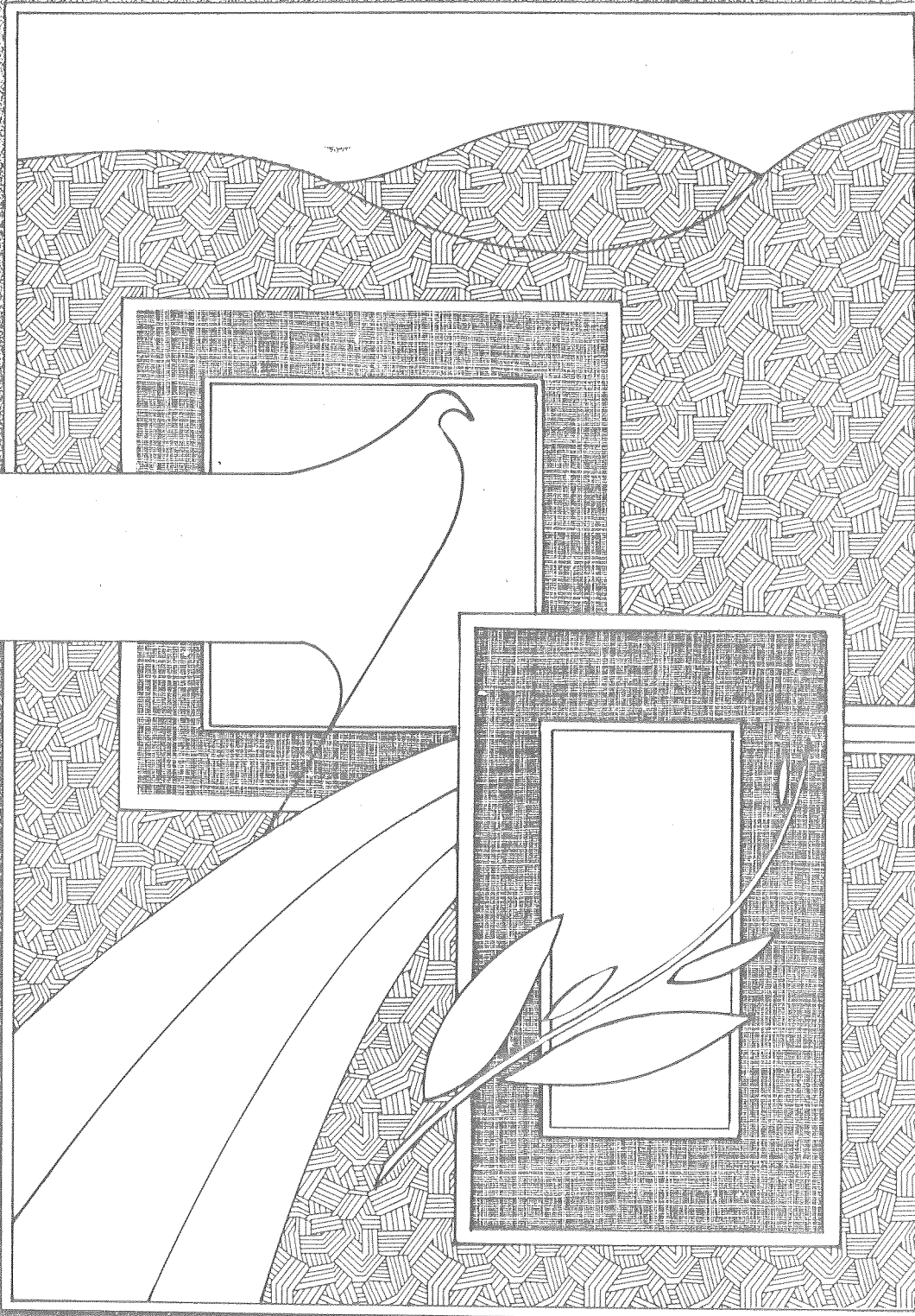


Auckland Conservancy

DEDICATED AREAS REPORT Number 13



Waihoa
Ecological
Area



WAIHOA ECOLOGICAL AREA (PROPOSED)



NZ FOREST SERVICE
AUCKLAND CONSERVANCY
CPO Box 39
AUCKLAND

(This is an unpublished internal report)

David Willetts
March 1985

CONTENTS

	<u>Page</u>
Location	2
Access	2
History of Reservation	2
Rationale and Objectives of Designation	2
Topography	4
Climate	4
Geology	4
Pedology and Erosion	5
Vegetation	5
Introduced Animals and Forest Condition	8
Presence of Exotic Plants	14
Native Fauna	15
Human History and Influence	15
Recreational Facilities and Opportunities	15
Research Carried Out	16
Summary, Discussion and Recommendations	16
Acknowledgements	17
References	18
Appendix 1 : Botanical Species List	20
- Proposed Waihoa Ecological Area	
Appendix 2 : Faunal Species List	26
- Proposed Waihoa Ecological Area	
 <u>Figures</u>	
1 : Location of proposed Waihoa Ecological Area	3
2 : Map of proposed Waihoa Ecological Area	6
 <u>Tables</u>	
1-5 : Stand Structures of the Vegetation Types	9-13

Location (Figure 1)

The proposed Waihoa Ecological Area is part of Tangihua Forest, a tract of indigenous forest on the Tangihua Range and the southernmost forest in the Northland State Forest Park. It also lies within the Tangihua Ecological District (Simpson 1982, Biological Resources Centre, 1983). Farmland encircles the range. The proposed reserve is 25 km west-south-west of Whangarei (approx. midpoint at map reference NZMS 1 N23 640790), and covers circa 1000 ha, about a third of Tangihua Forest. The remainder of the forest is zoned Natural Environment (see Northland Forest Park Management Plan for zonation definitions). Aerial photographs were taken in February 1984 (survey no. 8328, run H, scale 1:50,000).

Access

There is no direct public access to Tangihua State Forest (Figure 2). Permission must be sought to cross private land on all approaches. A private road exists from the end of O'Carroll Road to the TVNZ transmitter on Mt Horokaka. Previously access has been readily available to a track which leads through Tangihua Forest to the boundary of the reserve from near the end of Tangihua Road. Two unformed legal roads exist (Figure 2), which could provide possible future access.

History of Reservation

The initial proposal for the dedication of the Waihoa Ecological Area by J. Nicholls (scientist, F.R.I. Rotorua) was for the reservation of the whole of Tangihua State Forest. This proposal was discussed at the 22nd meeting of the Scientific Coordinating Committee (S.C.C.), on the 20th-24th July 1981. It was decided that the central portion of the forest was best suited for reservation. Auckland Conservancy acceptance of the modified proposal was given in a letter to Head Office on the 5th of January 1982. Approval by the Minister of Forests is being sought.

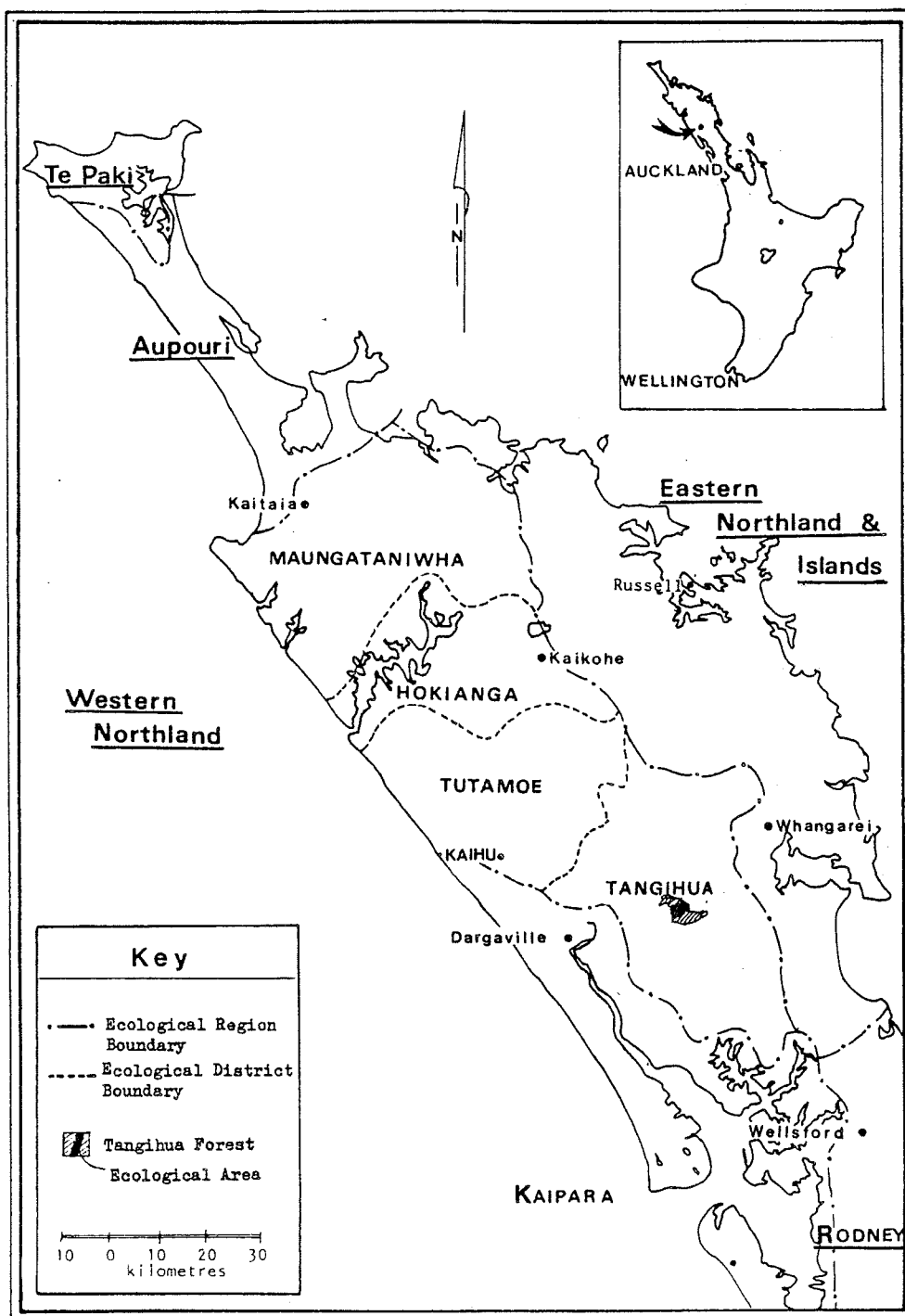
Rationale and Objectives of Designation

The proposed reserve meets most of the criteria for selection of Ecological Areas as set down by the S.C.C. (1983). It attains its recommended minimum size of 1000 ha, is unroaded, has a compact shape comprising several upper catchments, and contains the central unlogged core of Tangihua Forest. However, it excludes the full range of landforms available, by not incorporating Tangihua Peak. Incorporation of the peak would also allow the reserve boundary to follow the catchment boundary (see Overlay 1, Fig. 2).

The objective of the Waihoa Ecological Area has been stated as to reserve :

'... the largest and least modified indigenous forest remnant in the Northern Wairoa River Catchment.'
(Nicholls, unpubl., 1981)

Fig 1 : Location Map of Proposed Waihoa Ecological Area Showing Boundaries of Ecological Regions and Districts.



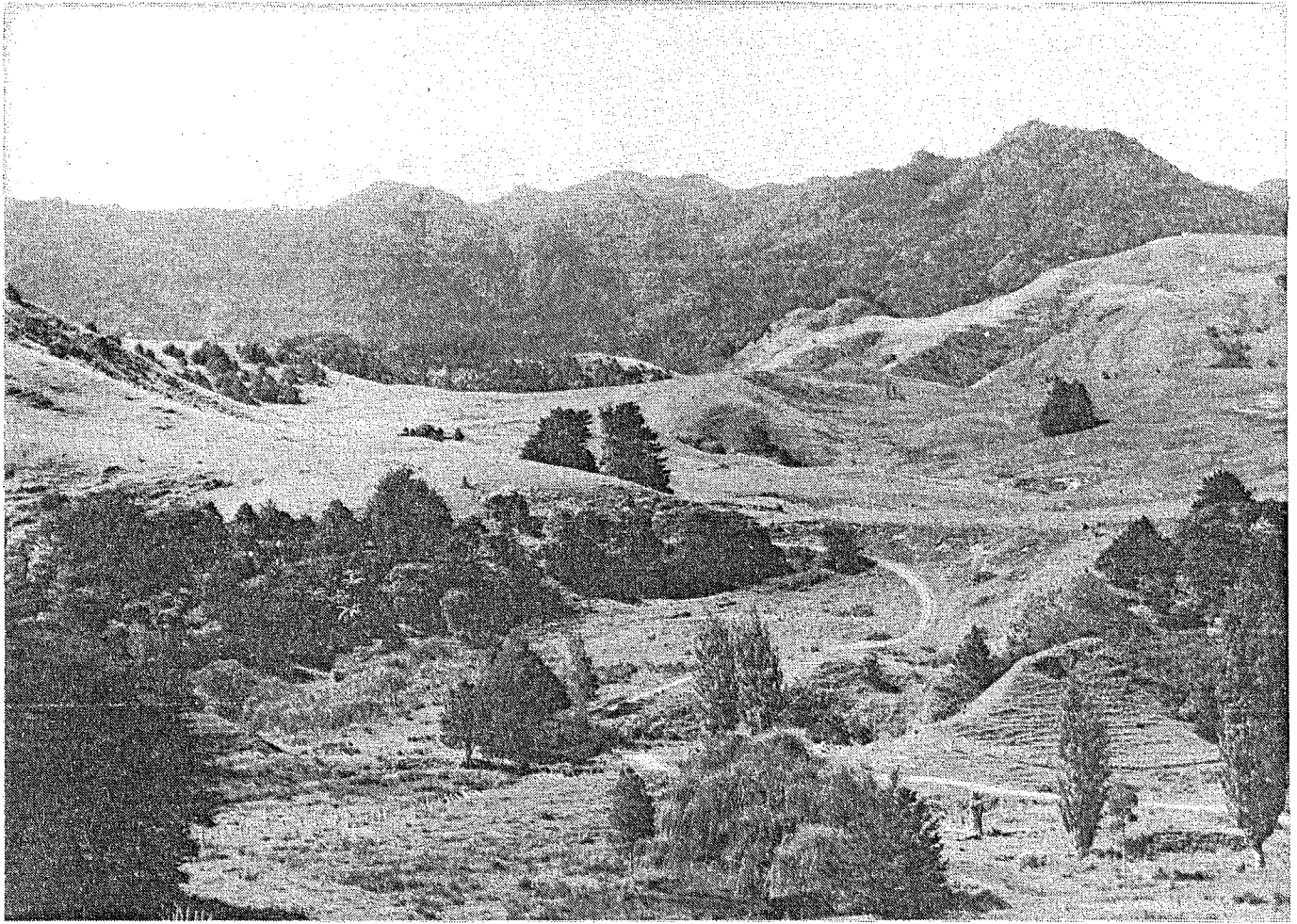


Photo 1 : The south-west side of the proposed Ecological Area.
(photo by J. Kendrick)

Once gazetted the Ecological Area will be the only sizeable reserve in the Tangihua Ecological District. There are fifteen Scenic Reserves in the Ecological District, covering a total of 688.7 ha (Dept of Lands and Survey, 1984).

Topography

The Tangihua Range is an ancient dissected volcanic massif with a long narrow spine and steep stream heads opening out to wide-floored peripheral valleys. The proposed reserve occupies the central portion of the range, comprising the upper catchments of the Waihoa and Tauroa Streams. The altitudinal range of the reserve is circa 65 m - 620 m a.s.l. Waterfalls are common including some very high ones. One in the south of the forest has a drop of approximately 100 m.

To the north, streams drain into the Waiotama River while streams to the south drain into the Tauraroa River. Both of these rivers are tributaries of the Wairoa River. Bare rock faces and grassy clearings are common, especially on the steep upper slopes of the range.

Climate

A rain gauge maintained at Tangihua Settlement (at 152 m a.s.l.) recorded a yearly normal rainfall of 1578 mm. A Meteorological Service rainfall map shows the annual rainfall on the Tangihua Ranges as being between 1600 mm and 2000 mm (N.Z. Met. Service, 1973). The mean annual rainfall at Mt Horokaka is circa 1760 mm (N.Z. Met. Service, 1975). The nearest climatological recording stations are at Whangarei and Dargaville. The mean daily maximum and minimum temperatures are 19.9°C and 10.9°C at Whangarei (1970-1980), and 19.2°C and 10.0°C at Dargaville (1943-1980).

Geology

Most of the proposed Ecological Area consists of extrusive basalt and dolerite interspersed with rare block of micaceous sandstone, mudstone and muddy limestone. This rock type dates from the late Mesozoic to early Tertiary. Along the south-western boundary of the proposed reserve is a region of volcanic breccia (angular debris of volcanic rock, either loose or consolidated) composed of basalt and dolerite. The north-east corner of the area has a small region of intrusive volcanic rock composed of granodiorite and gabbro (Markham, 1981).

In Northland several isolated, rugged bush-clad areas such as the Tangihua, Mangamuka and Tutamoe Ranges are composed of these types of ancient volcanic rock (Ballance and Williams, 1982). These volcanics were formed under the sea before being uplifted by a series of earth movements called the Rangitata Orogeny (Ballance, 1970).

Pedology and Erosion

Most of the proposed Ecological Area contains Te Kie steepland soils, either stony clay loam or reddish clay loam. These soils are derived from andesitic rocks (of volcanic origin) and have shallow topsoils liable to rapid sheet and slip erosion. They are of moderate to high fertility (Ministry of Works, 1964).

Hill soils are found in the southern corner of the proposed reserve. They comprise moderately leached Takitu gravelly clay loam and Waimatenui clay. Overall drainage of soils in the area is good (Sutherland et al., 1980).

From the roads around Tangihua Forest, numerous slips and grassy clearings are visible on the central range and on the side of peripheral ridges. Aerial photographs also show large slips, some of which are overgrown and were not seen during the field inspection. Mt Horokaka has a prominent slip on its northern side, approximately 20 m wide by 60 m high.

Vegetation

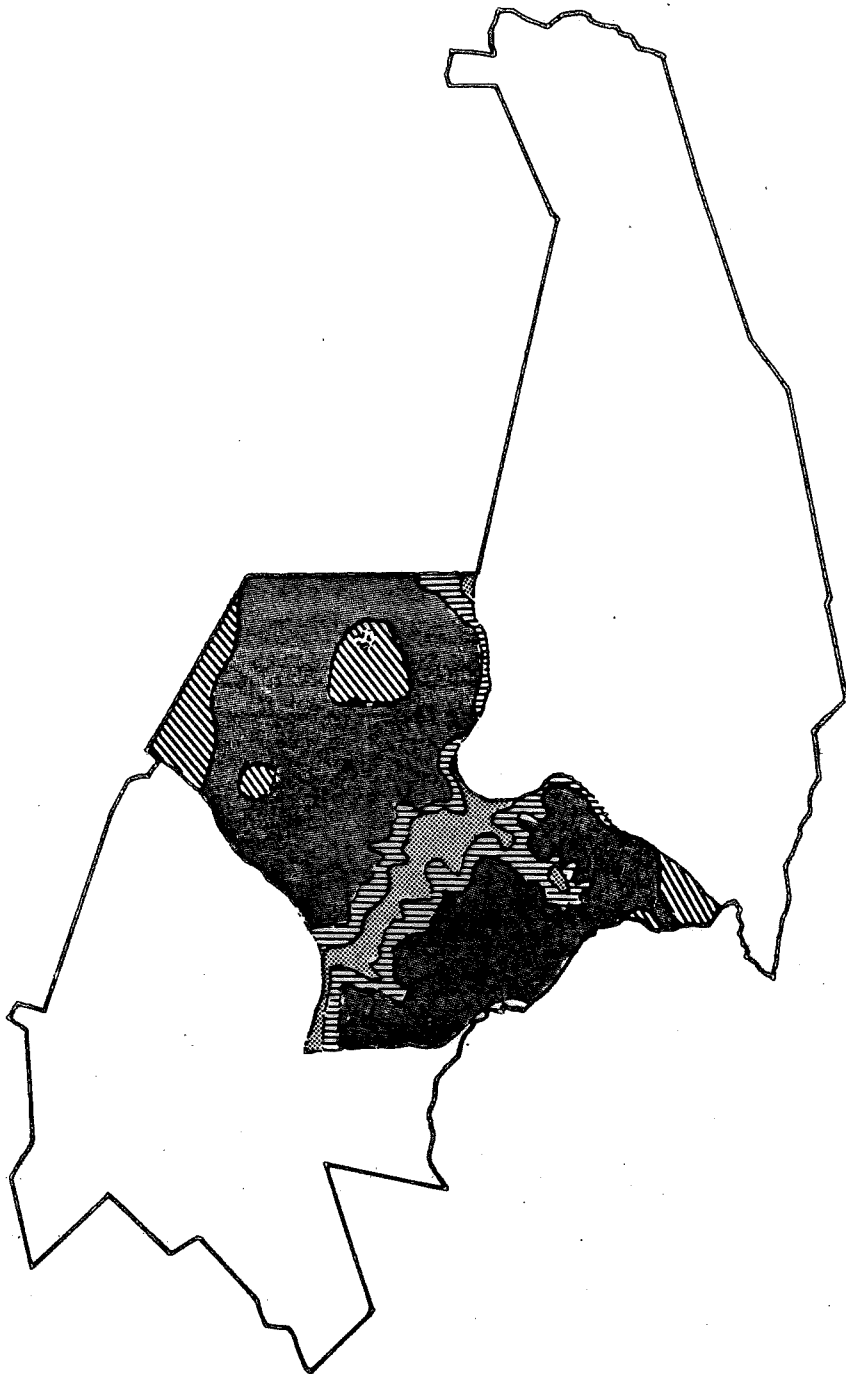
This description was obtained primarily from five days field work during May and a day in July 1984, and also from a vegetation survey conducted in 1957 (NZFS, 1957). Overlay 1 of Figure 2 shows the location of the vegetation descriptions made in these surveys.

The method used to obtain information during the 1984 field work was a modified recce-type system, recording species present in five tiers, and the dominant lianes and epiphytes. The tiers were : canopy emergents, canopy, subcanopy (from beneath canopy down to 2 m), shrub (2 m to 50 cm) and ground cover (50 cm and below). Site descriptions were grouped into types, based as closely as possible on those classified by Nicholls (1976).

I have divided the forest into five types :






1. mature kauri forest;
2. kauri-podocarp-hardwood forest (B2, Nicholls 1976);
3. low-mid altitude podocarp-hardwood forest;
4. mid altitude podocarp-low hardwood forest (D7, Nicholls 1976);
and
5. high altitude hardwood forest.

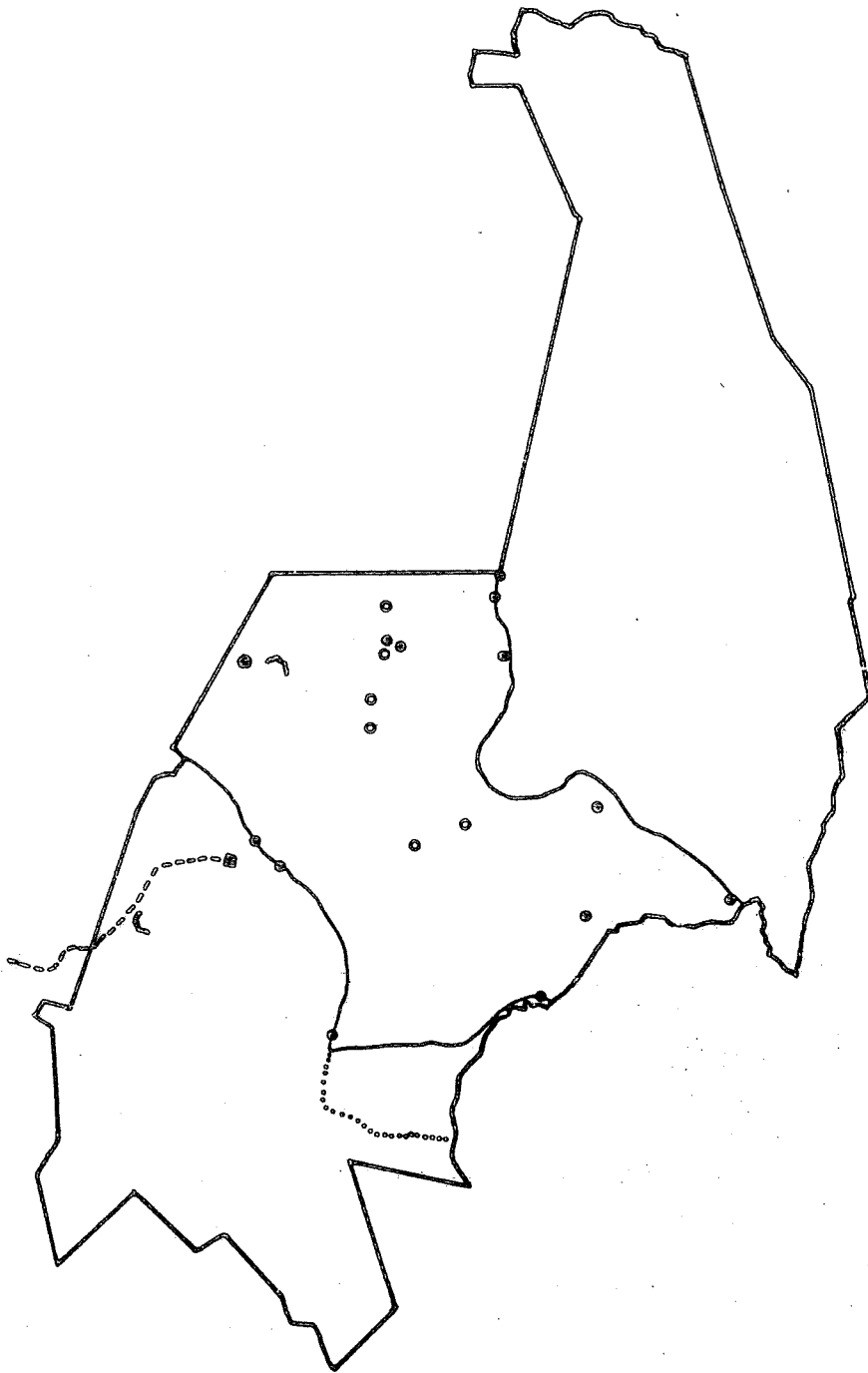
The extent of the five types identified is shown on Overlay 2 of Figure 2. A floral species list giving both scientific and common names is provided in Appendix 1. The tables following this description give a more detailed description of the forest structure within each vegetation type.



OVERLAY 2

VEGETATION TYPES

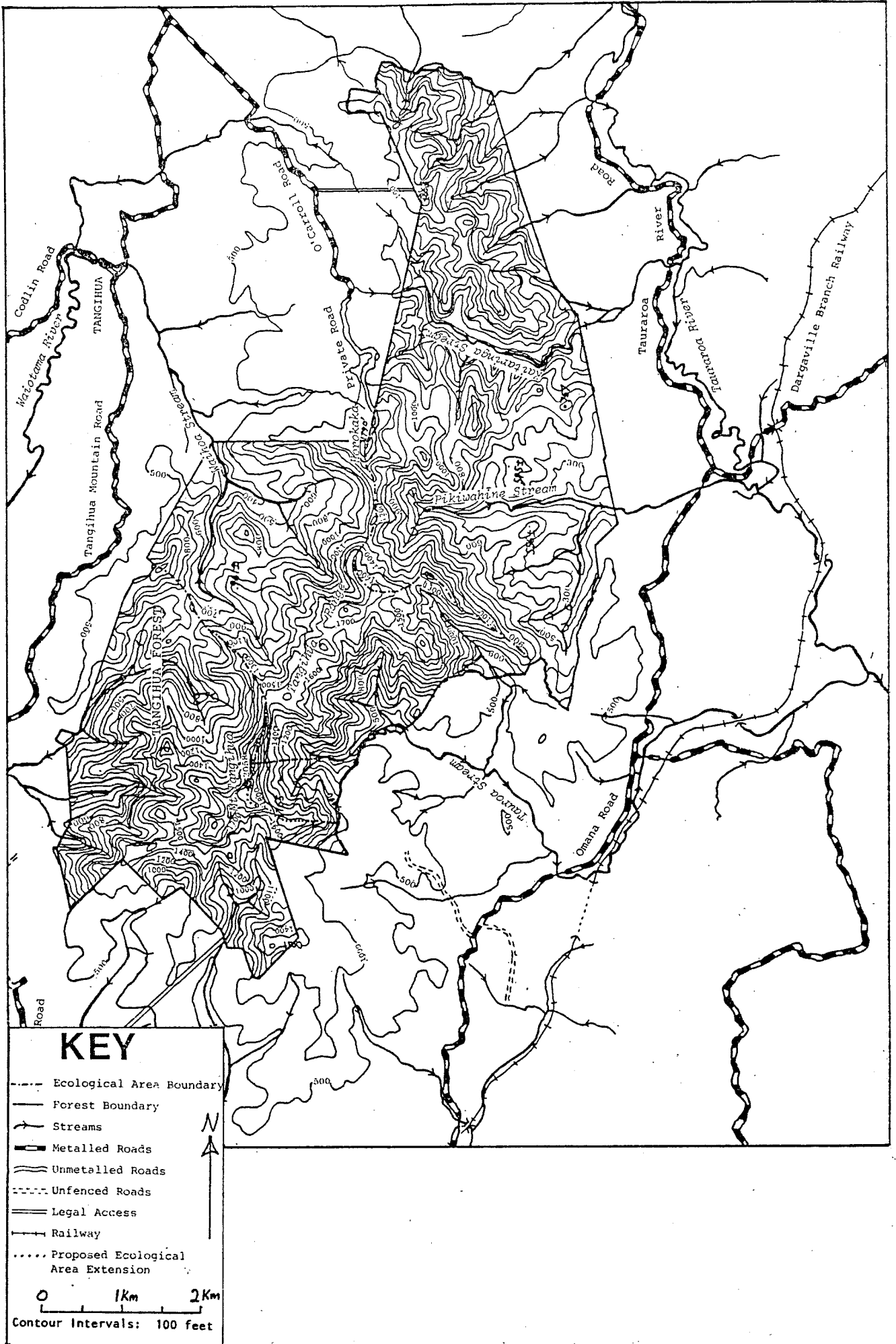
-  Kauri Forest
-  Kauri-Podocarp-Hardwood
-  Low-Mid Alt. Podocarp-Hardwood
-  Mid Alt. Podocarp-Low Hardwood
-  High Alt. Hardwood



OVERLAY 1

- Forest Boundary
- - - - E.A. Boundary
- 1984 Vegetation Description
- 1957 Vegetation Description
- - - - Tramping Track
- Hut
- ∨ Kauri Dam Site
- Proposed Ecological Area Extension

Fig. 2: PROPOSED WAIHOA ECOLOGICAL AREA



Type 1 : Mature Kauri Forest (stand structure, table 1).

A small stand of mature kauri forest (approx. 1 ha) is situated on a knoll in the Waihoa Stream basin (see Overlay 2 of Figure 2). The high dense canopy is dominated by kauri and rimu with regenerating kauri, rimu, miro, totara, rewarewa and lancewood comprising the dense subcanopy. The shrub layer is fairly open; kauri saplings and ponga are the main constituents. Ground cover is light on the knoll and increases on the surrounding slopes.

Type 2 : Kauri-Podocarp-Hardwood Forest (B2, Nicholls 1976) (stand structure, table 2).

Kauri-podocarp-hardwood forest is characterised by scattered emergent kauri, sometimes forming low density stands, and by a few pole kauri stands. Scattered pole kauri are emergent along sections of the proposed reserve boundary and are probably indicative of past disturbances to the forest during land clearances on adjoining sections. There are small groups of two to five mature kauri trees (at approx. 250 m a.s.l.) on each of three ridges to the south-west of the mature kauri stand. There are other widely scattered emergent kauri within the Waihoa Stream basin, while emergent podocarps are occasional to frequent; miro and kahikatea are the most common. Taraire and tawa are prevalent in the dense canopy. The subcanopy contains a variety of hardwoods and occasional kauri and podocarp poles. Nikau and ponga are the main members of the moderately open shrub layer. The ground cover is dense with scattered clumps of kiekie, and *Blechnum fraseri* as the dominant ground fern.

Type 3 : Low-Mid Altitude Podocarp-Hardwood Forest (stand structure, table 3).

This type occurs below approx. 430 m in the proposed reserve, wherever kauri is absent. Podocarps, northern rata and rewarewa occur as scattered emergents. The canopy varies from even and dense to uneven and open, with taraire, kohekohe and tawa being the prevalent canopy trees. Nikau is predominant over a variety of hardwood species in the moderately dense subcanopy and the open shrub tier. *Coprosma arborea* is a prominent subcanopy tree. Ground cover varies in density. In the steeper parts of the Tauroa Stream catchment kiekie is dense, filling out the ground cover and shrub tier. The most common lianes and epiphytes are *Collospermum hastatum* and several climbing rata species.

In the Waihoa Stream catchment there are some long open sections of ridge tops which have a grassy ground cover of native and adventive species; there are also numerous steep clearings on both sides of the range. In these places the canopy is open and variable, with little distinction between canopy and subcanopy. Common trees are nikau, kowhai, lancewood, puriri, mahoe, kohekohe and totara, with occasional *Cordyline australis*, white maire, *Carmichaelia aligera*, and karaka. Common weeds in these areas are fleabane, mist grass and *Siegesbeckia orientalis*. *Olearia albida* and *Melicope ternata*, both usually coastal species, are present and mostly encountered in the clear areas. *Arthropteris tenella*, an epiphytic fern, was found on a rock face beside the Waihoa Stream.

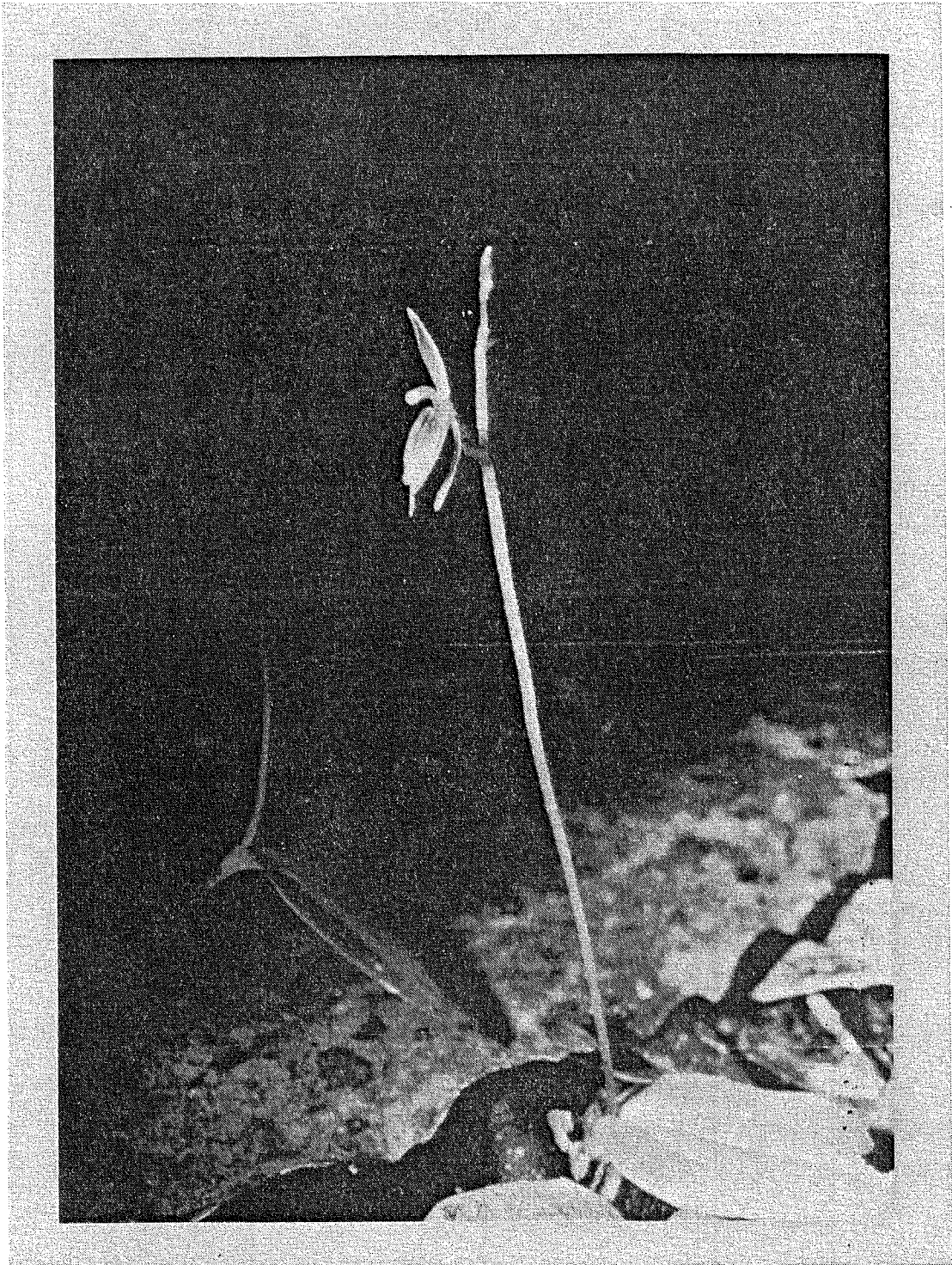


Photo 2 : *Acianthus reniforme* (photo by S. Courtney).

TABLE 1 : GENERALISED STAND STRUCTURE FOR MATURE KAURI FOREST

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT					
CANOPY	20-30		kauri	rimu	
SUB-CANOPY	2-18	ponga kauri <i>Coprosma arborea</i> miro lancewood	rewarewa rimu neinei taraire towai	Hall's totara	
SHRUB	1-2	ponga kauri		<i>Coprosma spathulata</i> kiekie	
GROUND-COVER	0-0.5	<i>Blechnum fraseri</i>	<i>Gahnia pauciflora</i> <i>Dianella nigra</i>	<i>Lycopodium deuterodensum</i> <i>Gahnia xanthocarpa</i> kauri grass	
EPIPHYTES AND LIANES			<i>Collosperrum hastatum</i> <i>Earina mucronata</i> <i>Metrosideros fulgens</i>		

DISTRIBUTION: An isolated area on a knoll in the Waihoa Stream catchment.

NOTES:

TABLE 2 : GENERALISED STAND STRUCTURE FOR
KAURI-PODOCARP-HARDWOOD FOREST (B2; NICHOLLS
1976)

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT	18-30		miro kahikatea	kauri rimu Hall's totara northern rata	
CANOPY	11-17	tawa taraire	towai rimu	kohekohe makamaka kauri tanekaha	
SUBCANOPY	2-10	ponga <i>Coprosma arborea</i>	pigeonwood rewarewa makamaka nikau lancewood	kauri rimu Hall's totara towai kohekohe mamaku	
SHRUB	0.5-2	ponga	nikau	taraire mingimingi <i>Coprosma arborea</i> <i>Dicksonia lanata</i>	
GROUNDCOVER	0-0.5	<i>Blechnum fraseri</i> hook sedge kiekie (1)	<i>Gahnia xanthocarpa</i> <i>G. setifolia</i>	<i>Uncinia banksii</i> kiokio piupiu <i>Lindsaea trichomanoides</i> kauri grass	
EPIPHYTES AND LIANES		kiekie <i>Collospermum hastatum</i>	<i>Farina micronata</i> <i>Metrosideros fulgens</i> supplejack <i>Clematis paniculata</i>	<i>Griselinia lucida</i> <i>Astelia solandri</i> <i>Metrosideros spp.</i>	

DISTRIBUTION : On low ridges in the proposed reserve, with kauri as isolated trees or in low density stands

NOTES : (1) locally abundant

TABLE 3 : GENERALISED STAND STRUCTURE FOR
LOW-MID ALTITUDE PODOCARP-HARDWOOD FOREST

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT	13-30		rewarewa northern rata (1)	miro Hall's totara rimu matai kahikatea	pukatea
CANOPY	8-13	taraire kohekohe tawa	mamaku puriri kowhai (3)	karaka towai <i>Coprosma arborea</i> rewarewa <i>Cordyline australis</i> (3) nikau	titoki
SUBCANOPY	2-8	nikau	taraire kohekohe ponga <i>Coprosma arborea</i> tawheowheo	heketara mahoe <i>Meliccytus macrophyllus</i> tawa rewarewa mamaku	<i>Olearia albida</i> <i>Melicope ternata</i>
SHRUB	0.5-2	nikau	ponga lancewood	wheki rewarewa broom (3) hangehange <i>Rhabdothamnus solandri</i>	
GROUNDCOVER	0-0.5	kieke (2) hook sedge	<i>Asplenium bulbiferum</i> <i>A. lamprophy- llum</i> pakauroharoha <i>Adiantum</i> spp. <i>Lastreopsis hispida</i> <i>Blechnum</i> spp.	parataniwha bushrice grass <i>Dianella nigra</i>	
EPIPHYTES AND LIANES		<i>Collospermum hastatum</i> <i>Metrosideros</i> spp.	supplejack kieke <i>Earina mucronata</i> hounds tongue <i>Blechnum filiforme</i>	<i>Rubus</i> spp. <i>Griselinia lucida</i> <i>Astelia solandri</i> <i>Clematis paniculata</i> raukatauri	

DISTRIBUTION : Below 430 m, where kauri is absent

NOTES : (1) often dead ratas encountered
(2) locally abundant
(3) usually in clear areas

TABLE 4 : GENERALISED STAND STRUCTURE FOR
MID ALTITUDE PODOCARP-LOW HARDWOOD FOREST
(D7; NICHOLLS 1976)

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT	13-18		miro rimu	Hall's totara rewarewa hinau	northern rata
CANOPY	6-12		heketara towai hinau tawheowheo	mangeao mahoe tawa pigeonwood pole podocarps	
SUBCANOPY	0.5-2		<i>Olearia</i> <i>furfuracea</i> neinei	nikau ponga <i>Cyathea</i> <i>smithii</i>	
SHRUB	0-0.5	kiekie	nikau <i>Cyathea</i> <i>smithii</i>	ponga turepo	
GROUNDCOVER			<i>Blechnum</i> <i>fraseri</i> piupiu hook sedge kauri grass <i>Microlaena</i> spp.	manamana <i>Libertia grandiflora</i> <i>Gahnia setifolia</i> <i>Asplenium lamprophyllum</i> <i>Polystichum richardii</i> <i>Phormium cookianum</i>	
EPIPHYTES AND LIANES			<i>Metrosideros</i> <i>perforata</i> <i>M. fulgens</i> hounds tongue <i>Astelia</i> <i>solandri</i>	<i>Griselinia lucida</i> mangemange <i>Collospermum</i> <i>hastatum</i> supplejack raukatauri	

DISTRIBUTION : Between circa 430 m and circa 490 m a.s.l.; may extend lower on exposed ridges.

TABLE 5

GENERALISED STAND STRUCTURE FOR
HIGH ALTITUDE HARDWOOD FOREST

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT	8-10			mamaku	
CANOPY	4-7	tawheowheo heketara <i>Cyathea smithii</i> (1) <i>Olearia furfuracea</i>	mahoe rangiora lacebark	rewarewa mapou pigeonwood mangeao nikau <i>Griselinia littoralis</i>	rimu Hall's totara miro
SUBCANOPY	2-4		<i>Coprosma lucida</i> <i>Cyathea smithii</i> wheki	<i>Hebe stricta</i> wheki kanono <i>Dracophyllum sinclarii</i> kohekohe	
SHRUB	0.5-2		<i>Metrosideros fulgens</i> (2)	kanono <i>Coprosma robusta</i> <i>Cordyline banksii</i> mingimingi tawheowheo bracken	
GROUNDCOVER	0-0.5	kiekie <i>Microlaena</i> spp.	<i>Uncinia banksii</i> piupiu kauri grass	<i>Polystichum richardii</i> <i>Phormium cookianum</i> <i>Libertia grandiflora</i>	
EPIPHYTES AND LIANES			<i>Metrosideros fulgens</i> <i>Earina autumnalis</i> <i>Clematis parviflora</i> <i>Rubus cissoides</i> <i>Astelia sotandari</i> supplejack.	mangemange hound's tongue <i>Metrosideros</i> <i>Griselinia</i> spp <i>lucida</i> <i>Pneumatopteris pennigera</i>	<i>Metrosideros carminea</i>

DISTRIBUTION : Areas above circa 490 m in the proposed reserve

NOTES :

- (1) abundant on the plateau capping the central range
- (2) becomes abundant over circa 585 m on the ridge approaching Mt. Tangihua

Several kohekohe trees showed moderate possum browse, as did mamaku, pate and cabbage tree. Five-finger is rare in the proposed reserve. Ogle (1982) stated that possum browse of the most palatable species results in the early elimination of plants such as five-finger. He suggests that adequate regeneration cannot occur under possum-induced canopy gaps where cattle or goats are present.

An assessment of possum numbers was made in 1971 following complaints of large numbers of rata trees dying in the forest. It found the possum population to be light internally, rising to a moderate density on the fringe of the forest (Purdon, 1971). Lawn (1972) expressed doubts on the accuracy of these findings. He thought that possum numbers were higher.

Dead trees of several species are numerous and readily seen from the forest perimeter. At four of the 12 vegetation description sites dead emergent northern rata occur. A 1957 vegetation survey (NZFS, 1957) found that the shrub tier was sparse on all sites described and that ground cover was almost absent in places. The 1984 fieldwork confirms a generally sparse shrub tier, especially on the easier terrain of the Waihoa Stream catchment. Where kauri or other softwood species occur they are found in all stages of regeneration.

The combined presence of goats, cattle and possums has had a deleterious effect on forest condition in the reserve. The inadequate regeneration in clearings, numerous dead trees and distinct browse zone in the lower tiers are the effects of years of browsing by these mammals.

A fencing survey of Tangihua Forest (Roberts, 1974) found that the forest boundary was unfenced for almost half its length with only a small section of stock proof fence along the remainder. Most fencing along the proposed reserve boundary adjoining farm land was not goat proof at the time of the 1984 field inspection.

Presence of Exotic Plants

A list of exotic plant species identified in the proposed Ecological Area is provided in Appendix 1.

Where the forest adjoins farmland, pasture often extends into the proposed Ecological Area. Adventive grasses and thistles can be found on many of the bluffs, slips and clearings. Mist grass (*Eupatorium riparium*) is a problem weed in the south-eastern branch of Tauroa Stream; in some places it forms the dominant ground cover on the stream banks. Another weed, *Siegesbeckia orientalis*, is dense on the open lower sections of the boundary ridge leading to Mt Tangihua, and occurs in open areas throughout the proposed reserve, as does fleabane (*Erigeron floribundus*).

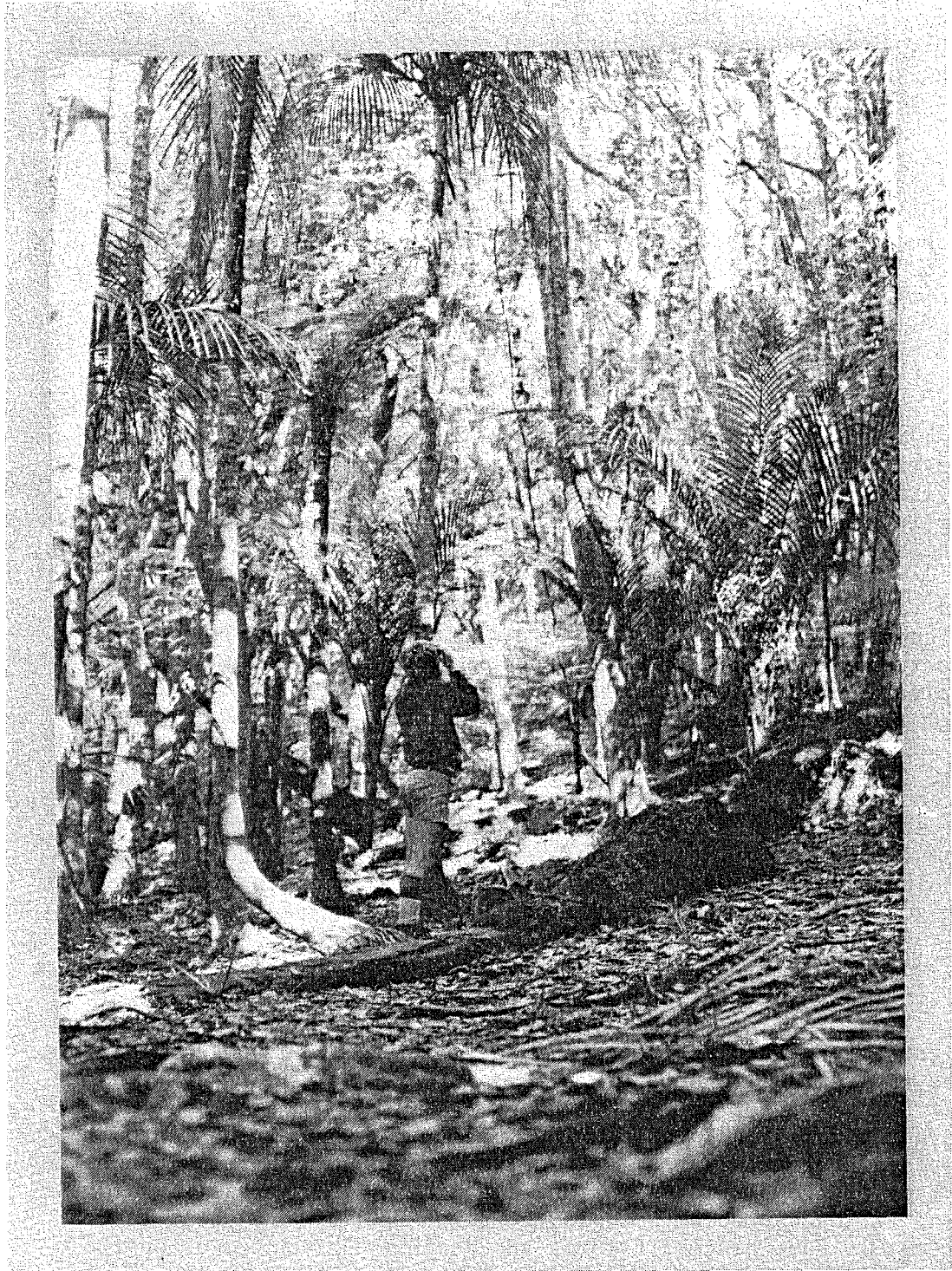


Photo 3 : Open shrub and ground tiers near perimeter of Waihoa E.A.
(photo by L. Forester).

Native Fauna

A list of native fauna recorded in the proposed reserve is given in Appendix 2.

The Wildlife Service has rated Tangihua Forest as a high value wildlife habitat (Ogle, 1982). The presence of kaka, pied tits, and kauri snails are cited as reasons for the high ranking. Kaka were not seen during the field inspection for this report.

Several kiwis were heard calling near the tramping club hut and numerous probe holes were seen. A group of 24 mallards (sheltering from the shooting season) were discovered on a small (approximately 10 m x 15 m) pond near the mature kauri stand shown on the vegetation map.

Human History and Influence

Maoris probably settled in the fertile river valleys around the Tangihua Range in pre-European times. Three or four small man-made terraces were encountered on a ridge in the proposed Ecological Area at approximate map reference NZMS 1 N23 648807. The New Zealand Historic Places Trust lists six archaeological sites which occur adjacent to and north of the forest - two pa sites, a rock shelter and three sites with pits or pit/terraces (Annetta Moore, Assistant Conservancy Archaeologist, pers. comm.).

The earliest known logging operators in Tangihua Forest were the McCarroll brothers who started in 1911. Over the next 23 years a further six operators removed some 6,720 m³ of kauri and podocarp timber. The areas logged were the Pikiwahine, Tauraroa and Tangihua Stream basins, and former S.F. 121 (the westernmost section of Tangihua Forest) (NZFS, 1962). A dam site is located at approximate map reference NZMS 1 N23 644807. In the 1950s timber extraction was limited to small amounts extracted by two local farmers for boundary fencing.

There are numerous file notes on the illegal grazing of stock in Tangihua Forest (NZFS Kaikohe, file 6/23). In 1961 C.S. Rolls obtained a temporary grazing lease (No. 227) in what is now the southern corner of the proposed reserve. The lease was relinquished in 1971, and a change of Forest Service policy caused the other grazing lease in Tangihua Forest to be cancelled in 1972 (NZFS, 1962).

Past land clearances have affected the peripheral areas of the proposed reserve. Regenerating forest areas occur along parts of the forest perimeter, and in places pastureland extends over the forest boundary e.g. beside Waihoa Stream.

Recreational Facilities and Opportunities

During the 1960s several tramping tracks were cut in Tangihua Forest. (Terry Conaghan, Whangarei Tramping Club - pers. comm.) The Whangarei Tramping Club erected a hut quite near to the proposed Ecological Area in 1972 (map reference NZMS 1 N23 627811). This hut may be used by the public but should be booked in advance. Access to the hut is gained across private land near the end of Tangihua Road. A track leads from

the farm land along Tangihua Stream and up a short steep spur to the hut (See Overlay 1 Figure 2). An unformed track runs from the hut to Mt Tangihua, following the boundary ridge of the proposed reserve. Where this track arrives at the top of the central range, another track follows the range to Mt Horokaka.

Over 200 people per year are thought to use the track to Tangihua Trig (Nieuwland, 1981). Private hunting of goats and pigs occurs throughout Tangihua Forest. Some of the rock faces in the range, around Mt Tangihua for instance, would probably interest rock climbers. The possibility of allowing an Outdoor Education Centre to be built near Pikiwahine Stream is being considered by the Forest Service.

Research Carried Out

Old timber cruising records exist for the forest (NZFS Kaikohe, file 6/23, closed 1962) and the area was visited during the National Forest Survey (NZFS, 1957). The Wildlife Service Fauna Survey Unit visited Tangihua Forest on 1.7.78. The information gathered was used by Ogle (1982) in his book "Wildlife and Wildlife Values of Northland".

Summary, Discussion and Recommendations

The proposed Waihoa Ecological Area covers a 1000 ha segment of the Tangihua Range. Streams from the range drain ultimately into the Wairoa River. The range is an ancient eroded volcanic massif consisting of extrusive and intrusive volcanic rock. Te Kie steepland soils, which are moderately fertile, cover most of the proposed reserve. Erosion is moderate but the steepness of the range indicates a high potential for further erosion.

Five vegetation types have been identified : kauri forest, kauri-podocarp-hardwood forest, low-mid altitude podocarp-hardwood forest, mid altitude podocarp-low hardwood forest and high altitude hardwood forest.

Numerous clearings break up the forest cover, and dead trees are common in the proposed reserve. Goats have been in the forest for over 70 years, and along with cattle and possums are causing considerable browse damage. Some adventive species are well established in the proposed Ecological Area. Fleabane is common on grassy clearings and *Eupatorium riparium* dominates the streambanks in one sidestream.

The goat population should be controlled in order to improve the vegetation values of the forest and reduce the likelihood of further erosion. An examination of boundary fencing has shown it to be inadequate. To prevent stock entry and further damage in the proposed reserve, efforts should be made to ensure adequate fences are erected and maintained.

Ogle (1982) has rated Tangihua Forest as a high value wildlife habitat due to the presence of kaka, pied tits and kauri snails (no kaka were seen during the field inspection, however). There are six known archaeological sites adjacent to the forest. A series of man-made terraces were encountered in the proposed reserve, and a dam site exists

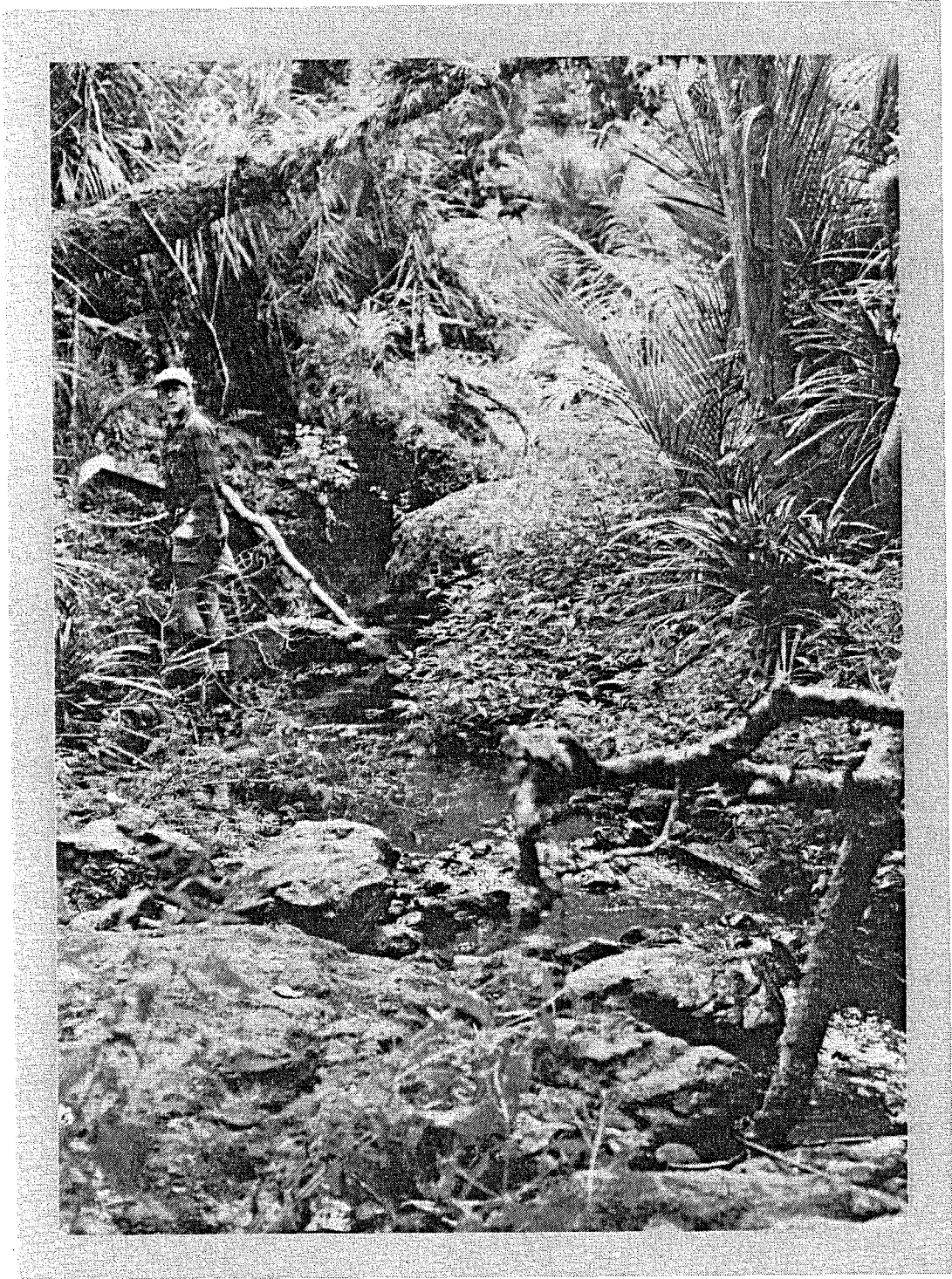


Photo 4 : Weed infested eastern branch of Tauroa Stream (photo by L. Forester).

in the Waihoa Stream catchment. European influences on the forest include logging, grazing of cattle, and track-cutting. A tramper's hut is located north-west of the proposed reserve.

Mt Tangihua, at 627 m, is the highest point in the range, and is not in the proposed reserve. Including the peak would gain the full altitudinal range available in the forest, and allow the boundary to follow the catchment boundary rather than a stream bed. I therefore propose a small extension of the Ecological Area to include the summit of Mt Tangihua.

To summarise the management recommendations, in order of priority :

1. the goat population should be reduced to the lowest practicable level and stock removed from the forest;
2. the forest boundary should be adequately fenced;
3. N.Z.F.S. should install several permanent plots to assess vegetation trends; and
4. the proposed extension to include Mt Tangihua should be considered before gazettal occurs.

Acknowledgements

I wish to thank Lisa Forester for her assistance in the field, and, along with Peter Bellingham, discussion of the manuscript. Peter Bellingham and Deirdre Cummings also helped with the field work. The advice and discussion offered by Freek Deuss and Bruce Burns is greatly appreciated.

References

- Ballance, P.F., 1970 : The Land Around Us : Structure and Shape. In 'New Zealand : The Physical Environment' D.J. Hooton Ed. 1970, Auck. Univ. Press.
- Ballance, P.F., and P.W. Williams, 1982 : The Geomorphology of Auckland and Northland. In 'Landforms of New Zealand' J.M. Soons and M.J. Selby eds Longman and Paul, N.Z.
- Biological Resources Centre, 1983 : Ecological Regions and Districts (2nd Edition) : Boundaries and Names. Govt. Printer, Wgton.
- Dept of Lands & Survey, 1984 : Register of Protected Natural Areas in New Zealand. Dept of Lands & Survey, Wgton.
- Lawn, R.G., 1972 : Working Plan Control Report. N.Z.F.S. Kaikohe file 34/1/23.
- Ministry of Works, Country Planning Branch, 1964 : National Resources Survey Part III : Northland Region. Govt Printer, Wgton.
- Markham, G.S., 1981 : 'Hukerenui-Whangarei'. N.Z.M.S. 290 Sheet Q06/07 Part Sheet R06/07 1:100,000 N.Z. Land Inventory, Rock Types. Dept of Lands & Survey, Wgton.
- McCaskill, L.W., 1981 : 'Scenic Reserves of Northland' (Books 1 & 2) Dept of Lands & Survey, Wgton.
- N.Z.F.S., 1957 : Ecological Forest Survey Tally Sheets No.'s 3469, 4270, 4668, 4670, 4971 (Map ref N23 630790) Held at F.R.I. Rotorua.
- N.Z.F.S., 1962 : Working Plan for Tangihua S.F. 23. Unpubl. N.Z.F.S. report. Held in Auck. Conservancy.
- N.Z. Meteorological Service, 1973 : Map of Northland, scale 1:500,000. Mean Annual Rainfall (mm), 1941-1970. Derived from N.Z. Met. Service Misc. publ. No. 145, 1973.
- , 1975 : Supplement One to Rainfall Normals for New Zealand 1941 to 1970. Govt Printer, Wgton.
- Nicholls, J.L., 1976 : A Revised Classification of the North Island Indigenous Forests. New Zealand Journal of Forestry 21(1) : 105-32.
- , 1981 : Ecological Area Proposals for Northland/Auckland Areas. N.Z.F.S. File 6/0/19, Auck. Conservancy.

- Nieuwland, P., 1981 : Kauri Management Unit notes on Ecological Area Proposals, April 29 1981. N.Z.F.S. file 32/3/1 Kaikohe.
- Ogle, C.C., 1982 : Wildlife and Wildlife Values of Northland. N.Z. Wildlife Service. Dept of Internal Affairs Fauna Survey Unit Report No. 30.
- Purdon, K.M., 1971 : Possum Survey, Tangihua State Forest No. 23. On N.Z.F.S. file 6/23, Kaikohe Office.
- Roberts, S., 1974 : Condition of Fences; S.F. 22 Houto and S.F. 23 Tangihua. Unpubl. report on N.Z.F.S. file 6/23, Kaikohe Office.
- Scientific Coordinating Committee (S.C.C.), 1983 : Guidelines for Selection of Ecological Areas. In Beech Research News No. 8 Held in Auck. Conservancy.
- Simpson, P., 1982 : Ecological Regions and Districts : A Natural Subdivision of New Zealand. Biological Resources Centre, Publication No. 1. Govt Printer, Wgton.
- Sutherland et al., 1980 : N.S.M.S. 290 Sheets P06/07, Q06/07 part sheet R06/07 1:100,000. N.Z. Land Inventory, Soil Types. Dept of Lands and Survey, Wgton.

APPENDIX 1 : BOTANICAL SPECIES LIST - WAIHOA ECOLOGICAL AREA (PROPOSED)

Common names are in the right hand column

P = P.J. Bellingham, N.Z.F.S. botanist, pers. comm.

FERNS AND FERN ALLIES

<i>Adiantum cunninghamii</i>	common maidenhair
<i>A. fulvum</i>	black maidenhair
<i>A. hispidulum</i>	rosy maidenhair
<i>Anarthropteris lanceolata</i>	lance fern
<i>Arthropteris tenella</i>	
<i>Asplenium bulbiferum</i>	manamana, hen & chicken fern
<i>A. flaccidum</i> spp.	raukatauri
<i>A. lamprophyllum</i>	
<i>A. oblongifolium</i>	shining spleenwort
<i>A. polyodon</i>	
<i>Blechnum chambersii</i>	
<i>B. discolor</i>	piupiu, crownfern
<i>B. filiforme</i>	climbing sweetfern
<i>B. fluviatile</i>	
<i>B. fraseri</i>	Fraser's hardfern
<i>B. membranaceum</i>	thin hardfern
<i>B. sp. (Lomaria latifolia)</i>	
<i>B. sp. (B. capense agg.)</i>	kiokio
<i>Cardiomanes reniforme</i>	kidney fern
<i>Ctenopteris heterophylla</i>	
<i>Cyathea dealbata</i>	ponga, silver fern
<i>C. medullaris</i>	mamaku, black tree fern
<i>C. smithii</i>	katote, soft tree fern
<i>Deparia petersenii</i> (= <i>Athyrium japonicum</i>)	
<i>Dicksonia lanata</i>	
<i>D. squarrosa</i>	wheki
<i>Diplazium australe</i> (= <i>Athyrium australe</i>)	
<i>Doodia media</i> spp. <i>australis</i>	
<i>Gleichenia cunninghamii</i>	tapuwae kotuku, umbrella fern
<i>Grammitis billardieri</i>	strap fern
<i>G. pseudociliata</i>	"
<i>Histiopteris incisa</i>	swamp fern
<i>Hymenophyllum demissum</i>	filmy fern
<i>H. dilatatum</i>	"
<i>H. ferrugineum</i>	"
<i>H. flabellatum</i>	"
<i>H. flexuosum</i>	"
<i>H. multifidum</i>	"
<i>H. rarum</i>	"
<i>H. revolutum</i>	"
<i>H. sanguinolentum</i>	piripiri
<i>H. scabrum</i>	filmy fern
<i>Hypolepis ambigua</i>	
<i>H. distans</i>	
<i>H. lactea</i>	
<i>H. rufobarbata</i>	
<i>Lastreopsis glabella</i>	
<i>L. hispida</i>	
<i>Leptopteris hymenophylloides</i>	heruheru, crepe fern
<i>Lindsaea trichomanoides</i>	

<i>Lycopodium cernuum</i>	club moss
<i>L. deuterodensum</i>	club moss
<i>L. varium</i> (incl. <i>L. billardieri</i>)	club moss
<i>L. volubile</i>	club moss
<i>Lygodium articulatum</i>	mangemange
<i>Paesia scaberula</i>	pig fern, hardfern, ringfern
<i>Pellaea rotundifolia</i>	
<i>Phymatosorus diversifolius</i>	hound's tongue
<i>P. scandens</i>	moki, fragrant fern
<i>Pneumatopteris pennigera</i>	pakauroharoha
<i>Polystichum richardii</i>	tutoke, shore shield fern
<i>Pteridium esculentum</i>	bracken
<i>Pteris macilentata</i>	
<i>P. tremula</i>	shaking bracken
<i>Pyrrosia serpens</i>	leather-leaf fern
<i>Rumohra adiantiformis</i>	climbing shield fern
<i>Tmesipteris elongata</i> ssp. <i>elongata</i>	
<i>T. lanceolata</i>	
<i>T. sigmatifolia</i>	
<i>T. tannensis</i>	
<i>Trichomanes elongatum</i>	filmy fern
<i>T. endlicherianum</i>	filmy fern
<i>T. venosum</i>	filmy fern

GYMNOSPERMS

<i>Agathis australis</i>	kauri
<i>Dacrycarpus dacrydioides</i>	kahikatea
<i>Dacrydium cupressinum</i>	rimu
<i>Libocedrus plumosa</i>	kawaka
<i>Phyllocladus 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

DICOTYLEDONS

<i>Acaena anserinifolia</i>	bidibid
<i>Ackama rosaeifolia</i>	makamaka
<i>Alectryon excelsus</i>	titoki
<i>Aristotelia serrata</i>	wineberry, makomako
<i>Beilschmiedia tarairi</i>	taraire
<i>B. tawa</i>	tawa
<i>Brachyglottis repanda</i>	rangiora
<i>Callitriche muelleri</i>	starwort
<i>Carmichaelia arborea</i> var. (= <i>C. aligera</i>)	native broom
<i>Carpodetus serratus</i>	putaputaweta
<i>Centella uniflora</i>	
<i>Clematis cunninghamii</i> (= <i>C. parviflora</i>)	
<i>C. paniculata</i>	puawhanganga
<i>Coprosma arborea</i>	mamangi
<i>C. areolata</i>	
<i>C. grandifolia</i>	kanono
<i>C. lucida</i>	karamu
<i>C. rhamnoides</i>	

	<i>C. robusta</i>	karamu
	<i>C. spathulata</i>	
	<i>C. propinqua</i> x <i>C. robusta</i>	
	<i>Coriaria arborea</i>	tutu
	<i>Corynocarpus laevigatus</i>	karaka
	<i>Cyathodes fasciculata</i>	mingimingi
	<i>Dracophyllum latifolium</i>	neinei
	<i>D. sinclairii</i>	
	<i>Dysoxylum spectabile</i>	kohekohe
	<i>Elaeocarpus dentatus</i>	hinau
	<i>Elatostema rugosum</i>	parataniwha
	<i>Entelea arborescens</i>	
	<i>Epilobium nerterioides</i> (1)	
	<i>E. pedunculare</i> (2)	
	<i>E. rotundifolium</i>	
	<i>Fuchsia excorticata</i>	kotukutuku
	<i>Galium propinquum</i>	
	<i>Geniostoma rupestre</i> var. <i>crassum</i>	hangehange
	<i>Gnaphalium gymnocephalum</i>	
P	<i>Griselinia littoralis</i>	broadleaf
	<i>G. lucida</i>	puka, shining broadleaf
	<i>Haloragis erecta</i> var. <i>erecta</i>	
	<i>Hebe stricta</i> var. <i>stricta</i>	koromiko
	<i>Hedycarya arborea</i>	pigeonwood
	<i>Helichrysum aggregatum</i>	
	<i>Hoheria populnea</i> var. <i>populnea</i>	lacebark, hauhere
	<i>Hydrocotyle dissecta</i>	
	<i>H. novae-zelandiae</i>	
	<i>Hypericum japonicum</i>	
	<i>Ixerba brexioides</i>	tawari
	<i>Knightia excelsa</i>	rewarewa
	<i>Lagenifera pumila</i>	
	<i>Laurelia novae-zelandiae</i>	pukatea
	<i>Leptospermum ericoides</i>	kanuka
	<i>L. scoparium</i>	manuka
	<i>Litsea calicaris</i>	mangeao
	<i>Lobelia anceps</i>	
	<i>Lophomyrtus bullata</i>	ramarama
	<i>Macropiper excelsum</i>	kawakawa
	<i>Melicope simplex</i>	
	<i>M. ternata</i>	wharangi
	<i>Melicytus macrophyllus</i>	large-leaved mahoe
	<i>M. micranthus</i>	
	<i>M. ramiflorus</i>	mahoe
P	<i>Metrosideros carminea</i>	climbing rata
	<i>M. diffusa</i>	climbing rata
	<i>M. fulgens</i>	akakura, climbing rata
	<i>M. perforata</i>	akatorotoro, climbing rata
	<i>M. robusta</i>	northern rata
	<i>Mida salicifolia</i>	willow-leaved maire
	<i>Muehlenbeckia australis</i>	
P	<i>Myosotis</i> sp.	
	<i>Myrsine australis</i>	mapou, red matipo
	<i>Nertera depressa</i>	
	<i>N. dichondraefolia</i>	
	<i>Nestegis lanceolata</i>	white maire

(1) Specimen held at Auck. Insitute and Museum, specimen no. 167614

(2) A.I.M. spec. no. 167593

<i>Olearia albida</i>	
<i>O. furfuracea</i>	
<i>O. rani</i>	heketara
<i>Parsonsia</i> sp.	
<i>Pennantia corymbosa</i>	kaikomako
<i>Peperomia urvilleana</i>	
<i>Pittosporum cornifolium</i>	
<i>P. tenuifolium</i>	kohuhu
<i>Pratia angulata</i>	
<i>Pseudopanax arboreus</i>	five finger
<i>P. crassifolius</i>	lancewood
<i>P. edgerleyi</i>	raukawa
<i>Pseudowintera axillaris</i>	horopito
<i>Quintinia serrata</i>	tawheowheo
<i>Ranunculus hirtus</i>	
<i>Rhabdothamnus solandri</i>	waiu-atua
<i>Rubus australis</i>	bush lawyer
<i>R. cissoides</i>	bush lawyer
<i>R. squarrosus</i>	
<i>Schefflera digitata</i>	pate
<i>Senecio glomeratus</i>	
<i>S. minimus</i>	
<i>Solanum nodiflorum</i>	
<i>S. sp.</i> (either <i>S. aviculare</i> or <i>S. laciniatum</i>)	
<i>Sophora microphylla</i>	kowhai
<i>Stellaria parviflora</i>	
<i>Streblus heterophylla</i>	turepo
<i>Urtica incisa</i>	nettle
<i>Vitex lucens</i>	puriri
<i>Wahlenbergia gracilis</i>	
<i>Weinmannia silvicola</i> var. <i>silvicola</i>	towai

MONOCOTYLEDONS

<i>Acianthus fornicatus</i> var. <i>sinclairii</i>	
<i>A. reniformis</i>	
<i>Arthropodium cirratum</i>	rengarenga
<i>Astelia solandri</i>	kowharawhara
<i>A. trinervia</i>	kauri grass
<i>Carex dissita</i>	
<i>C. sp.</i>	
<i>Collospermum hastatum</i>	
<i>C. microspermum</i>	
<i>Cordyline australis</i>	ti, cabbage tree
<i>C. banksii</i>	ti ngahere
<i>C. pumilio</i>	ti koraha
<i>Cortaderia fulvida</i>	toetoe
<i>Corybas orbiculatus</i>	
<i>C. rivularis</i>	
<i>Cyperus ustulatus</i>	
<i>Dendrobium cunninghamii</i>	epiphytic orchid
<i>Dianella nigra</i>	turutu, blueberry
<i>Drymoanthus adversus</i>	epiphytic orchid
<i>Earina autumnalis</i>	Easter orchid
<i>Earina mucronata</i>	epiphytic orchid
<i>Echinopogon ovatus</i>	hedgehog grass
<i>Freycinetia baueriana</i> spp. <i>banksii</i>	kiekie

<i>Gahnia lacera</i>	
<i>G. pauciflora</i>	
<i>G. setifolia</i>	
<i>G. xanthocarpa</i>	
<i>Juncus gregiflorus</i>	
<i>J. planifolius</i>	
<i>Libertia grandiflora</i>	native iris
<i>Microlaena avenacea</i>	bush rice grass
<i>M. stipoides</i>	meadow rice grass
<i>Microtis unifolia</i>	
<i>Oplismenus imbecillis</i>	
<i>Phormium cookianum</i>	mountain flax
<i>Poa anceps</i>	
<i>Pterostylis brumalis</i>	
<i>Rhopalostylis sapida</i>	nikau
<i>Ripogonum scandens</i>	supplejack
<i>Rytidosperma gracile</i>	
<i>Schoenus maschalinus</i>	
<i>Scirpus inundatus</i>	hook grass
<i>Uncinia banksii</i>	hook grass
<i>U. uncinata</i>	

ADVENTIVE DICOTYLEDONS

<i>Anagallis arvensis</i>	scarlet pimpernel
<i>Cerastium glomeratum</i>	annual mouse-eared chickweed
<i>Chrysanthemum leucanthemum</i>	oxeyedaisy
<i>Cirsium arvense</i>	Californian thistle
<i>C. vulgare</i>	Scotch thistle
<i>Conyza floribunda</i>	fleabane
<i>Daucus carota</i>	wild carrot
<i>Digitalis purpurea</i>	foxglove
<i>E. mucronatus</i>	Mexican daisy
<i>Eupatorium adenophorum</i>	Mexican devil
<i>E. riparium</i>	mist grass
<i>Galium parisiense</i>	slender bedstraw
<i>Gnaphalium spicatum</i>	
<i>Hypochoeris radicata</i>	catsear
<i>Leontodon taraxacoides</i>	hawkbit
<i>Lotus pedunculatus</i>	
<i>Parentucellia viscosa</i>	tarweed
<i>Physalis peruviana</i>	Cape gooseberry
<i>Phytolacca octandra</i>	inkweed
<i>Plantago lanceolata</i>	
<i>P. major</i>	
<i>Polygonum decipiens</i>	swamp willow weed
<i>Prunella vulgaris</i>	selfheal
<i>Ranunculus</i> sp	buttercup
<i>Siegesbeckia orientalis</i>	
<i>Senecio bipinnatisectus</i>	Australian fireweed
<i>S. diaschides</i>	
<i>S. jacobaea</i>	ragwort
<i>Solanum nigrum</i>	deadly nightshade
<i>Sonchus oleraceus</i>	puha, sow thistle
<i>Trifolium dubium</i>	red clover
<i>T. repens</i>	clover
<i>Verbena bonariensis</i>	purple top

ADVENTIVE MONOCOTYLEDONS

<i>Agrostis stolonifera</i>	creeping bent
<i>Cortaderia selloana</i>	pampas grass
<i>Cynosurus cristatus</i>	crested dogstail
<i>Cyperus brevifolius</i>	
<i>Festuca arundinacea</i>	tall fescue
<i>Holcus lanatus</i>	Yorkshire fog
<i>Juncus effusus</i>	
<i>J. tenuis</i>	
<i>Paspalum dilatatum</i>	paspalum
<i>Rytidosperma racemosum</i>	

APPENDIX 2 : FAUNAL SPECIES LIST - PROPOSED WAIHOA ECOLOGICAL AREANATIVE BIRDS

<i>Anas superciliosa</i>	grey duck
<i>Apteryx australis mantelli</i>	N.I. brown kiwi
<i>Chalcites lucidus</i>	shining 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> *	N.I. kaka
<i>Ninox novaeseelandiae</i> *2	morepork
<i>Petroica macrocephala</i>	pieb tit
<i>Prothemadera novaeseelandiae</i>	tui
<i>Rhipidura fuliginosa</i>	fantail
<i>Zosterops lateralis</i>	silvereye

INTRODUCED BIRDS

<i>Acridotheres tristis</i>	myna
<i>Anas platyrhynchos</i>	mallard
<i>Emberiza citrinella</i>	yellowhammer
<i>Fringilla coelebs</i>	chaffinch
<i>Platycercus eximius</i>	eastern rosella
<i>Prunella modularis</i>	dunnock
<i>Turdus merula</i>	blackbird
<i>T. philomelos</i>	songthrush

OTHER NATIVE FAUNA

<i>Anguilla</i> sp.	eel
<i>Paranephrops planifrons</i>	freshwater crayfish
<i>Paryphanta busbyi</i>	kauri snail

INTRODUCED MAMMALS

<i>Bos taurus</i>	cattle
<i>Capra hircus</i>	feral goat
<i>Rattus</i> sp.	rat
<i>Sus scrofa</i>	wild pig
<i>Trichosurus vulpecula</i>	brush-tailed possum

* - (Ogle, 1982)

*2 - (NZFS, 1957)