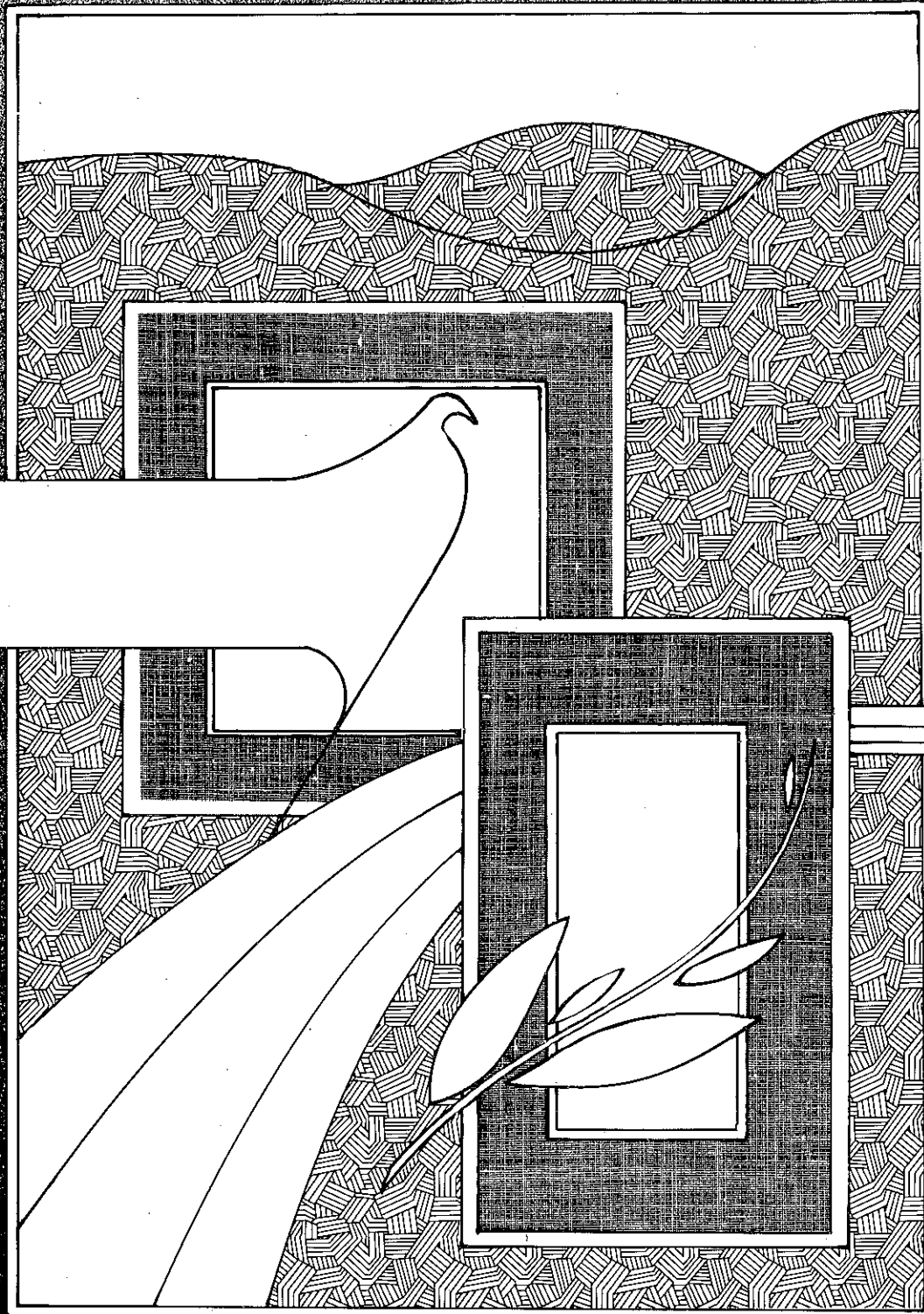


Auckland Conservancy

DEDICATED AREAS REPORT Number 8



Waiomu Ecological Area



WAIOMU ECOLOGICAL AREA



NZ FOREST SERVICE
AUCKLAND CONSERVANCY
CPO Box 39
AUCKLAND

(This is an unpublished internal report)

Bruce Burns
January 1985

WAIOMU ECOLOGICAL AREA

<u>Contents</u>	<u>Page No.</u>
Location	1
Access	1
History of Reservation	1
Rationale and Objectives of Designation	1
Topography	2
Climate	2
Geology	3
Pedology and Erosion	3
Vegetation	3
Native Fauna	6
Introduced Animals and Forest Condition	6
Presence of Exotic Plants	6
Human History and Influence	7
Recreational Facilities and Opportunities	8
Research Carried Out and Suggested	8
Summary, Discussion and Recommendations	8
Acknowledgements	10
Appendix 1 : Botanical Species List - Waiomu Ecological Area	11
Appendix 2 : Wildlife of the Waiomu Ecological Area (Anderson 1983)	15
References	16

Location (Figure 1)

The proposed Waiomu Ecological Area is a reserve of indigenous forest covering two catchments on the western flank of the Coromandel Range. It is situated approximately 14 km due north of Thames (mid point at map ref. NZMS 1 N44 065408) and covers 1120.05 ha. It is bounded on all sides by the Kauaeranga Block of the Coromandel State Forest Park except to the north where it adjoins the Rapaura Water Gardens, a tourist attraction. The reserve occurs within the Thames Ecological District (Simpson 1982, BRC 1983) and contains two water supply catchments for the Waiomu and Tapu townships. The most recent aerial photographs were flown on the 10th January, 1983 (NZAM Survey No. 8163, run 0, photos 3,4).

Access

A well-used track system crossing through the reserve provides several points of walking access. One such track enters from the end of the Waiomu Valley Rd off State Highway 25 between Thames and Coromandel, where it crosses private farm land then follows up a central ridge in the Waiomu Valley to the top of the main north-south ridge (track 19, NZFS 1983). Here it joins another track which follows along this main ridge. To the north, the track leads to the Tapu-Coroglen Road summit. To the south, it leads to Crosbies Hut (track 9, NZFS 1983).

History of Reservation

The Waiomu kauri stands have been considered for reserval since 1970. Proposals came from both district (Johnston 1970) and F.R.I. level. The only available category for scientific reserves in 1970 was Forest Sanctuary with its rigorous boundary prescriptions and severe limitations on size. The initial proposal was for only 81 ha covering the dense kauri stand (file 6/0/19, 1977). After the 1976 Forests Amendment Act introduced the reserve category of dedicated Ecological Areas, the proposal was reconsidered. Through liaison between Conservancy and F.R.I. staff, particularly John Nicholls (F.R.I. Rotorua), a firm proposal for Waiomu was developed covering over 1000 ha and taking in an area of kauri-hard beech forest (Nicholls 1977). After Scientific Co-ordinating Committee* approval in 1979 (S.C.C. 1979) the proposal was approved in principle by the Minister of Forests but still awaits final gazettal.

Rationale and Objectives of Designation

Ecological Areas, such as Waiomu, are reserves of forest land set aside to :

1. understand and explain natural processes;
2. maintain bench-marks for measuring change on initially comparable developed land;

* This body has now been replaced by the State Forests Scientific Reserves Advisory Committee (SFSRAC).

3. maintain genetic diversity of plants and animals; and
4. preserve rare plants, native fauna, archaeological or other historic sites, particular topographical features and geological and soil sites. (NZFS 1977)

The Waiomu reserve fulfills many of the original criteria set down for selection of ecological areas (S.C.C. 1980). It represents the full range of land forms and vegetation sequences of the region (except for coastal vegetation and some high-altitude associations). It has a large area, over 1000 ha, covering two catchments with permanent waterways. The reserve is unroaded with a compact shape and almost all clearly defined natural boundaries.

The Coromandel State Forest Park Management Plan (NZFS 1978) states that the purpose of designation is :

'to reserve a representative portion of the only remaining concentrated stands of semi-mature low altitude kauri on the Coromandel Range and the surrounding softwood-hardwood forest ...'

After gazettal, the Waiomu reserve will receive an IUCN* classification of IV (Nature Conservation Reserve), as do most ecological areas. IUCN management objectives of this type of reserve allow the application of manipulative management techniques to assure the survival of certain species of plants and animals. Scientific research, environmental monitoring and educational use are the primary activities associated with this category (IUCN 1978).

Topography

The Waiomu Ecological Area is composed of steep to very steep long mountain slopes of the main Coromandel axial range (slopes $> 26^\circ$, Water and Soil Division, MOWD, 1975). The reserve has an altitudinal range of 80 m to 720 m a.s.l.

Climate

Discussions of climate on the Coromandel are given in Burns (1983) and Maunder (1974). The closest climate recording station to the Waiomu Ecological Area is at Thames. This station has recorded a mean annual rainfall of 1278 mm, a mean daily minimum temperature of 10.6°C and a mean daily maximum of 19.0°C (NZMS 1973). However Thames is at sea level and the climate actually experienced in the reserve is subject to the effects of altitude (higher rainfall and lower temperatures) and the reserve's exposure to the predominant westerly airflow.

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

Geology

The reserve's basic rock type is Beeson's Island Volcanics. These are rocks composed of andesite erupted during the upper Miocene and early Pliocene (N.Z. Geological Survey, D.S.I.R. 1967, MOWD 1975). These rocks also contain 1-2% pyrite resulting from weak hydrothermal alteration (KRTA 1984).

The Waiomu region is characterised by a number of quartz reefs, many of which have produced and still may produce gold. All of these occur on the western boundary of the Ecological Area (discussed further in Human History and Influence). More detailed geological information particularly concerning mineralisation is given in Merchant (1978).

Pedology and Erosion

The Waiomu reserve has Te Kie and Aroha steepland soils. These are related to brown granular clays formed from weathered fresh and propylitised andesite. They consist of a thin greyish brown stony topsoil with a weakly developed nutty and granular structure on a yellowish brown to brown stony clay loam. Te Kie soils are of medium to high natural fertility; Aroha soils of medium to low. Both soil types are liable to erosion, however only slight soil slip erosion has been noted for the reserve (Department of Lands and Survey 1975, Eyre 1977). The Land Resource Inventory Worksheet classifies the entire Waiomu Ecological Area as class VII land (Water and Soil Division, MOWD 1975). This is a land use capability class based on an 8 class system where class VIII land has the greatest limitations to productive use.

Vegetation

This description is based on four Ecological Forest Survey Tally Sheets (NZFS 1971), twenty one Forest Survey Tally Sheets (NZFS 1948, 1949) and four and a half days field work in the area (15th, 16th and 21st February 1983 and 19th, 20th September 1983).

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 groundlevel). Site descriptions are grouped subjectively into types based as closely as possible on those classified by Nicholls (1976). Further discussion of this technique is given in Burns (1983).

I have identified four major forest types in the proposed Waiomu Ecological Area (Fig. 1) :

1. dense kauri forest;
2. podocarp-hardwood-kauri-hard beech (Type C1, Nicholls 1976);
3. low to middle altitude podocarp-hardwood forest with rare kauri (Type D5, Nicholls 1976); and
4. high altitude podocarp-hardwood forest.

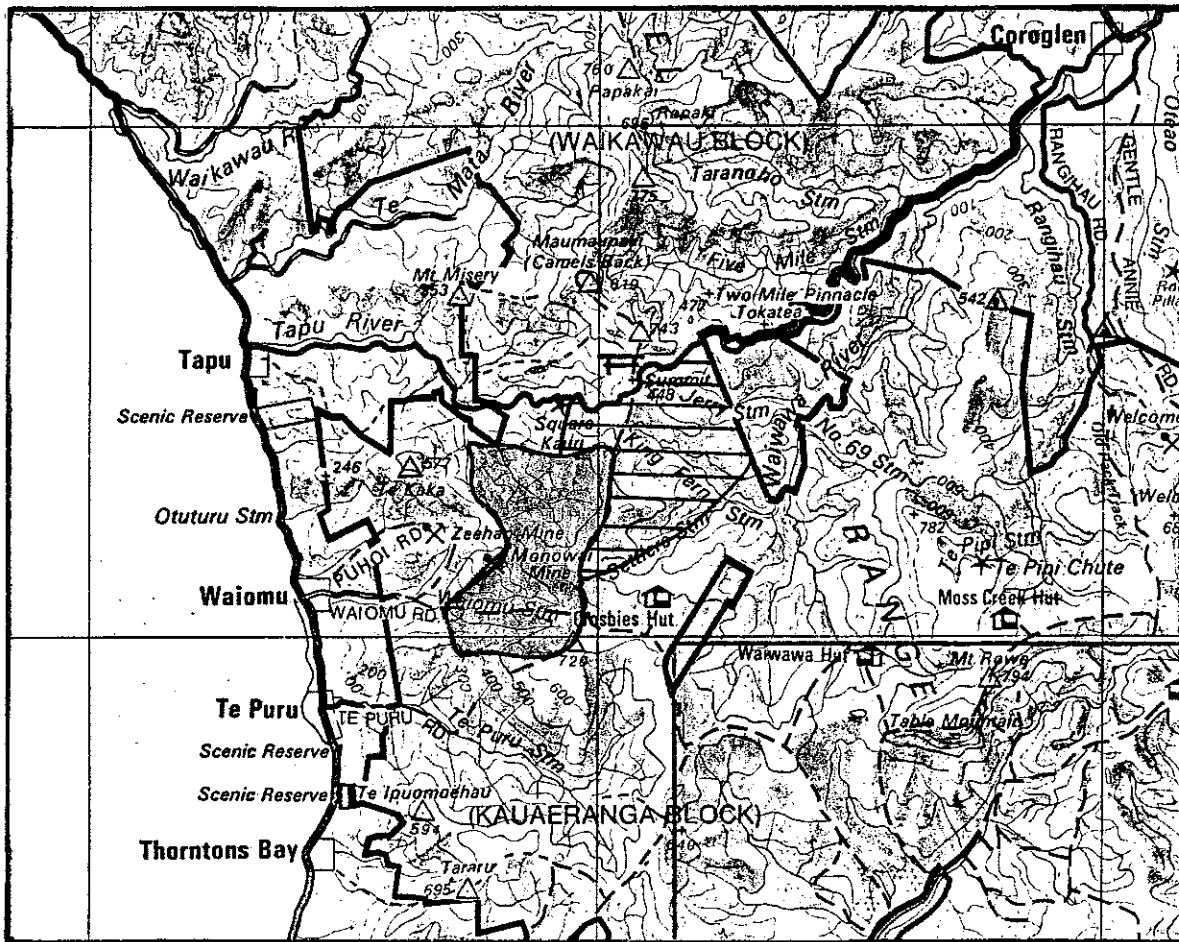





Figure 1 : Location Diagram - Waiomu Ecological Area

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

- Ecological Area 
- State Forest Park Boundary 
- Proposed Extension (Anderson 1983) 

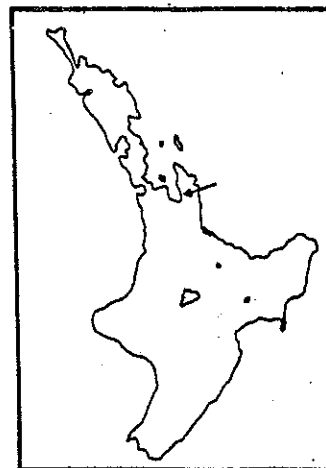


Photo 1: Looking west down
Waiomu Valley with
kauri stand in centre
of photo.
(photo by B. Burns)

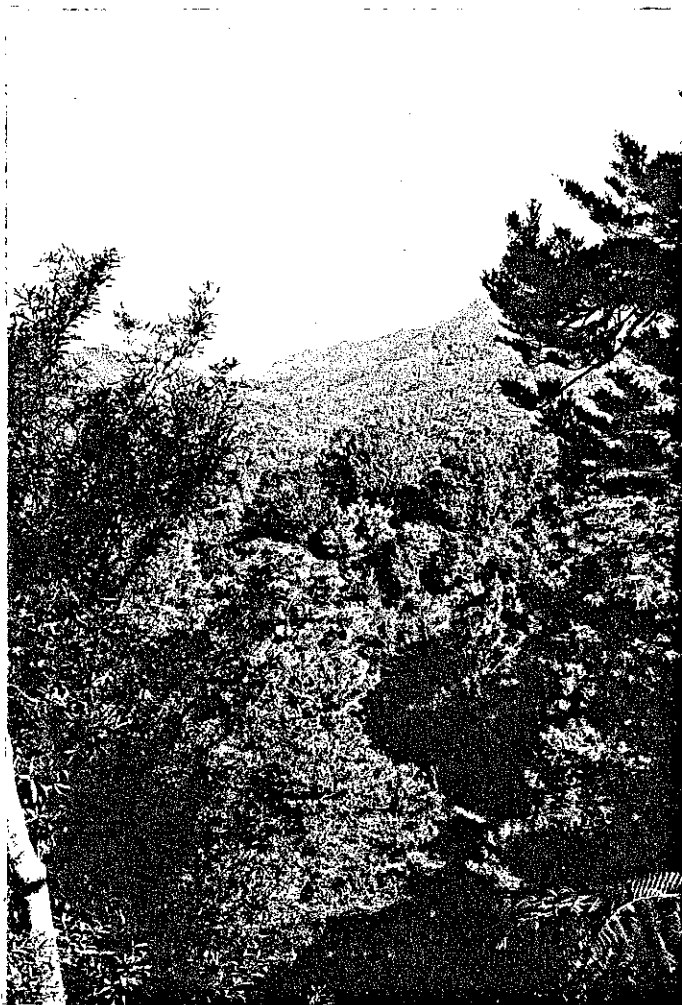


Photo 2: Kauri stand with dense
Astelia trinervia as
groundcover.
(photo B. Burns)

The extent of these types is shown on overlay 1 of figure 2. A detailed species list is given as appendix 1, giving both scientific and common names of plants present.

1. The dense kauri stands found in the middle of the Waiomu Stream catchment up to approx 300 m altitude are a notable feature of the reserve. The kauri forest represented here has long been recognised as one of the largest areas remaining in the Coromandel. In two reports it has been compared with the Manaia Forest Sanctuary kauri. Cornwell (1949) describes the Waiomu kauri stands amongst others, discusses the versatility of kauri as a species in the Coromandel, its regeneration and the need for several areas of kauri to be set aside on the Peninsula for research into kauri ecology. Nicholls (1972) directly compares the Manaia and Waiomu kauri stands with a general kauri forest type. Of Waiomu, he concludes :

'The Waiomu stands are exceptionally heavy [dense] kauri forest compared with the remainder on the flanks of the Coromandel Range. The preponderance of relatively small stems and the abundance of tanekaha and Hall's totara may mean that these stands are younger than the average. A complete absence of outward signs of decay and the common occurrence of young kauri and tanekaha indicates a long future persistence of kauri forest here. The abundance of tanekaha, the presence of occasional toru, a scarcity of quintinia [tawheowheo] and the absence of tawari and pseudowintera [horopito] may be due to the occurrence of these stands near the lower limit of the general kauri type'.

Kauri dominates the canopy at 20-30 m with occasional Hall's totara. Beneath this, the subcanopy consists of miro, Hall's totara, towai, tanekaha, tawa, rewarewa, black maire and infrequent toatoa. Shrubs present are Kirk's daisy, *Pseudopanax discolor*, towai, mamaku and tawheowheo. The groundcover is dense; a mixture of *Astelia trinervia*, karapapa and kiokio. Kiekie, *Astelia solandri*, mangemange and *Collospermum hastatum* are common epiphytes and climbers.

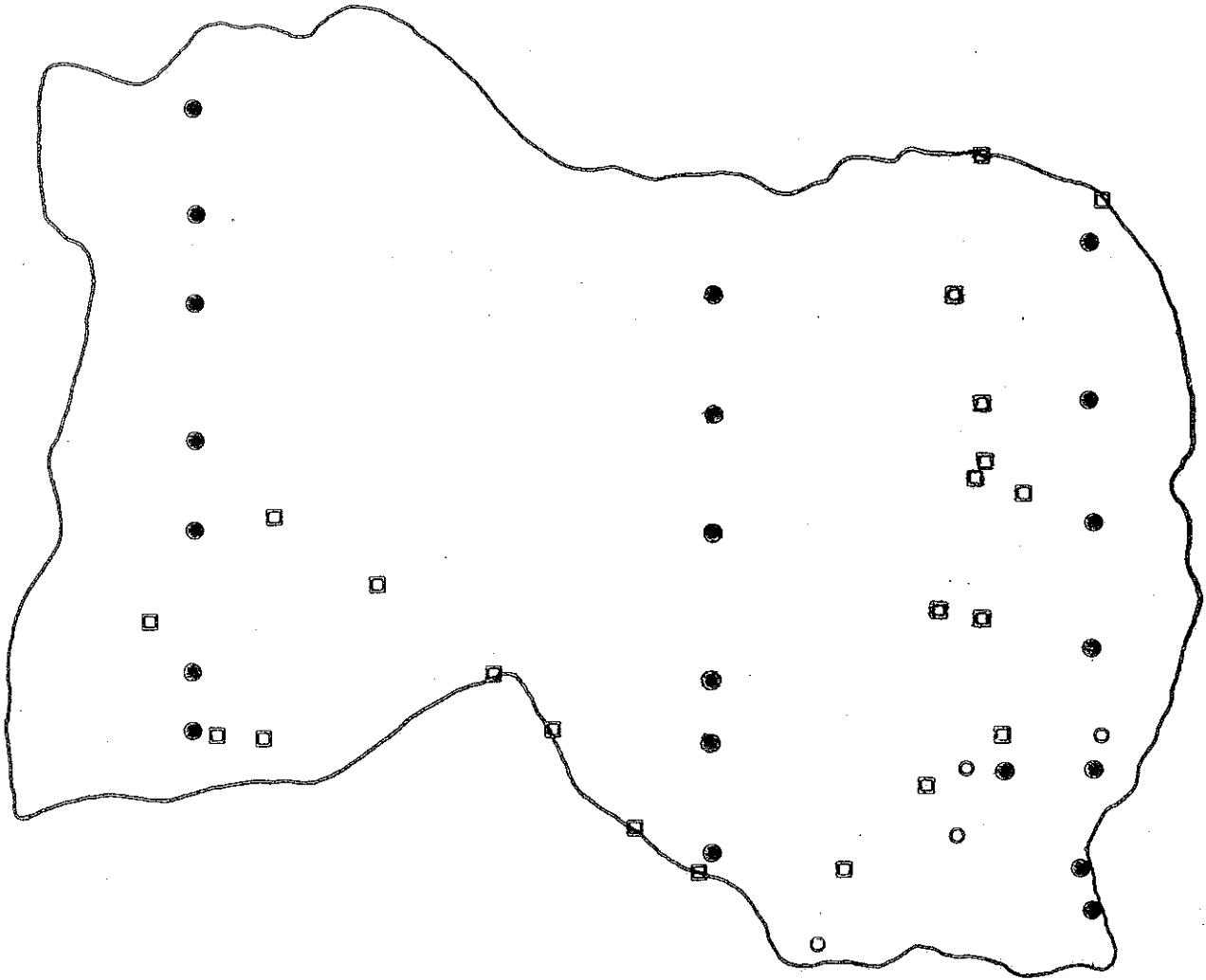
2. The second forest type identified is a podocarp-hardwood-kauri-hard beech type located on one spur in the north-western corner of the reserve below 300 m altitude. This forest is another feature of Waiomu with a high vegetation value. Hard beech is rare in the Coromandel and this area supports many fine specimens.

Although hard beech and kauri occur throughout this type, they are associated with different species on the top of the spur than further downslope. There is evidence of a past fire on top of this spur and this has probably caused the observed difference. On the spur, kauri and hard beech form a 16-20 m high canopy over a low scrubby subcanopy of manuka, toru, *Olearia furfuracea*, *Cordyline banksii*, towai and fivefinger. Shrub species are Kirk's daisy and mingimingi, whilst the groundcover consists of kiokio, bracken, *Gahnia setifolia* and *Lycopodium deuterodensum*.

Further downslope, the canopy consists of tawa, kauri, toatoa and larger trees of hard beech. Subcanopy species include heketara, ponga, mamaku, towai, kohekohe, tanekaha and occasional kauri with Kirk's daisy, heketara, karapapa and kiekie as a shrub tier. Groundcover is dense with kiokio and crown fern. The climbers mangemange, kiekie and climbing rata species are present throughout this downslope type.

3. The most common forest type present is a low to middle altitude podocarp-hardwood type (with rare kauri in forest adjacent to the areas of high density kauri). This type extends up to approximately 500 m altitude. Commonly emergent above the main canopy is northern rata with occasional large rimu, miro, tawa, rewarewa, and in gullies, pukatea. The canopy, generally between 16-20 m high, is a mixture of tawa, towai, miro, rewarewa, hinau, and less frequent kohekohe and fivefinger. Tawari is a minor component of the canopy above 400 m altitude. The subcanopy consists mainly of kohekohe, towai, heketara, ponga, raurekau and mahoe with occasional hinau, black maire, pigeonwood, mapou, lancewood and fivefinger. In gully situations, the subcanopy contains nikau, pate and wineberry. Closer to the ground, the shrub tier is often dense with kiekie, karapapa, hangehange, ponga, rangiora, mamangi, heketara and kohekohe seedlings. *Cyathea smithii* is present in this tier at higher altitudes. The groundcover is also dense, again with kiekie and karapapa, but also with crown fern, kiokio, *Blechnum fraseri*, *Astelia trinervia* and hookgrass. This type supports a rich epiphyte and liane flora. Principle species are mangemange, supplejack, kiekie, *Collospermum hastatum* and *Astelia solandri*.
4. The fourth forest type identified is a high-altitude podocarp-hardwood type occurring above 500 m altitude. As one ascends, a number of species gradually enter and become more important. Each species has its own altitudinal limits and therefore there is no distinct boundary between this type and the previous. The high altitude forest has emergent northern rata and rimu but these are rare and become rarer with altitude. The canopy is relatively low, between 10-15 m, with many trees stunted and twisted apparently from exposure to prevailing winds. The canopy is dominated by towai, tawa, tawari and tawheowheo with occasional rimu and miro. *Pseudopanax colensoi* and *Griselinia littoralis* occur in the canopy above approximately 700 m altitude. The subcanopy is composed of tawari, toro, towai, tawheowheo, heketara, raurekau, fivefinger, *Cyathea smithii* and wheki. Common shrubs are toro, tawheowheo, karapapa, heketara, raurekau, horopito, wheki and *Cyathea smithii*. Again, the groundcover is dense consisting predominantly of kiekie, *Astelia trinervia*, crown fern, kiokio and *Blechnum fraseri*. Epiphytes and climbers include *Astelia solandri*, *Asplenium* species and climbing rata species in this type.

Three species listed as rare in the Coromandel State Forest Park occur in the Ecological Area ; hard beech, *Metrosideros albiflora* and *Coprosma dodonaeifolia* (NZFS 1978, appendix 13). Other species of note present are *Pittosporum kirkii*, of restricted distribution; *Pseudopanax discolor*, finding its southern limit in the Coromandel and *P. colensoi*; reaching its northern limit (Braggins et al. 1983).



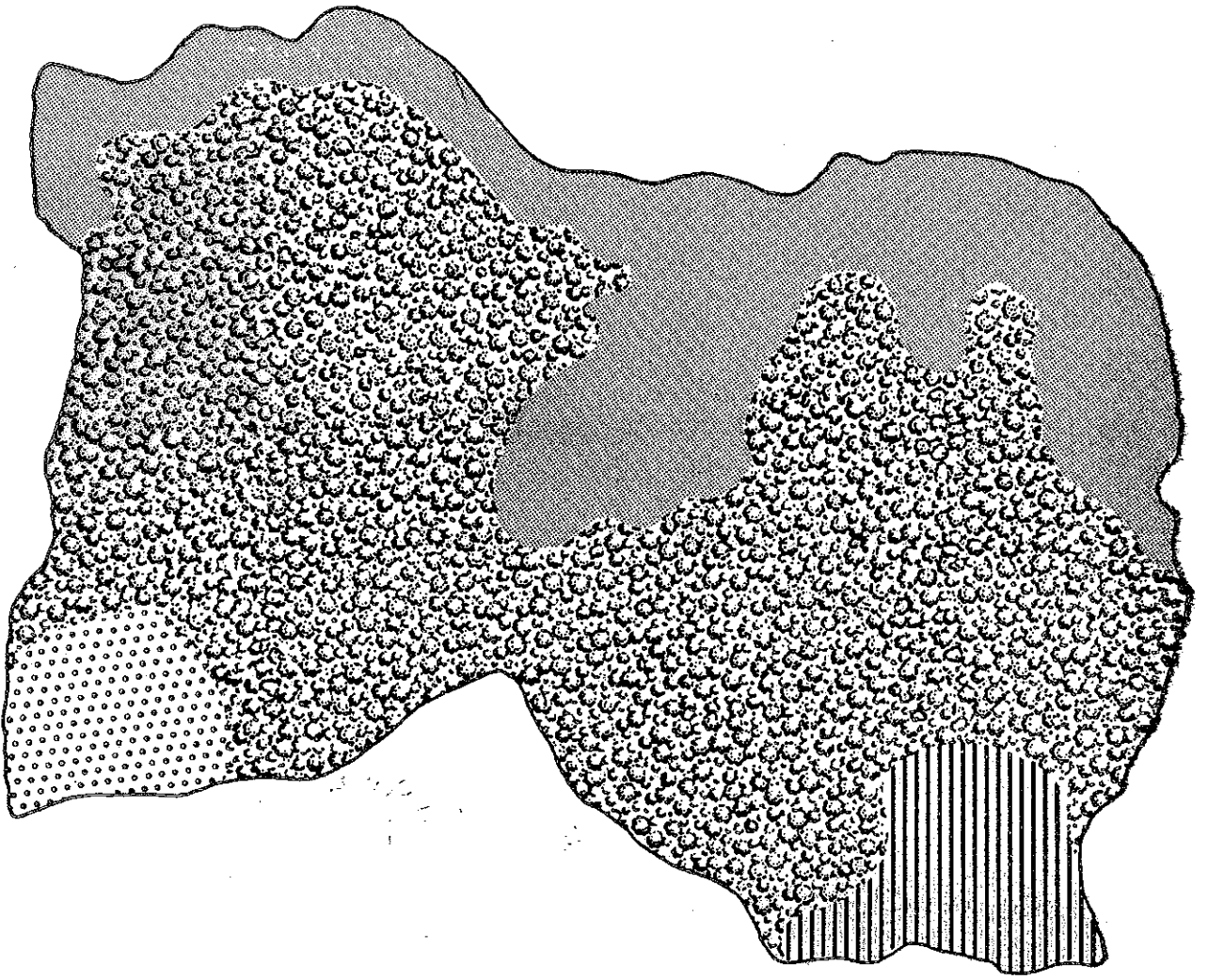
OVERLAY 2 : LOCATION OF VEGETATION

DESCRIPTIONS

● NZFS, 1948, 1949

○ NZFS, 1971

□ Burns 1984



OVERLAY 1 : FOREST TYPES

- ▬▬▬ dense kauri
- ... podocarp - hardwood
- ... kauri - hard beech
- ... mid. to low alt.
- ▬▬▬ podocarp - hardwood
- ▬▬▬ high alt. podocarp - hardwood

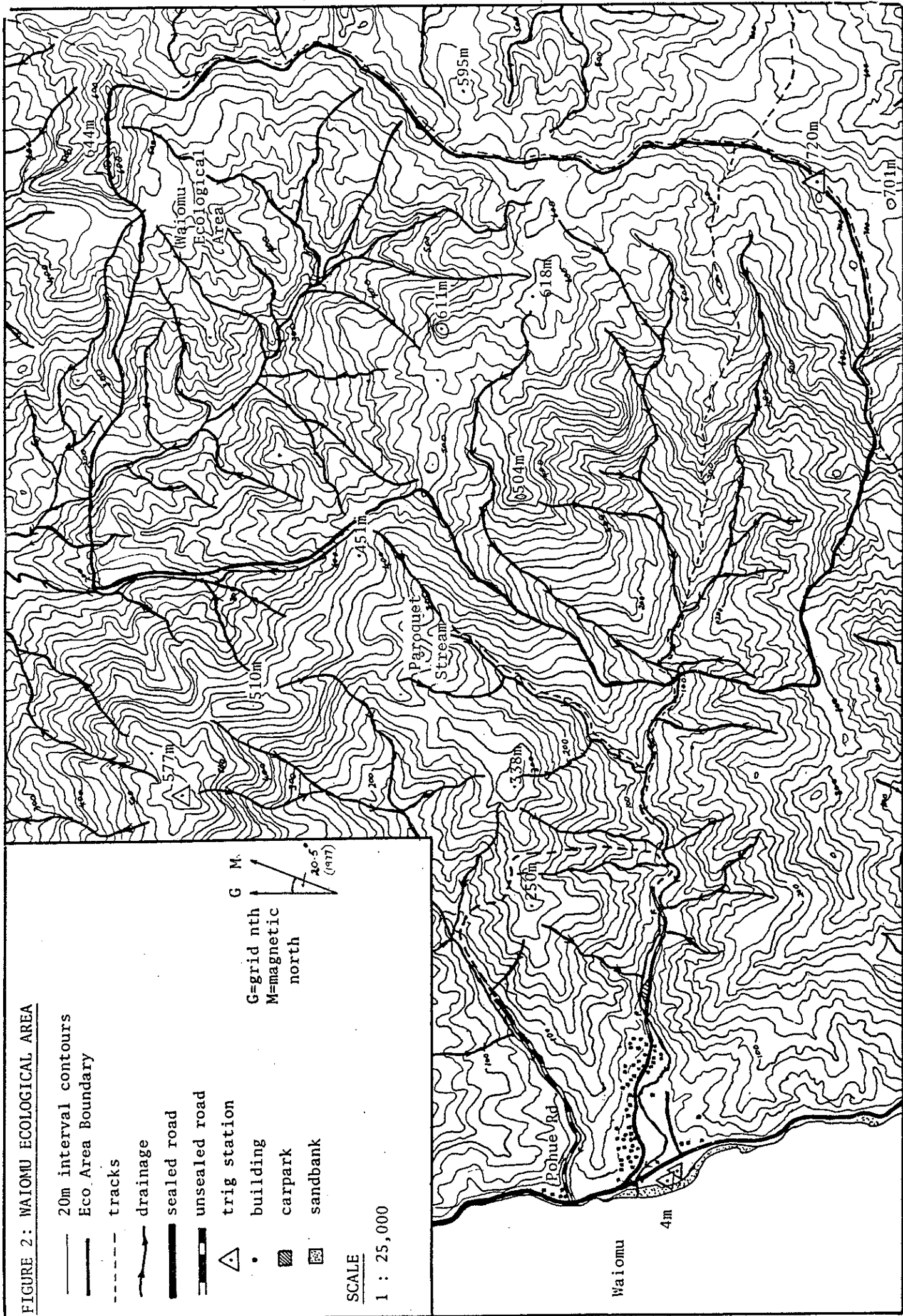
FIGURE 2: WAIOMU ECOLOGICAL AREA

- 20m interval contours
- Eco Area Boundary
- - - tracks
- drainage
- ▬ sealed road
- ▬ unsealed road
- △ trig station
- building
- ▨ carpark
- ▩ sandbank

G M.
 ↑
 20.5°
 (1977)

SCALE

1 : 25,000



Native Fauna

A list of wildlife recorded in Waiomu is given as appendix 2. The central Coromandel block including Waiomu Ecological Area has an 'outstanding' wildlife rating (Anderson 1983). Three species of rare native bird were recorded from the vicinity of Waiomu. Kaka and long-tailed cuckoo were found within the reserve whereas several kokako (*Callaeas cinerea*) were located just to the north of the area (around the Tapu-Coroglen Rd). Long-tailed bats (*Chalinolobus tuberculatus*) are known from just outside the western boundary and therefore are possibly present within the Ecological Area.

Two species of native frog have been found. These are the rare Archey's frog, and Hochstetter's frog (Anderson 1983).

Introduced Animals and Forest Condition

Of 84 circular 4 m² plots examined throughout the Ecological Area, intact goat pellets were only present in 6 (7.1%) and intact possum pellets in 7 (8.3%). No goats were seen or heard within the reserve. Browse was recorded on fourteen species but nowhere was it heavy or extensive. Most browse was noticed on karapapa, fivefinger, kiekie, crown fern, kiokio, *Cyathea smithii* and *Pseudopanax colensoi*. Areas dug up by pigs were also found in several places in the reserve.

An instantaneous assessment of forest condition can do no more than identify probable indicators of future change in the forest composition, structure and biomass.

Possible indicators are :

1. the presence of seedlings and saplings of canopy species;
2. the openness of the vegetation as a whole and in different tiers; and
3. the presence of dead or dying individuals.

Relevant observations are recorded below.

Nicholls (1972) records that seedlings of kauri and most of the softwoods occur frequently in the Waiomu stands. I gained this same impression for most of the reserve. No seedlings of hard beech were seen however.

The vegetation was everywhere dense particularly in the scrub and groundcover tiers. No browse zones, tiers of the forest noticeably open through browse, were identified. Few dead or dying trees were seen.

Presence of Exotic Plants

Few introduced plants grow within the Waiomu reserve and none pose any threat to the native vegetation.

Human History and Influence

No recorded archaeological sites exist in the Waiomu Ecological Area (N.Z. Historic Places Trust, personal communication to Conservancy Archaeologist).

Little logging has taken place in the reserve. A few kauri have been taken from the northern Tapu catchment (S.C.C. 1979) but the remaining forest seems undisturbed.

Gold and silver mining has been the main activity in the Waiomu region but mostly outside the Ecological Area. Fifteen claims were concentrated around the lower reaches of the Waiomu Stream and up the Paroquet Stream Valley (Slane and White 1980). Mining in the area has been intermittent since it began in 1886 with the Paroquet Claim. Total production of all the claims was estimated at a value of £42,947 (Downey 1935). The Monowai mine was by far the most productive. Begun in 1891, its recorded production totals 1240 kg of gold/silver bullion from 21,000 tonnes of ore (KRTA 1984). Downey (1935) states that at no time was the mine worked with any profit to the shareholders. The gold was of low quality with the initial surface workings more profitable.

A stamping battery was sited at the junction of the Waiomu and Paroquet Streams. Remains of the foundations of a tank can still be seen. On the opposite bank of the Waiomu Stream was the site of a miner's town constructed in the early mining days. No remnants of the town are now visible. Within the reserve itself old adits (mine entrances), sluices and prospected quartz outcrops are found along the lower parts of the main Waiomu Valley track.

Interest in reopening the Monowai mine has resulted in prospecting at spasmodic intervals between 1914 and 1935. In 1951, two of the old mine levels were cleared and sampled by the Electrolyte Zinc Company of Australia and in 1959 further adit clearing and sampling was carried out by South Pacific Mines.

Central Pacific Minerals (N.Z.) Ltd continued prospecting in 1971 and 1972. In 1977, this company applied for a prospecting licence over the Waiomu Valley (Johnston 1981, P.L. 31467) in competition with an application from Amoco Minerals N.Z. Ltd (Johnston 1982, P.L. 31481). The latter company was successful. However in November 1983, Crusader Minerals (N.Z.) Ltd acquired this prospecting licence and immediately applied for a mining licence (KRTA 1984, M.L. 322024) over 289 ha surrounding the Monowai mine.

Their proposal is to reopen the Monowai mine through several mine entrances up the Paroquet Valley. Mining would be underground including work beneath a strip of land within the Ecological Area on the western boundary. The company proposes to build a road up the Waiomu Stream and then into the Paroquet Valley and to site the administrative and storage buildings on the boundary of the Ecological Area.

As well, to ensure that the Waiomu township is provided with an adequate water supply, uncontaminated from leakage through the heavy metal deposits exposed during mining, the company intends to install an alternative water supply to the town using water taken from the Waiomu Stream above the Paroquet Stream. This intake would be within the Ecological Area (KRTA 1984).

Photo 3: Hard beech - kauri
stand in north-west
of Ecological Area
(photo by D. Watts)



Photo 4: *Alseuosmia macrophylla* in flower, a common shrub
of the Ecological Area.

(photo by B. Burns)

An Environmental Impact Report was prepared by the company (KRTA 1984). However the Commission for the Environment has asked the company to answer further questions on their proposal before the matter is taken before the Planning Tribunal.

Recreational Facilities and Opportunities

A track system exists through the Waiomu reserve (see 'Access'). A particularly popular walk is to the densest kauri stand, so much so that the S.C.C. states in their approval of the area that :

'a watching brief be maintained over recreational use of the area to ensure that the level of use does not threaten the values of the reserve as an Ecological Area' (S.C.C. 1979).

In order to minimise the impact of high recreational use, Holder et. al. (1983) recommend that the track to the kauri grove should be upgraded to 'walk' standard with interpretation signs for cultural and ecological aspects.

(walk stand : well-formed, well-signposted walkway designed to accommodate high density use with a minimum of impact. It should be of an easy grade, water tabled, stepped, benched and bridged as required (Dept. of Lands and Survey 1979, summarised in Holder et. al. 1983)).

Research Carried Out and Suggested

The kauri stands have been examined and described by Nicholls (1972). The reserve would be useful for studies into kauri and hard beech population dynamics on the Coromandel Peninsula.

Summary, Discussion and Recommendations

The proposed Waiomu Ecological Area is a 1120.05 ha tract of indigenous forest on the western coastline of the Coromandel Peninsula. It forms part of the Kauaeranga Block of the Coromandel Forest Park and is in the Thames Ecological District. Both catchments within the reserve are used for water supply. The reserve is composed of steep long mountain slopes on a base of andesitic rock (Beeson's Island Volcanics). Weak propylitic hydrothermal alteration has occurred over a wide area with numerous quartz outcrops. Soils are Te Kie and Aroha steepland soils related to brown granular clays and are of medium natural fertility.

I have identified four major forest types in the proposed Waiomu Ecological Area. These are : dense kauri forest, podocarp-hardwood-kauri-hard beech forest, low to mid-altitude podocarp-hardwood forest with rare kauri, and high-altitude podocarp-hardwood forest. Three plant species found in Waiomu are considered rare within the Coromandel Forest Park : hard beech, *Coprosma dodonaeifolia* and *Metrosideros albiflora*.

The central Coromandel block including the Waiomu Ecological Area has an 'outstanding' wildlife rating. Three rare native bird species have been recorded from the vicinity of the Ecological Area as well as two species of native frogs. There was little sign of browsing mammal presence and few exotic plants were observed.

Little logging is recorded and the forest's overall condition suggests it is little modified by man or animal. Gold and silver mining have been the main activities in the vicinity of the Ecological Area, with a concentration of fifteen (now abandoned) claims around the lower reaches of the Waiomu Valley. Mining began in 1886 and after the initial burst of activity has continued intermittently since.

The tracks within the reserve, particularly to the kauri grove, are an important recreational feature of the Coromandel Forest Park.

A brief inspection cannot be conclusive about animal numbers or their impact. However from the general absence of animal sign and the few animals encountered, there seems no immediate need for animal control operations in the Ecological Area.

There is a current proposal to reopen the Monowai mine on the edge of the Ecological Area. The mining and associated operations will act as sources of noise, dust, air and waste pollution into the reserve. The benefits from the mining operation in terms of employment and revenue will have to be carefully weighed against the deterioration of environmental values : effects on water quality, damage to the vegetation, effects on wildlife and on the recreational experience. It is my opinion that the mining, with proper safeguards, could go ahead as proposed with minor effects on the Ecological Area. The greatest impacts will be downstream.

Anderson (1983) has proposed an extension of the Waiomu reserve to the north and east to include an area where kokako and Archey's frog have been observed (Figure 1). The inclusion of known habitat of these two rare and endangered species undoubtedly needs considering.

Management recommendations in order of priority are :

1. the NZFS should ensure that any mining or prospecting activity close to or in the reserve does not interfere with the integrity of the reserve;
2. assess the value of adding an area of kokako and Archey's frog habitat to the north and east of the reserve;
3. monitor population trends of possum and goat; and
4. set up several permanent plots in different vegetation types to monitor vegetation trends.

Acknowledgements

I acknowledge and thank for their assistance in the field at various times Rhys Gardner, Alicia Warren and William Richards.

Appendix 1 : Botanical Species List - Waiomu Ecological AreaFerns

<i>Asplenium bulbiferum</i> var. <i>bulbiferum</i>	hen and chicken fern
<i>A. flaccidum</i> var. <i>flaccidum</i>	hanging spleenwort
<i>A. oblongifolium</i>	shining spleenwort
<i>A. polyodon</i>	
<i>Blechnum capense</i> (forma a)	kiokio
<i>B. capense</i> (forma b : <i>Lomaria latifolia</i>)	
<i>B. chambersii</i>	
<i>B. discolor</i>	crown fern
<i>B. filiforme</i>	
<i>B. fluviatile</i>	
<i>B. fraseri</i>	
<i>B. nigrum</i>	
<i>Ctenopteris heterophylla</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>Grammitis billardieri</i>	
<i>Histiopteris incisa</i>	histiopteris
<i>Hymenophyllum demissum</i>	filmy fern
<i>H. dilatatum</i>	filmy fern
<i>H. ferrugineum</i>	filmy fern
<i>H. revolutum</i>	filmy fern
<i>H. sanguinolentum</i>	filmy fern
<i>H. scabrum</i>	filmy fern
<i>Lastreopteris hispida</i>	
<i>Leptopteris hymenophylloides</i>	heruheru
<i>Lindsaea trichomanoides</i>	
<i>Lygodium articulatum</i>	mangemange
<i>Paesia scaberula</i>	hard fern or ring fern
<i>Phymatosorus diversifolium</i>	
<i>P. scandens</i>	fragrant fern
<i>Pneumatopteris pennigera</i>	
<i>Pyrrosia serpens</i>	
<i>Trichomanes elongata</i>	
<i>T. reniforme</i>	kidney fern
<i>T. venosum</i>	

Fern Allies

<i>Lycopodium billardieri</i>
<i>L. deuterodensum</i>
<i>L. volubile</i>
<i>Tmesipteris elongata</i>
<i>T. sigmatifolia</i>
<i>T. tarrimensis</i>

Gymnosperms

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

Dicot. Trees and Shrubs

<i>Alectryon excelsus</i>	titoki
<i>Alseuosmia macrophylla</i>	karapapa
<i>Aristotelia serrata</i>	wineberry
<i>Beilschmiedia tawa</i>	tawa
<i>Brachyglottis repanda</i>	rangiora
<i>Coprosma dodonaeifolia</i>	
<i>C. grandifolia</i>	
<i>C. lucida</i>	karamu
<i>C. robusta</i>	karamu
<i>Coriaria arborea</i>	tutu
<i>Corynocarpus laevigatus</i>	karaka
<i>Cyathodes fasciculata</i>	mingimingi
<i>C. juniperina</i>	
<i>Dracophyllum latifolium</i>	neinei
<i>Dysosyllum spectabile</i>	kohekohe
<i>Elaeocarpus dentatus</i>	hinau
<i>Fuchsia excorticata</i>	kotukutuku
<i>Gaultheria antipoda</i>	
<i>Geniostoma rupestre</i> var. <i>crassum</i>	hangehange
<i>Griselinia littoralis</i>	broadleaf
<i>G. lucida</i>	puka
<i>Hebe macrocarpa</i> var. <i>latifolia</i>	
<i>Hebe stricta</i>	koromiko
<i>Hedycarya arborea</i>	pigeonwood
<i>Ixerba brexioides</i>	tawari
<i>Knightia excelsa</i>	rewarewa
<i>Laurelia novae-zelandiae</i>	pukatea
<i>Leptospermum scoparium</i>	manuka
<i>Litsaea calicaris</i>	mangaeo
<i>Lophomyrtus bullata</i>	ramarama
<i>Macropiper excelsum</i>	kawakawa
<i>Melicytis ramifloris</i>	mahoe
<i>Metrosideros robusta</i>	northern rata
<i>Myrsine australis</i>	mapou
<i>M. salicina</i>	toro
<i>Nestegis lanceolata</i>	black maire
<i>N. montana</i>	
<i>Nothofagus truncata</i>	hard beech
<i>Olearia furfuracea</i>	
<i>O. rani</i>	heketara
<i>Persoonia toru</i>	toru
<i>Phebalium nudum</i>	mairehau
<i>Pittosporum cornifolium</i>	
<i>P. kirkii</i>	
<i>P. tenuifolium</i>	kohuhu

<i>Pseudopanax anomalum</i>	
<i>P. arboreum</i>	fivefinger
<i>P. colensoi</i>	
<i>P. crassifolium</i>	lancewood
<i>P. discolor</i>	
<i>P. edgerleyi</i>	
<i>Pseudowintera axillaris</i>	horopito
<i>Quintinia serrata</i>	tawheowheo
<i>Rhabdothamnus solandri</i>	
<i>Schefflera digitata</i>	pate
<i>Senecio kirkii</i> var. <i>angustior</i>	Kirk's daisy
<i>S. k.</i> var. <i>kirkii</i>	
<i>Ulex europaeus</i>	gorse
<i>Weinmannia silvicola</i>	towai

Dicot. lianes

<i>Clematis paniculata</i>	puawhananga
<i>Metrosideros albiflora</i>	
<i>M. diffusa</i>	climbing rata
<i>M. fulgens</i>	climbing rata
<i>M. perforata</i>	climbing rata
<i>Parsonsia</i> spp.	
<i>Rubus australis</i>	bush lawyer
<i>R. cissoides</i>	bush lawyer

Dicot herbs

Epilobium nerterioides
Gnaphalium keriense
Nertera dichondraefolia
Ranunculus hirtus

Grasses

Microlaena avenacea bush rice grass

Orchids

Acianthus fornicatus var. *sinclairii*
A. reniforme
Corybas orbiculatus
C. rivularis
Dendrobium cunninghamii
Drymocanthus adversus
Earina autumnalis
E. mucronata
Pterostylis spp.

Other Monocots

<i>Astelia fragrans</i>	
<i>A. solandri</i>	
<i>A. trinervia</i>	kauri grass
<i>Carex dissita</i>	
<i>C. geminata</i>	
<i>Collospermum hastatum</i>	
<i>Cordyline banksii</i>	kiekie
<i>C. pumilio</i>	
<i>Dianella nigra</i>	
<i>Freycinetia baueriana</i> subsp. <i>banksii</i>	
<i>Gahnia pauciflora</i>	
<i>G. setifolia</i>	
<i>Libertia pulchella</i>	
<i>Morelotia affinis</i>	
<i>Rhopalostylis sapida</i>	nikau
<i>Ripogonum scandens</i>	supplejack
<i>Schoenus maschalinus</i>	
<i>Scirpus reticulatus</i>	
<i>Uncinia uncinata</i>	hookgrass
<i>U. zotovii</i>	

Appendix 2 : Wildlife of the Waiomu Ecological Area

(Anderson 1983)

Native Birds

<i>Anthornis melanura</i>	bellbird
<i>Chalcites lucidus</i>	shining cuckoo
<i>Eudynamis taitensis</i>	long-tailed cuckoo
<i>Gerygone igata</i>	grey warbler
<i>Halcyon sancta</i>	kingfisher
<i>Hemiphaga novaeseelandiae</i>	N.Z. pigeon
<i>Hirundo neoxena</i>	welcome swallow
<i>Nestor meridionalis</i>	kaka
<i>Petroica macrocephala</i>	ped tit
<i>Prothemadera novaeseelandiae</i>	tui
<i>Rhipidura fuliginosa</i>	N.I. fantail
<i>Zosterops lateralis</i>	silvereye

Introduced Birds

<i>Acridotheres tristis</i>	myna
<i>Fringilla coelebs</i>	chaffinch
<i>Platycercus eximius</i>	eastern rosella
<i>Prunella modularis</i>	dunnock
<i>Turdus merula</i>	blackbird

Amphibians

<i>Leiopelma archeyi</i>	Archey's frog
<i>L. hochstetteri</i>	Hochstetter's frog

Mammals

<i>Capra hircus</i>	goat
<i>Sus scrofa</i>	pig
<i>Trichosurus vulpecula</i>	possum

References

- Anderson, P. (1983): 'Wildlife values - gazetted and proposed ecological reserves' including 'Wildlife values - Coromandel Forest Park'. Unpublished Wildlife Service reports prepared for Conservator of Forests, NZFS, Auckland. Auckland Conservancy file 6/0/19.
- Biological Resources Centre (BRC) (1983): Ecological Regions and Districts (2nd Edition): Boundaries and Names. Government Printer.
- Braggins, J.E., E.K. Cameron, N.D. Mitchell, F.J. Newhook, J. Ogden and J.A. Rattenbury (1983): Submission to the Thames-Coromandel District Council Management Plan by Botanists at the University of Auckland concerning the protection and preservation of native species and their habitats. Unpublished report, Botany Department, University of Auckland.
- Burns, B.R. (1983): Ecological Areas in the Coromandel - a workplan. Unpublished report. Auckland Conservancy file 6/0/19.
- Cornwell, W.L. (1949): Some observations on kauri with special reference to Manaia Kauri Forest. Letter to Forest Ranger, Coromandel Unit, National Forest Survey, Tapu. Thames District file 6/149/34/1.
- Department of Lands and Survey (1975): Land Inventory Survey: Coromandel-Thames Counties. Department of Lands and Survey. Government Printer.
- Department of Lands and Survey (1979): A guide to walkway construction and maintenance for the N.Z. Walkway Commission. Department of Lands and Survey.
- Downey, J.F. (1935): Goldmines of the Hauraki District, N.Z. Wellington. Government Printer.
- Eyre, J.R. (1977): Soils in the Auckland Conservancy: summary of knowledge. Unpublished NZFS report held in Auckland Conservancy library.
- Holder, K., C. Murdock and K. Nichols (1983): Coromandel Forest Park. A recreation strategy. Thames District, NZFS.

- I.U.C.N. (1978): Categories, objectives and criteria for protected areas.
Annex to General Assembly Paper G.A. 78/24. IUCN Morges, Switzerland.
- Johnston, M.J. (1970): Waiomu Valley Kauri.
Unpublished NZFS report. Auckland Conservancy file 6/149.
- Johnston, M.J. (1982): A resume of prospecting and mining applications in Coromandel Forest Park. Nov. 1976 - Dec. 1982.
Unpublished NZFS report.
Thames file 20/0/149.
- (K.R.T.A.) Kingston, Reynolds, Thom and Allardice Ltd (1984): Crusader Minerals N.Z. Ltd.
Environmental Impact Report - Monowai Mine and Maratoto Mill.
Unpublished report. KRTA
- Maunder, W.J. (1974): Climate and Climatic Resources of the Waikato, Coromandel, King Country Region. N.Z. Meteorological Service, Miscellaneous Publication 115(7)
N.Z. Government Printer.
- Merchant, R.J. (1978): Metallogenesis in the Thames-Tapu area, Coromandel Peninsula, New Zealand.
PhD Thesis, University of Auckland.
- New Zealand Forest Service (1948): Forest Survey Tally Sheets.
1073-1079, 1164, 1165. Held at F.R.I. Rotorua.
- N.Z.F.S. (1949): Forest Survey Tally Sheets.
1112-1117, 1166-1172. Held at F.R.I. Rotorua.
- N.Z.F.S. (1971): Ecological Forest Survey Tally Sheets. E1-E4. Held at F.R.I. Rotorua.
- N.Z.F.S. (Conway M.J.) (1977): Management Policy for New Zealand's Indigenous State Forests.
- N.Z.F.S. (1978): Coromandel State Forest Park Management Plan 1978-1988. N.Z.F.S.
- N.Z.F.S. (1983): Coromandel Forest Park - Hut and Track Information 1983. N.Z.F.S.
- N.Z. Geological Survey, D.S.I.R. (1967): Geological Map of N.Z. Sheet 3, Auckland. 1:250,000. D.S.I.R.
- N.Z. Meteorological Service (1973): Summaries of Climatological Observations to 1970. N.Z. Meteorological Service Miscellaneous Publication 143.

- Nicholls, J.L. (1972): A comparison of the Kakatarahae (Manaia) and Waiomu kauri stands. Unpublished NZFS report. Thames District file 6/149/34/1.
- Nicholls, J.L. (1976): A revised classification of the North Island indigenous forest. New Zealand Journal of Forestry, 21(1):105-32.
- Nicholls, J.L. (1977): Existing and Proposed Scientific Reserves in the Indigenous Forests of the Coromandel Region. Auckland Conservancy file 6/0/19.
- Scientific Co-ordinating Committee (S.C.C.) (1979): Supplement to and Minutes of the 15th Meeting of the Scientific Co-ordinating Committee. Auckland Conservancy file 6/0/19.
- S.C.C. (1980): Criteria - Guidelines for the Selection of the Ideal Reserve. Unpublished report. Auckland Conservancy file 6/0/19.
- Simpson, P. (1982): Ecological regions and districts: a natural subdivision of New Zealand. Biological Resources Centre Publication No. 1. Government Printer, Wellington.
- Slane, C. and G. White (1980): Gold Mines in State Forests of the Coromandel. Unpublished NZFS report. Auckland Conservancy.
- Water and Soil Division, Ministry of Works and Development (1975): New Zealand Land Resource Inventory Worksheet N44. N.Z. Government Printer.