

Kapowai Ecological Area



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Auckland Conservancy
DEDICATED AREAS REPORT

No. 3

KAPOWAI ECOLOGICAL AREA



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(This is an unpublished internal report)

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<u>Contents</u>	<u>Page No.</u>
Location	2
Access	2
History of Gazettal	2
Rationale and Objectives of Designation	2
Topography	5
Climate	5
Geology	5-7
Pedology and Erosion	7-8
Vegetation	8-10
Introduced Animals and Forest Condition	10
Presence of Exotic Plants	10
Native Fauna	11
Human History and Influence	11-12
Recreational Facilities and Opportunities	12-13
Research Carried Out and Suggested	13
Summary, Discussion and Recommendations	13-14
Acknowledgements	14
Appendix 1 : Botanical Species List - Kapowai Ecological Area	15-18
Appendix 2 : Wildlife of the Kapowai Ecological Area	19
References	20-22

Location

The Kapowai Ecological Area covers an upper catchment of the Kapowai River and a small part of the ultimate headwaters of the Kauaeranga River (approx. midpoint at map ref. NZMS1 N44 220415). It is a reserve of indigenous forest and scrub within-and bounded on all sides by-the Hikuai Block of the Coromandel State Forest Park. It also exists within the Tairua Ecological District (Simpson 1982, BRC 1983). The reserve covers 1477.39 ha. The most recent aerial photographs were flown on 10 January, 1983 (survey no. 8163, run N, photograph 11 and run 0, photograph 10).

Access

The reserve can be reached by following up the Kapowai River from the end of Kapowai Road off State Highway 25 between Tairua and Coroglen. Blue and red banded posts mark the walking route through a private exotic forest (Fletcher's), from the road end to the State Forest Park boundary. A track, sometimes ill-defined, then follows up the Kapowai River on the true left bank. Approximately one mile up from the road end it crosses the river. A single strand wire bridge exists at this point for emergency crossings. The track continues on the true right bank until it reaches the Ecological Area.

Other access can be gained to the headwaters of the catchment by following the Old Pack Track at the end of Rangihau Road. Once the summit of the main ridge on this track has been reached (near the Welcome Jack mine), the Ecological Area is to the east.

History of Gazettal

The initial proposal for this area came from J.L. Nicholls (scientist, F.R.I. Rotorua) in 1976. Inspection by the S.C.C. occurred in 1979 and on their approval, with slight boundary changes, final gazettal was on the 6th of May, 1982 (N.Z. Gazette, no. 50, p. 1504).

Rationale and Objectives of Designation

The Kapowai Ecological Area fulfils many of the criteria for selection of Ecological Areas as set down by the S.C.C. (S.C.C. 1980). It is over 1,000 ha, covers one complete catchment, is compact and unroaded with boundaries clearly defined by natural features. It also contains a variety of land forms and vegetation types characteristic of the local area.

The purpose of designation, as stated in the Coromandel State Forest Park Management Plan 1978-1988, is:

'to reserve a biologically important catchment containing mid-high elevation kauri, rimu, yellow-silver pine and the rare occurrence of hard beech associations.' (NZFS 1978)



Photo 1: Kapowai Ecological Area - looking east (photo by M.J. Johnston)



Photo 2: *Leiopelma hochstetteri* found beside stream (photo by D. Watts)

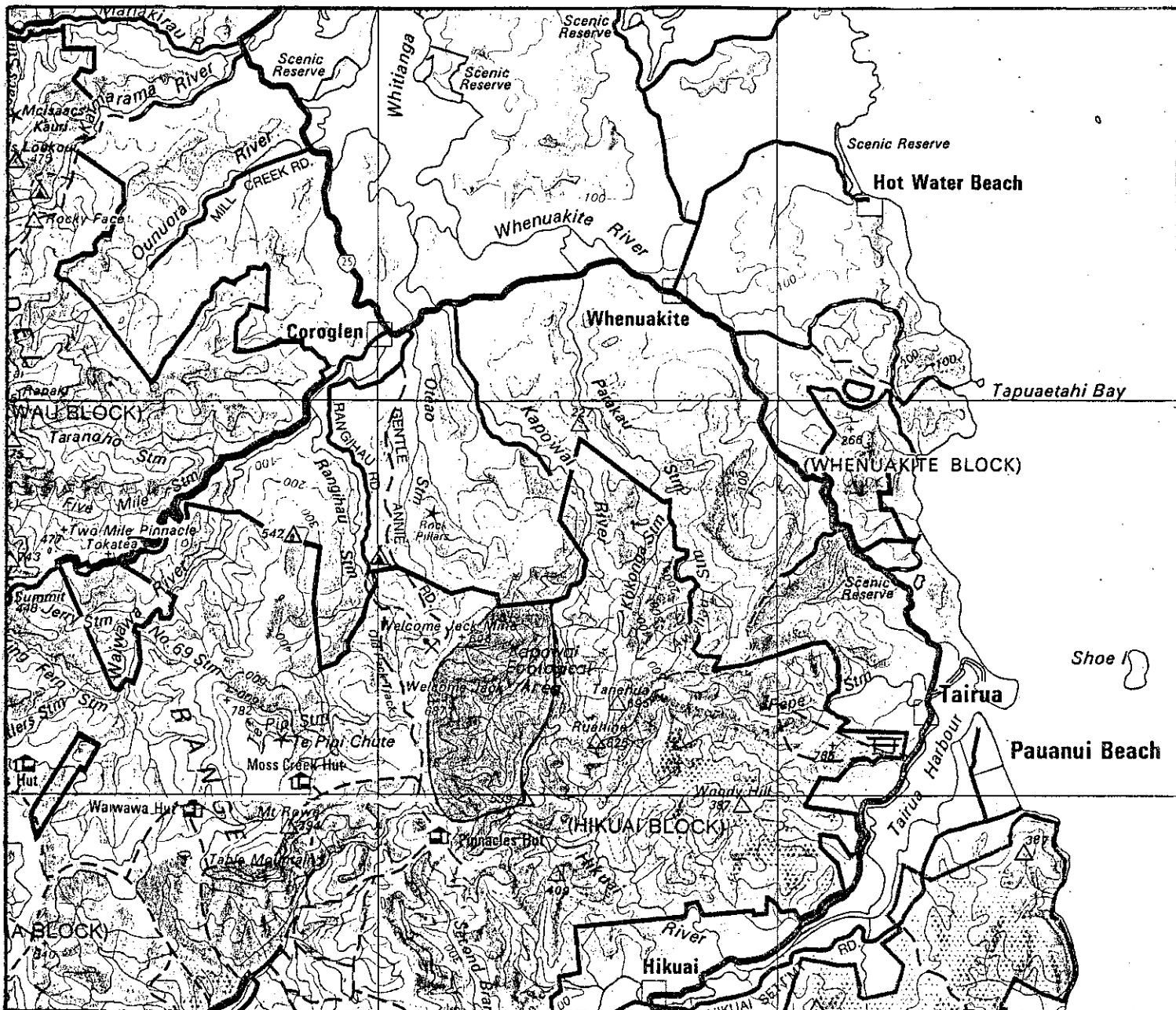




Fig. 1 : Location Diagram : Kapowai Ecological Area

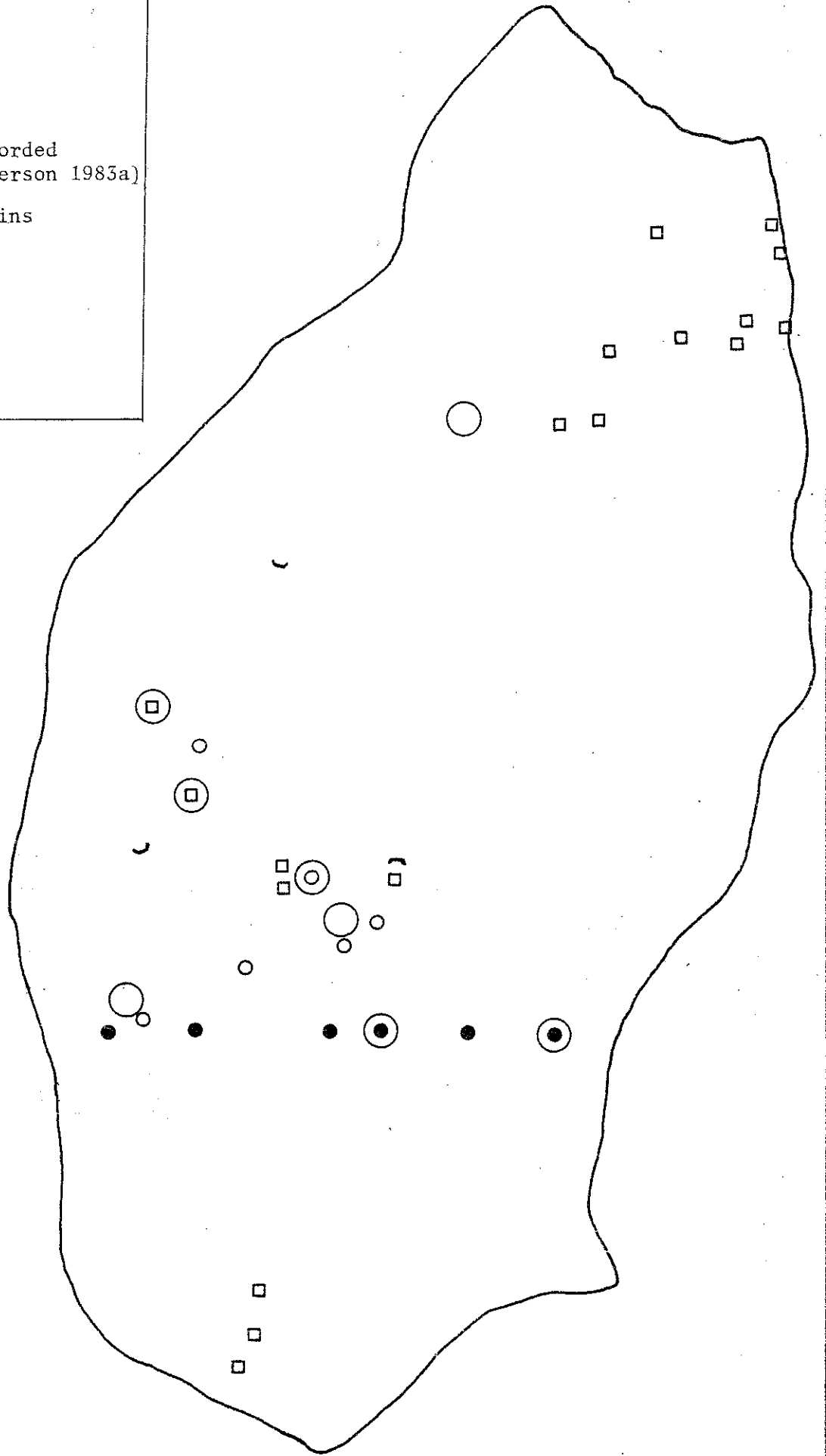
(Based on NZMS 274 Coromandel State Forest Park, 1:150,000, 1st Edition 1979, NZFS, Government Printer.)

Ecological Area 

State Forest Park Boundary 

LOCATION OF VEGETATION DESCRIPTIONS
(Overlay 2)

- NZFS 1949
- NZFS 1966
- this report
- hard beech recorded
(including Anderson 1983a)
- ⌒ kauri dam remains



FOREST TYPES

(Overlay 1)

Manuka/towai scrub



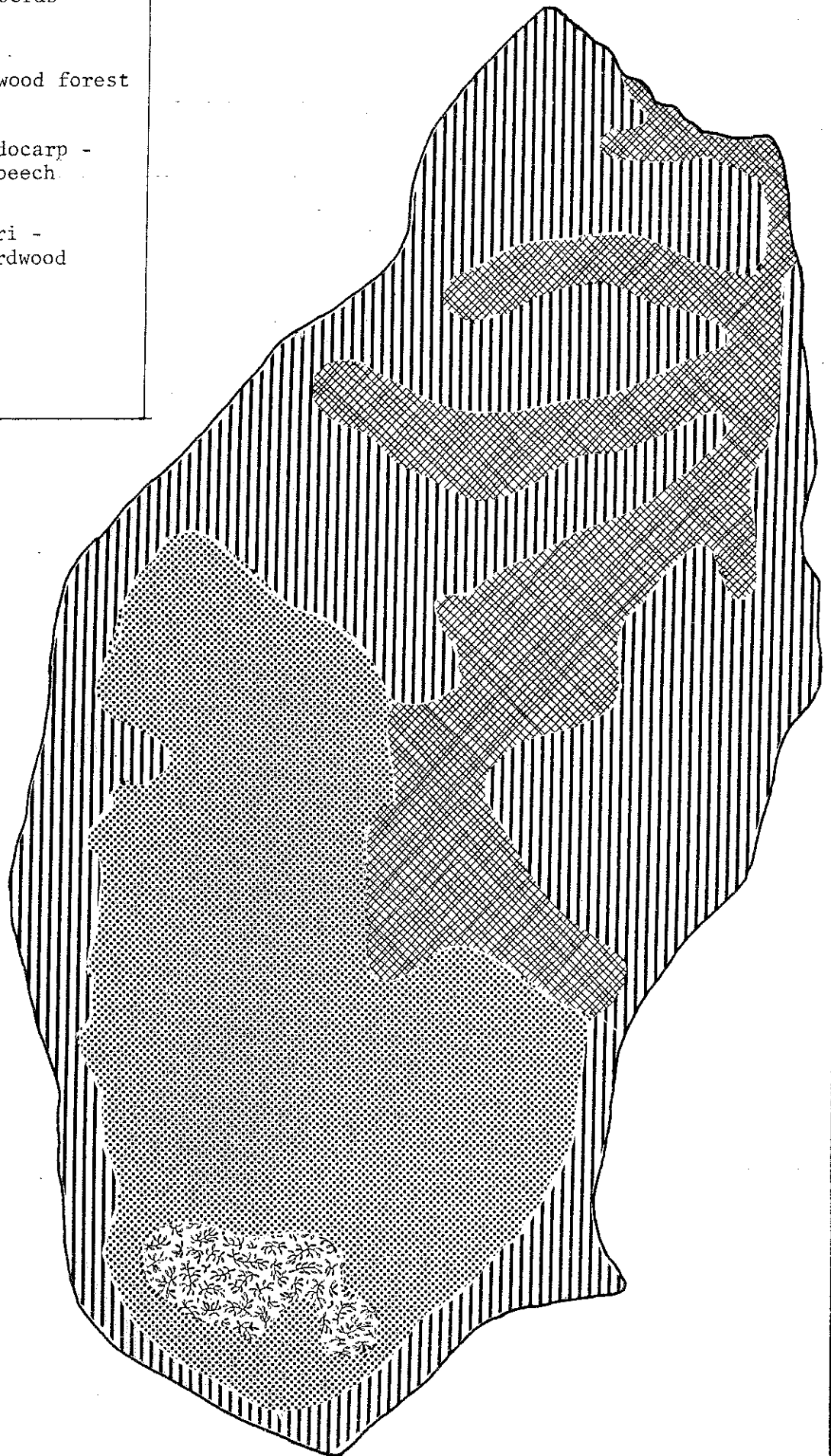
Low alt. hardwood forest



Hardwood - podocarp -
kauri - hard beech

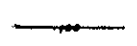
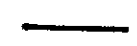





High alt. kauri -
podocarp - hardwood



LEGEND : KAPOWAI ECOLOGICAL AREA

(Fig. 2)

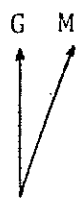
-  20 m interval contours
-  Eco Area Boundary
-  tracks
-  drainage
-  trig station

SCALE

1 : 25,000

G = grid north

M = magnetic north



The reserve has an IUCN* classification of IV (Nature Conservation Reserve, NZFS for IUCN 1984). The 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 primary activities associated with this category (IUCN 1978).

Topography

The region is characterised by extremely steep slopes with spectacular ignimbrite cliffs and rhyolite domes. It is much dissected country with slopes mostly $> 35^{\circ}$ (Water and Soil Division, MOWD, 1975). The reserve has an altitudinal range between 120 m and 760 m.

Climate

The closest climate recording station to the Kapowai is at Tairua Forest. However, it occurs at sea level and local exposure and altitude will have an over-riding effect on the true climate experienced in the reserve. Tairua Forest receives an average 1823 mm/year rainfall and experiences a daily temperature range from a mean minimum of 9.8°C to a mean maximum of 19.1°C . Further discussions of climate on the Coromandel are given in Burns (1983) and Maunder (1974).

Geology

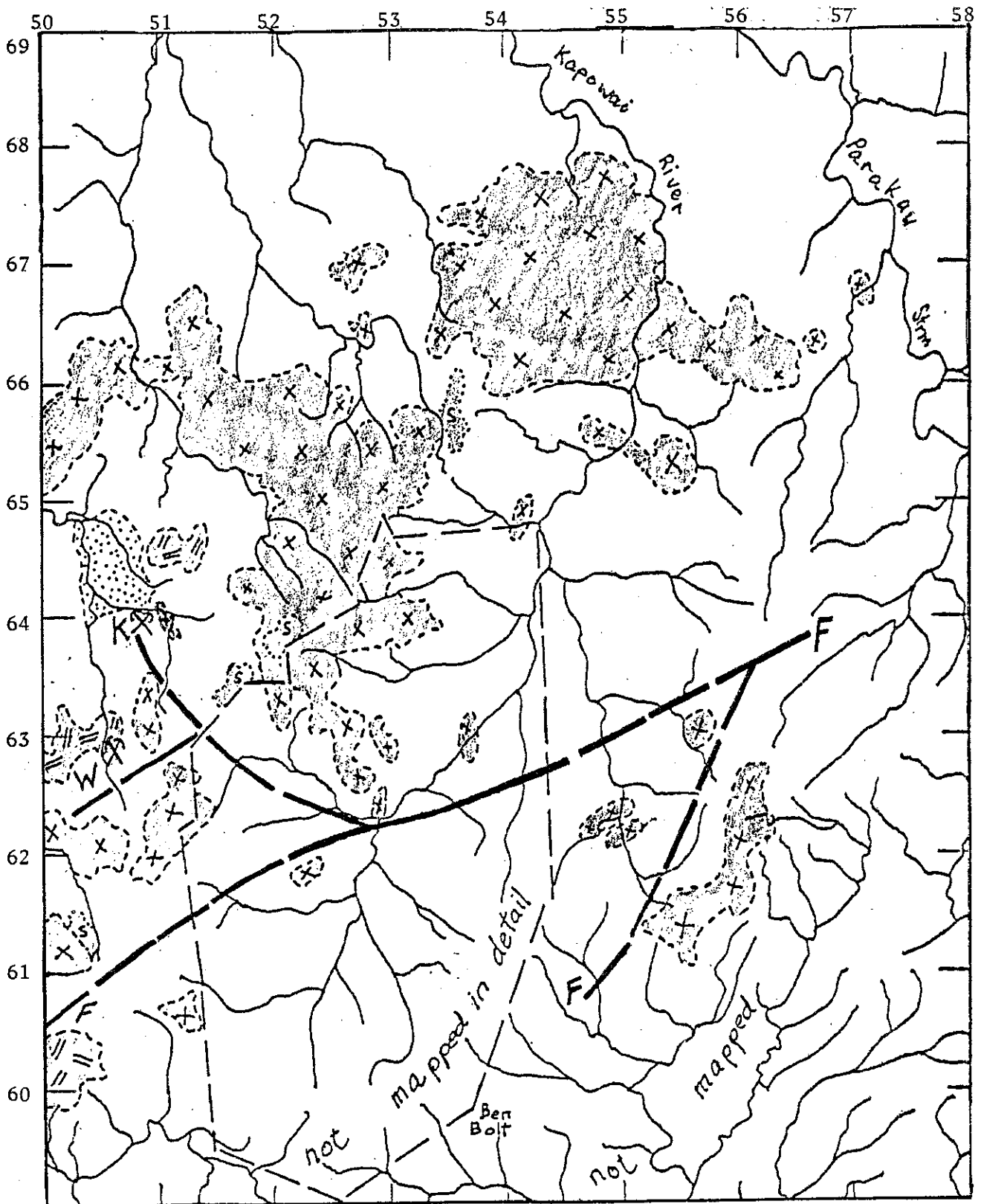
The geology of the Ecological Area has been discussed by Skinner (1983) quoted below. Other relevant references are N.Z. Geological Survey (1967), Hayward (1974a, 1974b) and Thompson (1966).

'The Kapowai Ecological Area, comprising essentially the watershed of the upper Kapowai River, lies within the area of glassy siliceous and pumiceous volcanic rocks known as Whitianga Group, similar to rocks at Hahei that have been dated at between 7.0 and 7.6 million years old. The Kapowai River main drainage system is controlled by one of a set of ring fractures on the eastern side of a deeply eroded circular collapse caldera.

The centre of this caldera lies immediately to the northwest of the Ecological Area in the Rangihau River, and is marked by a 4-5 km wide, almost continuous intrusive ring of rhyolite plugs, dikes and domes. These are mapped as Minden Rhyolite and intrude through bedded and layered to massive sheets of pumice and rhyolitic ash to block breccia, collectively known as the Wharepapa Ignimbrite of Coroglen Ignimbrite Sub-group. Outside the ring structure to the north, the ignimbrite has a thickness of about 100-200 m where it unconformably overlies andesites of the Waiwawa Sub-group (Coromandel Group). These are not exposed in the Kapowai Ecological Area itself. The ignimbrites are of much greater but unknown thickness within the ring structure and include ancient lake sediments with plant remains (Wainora Formation).

.../6

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



N.Z. MAPPING GRID 1 : 50,000

Fig. 3 : Geology of the Kapowai Ecological Area and surrounds

Taurauikau Andesite (Table Mountain)		Eco Area boundary	
Minden Rhyolite domes		Kapowai Mine	K
Wharepapa Ignimbrite (pumice)		Welcome Jack reef	W
Wainora Formation (lake sediments)			
Silicified rock and sinter			
Faults			

Scale: 0 1 2 km.

Drawn by D.N.B. Skinner
N.Z. Geological Survey

Excellent exposures occur in the Kapowai River, within the Ecological Area, of rhyolite dikes and plugs intruding the ignimbrites. These plugs form the spinous terrain on the north side of the river. To the south and east, there has been no detailed mapping, but the steep cliffs with bluffs and the flat topped ridges and steps are predominantly eroded ignimbrite sheets. Small scattered plugs and dikes of rhyolite intrude these sheets and form spinous peaks and serrate ridges. Ben Bolt could be one of these, but has not been visited.

Although the Kapowai River is physiographically controlled by the marginal ring fracture system to the Rangihau ring rhyolite structure, none of the actual ring faults have been observed. Instead, there are very good clay-pyrites filled shear zones crossing the centre of the Ecological Area. These trend NW-SE and ENE-WSW through the watershed, just up stream of Green Tree Stream, and define two major fault lines.

In spite of the abundance of white clay and pyrite in these shear zones, no sign of major hydrothermal alteration and quartz veining has been observed within the Ecological Area. This is in marked contrast with the eastern branch of the Rangihau River immediately adjoining the western side of the area, in which hydrothermal alteration is intense and old mines and reefs such as the Kapowai Mine and Welcome Jack reef were worked between 1898 and 1933 for a return of about 6,000 oz (170 kg) of bullion.

Silicification of the ignimbrites is common along the Kapowai-Rangihau divide, the most spectacular being along the line of 'The Big Slip'. Many of the upstanding knobs along this ridge, previously mapped as rhyolite, owe their superiority to the silicification as pipe-like bodies of the otherwise softer pumiceous rocks. Each is a fossil geothermal vent system. Indeed within the rhyolite dome of spot height 611 m, on the north west margin of the Ecological Area, there is a preserved hillock of thinly layered, haematite enriched siliceous sinter - a remnant geyserite mount of a fossil hot spring system. Judging from the physiography, others may exist on the east of the Ecological Area along the Hikuai-Kapowai divide.' (Skinner 1983, Fig. 3)

Pedology and Erosion

Apart from small areas of bare rock, the Kapowai Ecological Area contains Tangatara stony and bouldery clay loam steepland soils. These are strongly weathered skeletal soils from rhyolitic rock of low natural fertility. (Water and Soil Division, MOWD, 1975; Eyre 1977).

A great deal of erosion has occurred in the Kapowai. The Land Resource Inventory Worksheet N44 (Water and Soil Division, MOWD, 1975) records moderate to severe debris avalanche, soil slip and sheet type erosion. The very steep slopes and poor soils indicate that there is potential for extreme erosion in this area. The land within the Ecological Area is classified as class VII and class VIII.

Vegetation

This description is derived from these sources: five days field work within the catchment (19th-22nd March, 1983 and 21st September 1983); surveys conducted in 1949 and 1966 in some parts of the area (NZFS 1949, 1966); and from the forest type map and notes compiled by J.L. Nicholls (F.R.I.) for the S.C.C. (S.C.C. 1979). (Overlay 2 of figure 2 shows the location of the various field descriptions made.)

The method used for the 1983 fieldwork was a modified recce-type system recording species present 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 ground cover (50 cm to ground level). Site descriptions are grouped into types based as closely as possible on those classified by Nicholls (1976). Further discussion of this procedure is given in Burns (1983).

I have divided the forest into four types:

1. manuka/towai scrub;
2. lowland hardwood forest (D5, Nicholls 1976);
3. hardwood-podocarp-kauri-hard beech forest (C2, Nicholls 1976); and
4. high altitude kauri-podocarp-hardwood forest (B12, Nicholls 1976).

The extent of these types is shown on overlay 1 of figure 2, with recorded positions of hard beech indicated on overlay 2. Appendix 1 gives both scientific and common names for plant species observed.

Scrub occupies most of the ridges within the Kapowai catchment. Charcoal-blackened kauri stumps can be found within this type indicating that logging and fire have both occurred. The 2-6 m tall canopy consists of manuka, towai, rewarewa and *Olearia townsonii* with rewarewa (up to 10 m tall) commonly emergent. Common subcanopy and shrub species are koromiko, fivefinger, mingimingi, *Cordyline banksii* and saplings of manuka, rewarewa and *Olearia townsonii*. The short canopy admits much light and consequently a dense groundcover has developed. It consists predominantly of *Schoenus tendo*, kiokio, *Lycopodium volubile*, *L. deuterodensum* and *Loxoma cunninghamii*. The species composition of the canopy does not appear to be changing: rewarewa, towai and *Olearia townsonii* are regenerating in abundance whilst seedlings of kauri, rimu or other species are scarce.

The scrub changes with altitude : above 600 m it is low (<2 m tall) and dominated by manuka above a groundcover of *Gahnia pauciflora*, *Lycopodium laterale* and *Gleichenia dicarpa*.

On the streambanks and lowland river flats, a hardwood dominated forest exists with scattered podocarps and rare kauri. Occasionally emergent rimu, northern rata and rewarewa exist over a 10-15 m canopy mostly dominated by towai. Associated with towai in this tier are mamaku, mahoe and kohekohe and, to a lesser extent, pigeonwood, tawa and rangiora. Subcanopy species are wheki, *Cyathea cunninghamii*, heketara, rangiora and saplings of tawa, hinau, kohekohe, rewarewa, and above 300 m altitude, tawari. The shrub tier is generally sparse. Species present include ponga, wheki, *Cyathea smithii*, rangiora, kohekohe, rewarewa, hangehange and nikau. There is also little vegetative ground cover; tree fern litter smothers much of the forest floor. Species which do occur here are kiokio, crown fern, *Blechnum filiforme*, hookgrass and *Hymenophyllum demissum*. Bryophytes are also relatively important as a ground cover.

Epiphytes and climbers are not abundant in this type. Species include *Collospermum hastatum*, climbing rata species, mangemange, supplejack, *Asplenium* species, *Hymenophyllum* species and *Blechnum filiforme*.

In the southern, middle-to-high altitude regions of the Ecological Area, the vegetation consists of a hardwood-podocarp-kauri-hard beech forest. The canopy of this type is irregular in height (5-20 m) combining kauri, rimu, northern rata, Hall's totara, miro and tawa. Hard beech occurs as scattered dense stands up to 5 ha in size (Anderson 1983a). Towai, *Pseudopanax discolor* and tawari are contributors to the subcanopy, whilst the shrub tier consists of *P. discolor*, *Cyathea smithii* and occasional karapapa, heketara and rangiora. The groundcover contains *Astelia* species, *Gahnia pauciflora*, kiokio and crown fern and is occasionally dense.

Vegetation on the few high ridges over 700 m altitude within the reserve is high altitude kauri-podocarp-hardwood forest. Rimu is occasionally emergent in this type above a canopy of yellow-silver pine, tawari, kauri, southern rata, towai, and of lesser abundance, toru and toatoa. The subcanopy contains neinei, *Pseudopanax discolor*, *P. colensoi*, tawheowheo and saplings of towai, yellow-silver pine and tawari. The shrub tier has *Pseudopanax discolor*, horopito, *Corokia buddleoides* and *Archeria racemosa* with seedlings of kauri, toatoa, miro and tawari. *Astelia trinervia*, *Gahnia* spp. and bryophytes form most of the ground cover. Bryophytes are also important epiphytes in this forest.

The presence of hard beech in abundance is a major feature of the Kapowai Ecological Area. Only one site was found however, where hard beech was regenerating; in the Green Tree Stream catchment. All other records of this species in the area note the absence of seedlings or saplings (NZFS 1966).

Photo 3 : (right): Hard beech
foliage and bark
(photo D. Watts)

Photo 4 : (below): *Lindsaea*
viridis amidst *Parahebe*
catarractae seedlings on
stream bank
(photo D. Watts)



The Kapowai River, with its many boulders, banks and rocky outcrops supports a rich and varied riverbed flora. Endemics found beside the river, which are uncommon in the Coromandel are *Parahebe catarractae* subsp. *lanceolata* (Bartlett 1978, Garnock-Jones and Langer 1980) and *Lindsaea viridis*. *Marattia salicina* was also found on a steep stream bank (Anderson 1983a).

Members of the staff of the Botany Department, University of Auckland have listed 84 species of native plant of scientific significance in the Coromandel (Braggins et. al. 1983). Of these, seventeen have been found in the Kapowai Ecological Area. Scientists at F.R.I. also consider that a further eighteen of these species are likely to occur there (Johnston 1983).

Introduced Animals and Forest Condition

Of 84 circular 4 m² plots examined in the catchment, intact goat pellets were found in seventeen (20.2%), possum in four (4.8%), and pig in one (1.2%). As well, over five days in the field, ten goats were seen. Novis (1982) records a 'heavy' goat population in this area in a recent walk-through animal assessment. However, Anderson (1983a) considered that there were low numbers of feral goats with a high pig population (low numbers in the upper catchment but abundant in the lower).

'The wild pig damage would be some of the worst that I have seen anywhere in the Coromandel Ranges. Together with the goats, very little regeneration is to be now found. Most palatable shrubs i.e. *Coprosma* spp., *Alseuosmia macrophylla*, kawakawa, hangehange etc. are now very rare as terrestrial species or only occur as epiphytes. The damage appears to be confined mostly to within the Kapowai valley basin. On the upper ridges and plateau tops and adjoining dense shrubland-regeneration forest, very little damage was noted.' (Anderson 1983a)

As well as impact on the vegetation, Anderson suggests that pigs are preying on Hochstetter's frogs found in most streams in the catchment. Rooting and turning over of stones within the upper catchment streams was noted on several occasions.

Browse was most conspicuous on the river flats and associated lowland forest. It was recorded on kiokio, nikau seedlings, wheki, fivefinger, kotukutuku, hookgrass and the terminal buds of *Olearia townsonii* seedlings.

The southern mid-to-high altitude forests, although containing an occasional large dead kauri, contrast with the rest of the catchment in having an abundance of canopy tree seedlings and little evidence of browse.

Presence of Exotic Plants

Exotic plants are rare in the area. *Cortaderia selloana* (pampas grass) is present on riverflats and slip areas and *Hakea acicularis* occurs in the manuka/towai scrub. Both species have potential as weeds.

Native Fauna

Recently, the Wildlife Service has rated the Hikuai Block of the Coromandel State Forest Park, including the Kapowai catchment, as an outstanding wildlife habitat (Anderson 1983b). Wildlife species recorded from the area in July 1983 are listed as Appendix 2 (Anderson 1983a). He notes however that this time of year is one of inactivity for a number of species (e.g. kokako, pied tit, kiwi, song thrush as well as bats and lizards) and that other species may be absent due to migration (e.g. shining and long-tailed cuckoo). Therefore the list is probably not comprehensive. It could be assumed that at least shining cuckoo, kingfisher, harrier hawk and welcome swallow would be present in summer, while long-tailed cuckoo and kaka may also be periodically observed. The morepork should also be present.

Kapowai Ecological Area does have significance for three bird species namely the kokako, an endangered species, and the kiwi and fern bird, both of which have scattered distributions, and which along with the kokako are suffering from loss or modification of habitat in New Zealand. Hochstetter's frogs were found in low numbers in most streams of the upper catchment (Anderson 1983a).

Although no data exists on the fish fauna of the Kapowai River assumptions can be made on its probable species composition from information on species present in nearby streams and rivers.

'I would assume the Kapowai to hold stocks of both species of eels (*Anguina dieffenbachii* and *A. australis*), *Cheimarrichthys fosteri*, and redfinned bullies (*Gobiomorphus huttoni*); near the mouth, *Galaxias maculatus*, and *Retropinna retropinna*; further upstream and in tributary streams, *Galaxias fasciatus*, crayfish (*Paranephrops planifrons*) and possibly *Galaxias brevipinnis* may also be present.'
(Richardson, 1983)

Human History and Influence

There is no evidence of maori history in the reserve. Pre-european human use is unlikely due to its distance from the coast (J. Coster pers. comm.). Local maori elders have advised that the area has no significance to maori heritage (Johnston 1983).

In 1898 gold mining claims were staked on the land immediately adjacent to the western boundary of the present Ecological Area. Five mines were worked. The two largest were the Welcome Jack claim (NZMS 1 N44 200416), worked between 1899 and 1903 producing 1628 ozs (46.15 kg) of bullion; and the Kapowai Claim (NZMS 1 N44 191443) which was initially worked between 1899 and 1902. The Kapowai was subsequently reopened in 1928 and by the end of 1933, the total output of the field had reached 6097 ozs (172.85 kg) bullion. (Downey 1935, Slane and White 1980).

Recent prospecting has also occurred in the region of these mines. A licence for prospecting was issued in June 1980 to Amoco Minerals N.Z. Limited over 469 ha surrounding the Welcome Jack area (P.L. no. 31458). Following a sampling of the area, the licence was surrendered in total on 4 August 1982 (Johnston 1982). Currently another prospecting licence has been applied for (Application no. 311325, Homestake New Zealand Limited) covering 498 ha of the Kapowai Ecological Area and extending over much of the Rangihau River catchment to the west. From thorough investigation (Johnston, 1983), the NZFS have recommended that most (430 ha) of the Ecological Area be excluded from a prospecting licence.

The Kapowai Valley was logged for kauri at least from 1890 to 1905 and 1930 to 1935 (Skinner 1983). Extraction from this valley contributed to kauri taken from the forests surrounding Mercury Bay by the Kauri Timber Company. An estimated 613,000 m³ of timber came from this region. The Green Tree Stream alone produced approximately 8,500 m³ (Reed 1964). Dams to remove these logs were built across the Kapowai River and its tributaries. The main Kapowai dam was the largest of the whole region (Isdale 1983). This was a 'double stringer' construction built at the confluence of McGuinness Stream and the main river (NZMS 1 N44 218408). Half of this remains mostly intact. Two other dam remains exist in the headwaters of the McGuinness (NZMS 1 N44 205410) and Green Tree (NZMS 1 N44 212424) Streams respectively. I did not reach these relics to inspect them.

Skinner (1983) reports the former existence of a branch of a main haulage and pack track system running from the Welcome Jack battery down the north side of the spur between Green Tree and McGuinness Streams, across the Kapowai River and up an eastern tributary and spur, to the north side of Ben Bolt. From there, it led down the central ridge to the main junction of the Hikuai River branches and on out to the Tairua.

'Parts of this track are still extant and easily traversable within the valleys and remnant stands of native timber, but it gets lost in the burnt over second growth of the ridge tops. Along its discernable length and in the Kapowai River near a main timber dam site, there are remnant camp sites with timber milling and human artefacts still present.' (Skinner 1983)

According to Reed (1964), a subcontractor working in Gree Tree Stream brought a log-hauler up from Coroglen which dragged out 3,600 m³ of timber from the bush. It is evidently still there.

Most of the kauri stumps examined had charcoal on them indicating that fire has been a factor in the history of the site.

Recreational Facilities and Opportunities

The Ecological Area is untracked and no huts or other facilities are present. However, the catchment is used by goat and pig hunters and trampers. A number of empty camp sites were noted on the banks of the

Kapowai River as well as several goat carcasses. Anderson (1983a) noted that access for hunters with dogs and firearms was prohibited through Fletchers Forestry Co. and suggested this as a reason for high pig numbers. The catchment provides rugged tramping for experienced parties.

Research Carried Out and Suggested

I know of no research which has been carried out within the Kapowai Ecological Area. The reserve would be useful for studies of hard beech, a species which seems to be declining in the Coromandel. As well, there is little kauri regeneration on sites which formerly supported kauri forest. Investigation into this lack may be useful.

Summary, Discussion and Recommendations

The Kapowai Ecological Area covers 1477 ha, mainly in the catchment of the Kapowai River, but also covering part of the ultimate headwaters of the Kauaeranga River. The reserve is composed of extremely steep and dissected country with many bluffs and rhyolite domes. Soils are of low natural fertility and erosion is extensive.

I have divided the vegetation into four types: manuka/towai scrub, lowland hardwood forest, hardwood-podocarp-kauri-hard beech forest and high altitude kauri-podocarp-hardwood forest. There are few hard beech stands remnant in the Coromandel and the preservation of these stands within the Kapowai is a fundamental objective of the reserve. As well, there are a further sixteen plant species known of in the reserve with distributional significance. The wildlife rating of the region including the Kapowai Valley has been classed as outstanding. The valley has been logged for kauri and remains of dams can be found. Remnants of an old pack track and associated camp sites run across the Ecological Area. Gold mining was carried out immediately adjacent to the western boundary of the reserve.

A short survey of this type cannot be conclusive about animal numbers, nor whether they are responsible for a deterioration in forest condition, worsening of erosion or interfering with regenerative processes. This is especially so when animals and surveyors are restricted to common routes by the nature of the terrain. However, three independent observers have agreed that substantial animal damage is present throughout the catchment. (See 'Introduced Animals and Forest Condition' in this report). In a catchment which is probably sensitive to animal impact because of its extremely steep slopes, poor soils and an already severe occurrence of slipping, goat and pig control would surely enhance soil, water and vegetation values.

Management of the reserve must be directed towards preservation of the hard beech stands mapped in this report as they are the principal reason for the existence of the Ecological Area. The ecology of the species in the area must therefore be investigated if this objective is to be met. Indeed a knowledge of the vegetation processes occurring in the reserve is necessary for any long term management. Cognisance of the scientific value of hard beech in the Coromandel should be considered in any assessment of prospecting or mining applications in this region.

Management recommendations in order of priority are:

1. that the goat and pig populations be reduced to the lowest level practical;
2. that several permanent plots (possibly exclosure plot pairs) be set up, representing each vegetation type, to monitor vegetation and indicate trends; and
3. that an investigation into the ecology of hard beech in the Coromandel be encouraged and instigated.

Acknowledgements

I would like to thank Rhys Gardner for his able assistance in the field.

Appendix 1 : Botanical Species List - Kapowai Ecological Area

Ferns

<i>Adiantum cunninghamii</i>	maidenhair fern
<i>Anarthropteris lanceolata</i>	
<i>Asplenium bulbiferum</i>	hen and chicken fern
<i>A. flaccidum</i>	hanging spleenwort
<i>A. oblongifolium</i>	shining spleenwort
<i>A. polyodon</i>	
<i>Blechnum capense</i>	kiokio
<i>B. chambersii</i>	
<i>B. colensoi</i>	
<i>B. filiforme</i>	
<i>B. fluviatile</i>	
<i>B. fraseri</i>	
<i>Ctenopteris heterophylla</i>	
<i>Cyathea cunninghamii</i>	punui
<i>C. 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. ferrugineum</i>	filmy fern
<i>H. flabellatum</i>	filmy fern
<i>H. flexuosum</i>	filmy fern
<i>H. lyallii</i>	filmy fern
<i>H. multifidum</i>	filmy fern
<i>H. revolutum</i>	filmy fern
<i>H. sanguinolentum</i>	filmy fern
<i>H. scabrum</i>	filmy fern
<i>Lastreopsis hispida</i>	
<i>Leptopteris hymenophylloides</i>	heruheru
<i>Lindsaea trichomanoides</i>	
<i>L. viridis</i>	
<i>Loxoma cunninghamii</i>	
<i>Lygodium articulatum</i>	mangemange
<i>Marattia salicina</i> (Anderson 1983a)	king fern
<i>Paesia scaberula</i>	hard fern or ring fern
<i>Phymatosorus diversifolium</i>	
<i>P. scandens</i>	fragrant fern
<i>Pneumatopteris pennigera</i>	
<i>Pteridium aquilinum</i> var. <i>esculentum</i>	bracken
<i>Pyrrosia serpens</i>	
<i>Rumohra adiantiformis</i>	comb fern
<i>Schizaea fistulosa</i>	kidney fern
<i>Trichomanes reniforme</i>	
<i>T. strictum</i>	
<i>T. venosum</i>	veined bristle fern

Fern Allies

Lycopodium billardieri
L. cernuum
L. deuterodensum
L. laterale
L. scariosum
L. volubile
Tmesipteris elongata

Gymnosperms

<i>Agathis australis</i>	kauri
<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Dacrydium cupressinum</i>	rimu
<i>Lepidothamnus intermedius</i>	yellow-silver pine
<i>Phyllocladus glaucus</i>	toatoa
<i>P. trichomanoides</i>	tanekaha
<i>Podocarpus hallii</i>	Hall's totara
<i>P. totara</i>	totara
<i>Prumnopitys ferruginea</i>	miro
<i>P. taxifolia</i>	matai

Dicot Trees and Shrubs

<i>Alectryon excelsus</i>	titoki
<i>Alseuosmia macrophylla</i>	karapapa
<i>Aristolelia serrata</i>	wineberry
<i>Archeria racemosa</i>	
<i>Brachyglottis myrianthos</i>	
<i>B. repanda</i>	rangiora
<i>Carpodetus serratus</i>	putaputaweta
<i>Coprosma grandifolia</i>	mamangi
<i>C. dodonaeifolia</i>	
<i>C. lucida</i>	karamu
<i>C. robusta</i>	karamu
<i>Coriaria arborea</i>	tutu
<i>Corokia buddleoides</i> var. <i>linearis</i>	korokia
<i>Cyathodes fraseri</i>	
<i>C. juniperina</i>	mingimingi
<i>Dracophyllum latifolium</i>	neinei
<i>D. patens</i>	
<i>Dysosyllum spectabile</i>	kohekohe
<i>Elaeocarpus deutatus</i>	hinau
<i>Fuchsia excorticata</i>	kotukutuku
<i>Geniostoma rupestre</i> var. <i>crassum</i>	hangehange
<i>Griselinia littoralis</i>	broadleaf
<i>G. lucida</i>	puka
<i>Hakea acicularis</i>	hakea
<i>Hebe macrocarpa</i> var. <i>latifolia</i>	
<i>H. 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 ericoides</i>	kanuka
<i>L. scoparium</i>	manuka
<i>Meliccytis ramifloris</i>	mahoe
<i>Metrosideros robusta</i>	northern rata
<i>M. umbellata</i>	southern rata
<i>Myrsine australis</i>	mapou
<i>Myrtus bullata</i>	ramarama
<i>Nothofagus truncata</i>	hard beech
<i>Olearia rani</i>	heketara
<i>O. townsonii</i>	
<i>Phebalium nudum</i>	mairehau
<i>Pittosporum huttonianum</i>	
<i>Pseudopanax arboreum</i>	five finger
<i>P. colensoi</i>	
<i>P. crassifolium</i>	lancewood
<i>P. discolor</i>	
<i>P. laetum</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>angulata</i>	Kirk's daisy
<i>Toronia toru</i>	toru
<i>Weinmannia silvicola</i>	towai

Dicot lianes

<i>Clematis paniculata</i>	puawhanganga
<i>Metrosideros albiflora</i>	climbing rata
<i>M. diffusa</i>	climbing rata
<i>M. fulgens</i>	climbing rata
<i>M. perforata</i>	climbing rata
<i>Muehlenbeckia australis</i>	
<i>Rubus cissoides</i>	bush lawyer

Dicot herbs

<i>Acaena anserinifolia</i>
<i>Callitriche muelleri</i>
<i>Cardamine debilis</i>
<i>Centella uniflora</i>
<i>Drosera binata</i>
<i>D. peltata</i>
<i>Epilobium nerterioides</i>
<i>E. rotundifolium</i>
<i>Gnaphalium gymnocephalum</i>
<i>G. keriense</i>
<i>G. sphericum</i>
<i>Hydrocotyle moschata</i>
<i>Lagynifera pumila</i>
<i>Lobelia anceps</i>
<i>Nertera depressa</i>
<i>Oxalis lactea</i>

Parahebe catarractae var. *lanceolata*
Ranunculus hirtus
Senecio minimus
Stellaria parviflora
Wahlenbergia gracilis

Grasses

<i>Cortaderia selloana</i>	pampas grass
<i>Ehrharta diplax</i>	bush rice grass
<i>Oplismenus hirtellus</i>	

Orchids

Dendrobium cunninghami
Drymoanthus adversus
Earina autumnalis
E. mucronata

Other Monocots

<i>Astelia fragrans</i>	
<i>A. solandri</i>	
<i>A. trinervia</i>	kauri grass
<i>Carex solandri</i>	
<i>Collospermum hastatum</i>	
<i>C. microspermum</i>	
<i>Cordyline banksii</i>	
<i>C. pumilio</i>	
<i>Dianella nigra</i>	blue-berry
<i>Eleocharis gracilis</i>	
<i>Freycinetia baueriana</i> subsp. <i>banksii</i>	kiekie
<i>Gahnia pauciflora</i>	
<i>Juncus gregifloris</i>	
<i>J. pallidus</i>	
<i>Libertia pulchella</i>	
<i>Luzulla pita</i>	
<i>Machaerina sinclairii</i>	
<i>Schoenus masculinus</i>	
<i>S. tendo</i>	
<i>Scirpus inundatus</i>	
<i>Rhopalostylis sapida</i>	nikau
<i>Ripogonum scandens</i>	supplejack
<i>Uncinia distans</i>	
<i>U. uncinata</i>	hookgrass

Appendix 2 : Wildlife of the Kapowai Ecological Area

(from Anderson 1983a unless otherwise stated)

Native Birds

<i>Apteryx australis</i>	North Island brown kiwi
<i>Anthornis melanura</i>	bellbird
<i>Anthus novaeseelandiae</i>	N.Z. pipit
<i>Bowdleria punctata</i>	N.I. fernbird
<i>Callaeas cinerea</i>	kokako (O.S.N.Z. 1977)
<i>Gerygone igata</i>	grey warbler
<i>Hemiphaga novaeseelandiae</i>	N.Z. pigeon
<i>Nestor meridionalis</i>	N.I. kaka
<i>Petroica macrocephala</i>	pied tit
<i>Prosthemadera novaeseelandiae</i>	tui
<i>Rhipidura fuliginosa</i>	N.Z. fantail
<i>Zosterops lateralis</i>	silvereye

Introduced Birds

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

Other Native Fauna

<i>Leiopelma hochstetteri</i>	Hochstetter's frog
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Introduced Mammals

<i>Capra hircus</i>	feral goats
<i>Mustela ?erminea</i>	mustelids
<i>Rattus rattus</i>	rats
<i>Sus scrofa</i>	wild pigs
<i>Trichosurus vulpecula</i>	brush-tailed possum

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