaricatus - Cyperus ustulatus, Eleocharis acuta shrubland on coastal flats.
	4. Cordyline australis - blackberry treeland on alluvial floodplain.
	6. Raupo reedland on old marine strand depression.
	14. Gravel, tauhinu - lupin, blackberry shrubland on gravel beach.
	Common gecko and shore skink on beach (F.S.U).
Raukokore Reserve 5355-0002	32. Broadleaved tawa, puriri-rewarewa forest on lower hillslopes.
	+
	34. (Hard beech, rewarewa, broadleaved tawa forest on upper hiilslopes)
	33. Broadleaved tawa, pukatea-kohekohe-karaka-kawakawa-mahoe forest on alluvial terrace.
	Metrosideros carminea, extending down Raukokore River to S.H. 35 bridge; extensive windthrow.
Kapongaro forest 5255-0008	15. Taraire, broadleaved tawa, puriri-kohekohe-rewarewa forest in gully system on raised marine terrace.
Tawaroa Topu 5355-0003	32. Broadleaved tawa, puriri-karaka forest on moderate hillslope.

APPENDIX VI

Checklist of ecological resources in existing and proposed PNAs of the district

PART A EXISTING (GAZETTED) PNAS[1]	PART B PROPOSED PNAS[1]
Whinray Scenic Reserve	Raukumara Wilderness Area
Oroi Scenic Reserve	Maungawaru Ecological Area
Tokata Scenic Reserve	Whanokao Ecological Area
Aorangiwai Scenic Reserve	Hikurangi Ecological Area
Part Meremere Hill Scenic Reserve	Raukokore Ecological Area
Part Toatoa Scenic Reserve	Kopuapounamu Ecological Area
Part Whitikau Scenic Reserve	Puketoetoe Ecological Area
Motu River National Water Conservation Order	Paraumu Ecological Area
	Part "Nukutere Scenic Reserve"

1. Preservation of indigenous landscape, fauna and flora reasonably guaranteed (Kelly, 1980)

PART A
EXISTING GAZETTED PNAS
Scenic Reserves

Whinray Scenic Reserve (Clarkson and Regnier, 1984)	397 ha	River terraces and gentle lower slopes	1. Kahikatea-rimu/kamahi-tawa-tawari forest
		Steeper slopes and ridges	2. Rimu/tawa forest
		High ridges	3. Tawari-kamahi forest
		Valley bottom with impeded drainage	4. Kahikatea/Carex-raupo-toetoe shrub-sedgeland.
			5. Shrubland and scrub. Includes all secondary successions ranging from minor patches of recently retired pasture, now dominated by bracken fernland, to five finger-mahoe-tawa scrub.
			6. Pasture
Whitikau Scenic Reserve (Clarkson and Regnier, 1984)	872 ha (approx.140 ha in Motu E.D.)	Hillslopes below 670m Hillslopes above 670m	1. Rimu/tawa forest 2. Tawa/tawari-kamahi forests 3. Bracken fernland - scrub 4. Pasture
Part Toatoa Scenic Reserve (Clarkson and Regnier, 1983)	2849 ha (approx. 2350 ha in Motu E.D.	Steep lower hillslopes from 360 m up to 600-700 m	1. Rimu/tawa/tawari forest with kamahi, hinau, rewarewa and emergent miro.
		Upper hillslopes between about 600-760 m, extending to below 450 m on ridge tops	2(a) Hard beech/tawari forest. Hard beech, and locally dominant toatoa and occasional Hall's totara over tawari. Scattered red beech.
			2(b) Tawari - kamahi forest. Tawari-kamahi with emergent Hall's totara, toatoa, scattered rimu and occasional northern rata.
		Upper hillslopes above 760 m	3. Red beech/tawari forest, with Hall's totara.

		Knoll around Ngateretere Trig (840-985 m)	4. Silver beech/tawari forest. 5. Scrub dominated by bracken and/or manuka with Coprosma robusta, C. lucida, Pseudopanax arboreus, kohuhu and other broad-leaved shrubs 6. Pasture Coprosma rubra is at its northern limit just outside the reserve.
Part Meremere Hill Scenic Reserve (Clarkson and Regnier, 1983)	1368 ha (approx. 80 ha in Motu E.D.)	Between 100-450 m. Sheltered gullies and ridge sides	1. Tawa forest with pukatea, hinau, rewarewa and scattered emergent rimu and northern rata.
		Ridges below 500m	2. Hard beech forest, with tanekaha, kamahi, lancewood and rewarewa.
		Between 450-500 m and 700m. Upper slopes and ridges.	3(a) Tawa/tawari forest. Tawa canopy (as in 1) becomes discontinuous, particularly on ridgetops, and there is a lower tier of abundant tawari, occasional kamahi and a few emergent rimu and miro. Tawari dominant canopy, with tawa Hall's totara and miro. Alsophila smithii dominates recent slip faces.
		As above	(b) Hard beech/tawari forest. Hard beech and occasional toatoa over tawari and kamahi with scattered miro, Hall's totara and rimu.
		Above 700 m	As for 3(b), with some red beech also present.
		As for 1 and 2	4. Scrub dominated by any of manuka, bracken, tutu, kiokio, mingimingi, Pseudopanax arboreus, kohuhu, mamaku, rangiora, Coprosma robusta, kamahi, mahoe and rewarewa.
			Vegetation types 1 and 3 are represented in Motu E.D.
Oroi Scenic Reserve (Clarkson and Regnier, 1983)	19.5 ha	Semi-coastal ridges and valleys, between 15-120 m	1. Tawa-rewarewa-puriri forest, with a few hard beech and pohutukawa.
		Lower ridges and slopes	2. Manuka scrub succeeding to pohutukawa/kamahi-kohuhu treeland.
		Banks of Opape Stream	3. Willow - black wattle-manuka/bracken treeland.
			4. Pasture.
Tokata Scenic Reserve (Clarkson and Regnier, 1983)	1.77 ha	Coastal slopes at Motu River mouth between 0-30 m	1. Pohutukawa-puriri/kohekohe-Olearia forest, with Coprosma macrocarpa.
		Rocky coastline, within spray and sub-aerial zone	2. Rockfield, with scattered sea primrose, primrose, glasswort, NZ iceplant, taupata, Scirpus nodosus, Rytidosperma spp. coastal flax and rengarenga.
			3. Sandfield.
Aorangiwai Scenic Reserve (Nicholls, 1968)	751 ha	Steep slopes rising to Mt Aorangi. Steep slopes and bluffs. Between 180-1260m.	Vegetation: 1. Occasional large rimu and rata and (local) kahikatea, over abundant tawa and kamahi, frequent pukatea and occasional hinau and rewarewa. 2. Occasional large rimu and rata, over abundant tawa, kamahi and tawari and occasional miro, hinau and rewarewa. 3. In the qullies, frequent rimu, miro and matai and (local) totara and kahikatea over maire and kamahi. 4. Upper ridges, occasional rimu, miro and other softwoods and abundant red and silver beech, over kamahi and tawari. 5. Subalpine scrub, shrubland and grassland.
Other Reserves			
Motu River National Conservation Order	c. 95 km on main river	Motu River and some tributaries	Bare gravel and flowing water. Large population of blue ducks.

PART B: PROPOSED P.N.As.

1. Proposed Wilderness Area in Raukumara Forest Park
(approved in principle)

Proposed Raukumara Wilderness Area (Nicholls, 1983b)	39 000 ha	Mostly very steep and broken land, between 100-1486 m	Hard beech predominates up to 600 m a.s.l., with understorey kamahi and quintinia and scattered rimu, miro, tanekaha, toatoa, northern rata, rewarewa, and B. tawa s.l. Between 600-850 m, red and silver beech mix with or replace hard beech, and tanekaha, northern rata, rewarewa, and tawa disappear. Montane forest on the high divides is generally composed of red and silver beech, Hall's totara, toatoa, kamahi, tawari, and local kaikawaka, up to about 1150 m. Silver beech then predominates to the tree-line, with locally abundant kaikawaka, mountain toatoa and pink pine, and very localised mountain beech. A major belt of rimu-rata/tawa forest, with some pukatea, hinau, rewarewa, kamahi, and mahoe, covers relatively easy terrain in the upper Mangatutara and Te Kahika catchments, and occurs elsewhere as pockets in gully bottoms and on terraces. In the total absence of hard beech in the upper Mangatutara Valley, this podocarp hardwood type reaches 800m, and matai, kahikatea and maire are locally common. Few lowland or coastal plant species are present despite the low altitude along the Motu River.

2. Proposed Ecological Areas in Raukumara Forest Park
(Recommended by SFSRAC 5/83. Not yet approved in principle 2/84)

Proposed Maungawaru Ecological Area (Nicholls, 1983b)	c. 2250 ha	Subalpine Maungawaru Plateau, and adjacent steep land, between 600-1450 m	Includes the sub-alpine vegetation of the Area Maungawaru Plateau, 1350-1450m a.s.l., and surrounding forest in the headwaters of major tributaries of the Mangaotane Stream, down to 600m. The area of the Plateau, mainly above tree-line, is about 450 ha. Vegetation on the Plateau is montane shrubland or dwarfed forest in shallow gullies, with more open patches on broad ridges where there are scattered Olearia colensoi in grassland, herbfields or mires. Pink pine and very stunted mountain beech are common, and the pygmy pine x yellow-silver pine hybrid is locally abundant. Montane forest on rocky spurs and steep gully sides leading from the plateau is dominated by silver and mountain beech, with kaikawaka, mountain toatoa and pink pine throughout and forming discrete stands in places. With decreasing altitude, this type grades into red beech-silver beech-kamahi-tawari forest with occasional to locally frequent Hall's totara and kaikawaka. Wide ridges with little rocky or poorly-drained ground carry nearly pure red and silver beech forest down to approx 850 m. Below this, rimu and miro appear.
Proposed Whanokao Ecological Area (Nicholls, 1983b)	c. 4500 ha	Upper catchment of Tapuaeroa River, between 400-1618 m	Covers the stunted forest and sub-alpine vegetation of the precipitous Mt Whanokao (Honokawa on maps), and contrasting montane forest types on the northern and southern sides of the upper Tapuaeroa catchment, podocarp-hardwood forest and shrub-hardwood forest on very steep terrain bordering the river in the east of the area, and podocarp-hardwood forest with unusually high numbers of rimu, matai, and kahikatea on

relatively easy terrain upstream. Boundaries follow the Tapuaeroa catchment boundary except for two minor exceptions.

Some noteworthy species above tree-line on Mt Whanokao are pygmy pine, snow totara, Olearia colensoi and Brachyglottis rotundifolia. The surrounding montane beech forest above 850 m is similar to that along the Mt Raukumura ridge, except for the addition of mountain beech. In contrast, the montane forest on the south side of the catchment is almost purely silver beech, with an understorey of broadleaf, fuchsia, Pseudopanax spp., Dracophyllum spp., and Olearia colensoi.

Forest between 750-850m a.s.l. all round the catchment comprises red and silver beech, kamahi, tawari, and quintinia, with occasional rimu, miro, Hall's totara, and toatoa. Podocarp-hardwood forest similar to that in the proposed Kopuapounamu EA covers very steep ridges in the lower catchment, where abundant tutu, wineberry, pate, manuka and other shrubs densely cover frequent old slip faces above the deeply entrenched river and its tributaries. The main area of rimu-rata/tawa forest with above-average numbers of rimu and locally frequent matai and kahikatea occurs up to 750m a.s.l. in the Mangamuku sub-catchment.

Proposed Hikurangi Ecological Area
(Nicholls, 1983a)

c. 6500 ha

Upper catchment of Waingakia Stream, and part of Mt Hikurangi, between 450-1764 m

Covers Mt Hikurangi open tops within State Forest, and catchment of Waingakia tributary of the Mata River. The summit of the mountain at 176 m a.s.l. is the highest point on the North Island axial ranges.

The peaks of Mt Hikurangi have a very similar flora to those of Mt Whanokao. Coriaria pottsiana is an East Cape endemic,.(Druce 1980). A belt of stunted silver beech with kaikawaka, mountain toatoa, pink pine, and patches of mountain beech covers the steep, rocky ridges and faces immediately below the scrub and herbfield, with red beech-silver beech-kamahi-tawari forest containing miro and Hall's totara and rare kaikawaka below this down to about 900 m.

The forest pattern in the rest of Waingakia catchment is typical of the whole south-east face of the Raukumara Range. Below 750 m, there is tawa-kamahi-tawari forest with scattered podocarps (mainly rimu) in the lowest, widest, section of the valley, and forest below that altitude upstream as the valley closes in upstream has a consistent admixture of red and silver beech. Above this, tawa and other lowland hardwoods disappear; red and silver beech dominated forest with the kamahi-tawari understorey continues up to about 1200m. Rimu and miro are scattered throughout up to 900m, but above that the only softwoods are very rare Hall's totara and kaikawaka.

The uppermost montane forest is composed of abundant stunted silver beech, over a dense underwood in which broadleaf, fuchsia, Dracophyllum spp., Pseudopanax spp., and Olearia colensoi are prominent. Kaikawaka, mountain toatoa, and pink pine occur very locally, on occasional rocky outcrops along the leading spurs and fringing the scrub patches on the main range.

Proposed Raukokore Ecological Area
(Nicholls, 198 a and 1983b)

c. 3300 ha

Part mid-catchment of Raukokore River, and adjacent minor area, between 175-1618 m

Along the highest ridges on the west side of the Raukokore catchment, there is rimu-tawa forest with strong admixtures of red and silver beech, and this gives way towards the river to purely podocarp-hardwood forest. Matai and kahikatea occur on small riparian flats or low terraces. Stands of kanuka with regenerating podocarps, including tanekaha, occur where mixed podocarp-

			dominant forest probably once occurred on the only sizable area of flat ground at the northern boundary of this proposed reserve. Although the altitude along the river inside the proposed reserve is nearly all below 300m, no kohekohe or other coastal species occur, which is typical of all the narrow interior river valleys in the ecological district. Podocarp-hardwood forest persists on relatively easy terrain close to the west side of the river, but an association of abundant hard beech, kamahi, tawari, and quintinia, with scattered to locally frequent rimu, miro, Hall's totara, toatoa, *B. tawa s.l.*, hinau, and rewarewa predominates on the broken country leading to Wharehinu Trig and upriver to the wilderness area boundary. Tanekaha also occurs frequently on the lower ridges. Above 750m round Wharehinu, there is an incoming of silver beech and occasional kaikawaka. Only a fragment of this type of forest is in the proposed reserve, but it is amply represented in the proposed Puketoetoe ecological area.
Proposed Kopuapounamu Ecological Area (Nicholls, 1983a)	*c.* 1000 ha	Upper catchment of Kopuapounamu tributary of Awatere River, between 450-1414 m	Represents the remaining indigenous forest at the north-east extremity of the Motu Ecological District, where the underlying rock is grossly deformed and the land notoriously unstable. Hard beech is absent eastwards from the middle Raukokore River valley, and so podocarp-hardwood forest here gives way quite abruptly at about 800m a.s.l. to montane red and silver beech forest (i.e. there are no definite belts of the rimu-tawa-beech and rimu-beech types so characteristic of the rest of the main forest tract). Also included is the part of the portion of the main Raukumara divide where beeches are anomalous and very rare.

			The main trees in the podocarp-hardwood forest are *B. tawa s. l.*, kamahi, tawari, and mahoe, and pukatea up to 600m; rimu, miro, Hall's totara, rata, hinau, and rewarewa are scattered throughout; matai, kahikatea, and maire occur very locally, and kohekohe only appears rarely along the lowest forest fringe. Between 800-900m, red beech appears in the podocarp-hardwood forest; above this is red beech-silver beech-kamahi-tawari-quintinia forest with occasional miro and Hall's totara, grading into a stunted forest along the Mt Raukumara ridge of silver beech-kaikawaka-pink pine-mountain toatoa. This gives way at 1,200m to stunted scrub which includes snow totara. In marked contrast, the narrow main divide and its western spurs, from only 750 m to about 1100 m, have a stunted forest of dense kamahi, tawari, toro, quintinia, and tree ferns. Miro and Hall's totara are locally frequent about the lower margins, and extremely scattered along the exposed ridge-tops. Rare clumps of red and silver beech and rare kaikawaka occur on the highest ground.
Proposed Puketoetoe Ecological Area (Nicholls, 1983a)	*c.* 1750 ha	Catchment of Ngarere Stream, a tributary of the lower Motu River, and minor adjacent catchments, between 80-1,120 m	Contains a representative example of the hard beech dominated forest of the moderately high, very steep and rugged country typical of the north-western quarter of the Raukumara S.F.P., between the Hawai-Motu divide and the headwaters of the Raukokore River. Also includes exceptional mixtures, (for North Island indigenous forest), of hard beech, silver beech, rimu and kaikawaka. Near the Motu River, relatively minor areas of podocarp-hardwood forest occur on high river terrace remnants and adjacent hillsides. Rimu, miro, northern rata and occasional matai are

			emergent above B. tawa s. l., pukatea and a dense understorey of kamahi, mahoe, pigeonwood, and tree ferns. As along the Raukokore River at the same low altitude, any element of coastal plants appears to be lacking. Up to about 750 m, some pockets of rimu-B. tawa s.l. forest occur in gullies. Hard beech predominates, over abundant kamahi and tawari and various admixtures of small rimu, miro, toatoa, northern rata, B. tawa s.l., hinau, rewarewa and quintinia, with Dracophyllum latifolium and Archeria racemosa in the understorey. Between 750-1100 m, the forest along the high ridges and in the broad, basin-like valleys at the head of the catchment is a complex of varying associations. The main species are hard beech, silver beech, rimu, miro, Hall's totara, kaikawaka, tawari, kamahi and quintina. Red beech does occur but is comparatively rare. On the higher ground about Puketoetoe Trig is a dense low forest of silver beech, mountain toatoa, pink pine, tawari, kamahi, quintinia, and occasional kaikawaka.
Proposed Paraumu Ecological Area (Nicholls, 1983a)	c. 1250 ha	Catchment of tributaries of Hawai River, between 30-630 m. Mostly finely dissected, moderately steep hill country below 300 m	This ecological area is the only part of the Raukumara S.F.P. containing the typical hard beech dominated lowland forest of the Eastern Bay of Plenty. Hard beech is dominant along the ridges spurs and upper valley sides with pockets of purely podocarp-hardwood forest in gully bottoms. Associated with the hard beech are frequent to locally abundant tanekaha and kamahi and varying admixtures of small northern rata of terrestial origin, rimu, miro, tawa, hinau, rewarewa, kohekohe, and nikau. Puriri occurs near the northern boundary; pohutukawa, karaka, ngaio, and mangeao occur not far outside it but are not certainly known inside the proposed ecological

			area. Some spurs near the north edge carry secondary forest of hard beech, northern rata, tanekaha, rewarewa, kamahi, kanuka, and toru. In the relatively small area above 300 m, the hard beech forest composition changes a little with toatoa tending to replace tanekaha, a disappearance of kohekohe and nikau and concomitant incoming of tawari and quintinia. Broad, undulating, ridges about Paraumu and Te Upokookohu Trigs, have appreciable areas of podocarp-hardwood forest with scattered rimu and northern rata over B. tawa s.l. kamahi, tawari, hinau, rewarewa, and pukatea. Some kohekohe and nikau persist in this type up to about 450 m.

3. Proposed scenic reserve

Part proposed Opape Scenic Reserve ("Nukutere Scenic Reserve") (Daniel, 1983)	(approved in principle)	Semi-coastal lower hill-slopes, between 60-250 m	1. Kohekohe and puriri forest with some large pohutukawa on ridge tops.
		Ridges and valleys, steep slopes, colluvium and lower altitude gullies between 150-660 m	2. Hard beech forest, with rimu and tawa, with tawa kohekohe and pukatea, white maire and tanekaha.
		Upper hillslopes and ridges around Te Pakera Trigs between 660-850 m	3. Rimu-beech forest Hard beech, red beech, silver beech, kamahi, tawari and scattered Rimu miro and Hall's totara.
		Mid and upper hillslopes, between 520-645 m (small area only)	4. Rimu and tawa forest, with kamahi, tawari, and ocasional miro, hinau and rewarewa.
		Moderate valley slopes between 380-540 m	5. Rimu-beech forest (as for 3) with more tawa, no red or silver beech and occasional huge emergent rata and rimu. Has been logged.
		Basal to ridge steep slopes between 100-420 m	6. Fire induced secondary mosaic of broadleaved shrubs and podocarps, in which rewarewa predominates. Occasional kohekohe and puriri.