

Otahu Ecological Area



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OTAHU ECOLOGICAL AREA

(2ND EDITION)



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AUCKLAND.

(this is an unpublished internal report)

Bruce Burns
May 1984

Otahu Ecological Area

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Location (Fig. 1)

The Otahu Ecological Area is an area of indigenous forest and scrub in the south-east of the Coromandel Peninsula (midpoint at map ref. NZMS 260 T12 595320), 29 km south-east of Thames. It is within, and bounded on all sides by the Maratoto Block of the Coromandel State Forest Park. It is also the only Ecological Area within the Waihi Ecological District (Simpson 1982, BRC 1983).

The Ecological Area forms a complete upper catchment of the Otahu River and has a total area of 396 ha. The most recent aerial photographs covering the reserve were flown on 10 January 1983. They are NZ Aerial Mapping Survey No. 8163, photos V17 and V18.

Access

Access to the area is gained via Quarry Road off Provincial State Highway 25 between Waihi and Whangamata. The road ends close to the area. There are no marked tracks into Otahu and the best access route was found to be up a rough track which follows the Lignite Stream.

Another route, which proved unsatisfactory, is to travel down the Wharekirauponga Stream track and then bear due west to intercept the Ecological Area. Unfortunately the towai and manuka scrub that has to be passed through to reach the reserve is dense and travel is consequently slow.

The Otahu catchment lies within the Coromandel State Forest Park and access could be gained from a number of other directions mostly into the higher altitude sections.

History of Gazettal

The reserve was one of the first N.Z. Forest Service Dedicated Areas to be proposed and gazetted. Initially, it was proposed by John Nicholls (F.R.I. Rotorua) as a potential forest sanctuary (file 6/149/21, 1972). However, when the 'Dedicated Area' status for forest land arose through the 1973 Forests Amendment Act, it was considered that 'Biological Area' would be a more apt designation. The reserve was approved in principle on 20 December 1974 and final gazettal occurred on 25 March 1976 (gazettal notice p. 654, 1976). Subsequently, though not yet officially, the reserve has been re-termed an 'Ecological Area' (NZFS 1983).

Rationale and Objectives of Designation

Many of the criteria for selection of Ecological Areas (S.C.C. 1980) are fulfilled by the Otahu reserve. The area is isolated, not readily accessible and covers a complete catchment. It also has high vegetation values in the context of the Waihi Ecological District. The purpose of designation as stated in the Coromandel State Forest Park Management Plan is:

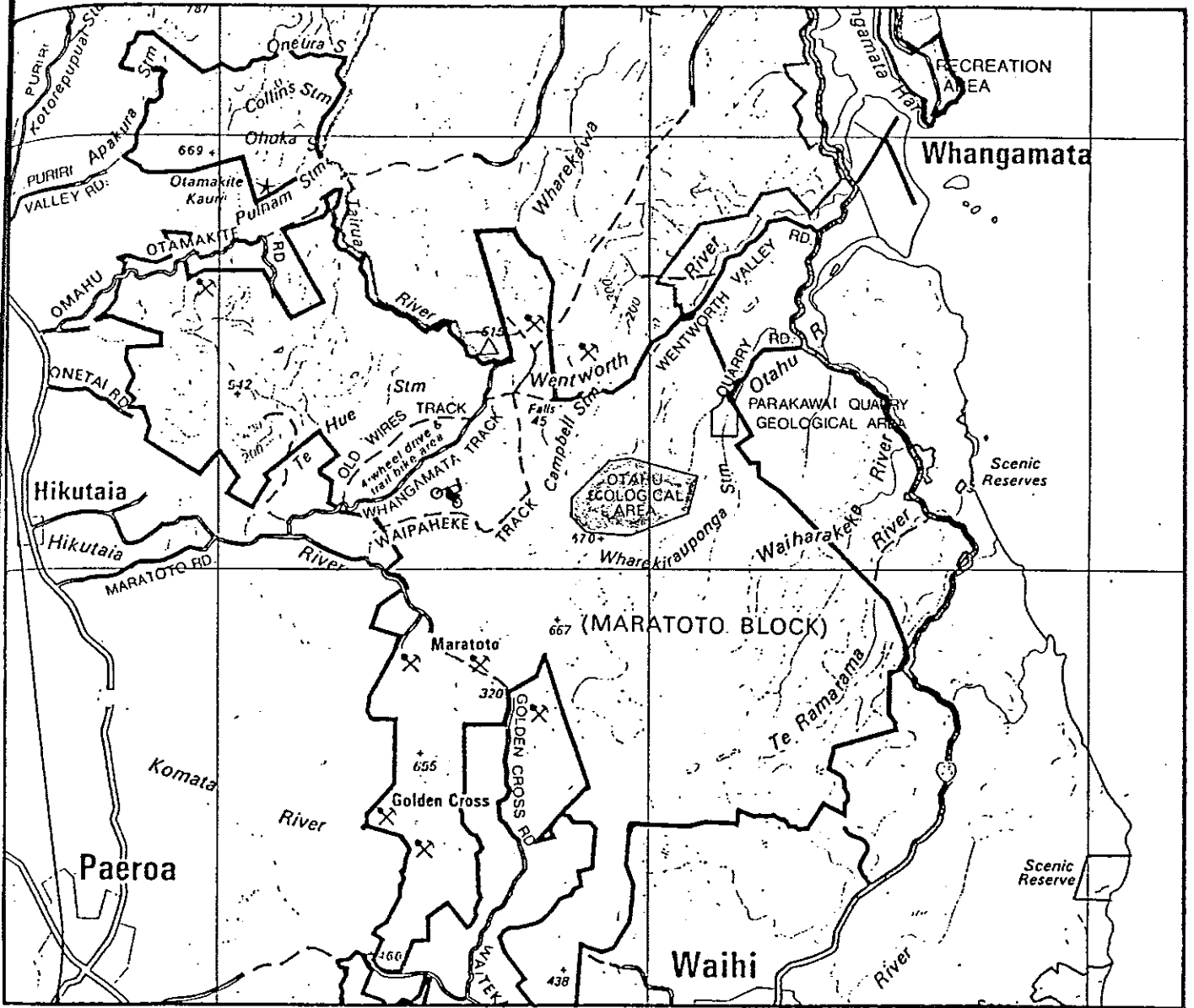


Fig 1 : Location Diagram - Otahu Ecological Area

(based on NZMS 274 Coromandel State Forest Park, 1:150,000, 1st Edition 1979, NZFS, Government Printer).

- Ecological Area
- State Forest Park Boundary

'to reserve a typical segment of the indigenous vegetation on the flanks of the Coromandel Range with shrubland, secondary hardwood forest and stands of pole kauri at the forest margin; softwood-hardwood forest with very scattered kauri on ridges below 450 m and a purely softwood-hardwood forest on the higher slopes'

(NZFS 1978)

The reserve has been given an IUCN* classification of IV (Nature Conservation Reserve) (NZFS for IUCN 1979). These are areas set aside where manipulative management techniques can be applied to guarantee the stability or survival of certain species of plants and animals and to assure their survival in the future. Scientific research, environmental monitoring and educational use are the primary activities associated with this category (IUCN 1978).

Topography

The Otahu Ecological Area is bounded by leading ridges and forms an upper catchment of the Otahu River. The reserve contains steep long mountain slopes of the main axial range gradually changing to the east to moderately steep to steep rounded hills with a deep mantle of tephra. Slopes are generally between 20° and 35° (Water and Soil Division, MOWD 1975). The reserve has an altitudinal range of 90 to 670 m a.s.l. The ridge line is interrupted to the south by a rhyolitic dome rising with sheer bluffs to 487 m.

Climate

Discussions of climate on the Coromandel are given in Burns (1983) and Maunder (1974). The closest meteorological station exists at Tairua State Forest Headquarters. This station has recorded a mean annual rainfall of 1823 mm, a mean daily minimum temperature of 9.8°C and a mean daily maximum of 19.1°C (N.Z. Met. Serv. 1973).

Geology

The geologic features of the region are evidence to the volcanic origins of the Coromandel Range, e.g. the nearby Parakawai Quarry.

The Otahu catchment is situated over the interface of two characteristic geological strata of the Coromandel. The rock type of the western half of the catchment is comprised of Beeson's Island Volcanics; 'hypersthene andesite flows, breccia and fluvial sediment with rare hornblende andesite that is possibly more common near the base' (N.Z. Geological Survey 1967). To the east, the catchment is based upon Minden Rhyolites, characterised by a number of rhyolitic, much eroded domes which are prominent on the eastern ridge.

* International Union for the Conservation of Nature and Natural Resources.

Pedology and Erosion

The soils to the west of the catchment are Aroha steep-land soils related to northern brown granular clays. These are sandy or clay loam skeletal soils of medium to low natural fertility derived from andesitic rock. To the east, the soils change to central yellow brown loams based on a Whangamata gravelly sandy loam hill soil (Water and Soil Division, MOWD 1975; Eyre 1977).

The Land Resource Inventory Worksheet (Water and Soil Division, MOWD 1975) classifies the western part of the catchment class VII land and the eastern part, class VI. The same document records only slight (10% by area) debris avalanche erosion of the steep-land soils, stating that these soils have the potential for severe erosion of this type. In the course of three days field work I came upon six large slips, mostly in the steeper parts of the catchment.

Vegetation

This vegetation description was compiled from three days field work and two Ecological Forest Survey Tally Sheets (NZFS 1966) (overlay 1 of figure 2 shows the location of the various field descriptions made).

The method used to describe vegetation is a modified recce-type description in which the vegetation is recorded in a number of tiers. The five tiers used are canopy emergents, canopy, subcanopy (from beneath canopy height down to 2 m), shrub (2 m down to 50 cm) and groundcover (50 cm to ground level). Site descriptions are grouped into types based as closely as possible on Nicholls' (1976) classification. Further discussion of this technique is given in Burns (1983).

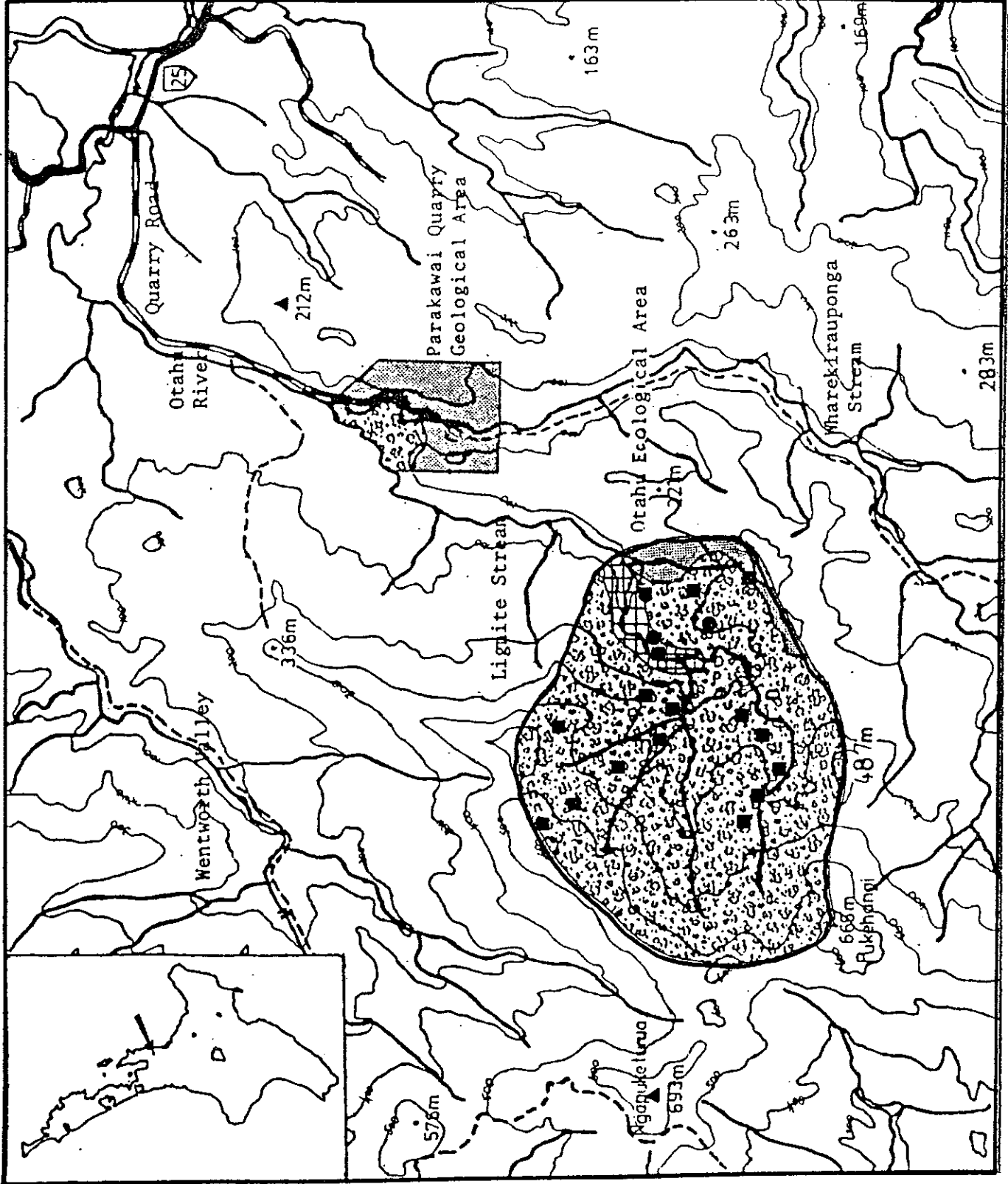
I have classified the vegetation into three types:

1. manuka scrub with regenerating kauri;
2. dense ricker and pole kauri forest (Nicholls' type A4); and
3. podocarp-hardwood forest (Nicholls' type B5).

Appendix 1 gives a botanical species list incorporating both scientific and common names. Figure 2 shows the extent of these types.

A dense scrub occurs on the ridges to the east of the area dominated by a 2-3 m tall canopy of manuka with young kauri, toru, rewarewa and towai irregularly emergent and standing 4 to 10 m high. The canopy allows much light to reach the understory of *Hebe* spp., mingimingi and *Pseudopanax discolor* and a dense groundcover of *Shoenus tendo*, *Gleichenia dicarpa*, *Lycopodium* spp. and *Blechnum capense*. It is probable that this area is regenerating after logging and fire. Seedlings, especially kauri, are abundant over the area.

The second vegetation type is dominated by dense ricker and pole kauri. This type occurs over small areas on low altitude ridge sites overlooking the main stream. Many of these stands are surrounded by kauri seedlings in the adjacent scrub and kauri is apparently extending its range in the catchment. The stands consist of a canopy of almost pure kauri (up to approximately 24 m tall) with an occasional tanekaha. In most sites of this type, manuka or kanuka are still present as subcanopy species but in others they are absent and this tier is generally open. Other common understory trees are toru, rewarewa and kohuhu. A shrub tier of mamangi,



Overlay Parakawai Quarry
vegetatological map
and Otahuhu Biological
Areas 1966

Legend

- This report
Provincial State
Highway
- Unsealed Roads.
- Tracks
- Rivers and Streams
- Falls
- Old Dam Remains
- Quarry Face
- Softwood-Hardwood
Forest
- Dense pole kauri
stands
- Manuka Scrub
- 100m topographical
contours

Scale

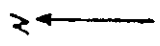
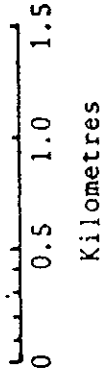













Fig 2: Parakawai Quarry Geological Area and Otahu Biological Area.

Legend

-  Provincial State Highway
-  Unsealed Roads.
-  Tracks
-  Rivers and Streams
-  Falls
-  Old Dam Remains
-  Quarry Face
-  Softwood-Hardwood Forest
-  Dense pole kauri stands
-  Manuka Scrub
-  100m topographical contours

Scale

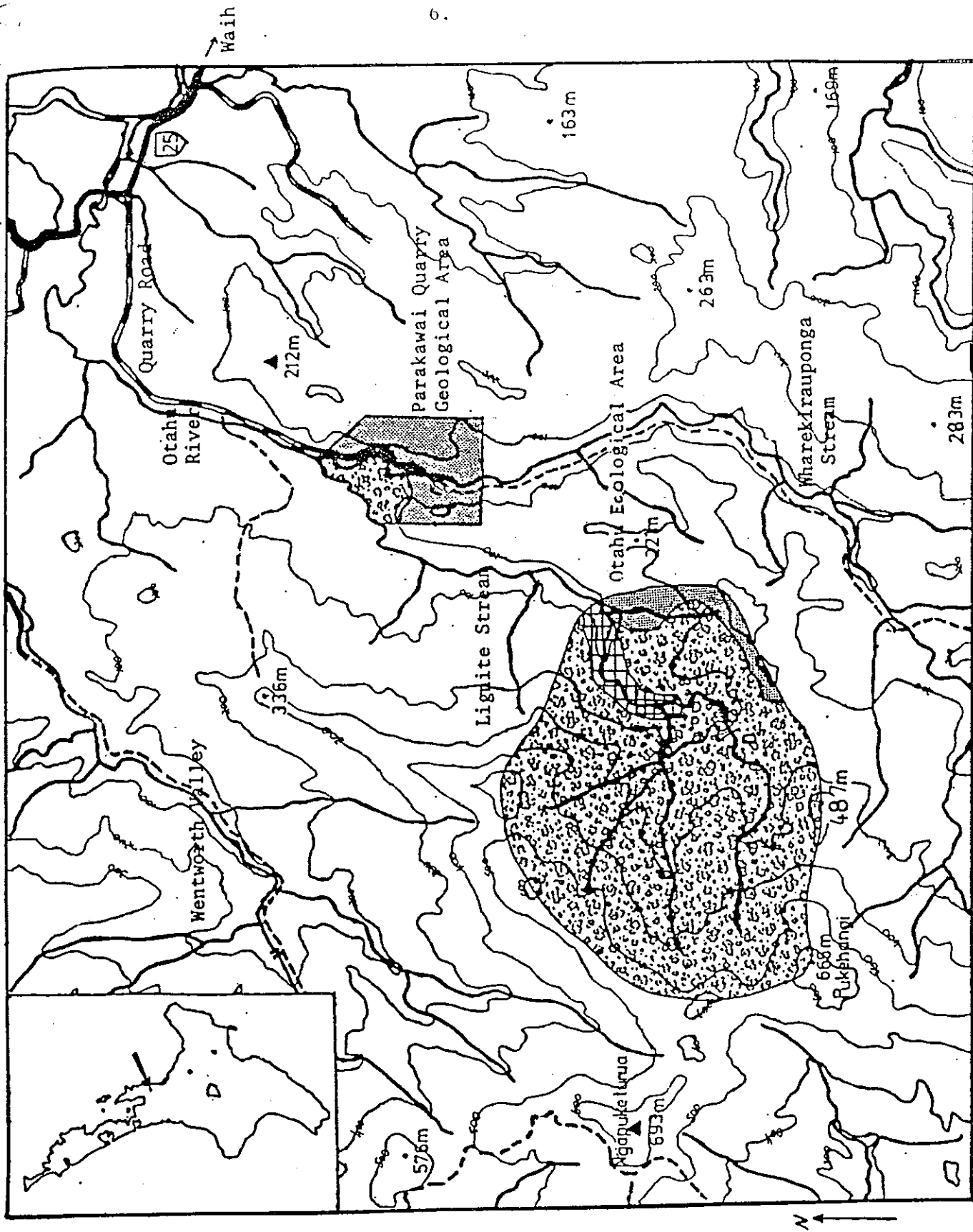
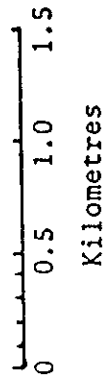


Photo 1 : Stand of kauri - Otahu
Ecological Area
(photo by P. de Jager)

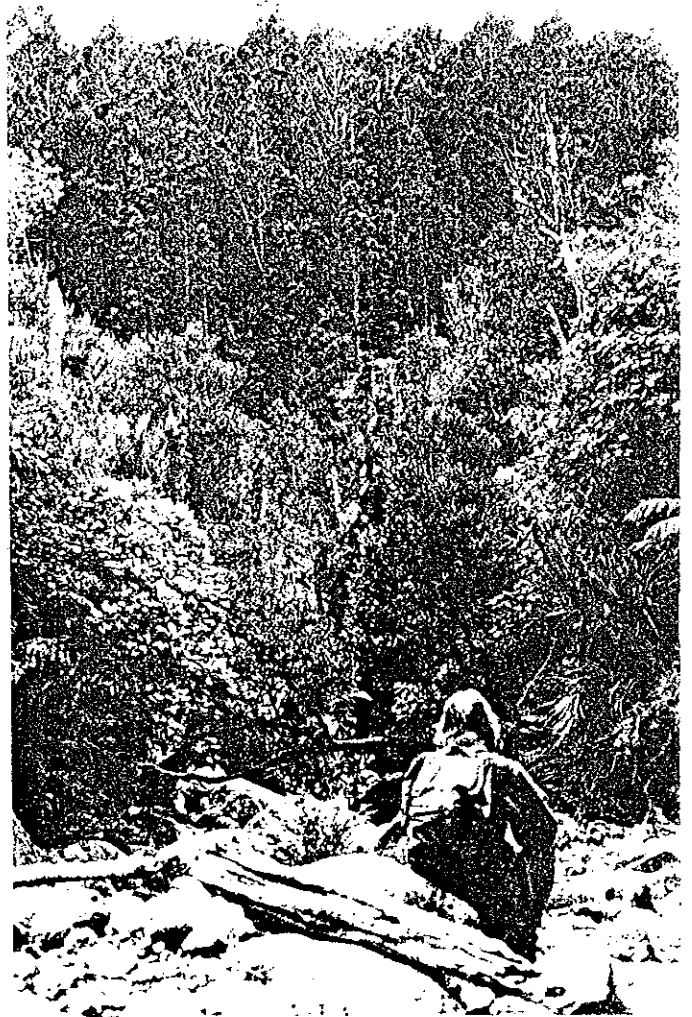


Photo 2 : Young kauri breaking through
gap in manuka scrub.
(photo by P. de Jager)

Pseudopanax discolor and mingimingi exists with a dense groundcover of *Astelia* spp., hookgrass and *Lycopodium deuterodensum*.

Mixed podocarp-hardwood makes up the third forest type covering the majority of the catchment. It is dominated by tawa, towai, rata and rewarewa with tawari occurring and occasionally attaining dominance at high altitude sites (above approx. 300 m a.s.l.). Throughout, podocarps (miro, Hall's totara and rimu) occur infrequently as scattered individuals except on high, exposed ridges where miro and Hall's totara may dominate. Large northern rata are emergent and often prevalent over this forest type. However, a substantial number of this species are dead. Kauri also exists within this forest but only as occasional individuals on low altitude ridges and spurs (one measured had a 2 m d.b.h.).

Around the streams and gullies, variations of this forest type occur, with pukatea and kohekohe assuming local dominance associated with nikau and the tree ferns, mamaku and ponga. Also, around the streams, open areas were observed covered in short swards of hookgrass, *Oplismenus hirtellus* and *Ehrharta diplax*.

Common understory and shrub species are horopito, mahoe, hangehange, *Pseudopanax discolor*, mapou, rangiora, wheki, pigeonwood and neinei. The groundcover is generally sparse in this type; hookgrass, *Ehrharta diplax*, umbrella fern, *Blechnum fraseri* and crown fern being the major species. Each of the last three species named occasionally cover small areas at high density.

Climbing rata spp., kiekie, supplejack and mangemange are common throughout the reserve and can make travelling difficult in places. Other common epiphytes are *Collospermum hastatum*, *Asplenium* spp. and the epiphytic orchids *Dendrobium cunninghamii*, *Earina mucronata* and *E. autumnalis*.

Introduced Animals and Forest Condition

Of 64 circular 4 m² plots examined in the catchment, intact goat pellets were present in 36 (56.3%), possum in 27 (42.2%) and pig in 1 (1.6%). As well, 16 goats were seen over four days field work with more goats heard in the distance on two separate occasions.

Browse was recorded on a wide range of species but was most conspicuous on kiekie, hookgrass, crown fern, *Blechnum fraseri*, nikau, *Ehrharta diplax* and lancewood.

The NZFS is currently employing hunters to reduce the goat population in the Maratoto Block including the Otahu Ecological Area.

In places the forest condition is poor with what appears to be a distinct browse zone. In most of the podocarp-hardwood forest type, few saplings or seedlings of canopy trees were present. Also, on one ridge examined, the canopy had deteriorated to consist of a number of emergent dead or dying trees above a short tree-fern canopy. On many ridges, wide bare goat tracks occur covered in goat pellets. Pigs are present in the area but their effect is not great and appears to be confined to the few river flats and scrub areas.

Presence of Exotic Plants

There are few exotic plants in the Otahu Ecological Area. *Hakea salicifolia* occurs in the scrub to the east and occasional exotic weeds; e.g. *Polygonum* species, *Digitalis purpurea*; occur on creek beds and stream banks.

Native Fauna

Recently, the Wildlife Service has rated the Maratoto Block of the Coromandel State Forest Park as an outstanding wildlife habitat (Anderson, 1983). The block contains two rare and endangered fauna species: kokako and Hochstetter's frog. Also the block contains the N.I. brown kiwi, parakeet, long-tailed bat, *Rhytida* snail and paua slug; species with a limited distribution in New Zealand. These species may not occur in the reserve but the possibility that they do and their presence nearby, from where they may migrate into the area, cannot be overlooked.

The Lignite Stream was observed to contain the native banded kokopu (*Galaxias fasciatus*).

Appendix 2 lists the fauna of the Maratoto Block (from Anderson 1983 unless otherwise stated).

Human History and Influence

There is no evidence of maori history in the area, probably due to the distance of the catchment from the coast (J. Coster pers. comm.).

Part of the reserve has been logged for kauri and this same area has probably been burnt over. Old kauri stumps can be found in the eastern scrub areas, some with charcoal.

In one small gully, just outside the Ecological Area, two old kauri logs were found (map ref. NZMS 260 T12 613318). These had been cut and trimmed ready for removal. The remains of a kauri dam were found at map ref. NZMS 260 T12 599315. Pieces of this dam with steel cables attached were also discovered further downstream.

The attached cables date the dam (or dams) at the 1890s or younger. The dam remains are probably part of the flume floor and construction below this used to seal off leakage (B. Hayward - personal communication).

Although limited mining did occur in the Wharekirauponga Stream close to Otahu (Slane and White 1980), no mining is known of in the Otahu catchment. Currently, Amoco Limited holds a prospecting licence (no. 31546) over 1052 ha immediately adjacent to the southern boundary of the reserve (Johnston 1982).

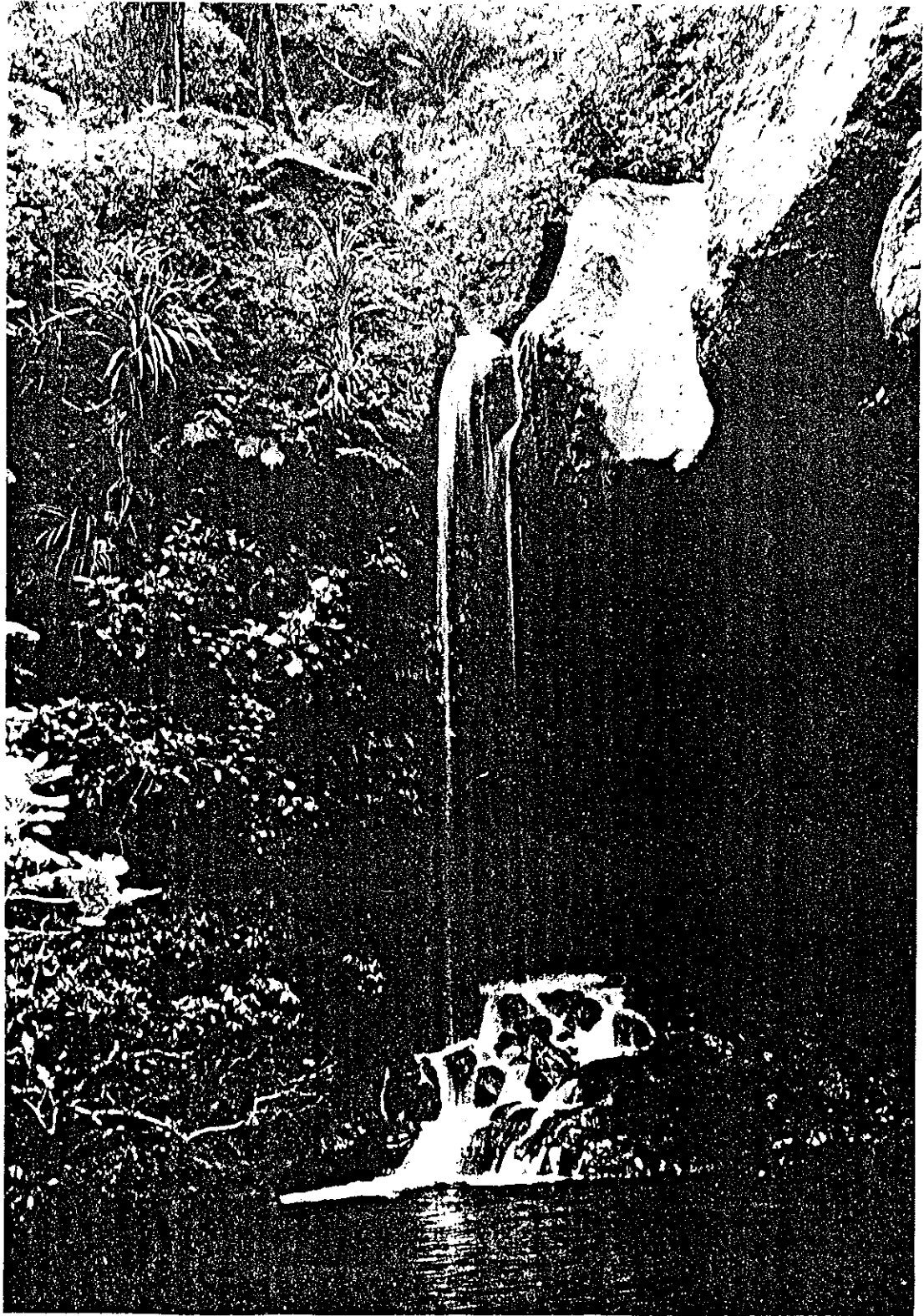


Photo 3 : Small waterfall on Lignite Stream.
(photo by P. de Jager)

Recreational Facilities and Opportunities

The Ecological Area is untracked and no huts or other facilities are present. Private goat hunters are at times active in the catchment.

Close to the confluence of the Lignite and Wharekirauponga Streams is the Parakowhai Youth Camp (map ref. NZMS 260 T12 619345). This is under Forest Service administration but seems to have been unused for some time. The camp consists of a grazed paddock with several fireplaces, two pit toilets and a stone and concrete shelter.

Research Carried Out and Suggested

The NZFS, Auckland Conservancy, have built four 20 m x 20 m fenced enclosure plots and four associated 20 m x 20 m unfenced control plots in the Otahu Ecological Area. These are distributed over the main vegetation types of the reserve and have been placed to monitor and evaluate the impact of browsing mammals on the vegetation. The plots were built in December 1983 and have been measured and photographed. Further information is on sample plot register A/885.

The Ecological Area would be a useful site for research into kauri population dynamics with its stands of young kauri of several different sizes.

Summary, Discussion and Recommendations

The Otahu Ecological Area is small (396 ha) isolated, with no ready access, and covers a complete catchment. By virtue of its areas of kauri regeneration it has high vegetation values in the context of the Waihi Ecological District in which there are no other Ecological Areas. Most of the reserve is covered in a mixed podocarp-hardwood forest apart from the kauri stands and a small area of manuka scrub in the east. Much of the forest is in poor condition with little regeneration apparent apart from kauri. There are many slips of the steep unstable soils on the western slopes. The vegetation has been much browsed and goat and possum signs are plentiful. The area has an outstanding wildlife rating.

A short survey of this type cannot conclusively demonstrate that animals are responsible for a deterioration in forest condition. However, in my opinion, it is likely that goats and possums are having a detrimental impact and have caused and are causing a reduction in the vegetation values of this area. Novis (1982) records a 'heavy' goat density in this area in his recent walk-through animal assessment (January-February 1982). He also observed that:

'a large number of slip areas remain bare due to goats removing the regenerating vegetation'.

The effects of browsing animals on the vegetation is being investigated by the use of plot pairs; one fenced, one unfenced. Four pairs have been located in different vegetation types. Goat culling is also occurring within the Maratoto Block which includes the reserve.

The S.C.C. (now the State Forest's Scientific Reserve Advisory Committee) consider that the size criterion for selection of Ecological Areas be areas greater than 1,000 ha (S.C.C. 1980). Otahu does not meet this and there have been two proposals for increasing its size, to which I add a third.

J. Nicholls (1977) suggested that the size of the Ecological Area was inadequate and proposed that an additional 800 ha be dedicated.

'to include the catchment of the Te Awaotemutu on the south and a much more significant portion of the high-altitude, podocarp-hardwood forest on the main divide'.

P. Anderson (1983) has proposed to increase the area of Otahu to include areas within the Maratoto Block where there have been sightings of kokako.

My proposal is to add approximately 220 ha to the north and east of the reserve. The manuka scrub-covered hills to the east contain abundant kauri and podocarp seedlings and saplings and are important regeneration sites for these species. To the north, the stream banks support an apparently diverse and virtually unmodified lowland podocarp-hardwood forest. The incorporation of these zones into the reserve would increase the range of landforms and vegetation types represented while still retaining the Ecological Area mostly within one catchment. The three proposals are shown in Fig. 2.

Consideration of increase in some of the directions proposed must take note of the prospecting and mining licences which exist over most of these areas. Prospecting licences granted to Amoco Limited cover 1052 ha in the Wharekirauponga Stream (P.L. 31546), covering much of the area proposed for inclusion by Nicholls, and 2285 ha in the Waitekauri area (P.L. 31559), covering most of the area proposed by Anderson. Also an application of a mining licence (M.L. 32815) is being sought in the Maratoto Valley over 7.8 ha (Johnston 1982).

Exotic plants are not a problem in the area at present. However, since 1977, both *Pinus radiata* and *Eucalyptus* species have been planted a short distance to the north (map ref. NZMS 260 T12 615340). These pose a future invasion threat.

The Otahu reserve is officially termed a 'Biological Area'. Subsequent to its gazettal, further Dedicated Areas have been named 'Ecological Areas' as this term is thought to better describe the purpose of this type of reserve.

Based on the above, the following management recommendations are made in order of priority.

1. That goats be controlled to the lowest number practicable.
2. That the effects of possums be assessed.
3. That the proposals for increasing the size of the Otahu Ecological Area be examined and an increase in size achieved.

PROPOSALS FOR ADDITIONS TO OTAHU BIOLOGICAL AREA

CURRENT BOUNDARIES

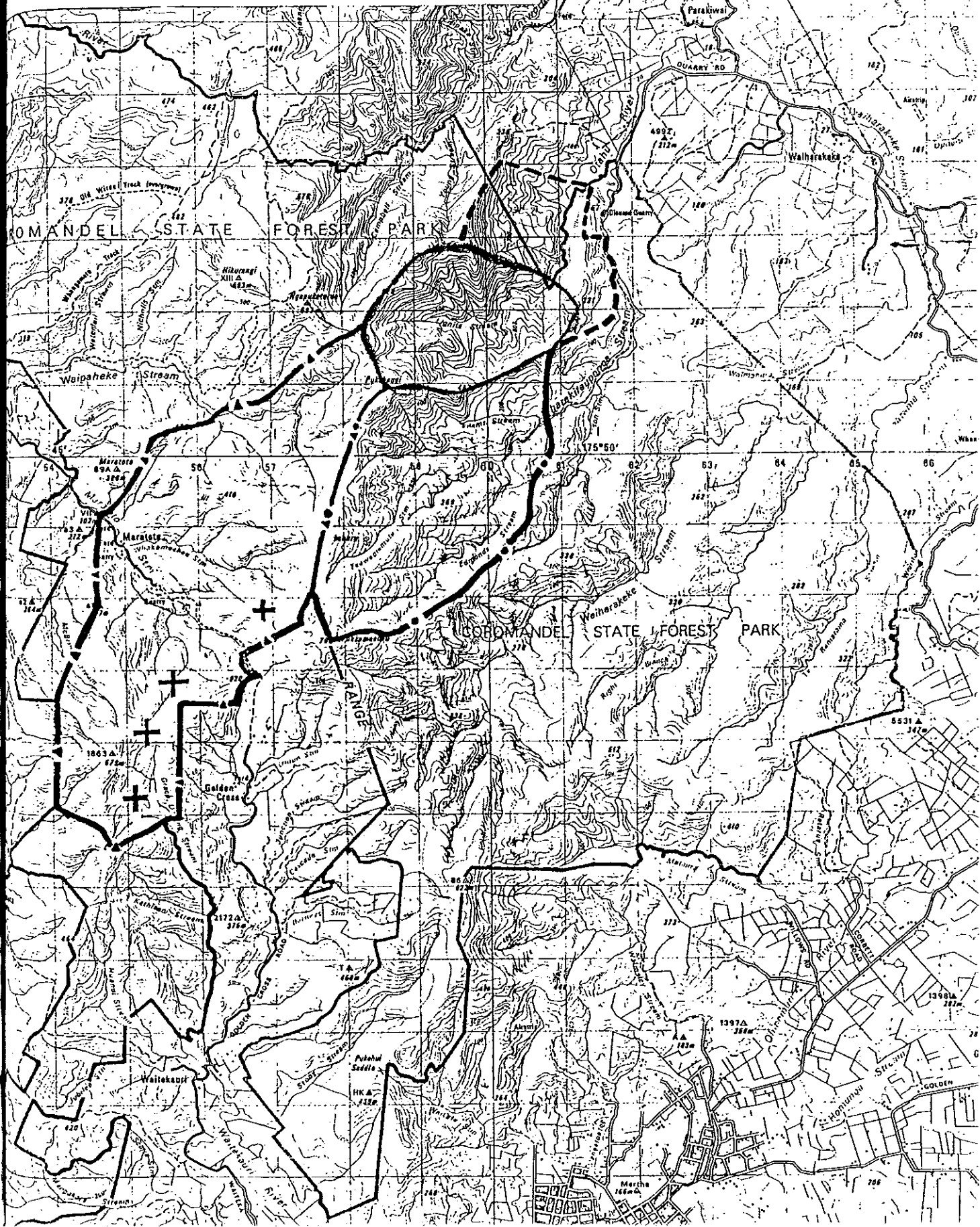
PROPOSAL BY NICHOLLS 1977

PROPOSAL BY ANDERSON 1983

PROPOSAL BY BURNS 1983

KOKAKO SIGHTINGS (ANDERSON 1983)

NZMS 260 Sheets T12 and T13, 1:50,000, 1st Edition, 1977,
(Lands and Survey, Government Printer).



4. That invasion by self-seeded pines or other exotic weeds into the area be monitored and controlled.
5. That the name of the reserve be officially changed to the Otahu Ecological Area.

Acknowledgements

I wish to acknowledge and thank Freek Deuss and William Richards for their help in the field. Also Ewen Cameron of the Botany Department, University of Auckland for his assistance in plant identification and F. Deuss for his proof reading and suggestions to the manuscript.

APPENDIX 1 : Botanical Species List - Otahū Ecological Area

Common names are in brackets after the scientific
e.g. *Agathis australis* (kauri).

Ferns and Fern Allies

<i>Adiantum cunninghamii</i>	(maidenhair)
<i>A. fulvum</i>	
<i>A. hispidulum</i>	(rosy maidenhair)
<i>Anarthropteris lanceolata</i>	
<i>Asplenium bulbiferum</i>	(hen and chicken fern)
<i>A. flaccidum</i>	(hanging spleenwort)
<i>A. polyodon</i>	
<i>Blechnum capense</i>	(kiokio)
<i>B. discolor</i>	(crown fern)
<i>B. filiforme</i>	
<i>B. fluviatile</i>	
<i>B. fraseri</i>	
<i>B. lanceolata</i>	
<i>B. nigrum</i>	
<i>Cyathea dealbata</i>	(ponga)
<i>C. medullaris</i>	(mamaku)
<i>C. smithii</i>	
<i>Dicksonia squarrosa</i>	(wheki)
<i>Gleichenia cunninghamii</i>	(umbrella fern)
<i>G. dicarpa</i>	(swamp umbrella fern)
<i>Grammitis billardieri</i>	
<i>Histiopteris incisa</i>	(histiopteris)
<i>Hymenophyllum demissum</i>	(filmy fern)
<i>H. dilatatum</i>	(filmy fern)
<i>H. flabellatum</i>	(filmy fern)
<i>H. flexuosum</i>	(filmy fern)
<i>H. multifidum</i>	(filmy fern)
<i>H. sanguinolentum</i>	(filmy fern)
<i>H. scabrum</i>	(filmy fern)
<i>Lastreopteris glabella</i>	
<i>L. hispida</i>	
<i>Leptopteris hymenophylloides</i>	(heruheru)
<i>Lindsaea linearis</i>	
<i>L. trichomanoides</i>	
<i>L. viridis</i>	
<i>Lycopodium billardieri</i>	
<i>L. deuterodensum</i>	
<i>L. scariosum</i>	
<i>Lygodium articulatum</i>	(mangemange)
<i>Osmonda regalis</i>	
<i>Paesia scaberula</i>	(hard fern or ring fern)
<i>Phymatosorus diversifolium</i>	
<i>P. scandens</i>	(fragrant fern)
<i>Pneumatopteris pennigera</i>	
<i>Polystichum richardii</i>	
<i>Pteris comans</i>	
<i>Pyrrosia serpens</i>	
<i>Schizaea dichotoma</i>	(fan fern)

<i>Imesipteris elongata</i>	
<i>T. lanceolata</i>	
<i>Trichomanes elongata</i>	
<i>T. reniforme</i>	
<i>T. venosum</i>	(kidney fern)

Conifers

<i>Agathis australis</i>	(kauri)
<i>Dacrycarpus dacrydioides</i>	(kahikatea)
<i>Dacrydium cupressinum</i>	(rimu)
<i>Phyllocladus trichomanoides</i>	(tanekaha)
<i>Podocarpus hallii</i>	(Hall's totara)
<i>Prumnopitys ferruginea</i>	(miro)
<i>P. taxifolia</i>	(matai)

Dicot Trees, Shrubs and Climbers

<i>Alseuosmia macrophylla</i>	(karapara)
<i>Beilschmiedia tawa</i>	(tawa)
<i>Brachyglottis repanda</i>	(rangiora)
<i>Clematis paniculata</i>	(puawhananga)
<i>Coprosma arborea</i>	(mamangi)
<i>C. lucida</i>	(karamu)
<i>C. robusta</i>	(karamu)
<i>Cyathodes fasciculata</i>	(mingimingi)
<i>C. juniperina</i>	
<i>Dracophyllum latifolium</i>	(neinei)
<i>Dysoxylum spectabile</i>	(kohekohe)
<i>Elaeocarpus dentatus</i>	(hinau)
<i>Geniostoma rupestre</i> var. <i>crassum</i>	(hangehange)
<i>Griselinia lucida</i>	(shining broadleaf)
<i>Hakea salicifolia</i>	
<i>Hebe macrocarpa</i> var. <i>latosepala</i>	
<i>Hedycarya arborea</i>	(pigeonwood)
<i>Ixerba brexioides</i>	(tawari)
<i>Knightia excelsa</i>	(rewarewa)
<i>Laurelia novae-zelandiae</i>	(pukatea)
<i>Lepospermum ericoides</i>	(kanuka)
<i>L. scoparium</i>	(manuka)
<i>Macropiper excelsum</i>	(kawakawa)
<i>Melicytis ramifloris</i>	(mahoe)
<i>Metrosideros diffusa</i>	(climbing rata)
<i>M. fulgens</i>	(climbing rata)
<i>M. perforata</i>	(climbing rata)
<i>M. robusta</i>	(northern rata)
<i>Muehlenbeckia complexa</i>	
<i>Myrsine australis</i>	(mapou)
<i>Myrtus bullata</i>	(ramarama)
<i>Nestegis lanceolata</i>	(white maire)
<i>N. montana</i>	
<i>Parsonsia</i> spp.	
<i>Persoonia toru</i>	(toru)
<i>Pittosporum tenuifolium</i>	(kohuhu)
<i>Phebalium nudum</i>	(mairehau)
<i>Pomaderris kumeraho</i>	(kumeraho)
<i>Pseudopanax arboreum</i>	(five-finger)
<i>P. crassifolium</i>	(lancewood)

<i>P. discolor</i>	
<i>P. edgerleyi</i>	
<i>Pseudowintera axillaris</i>	
<i>Quintinia serrata</i>	(horopito)
<i>Rhabdothamnus solandri</i>	(tawheowheo)
<i>Rubus australis</i>	
<i>R. cissoides</i>	(bush lawyer)
<i>Schefflera digitata</i>	(bush lawyer)
<i>Vitex lucens</i>	(pate)
<i>Weinmannia silvicola</i>	(puriri)
	(towai)

Dicot herbs

<i>Acaena</i> spp.	
<i>Callitriche stagnalis</i>	
<i>Cirsium vulgare</i>	
<i>Digitalis purpurea</i>	(thistle)
<i>Drosera peltata</i> subsp. <i>auriculata</i>	(foxglove)
<i>Elatostema rugosum</i>	
<i>Epilobium rotundifolium</i>	
<i>Gnaphalium gymmocephalum</i>	
<i>G. keriense</i>	
<i>G. simplicicaule</i>	
<i>Hydrocotyle dissecta</i>	
<i>Laginifera pumila</i>	
<i>Lobelia anceps</i>	
<i>Nertera depressa</i>	
<i>N. dichondraefolia</i>	
<i>Peperomia urvilleana</i>	
<i>Polygonum</i> spp.	
<i>Ranunculus hirtus</i>	
<i>Senecio jacobea</i>	
<i>S. minimus</i>	(ragwort)
<i>Solanum aviculare</i>	
<i>Wahlenbergia gracilis</i>	(poroporo)

Monocotyledons

<i>Astelia trinervia</i>	
<i>Bulbophyllum pygmaeum</i>	(kauri grass)
<i>Collospermum hastatum</i>	
<i>Cordyline banksii</i>	
<i>C. pumilio</i>	
<i>Corybas</i> spp.	
<i>Dendrobium cunninghamii</i>	
<i>Dianella nigra</i>	
<i>Earina autumnalis</i>	
<i>E. mucronata</i>	
<i>Ehrharta diplax</i>	
<i>Freycinetia baueriana</i> subsp. <i>banksii</i>	(bush rice grass)
<i>Gahnia setifolia</i>	(kiekie)
<i>G. xanthocarpa</i>	
<i>Juncus planifolius</i>	
<i>Juncus</i> spp.	
<i>Machaerina sinclairii</i>	
<i>Morelotia affinis</i>	

Oplismenus hirtellus
Pterostylis trullifolia
Rhopalostylis sapida
Ripogonum scandens
Schoenus tendo
Scirpus chlorostachyus
Uncinia banksii
U. uncinata

(nikau)
(supplejack)

(hookgrass)

APPENDIX 2 : Fauna present in Maratoto Block - Coromandel State
Forest Park

(after Anderson 1983 unless otherwise stated)

Native Birds

<i>Apteryx australis</i>	N.I. brown kiwi
<i>Anthornis melanura</i>	bellbird
<i>Callaeas cinerea</i>	N.I. kokako
<i>Chalcites lucidus</i>	shining cuckoo
<i>Circus approximans</i>	harrier hawk
<i>Cyanoramphus</i> spp.	parakeet spp.
<i>Gerygone igata</i>	grey warbler
<i>Haleyon sancta</i>	kingfisher
<i>Hemiphaga novaeseelandiae</i>	N.Z. pigeon
<i>Hirundo neoxena</i>	welcome swallow
<i>Ninox novaeseelandiae</i>	morepork
<i>Petroica macrocephala</i>	pied tit
<i>Phalacrocorax carbo</i>	black shag
<i>Prothemadera novaeseelandiae</i>	tui
<i>Rhipidura fuliginosa</i>	fantail
<i>Zosterops lateralis</i>	silvereye

Introduced Birds

<i>Acridotheres tristis</i>	myna
<i>Carduelis carduelis</i>	goldfinch
<i>C. flammea</i>	redpoll
<i>Emberiza citrinella</i>	yellowhammer
<i>Fringilla coelebs</i>	chaffinch
<i>Lophortyx californicus</i>	Californian quail
<i>Phasianus colchicus</i>	pheasant
<i>Platycercus eximius</i>	eastern rosella
<i>Turdus merula</i>	blackbird
<i>T. philomelos</i>	song thrush

Native Frogs

<i>Leiopelma hochstetteri</i>	Hochstetter's frog
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Native Fish

<i>Galaxias fasciatus</i>	banded kokopu
(observed by author in January 1983)	

Large Native Land Snails

<i>Rhytida greenwoodi</i>	
<i>Schizoglossa worthyae</i>	paua slug

Native Bats

<i>Chalinolobus tuberculatus</i>	long-tailed bat
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Introduced Mammals

Bos taurus

Capra hircus

Sus scrofa

Trichosurus vulpecula

cattle

goat

pig

possum

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