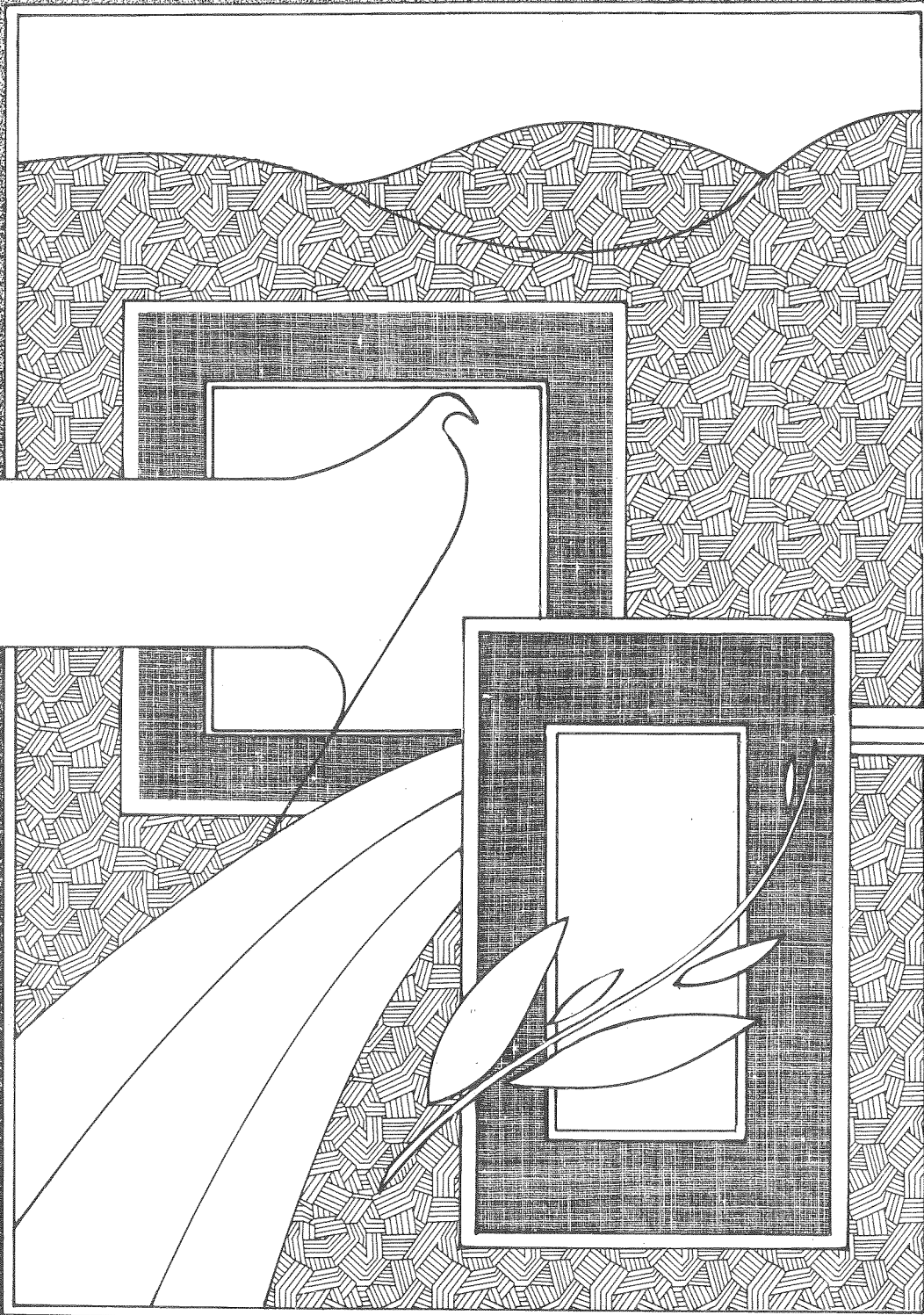


Auckland Conservancy

DEDICATED AREAS REPORT Number 12



Omahuta Forest Sanctuary
& Pukekohe Stream
Ecological Area.



OMAHUTA FOREST SANCTUARY AND PUKEKOHE
STREAM ECOLOGICAL AREA



NZ FOREST SERVICE
AUCKLAND CONSERVANCY
CPO BOX 39
AUCKLAND

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OMAHUTA FOREST SANCTUARY AND PUKEKOHE
STREAM ECOLOGICAL AREA

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Location

Pukekohe Stream Ecological Area covers an upper catchment of Pukekohe Stream including the main tributary and a smaller arm called Driving Stream. Measuring 269 ha the area is vegetated by indigenous forest and scrub.

Omahuta Forest Sanctuary lies at the northeastern corner of the Ecological Area and covers 6 ha.

Both reserves are within Omahuta Forest approximately 21 km northeast of Kaikohe (Fig. 1). Omahuta Forest is one of 17 forests within Northland State Forest Park. (Pukekohe Stream Ecological Area - approximate midpoint at map ref. NZMS 1 N10 129539; Omahuta Forest Sanctuary - approximate midpoint at map ref. NZMS 1 N10 136544). The reserves are within the Maungataniwha Ecological District (Simpson, 1982) which contains a total of six Sanctuaries and Ecological Areas. The smallest of these is Omahuta Forest Sanctuary which was set aside to preserve a stand of kauri some of which are among the biggest in Northland. Pukekohe Stream Ecological Area contains a representative area of forest with unusual stands of kauri growing with hard beech, the northernmost occurrence of this association. The other areas of forest which have been gazetted as Scientific Reserves in the Maungataniwha Ecological District include Warawara Forest Sanctuary (869 ha), Te Hura Ecological Area (Warawara Forest, 999 ha), Manganuiowae Ecological Area (Raetea Forest, 1760 ha) and Onekura Ecological Area (Puketi Forest, 2350 ha).

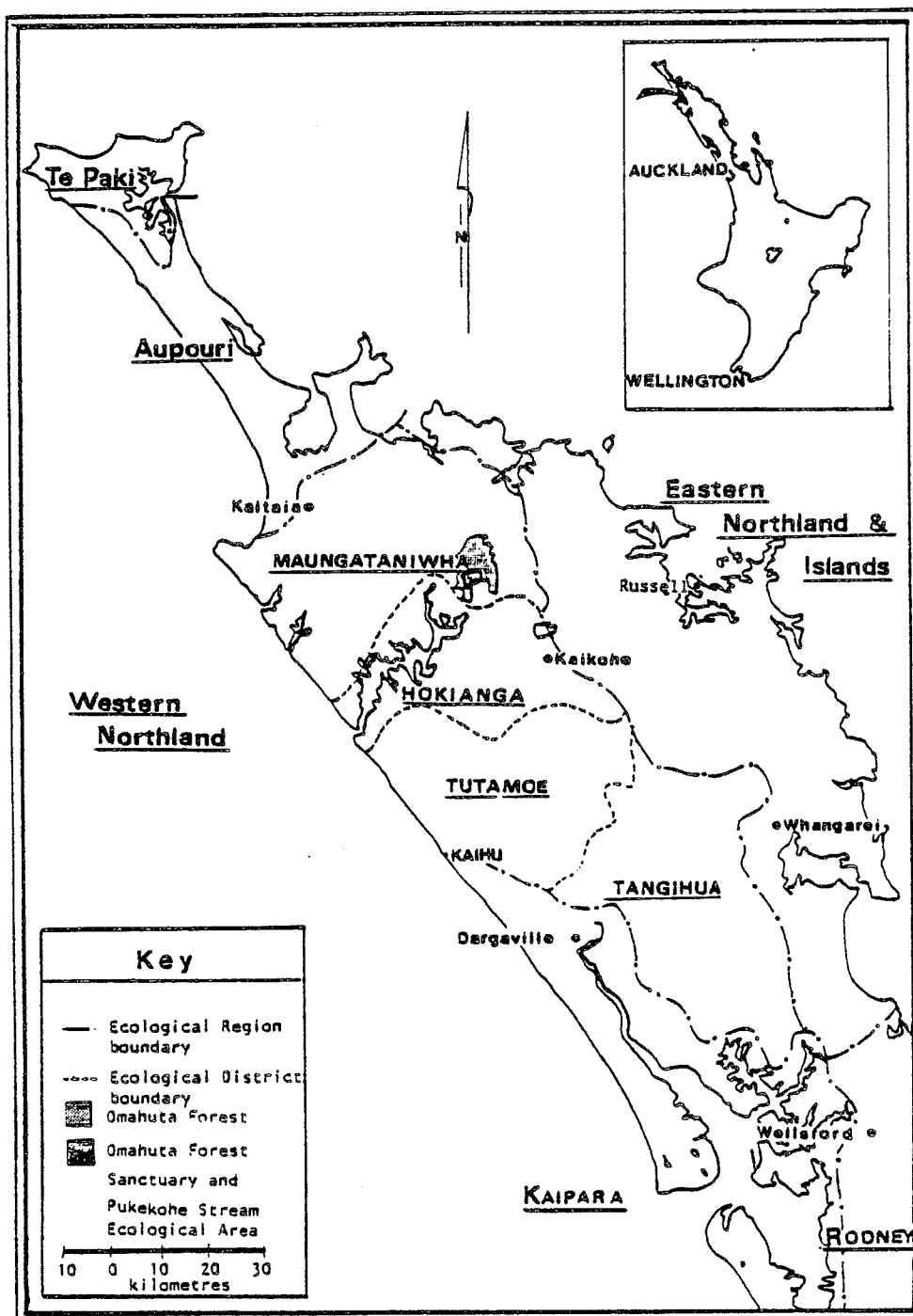
There are also eleven Scenic Reserves with a total area of 3557.3 ha in the Ecological District. Seven of these are less than 50 ha in size while the remaining cover more than 150 ha each. The largest is the Mangamuka Gorge Scenic Reserve, which at 2680 ha is the biggest Scenic Reserve in Northland.

Access

Access to the Sanctuary is by road. Omahuta Road turns off SH 1, 0.8 km south of the Mangamuka Bridge township and travels for 5 km before turning right down Omahuta Forest Road. It then proceeds for a further 6 km to a carpark at the southeastern corner of the Sanctuary passing Omahuta Forest Headquarters and Apple Tree Dam picnic area. The Sanctuary is fully tracked.

From the Sanctuary carpark, Kauri Sanctuary Road runs along the eastern and southern boundary of Pukekohe Stream Ecological Area and forms a loop back to the headquarters (Fig. 2). This road is suitable for four-wheel drive vehicles only and provides access to ridges and spurs running down to Driving Stream in the Ecological Area. An old logging track runs from Kauri Sanctuary Road down the ridge on the southwestern boundary of the area. Tracks have recently been cut through the Ecological Area (Overlay 1, Fig. 2) with two entrances. These are from below the largest standing kauri in the Sanctuary, Hokianga, and from Omahuta Forest Road 4 km from the headquarters. A walking track from the headquarters follows a ridge southwards to connect with this track (Overlay 1 of Fig. 2).

Fig 1 : Location Map of Omahuta Forest Sanctuary and Pukekohe Stream Ecological Area Showing Boundaries of Ecological Regions and Districts.



(Based on Ecological Regions and Districts - 2nd Edition

(Biological Resources Centre, 1983))

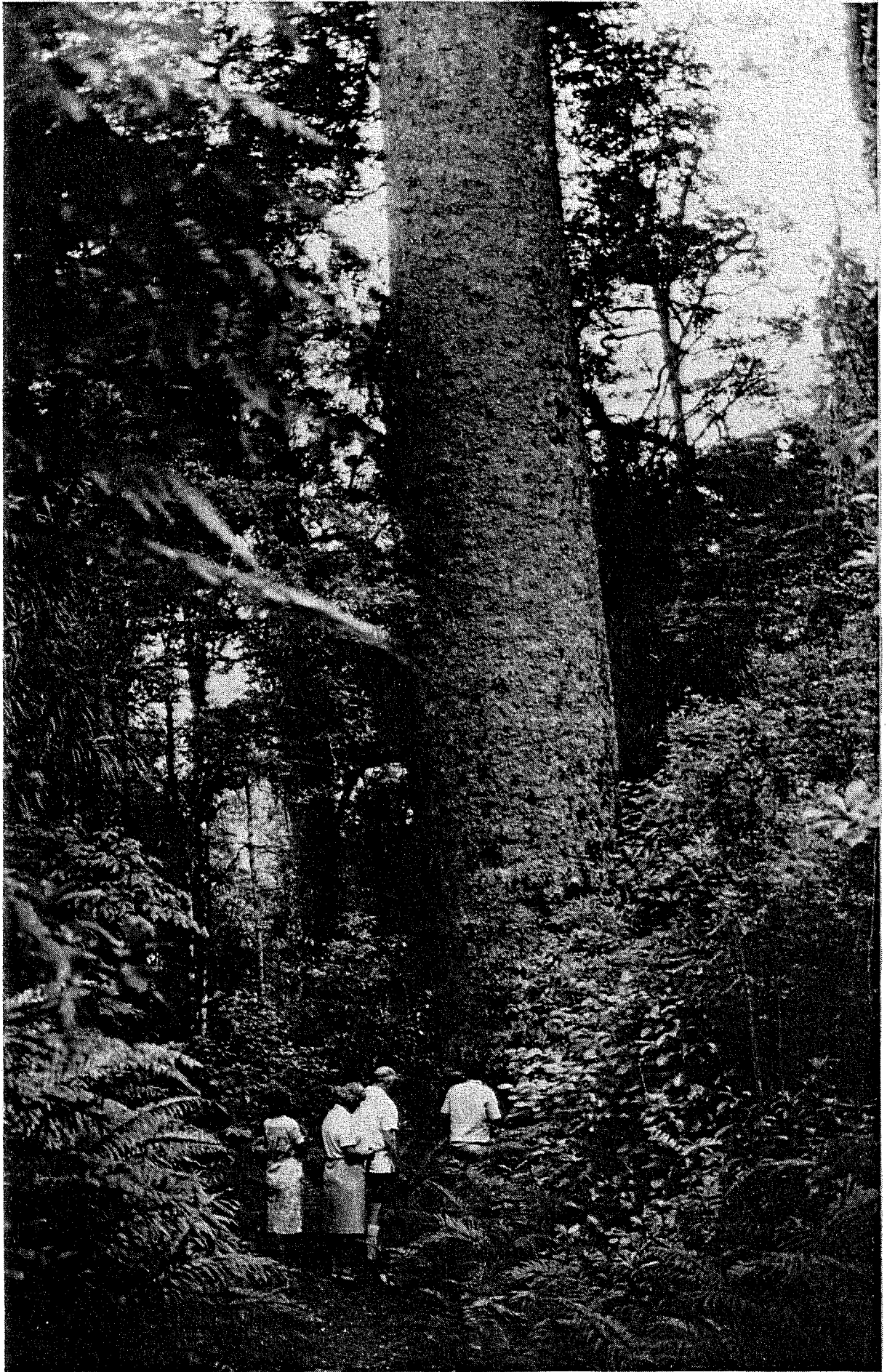


Photo 1 : Visitors beside Hokianga, the largest kauri in the Sanctuary
(Photo by J.L. Kendrick).

History of Gazettal

Omahuta Forest Sanctuary

A stand of very large kauri was first noted in Omahuta Forest by a survey party early this century. It was protected from logging and finally gazetted as a Forest Sanctuary on the 13th of December, 1951 (NZ Gazette, no. 91, p 1823). It was the first Forest Sanctuary to be gazetted.

Pukekohe Stream Ecological Area

The proposal for this area came from J L Nicholls (Scientist, Forest Research Institute, Rotorua) in July 1979. The Scientific Co-ordinating Committee (S.C.C.), now the State Forests Reserves Scientific Advisory Committee inspected and approved the area and final gazettal took place on the 4th of June, 1981 (NZ Gazette, no. 68, p 1569).

Rationale and Objectives of Designation

Although very small (6 ha) in comparison with the other five Scientific Reserves in the Maungataniwha Ecological District, Omahuta Forest Sanctuary was set aside to preserve what had long been recognised as a unique stand of old, large kauri.

The Sanctuary fulfils many of the criteria for the selection of Ecological Areas as set down by the S.C.C. (1980). Although small it preserves a unique clump of kauri. It is also unroaded, has a compact shape and also is to some degree buffered by the adjacent Pukekohe Stream Ecological Area.

The Pukekohe Stream Ecological Area fulfils many of the criteria for the selection of Ecological Areas as set down by the S.C.C. (1980). Although it is also small it preserves three rare kauri - hard beech stands with a buffer area around them. It also covers a whole sub-catchment, is compact and unroaded with boundaries clearly defined by natural features.

The purpose of designation, as stated in the proposal for reserving the area (NZFS file 32/3/1) is:-

"to protect the kauri - hard beech stands at the junction of Pukekohe and Driving Streams, about one kilometre west of Omahuta Forest Sanctuary. These are the most northerly known of the rare relic stands of the type north of Auckland ..."

J Nicholls (1979)

Climate

The climate of Northland is subtropical with a predominantly southwesterly airflow. Occasionally Northland is affected by tropical cyclones.

Omahuta Forest has an average yearly rainfall between 1600 and 2000 mm (NZ Meteorological Service, 1973, Map of Northland, 1941-1970 rainfall data). Until recently raingauges were maintained at Omahuta Forest headquarters and at Umawera, 5.8 km southwest of the Ecological Area. During the past 12 years a yearly average of approximately 1626 mm of rain fell on Omahuta Forest headquarters and from 1954 to 1978 a yearly average of approximately 1506 mm fell on Umawera.

Temperature data are available from Umawera and Kaikohe (23.4 km southeast of the Ecological Area). During 1970 to 1978 the mean temperature in Umawera was 15.1°C with an average daily maximum of 19.9°C and an average daily minimum of 10.2°C. During 1973 to 1980 the mean temperature in Kaikohe was 14.7 with an average daily maximum of 18.4°C and an average daily minimum of 11.0°C.

Topography

The Omahuta Forest Sanctuary occupies 6 ha of gently sloping ground crossed by several small streams which flow in a southwesterly direction into the headwaters of Pukekohe Stream within the Ecological Area. The altitudinal range of the area is 310 m to 350 m. The lower slopes of the area, around the southern boundary, are poorly drained and swampy.

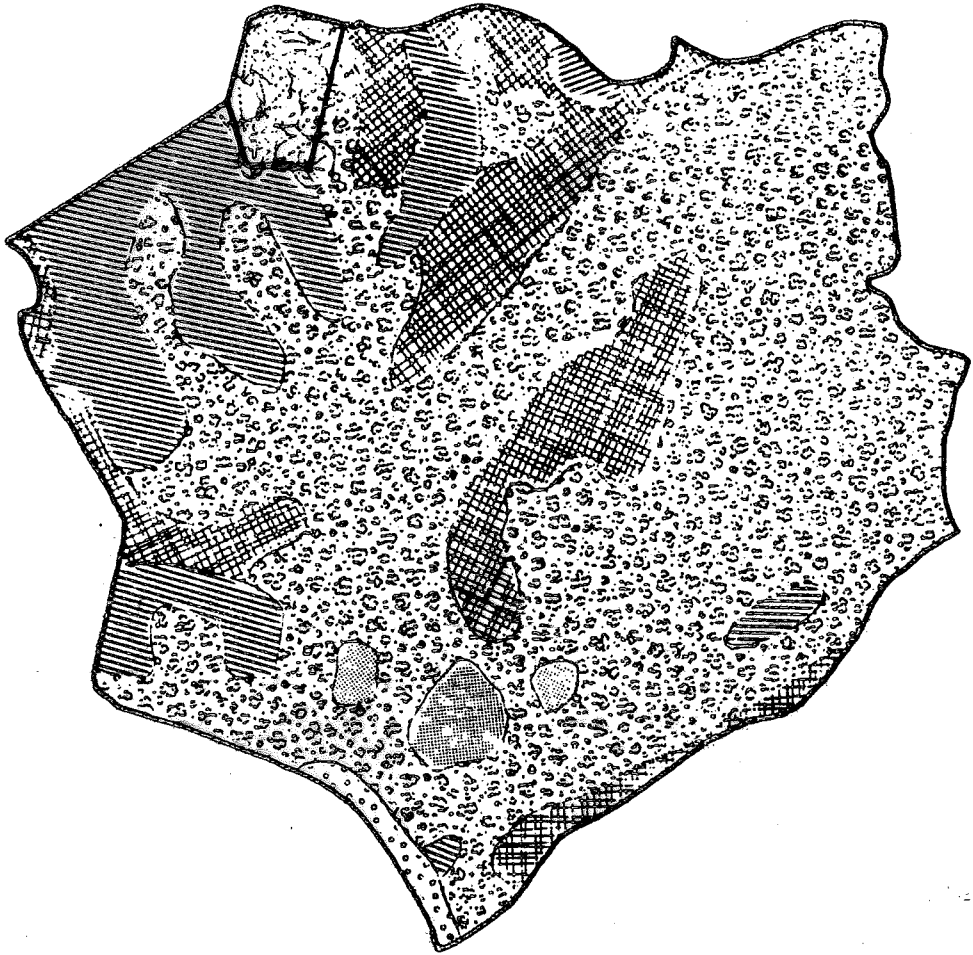
The Pukekohe Stream Ecological Area occupies a subcatchment of Pukekohe Stream. Ridges are steep and broken and rock outcrops in the stream form waterfalls. The area has an altitudinal range of 160 m to 420 m. An area on the northeastern boundary abutting the Sanctuary, has swampy ground contiguous with that mentioned above.

Geology






The dominant rock types of the reserves are Mesozoic (65-225 million years before present) greywackes and argillites (compacted mudstone and sandstone) chert (siliceous sedimentary rock) and marble interbedded with basic marine volcanics (Ministry of Works, Town and Country Planning Branch, 1964, NZMS, 1982).

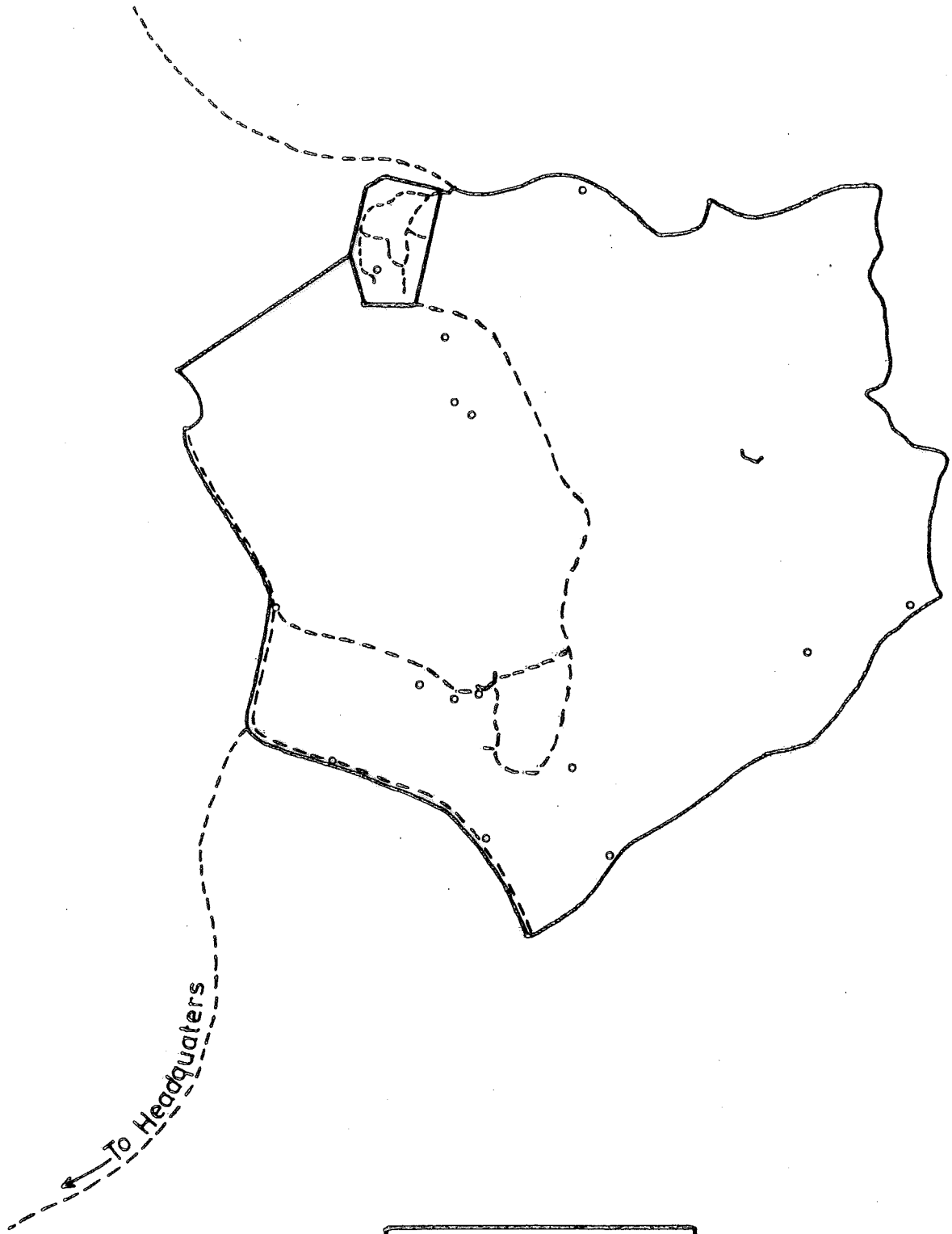
Pedology and Erosion

Soils of the reserves are yellow-brown earths and related steepland soils (Te Ranga and Marua series) and strongly leached to weakly podzolised soils (Rangiora series). The Forest Sanctuary, which supports a dense stand of large kauri, also contains moderately podzolised yellow-brown earths (NZMS, 1980). Podzolised soils are acidic and well leached of bases (Ministry of Works, Town and Country Planning Branch, 1964). A soil and leaf litter analysis for an area in the Sanctuary is given in an unpublished NZ Forest Service report by Cooper (1982).



FOREST TYPES
(Overlay 2)




- 
 Low alt. podocarp-hardwood
- 
 Kauri-podocarp-hardwood
- 
 Kauri-podocarp-hardwood-hard beech
- 
 Manuka scrub
- 
 Towal/heketara regen, Low alt, dense kauri

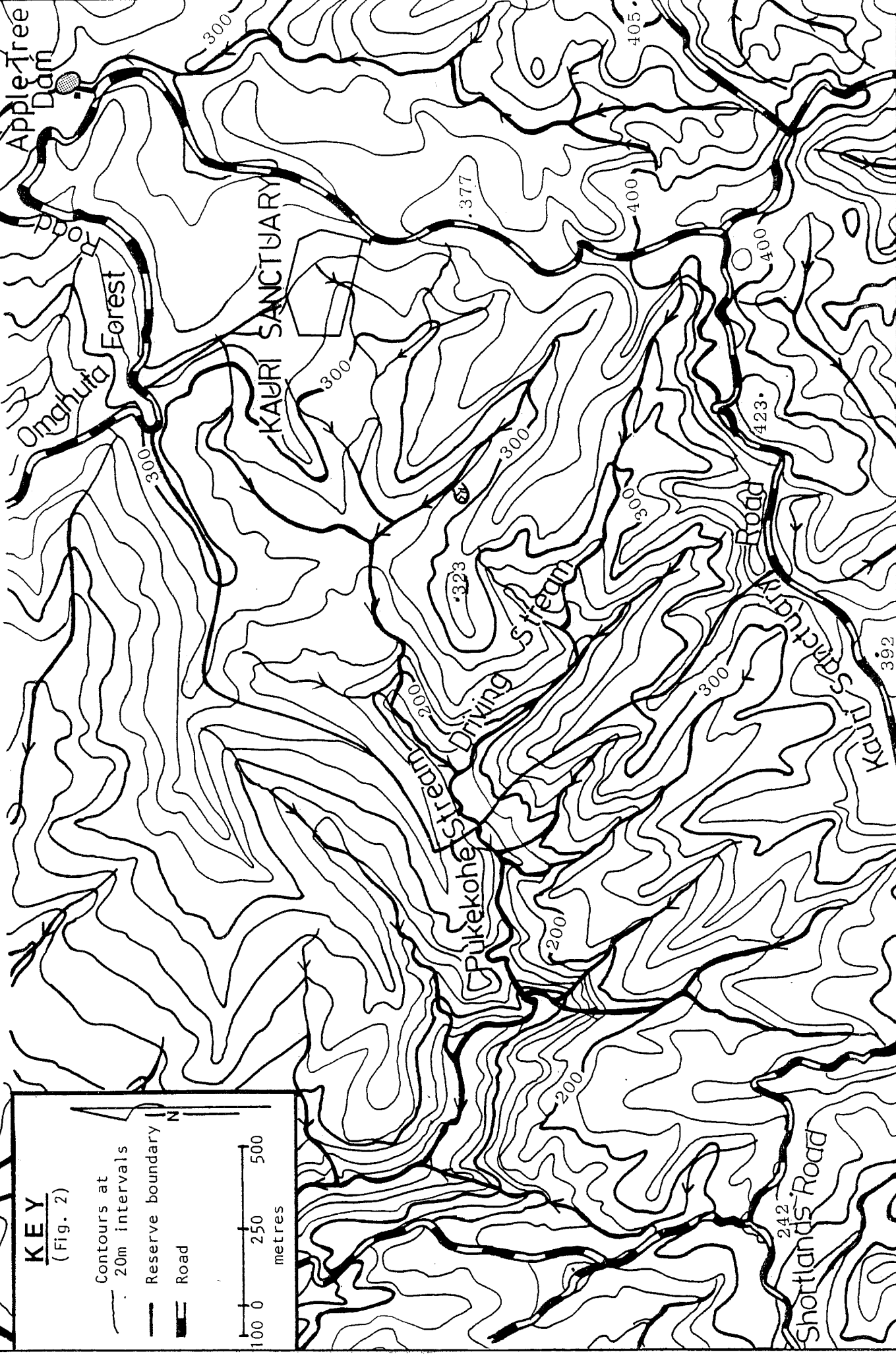
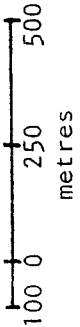


- | |
|---------------------------------------|
| <u>Overlay 1</u> |
| — Reserve boundary |
| - - - Track |
| o Location of vegetation descriptions |
| ⌒ Kauri dam remains |

PUKEKOHE STREAM ECOLOGICAL AREA

KEY (Fig. 2)

-  Contours at 20m intervals
-  Reserve boundary
-  Road



Steepland soils have shallow, moderately fertile topsoils which are liable to rapid sheet and slip erosion under pastoral use (Town and Country Planning Branch, Ministry of Works, 1964). Two earth slips were encountered within the Ecological Area, however neither is recent. One occurred during a period of very high rainfall in 1976 (Ted Bryers, pers. comm.), map ref. approximately NZMS 1 N10 128541. The other has regenerating scrub growing on it and is undoubtedly older, map ref. approximately NZMS 1 N10 125538.

Vegetation

The information used to give the following description was obtained largely from nine days fieldwork. A provisional forest type map and descriptions compiled by the Kauri Management Unit (1982) and internal Forest Service reports (Sexton, 1937, McKinnon, 1946) also provided information. Overlay 1 of Figure 2 shows the location of the field descriptions made.

A plant species list giving both scientific and common names is provided in Appendix 1.

The method used for the 1984 fieldwork was a modified recce-type system recording species present in five tiers and the dominant lianes and epiphytes. The tiers are: canopy emergents, canopy, subcanopy (minimum height 2 m), shrub (2 m down 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).

Six forest types have been identified:

1. low-mid altitude podocarp-hardwood forest;
2. kauri-podocarp-hardwood forest (B2, Nicholls 1976);
3. kauri-podocarp-hardwood-hard beech forest (C2, Nicholls 1976);
4. manuka dominated scrub;
5. regenerating forest dominated by towai and/or heketara; and
6. low altitude dense kauri forest (A1, Nicholls 1976).

The extent of these types is shown on Overlay 2 of Fig. 2. The tables at the end of this section give a more detailed description of vegetation types.

Low-mid altitude podocarp-hardwood forest is found in gullies and on low ridges in the Ecological Area as well as the lower part of the Sanctuary. Rimu and northern rata are common emergents, with taraire, kohekohe and rewarewa as dominant members of the 9 m to 13 m canopy. On a level swampy area just below the Sanctuary pukatea and swamp maire become common elements in the canopy. In the moderately dense subcanopy, makamaka, kohekohe and *Meliccytus macrophyllus* are abundant, while kanono is abundant in the more open shrub layer. Kiekie is often abundant on the ground and through the upper tiers as a liane. Also common as ground cover are *Blechnum fraseri* and kiokio.

Kauri-podocarp-hardwood forest is found mainly on ridges and leading spurs in the Ecological Area. Kauri occurs as a scattered emergent, sometimes forming low density stands. Some of these kauri are ones left as seed trees during logging. These were mapped by Sexton (1937). Hall's totara, towai, tawa and rewarewa are common in the 10 m - 17 m canopy. Mingimingi and rewarewa are abundant in the subcanopy, whilst Kirk's daisy is dominant in the shrub layer. Kauri grass and *Gahnia xanthocarpa* often make a dense groundcover. Climbing rata species are the most common lianes, and occasional epiphytes are *Astelia solandri* and *Collosperrum hastatum*.

On three ridges above the junction of Pukekohe and Driving Streams small stands of kauri-podocarp-hardwood-hard beech occur. Large (to approximately .75 m dbh) pole kauri are frequently emergent as are occasional tanekaha, Hall's totara and northern rata. In the moderately dense canopy kauri poles and hard beech are dominant. The subcanopy contains a wide variety of species, including tawa, makamaka, ponga, and kanono. Kirk's tree daisy and *Meliccytus macrophyllus* are abundant in the shrub tier. Ground cover is fairly open; kauri grass, *Blechnum fraseri* and kiekie are the predominant species. This area is the northernmost known location of a kauri-hard beech association in New Zealand, although a small stand of hard beech has been recently found several kilometres north by N F S Johnson, at map reference NZMS 1 N10 135583. In the kauri-hard beech association the larger kauri are just starting to form crowns while the hard beech are only infrequently more than 50 cm dbh.

Manuka scrub occurs on the ridge in the western corner of the reserve. The 4 m to 6 m canopy is even, and has only occasional emergent rewarewa, and one 7 m white maire was seen. *Hebe stricta* var. *stricta* and *Cordyline banksii* are common in the subcanopy, with occasional tree ferns. In the fairly open shrub layer Kirk's daisy, hangehange and mingimingi are frequent constituents. Ground cover comprises bracken, kiokio, and clubmosses with occasional tangle fern and umbrella fern. Epiphytes were few in this area.

Towai and/or heketara dominated regenerating forest occupies some broad ridgetops in the reserve. Emergent pole podocarps species vary according to the site, and occasional kauri rickers and northern rata are also emergent. In the low 5 m to 8 m variable density canopy towai and heketara are predominant over hinau and pole rimu as well as sundry softwood and hardwood species. Frequent constituents of the moderately dense subcanopy are heketara, mingimingi, kanone, karamu, and mapau. Common members of the shrub tier are kohuhu, Kirk's tree daisy and hangehange. Kiokio and *Gahnia xanthocarpa* occur commonly in the ground-cover while kiekie is locally dense. Epiphytes and lianes include *Collosperrum hastatum*, mangemange, kiekie and *Rubus australis*.

Mature kauri forest is found in the drier parts of the Sanctuary. Large emergent kauri up to 40 m dominate the area, and tall rimu are common. The canopy consists mainly of towai, tawa, tawari, rewarewa and several podocarp species. Common subcanopy trees are heketara, makamaka, mingimingi, kanono and five finger. Pate, hangehange and Kirk's tree daisy are abundant in the shrub layer. The ground cover is moderate with some dense areas, for example near the upper boundary of the Sanctuary which

has been disturbed by logging in the past. *Gahnia xanthocarpa*, *Blechnum fraseri*, kiokio, kiekie, piupiu and hook grass occur frequently. The large trees provide numerous sites for epiphytes and lianes such as *Ecarrina* spp., climbing ratas, *Rubus australis*, supplejack and *Astelia solandri*. There is little regeneration of kauri evident in this type. A small clump of manuka occurs on the eastern boundary beside the track to Apple Tree Dam.

Loxoma cunninghamii, a fern of localised distribution (Williams and Given, 1981), was found near the kauri dam in Pukekohe Stream, and also below a kauri-hard beech stand above Driving Stream.

TABLE 1

FOREST TYPE 1 : Low to Mid-Altitude Podocarp-Hardwood Forest

Increasing Dominance
←

	Ht (m)	Abundant	Frequent	Occasional	Rare
Emergent	15-25		rimu northern rata	miro Hall's totara	
Canopy	9-13	taraire kohekohe rewarewa	towai tawa	hinau pukatea* swamp maire*	
Sub-canopy	2-8	makamaka kohekohe <i>Melicytus macrophyllus</i>	heketara mamaku taraire wheki nikau	tree fuchsia five finger ponga	
Shrub	0.5-2	kanono	Kirk's tree daisy mapau heketara	ponga nate hangehange	
Groundcover	0-0.5	<i>Blechnum fraseri</i> kiekie kiokio	piupiu hook grass	kauri grass parataniwha manamana	<i>Loxoma cunninghamii</i>
Epiphytes		kiekie sunplejack <i>Collospermum hastatum</i>	puka mangemange <i>Metrosideros perforata</i>	<i>Blechnum filiforme</i>	

Distribution: on most valley sides and some low ridges in the catchment to approx. 420 m.

* These species occur together on wet boggy sites e.g. in the flat area below the Sanctuary.

TABLE 2

FOREST TYPE 2 : Kauri-Podocarp-Hardwood Forest

← Increasing Dominance

	Ht (m)	Abundant	Frequent	Occasional	Rare
Emergent	18-32		kauri rimu	Hall's totara northern rata miro tanekaha	
Canopy	10-17		Hall's totara kauri tawa rewarewa towai	taraire rimu tanekaha	
Sub-canopy	2-8	rewarewa mingimingi	neinei tawheowheo tawa	tawari hinau Hall's totara miro tanekaha	
Shrub	0.5-2	Kirk's tree daisy	mingimingi makamaka	mairehau tawa hangehange	
Groundcover	0-0.5	<i>Gahnia</i> <i>xanthocarpa</i>	kauri grass	<i>Blechnum</i> <i>fraseri</i> <i>Blechnum</i> <i>discolor</i> kiekie <i>Schizaea</i> <i>dichotoma</i>	
Epiphytes			<i>Metrosideros</i> <i>albiflora</i> <i>Metrosideros</i> <i>perforata</i> <i>Hymenophyllum</i> <i>revolutum</i>	<i>Collosperrum</i> <i>hastatum</i> <i>Astelia</i> <i>solandri</i> hangehange	

Distribution: in scattered pockets in the Ecological Area.

TABLE 3

FOREST TYPE 3 : Kauri-Podocary-Hardwood-Hard Beech Forest

Increasing Dominance



	Ht (m)	Abundant	Frequent	Occasional	Rare
Emergent	22-32		kauri	northern rata tanekaha Hall's totara	
Canopy	13-20	kauri hard beech	rewarewa tanekaha Hall's totara	hinau taraire rimu	
Sub-canopy	2-11		tanekaha ponga five finger kanono makamaka tawa	<i>Cyathea</i> <i>cunninghamii</i> <i>Coprosma</i> <i>lucida</i> heketara kanuka	
Shrub	0.5-2	Kirk's tree daisy <i>Meliccytus</i> <i>macrophyllus</i>	taraire ponga hangehange	mingimingi kanono neinei <i>Alseuosmia</i> <i>quercifolia</i>	
Groundcover	0-0.5	<i>Blechnum</i> <i>fraseri</i> kauri grass	kiekie	kiokio piupiu	
Epiphytes			<i>Metrosideros</i> <i>perforata</i> <i>Rubus</i> <i>australis</i>	supplejack mangemange <i>Phymatosorus</i> <i>diversifolius</i>	

Distribution: three small stands on spurs near the junction of Pukekohe and Driving Streams.

TABLE 4

FOREST TYPE 4 : Manuka Scrub

Increasing Dominance
←

	Ht (m)	Abundant	Frequent	Occasional	Rare
Emergent	6-8			rewarewa	white maire
Canopy	4-6	manuka		hinau five finger heketara <i>Cordyline</i> <i>australis</i>	
Sub-canopy	2-4		<i>Hebe stricta</i> var. <i>stricta</i> <i>Cordyline</i> <i>banksii</i>	wheki ponga manuka	
Shrub	0.5-2		Kirk's tree daisy hangehange mingimingi	<i>Cordyline</i> <i>pumilio</i>	
Groundcover	0-0.5		<i>Lycopodium</i> spp. kiokio bracken	<i>Gleichenia</i> spp.	
Epiphytes				<i>Bulbophyllum</i> <i>pygmaeum</i>	

Distribution: on the ridge in the western corner of the Ecological Area.

TABLE 5

FOREST TYPE 5 : Towai/Heketara Dominated Regeneration

Increasing Dominance

		←			
	Ht (m)	Abundant	Frequent	Occasional	Rare
Emergent	8-20			kauri rickers rewarewa northern rata pole podocarps sometimes in stands	
Canopy	5-8	towai	heketara hinau rimu	makamaka Hall's totara kohuhu rewarewa	kawaka
Sub-canopy	2-5		heketara mingimingi kanono karamu mapau	towai makamaka <i>Cordyline</i> <i>australis</i>	
Shrub	0.5-2	Kirk's tree daisy kohuhu	hangehange	<i>Dicksonia</i> <i>lanata</i> wheki puka miro	
Groundcover	0-0.5	kiokio <i>Gahnia</i> <i>wanthocarpa</i>	bracken* <i>Lycopodium</i> <i>volubile</i> pigfern kiekie	wheki	
Epiphytes			kiekie mangemange <i>Collopermum</i> <i>hastatum</i>	<i>Hymenophyllum</i> spp. <i>Rubus</i> <i>australis</i> <i>Metrosideros</i> <i>perforata</i>	

Distribution: several broad ridge tops in the Ecological Area.

* Some open areas covered with bracken occur in this type.



Photo 2 : Kauri-hard beech stand is in the centre of the picture, with Driving Stream to the right (Photo by J.L. Kendrick).



Photo 3 : Kauri-hard beech stand in the Pukekohe Stream Ecological Area (Photo by J.L. Kendrick)..

TABLE 6

FOREST TYPE 6 : Mature Kauri Forest

← Increasing Dominance

	Ht (m)	Abundant	Frequent	Occasional	Rare
Emergent	15-40	kauri	rimu		kahikatea
Canopy	9-13	towai tawa	rimu miro tawari rewarewa Hall's totara	kahikatea	<i>Nestegis montana</i>
Sub-canopy	3-7	makamaka heketara mingimingi	kanono wineberry five finger	kohekohe tawheowheo	mangaeo
Shrub	0.5-2	hangehange pate Kirk's tree daisy	<i>Dicksonia lanata</i> white maire wheki mapau	mahoe	
Groundcover	0-0.5	pigfern <i>Blechnum fraseri</i>	<i>Gahnia xanthocarpa</i> kiekie kiokio piupiu hook grass	<i>Gahnia setifolia</i> <i>Dianella nigra</i>	
Epiphytes			mangemange <i>Earina</i> spp. <i>Metrosideros</i> spp.	kiekie <i>Rubus australia</i> supplejack <i>Astelia solandri</i> <i>Blechnum filiforme</i>	

Distribution: found in the drier parts of the Forest Sanctuary.

Introduced Animals and Forest Condition

Of 60 circular 4 m² plots examined in the Pukekohe subcatchment possum pellets were only found in one (1.7%). At one site there was light browse on karapapa. In the Sanctuary Kirk's tree daisy was lightly browsed and on another site pigeonwood was moderately browsed.

One group of goat pellets was seen in the Ecological Area. In 1983 Forest Service cullers shot over 50 goats in areas west of the reserves.

Pig rooting was encountered in a number of places in both reserves and is the most obvious form of animal damage.

During field inspection several stray cattle were seen leaving the Sanctuary; wandering stock have been a continual problem in Omahuta Forest for many years (Auckland Conservancy file 6/5).

Ten rat traps were set at 50 m intervals for four nights along a disused logging road on the northern boundary of the Ecological Area. No animals were caught.

In general, none of the forest tiers were noticeably sparse. In areas of mature kauri forest seedlings of numerous podocarp and hardwood species occurred. However, no kauri seedlings were found. In the kauri-hard beech stands kauri and other podocarps were found in different stages of growth. Saplings of beech, but no seedlings were found.

Presence of Exotic Plants

Adventive plants have colonised the edges of open cut tracks and old logging roads. They are not penetrating into the thick indigenous forest which borders these tracks. In open areas along the upper Pukekohe Stream exotic grasses, rushes, sedges and small dicotyledons are growing. Some species may have potential as weeds, especially Eupatorium spp.

Native Fauna

The Wildlife Service has rated the tract of forest containing Omahuta Forest, Puketi Forest and Manginangina Scenic Reserve as outstanding wildlife habitat (Ogle, 1982). Kokako (*Collaeas cinerea wilsoni*) have previously been observed in Omahuta Forest. The last record was in 1981 by M J Daniels, Ecology Division, DSIR (Ogle, 1982).

A large number of broken shells of kauri snails (*Paryphanta busbyi busbyi*) were found, often associated with areas of pig rooting. Feral pigs are the major known predators of kauri snails (Ogle, 1982).

Other wildlife recorded in the reserve include pied tit (*Petroica macrocephala*) and kaka (*Nestor meridionalis* - one heard). North Island brown kiwi are probably also present.

In 1973 a colony of rare short-tailed bats (*Mystacina tuberculata tuberculata*) was discovered in Omahuta Forest Sanctuary inside the largest kauri, Kopi. When it fell, they remained within the Sanctuary roosting inside Kopi and another smaller fallen tree. Attempts to move the bats to a more suitable roost in a standing hollow tree failed. They have since moved to a new roost, the location of which is unknown. M J Daniels (Ecology Division, DSIR) saw three bats in the Sanctuary in November 1983 (Daniels, pers. comm.). He also discovered bat flies (*Mystacinoba zelandica*) inside Kopi indicating that bats had roosted in there recently. These bat flies are also rare as they only live in association with short-tailed bats.

Very little is known about other invertebrates in the reserves. Cooper (unpub., 1982) provided a list of insects found in the Sanctuary during his study.

Human History and Influence

Early Maori sites are rare in the district surrounding Omahuta Forest. However, early Maori occupation probably occurred in the Mangapa area several kilometres northeast of the reserves as evidenced by the remains of Maori gardens in the valley of the Omauna Stream which contains clear cultivations (Coster and Johnston, 1977).

Until the 1920's the Mangapa district was also the centre of gum-digging and bleeding operations. The main area worked was the extensive scrublands around and to the northeast of the trig at Te Rotomanoao. It seems likely that some kauri trees in the Pukekohe Stream catchment were also bled for their gum.

Since the turn of the century much of Omahuta Forest has been logged over for kauri. Sexton (1937) reported for the Pukekohe compartment that kauri has been exploited over the area. With the exception of one small clump and a few scattered trees along the south boundary, mature specimens are absent.

From 1941 to 1946 18 917 m³ of kauri were extracted from a mature kauri stand for defence purposes. A group of unusually large kauri were left and became the Omahuta Forest Sanctuary. Part of the logged stands is just south of the Sanctuary in the Ecological Area. In March of 1959 a hurricane blew over more than 200 of the kauri trees remaining in the stand. About 1200 m³ of kauri were subsequently salvaged (Lloyd, 1974).

Remnants from the logging days in Omahuta State Forest include traces of old camps, sawmills and kauri dams. The remains of a kauri dam in a reasonable state of preservation can be found in the upper reaches of Pukekohe Stream within the Ecological Area (map ref. NZMS 1 N 10 124542). A map by Sexton (1937) indicated that another dam is present at map ref. NZMS 1 N10 128534.

Early this century a stand of exceptionally large kauri in Omahuta Forest was noted by a survey party. In recognition of its unique character it was protected from logging and in 1951 became New Zealand's first Forest Sanctuary. For many years the public has had access to the area to view

some of Northland's biggest trees. After the area became a Forest Sanctuary the nine biggest trees were named by Eddie Thomson, bush boss for Morningside Timber Company, and tracks within the area were upgraded. In December 1973 Kopi, New Zealand's third biggest kauri, fell, leaving Hokianga as the largest standing tree in the Sanctuary. Hokianga ranks eighth in the hierarchy of big kauri (Kauri Management Unit, 1983).

Recreational Facilities and Opportunities

Camping and picnic facilities are available at Apple Tree Dam, half an hour walk along a bush track, or a short drive from the carpark at Omahuta Forest Sanctuary (Overlay 1 of Fig. 2). Fireplaces, picnic tables and toilets are provided at this site.

Tracks within Omahuta Forest Sanctuary have been upgraded to form a family walk. Viewing platforms and fences were built around the biggest trees to allow the public to appreciate the area without damaging the vegetation. A picnic table with a view over the Ecological Area and a toilet have been provided near the carpark. During December 1982 to February 1984 the Sanctuary received an average of 180 visitors a month (estimated from the visitor's book at Omahuta Forest headquarters, therefore a conservative number).

No huts or other facilities exist within the Ecological Area. Goat and pig hunting by private individuals occur in the area.

Tracks in the Ecological Area were cut in January 1984. They will probably be linked up with the New Zealand Walkway trunk route which will run from Cape Reinga to Invercargill (J Beachman, NZFS, pers. comm.). The main track runs from below Hokianga, the largest kauri in the Sanctuary, along a northwesterly oriented ridge to a kauri-hard beech area and then down to a waterfall in Pukekohe Stream before turning upstream to the kauri dam. The track then follows the northwestern boundary of the Ecological Area back to Omahuta Forest Road, 4 km from the forest headquarters (Overlay 1 of Fig. 2).

Research Carried Out and Suggested

Cooper (1982) recorded in detail the micro-ecological changes associated with the 1973 windthrow of Kopi with the Forest Sanctuary and also listed invertebrates found on the site. In 1982 M. Ahmed sampled approximately one hectare of vegetation in the Sanctuary as part of a Ph. D thesis on the dendrochronology and ecology of kauri (Ahmed, unpubl., 1984).

The kauri-hard beech association in the Ecological Area was described and discussed in a paper by Sexton (1941).

There appears to be little regeneration of hard-beech in the Omahuta stand. Research on hard beech regeneration could be useful. Aspects of the distribution of hard beech in Northland are worthy of study as most stands are isolated and widely scattered.

Summary, Discussion and Recommendations

The two reserves occupy a total of 275 ha in a subcatchment of Pukekohe Stream in Omahuta State Forest. Access is provided by Omahuta Forest Road to both the Ecological Area and the Sanctuary. Omahuta and Puketi Forests along with the Manginangina Scenic Reserve make up a tract of forest containing kokako and short-tailed bats and which Ogle (1982) rated as outstanding wildlife habitat.

The Forest Sanctuary occupies 6 ha of gently sloping terrain clad mainly in dense kauri forest. A small area of podocarp-hardwood forest occurs around the southern border of the Sanctuary. The soil is moderately podzolised and in places strongly leached. The reserved kauri are an unlogged remnant of a large kauri stand which was logged for defence purposes during the Second World War. The small dense stand of particularly large kauri became the first Forest Sanctuary in New Zealand.

A short-tailed bat colony was discovered in the Sanctuary in 1973. The present location of the roosting site is unknown, but a sighting of bats in November 1983 suggests that the colony has not shifted far (M J Daniels, pers. comm.). M J Daniels also saw a kokako near the Sanctuary in 1981. Ogle (1982) states,

"Control of mammalian predators around known bat colonies should be undertaken. The lesser short-tailed bat is listed as 'vulnerable' by Williams and Given (1981) in 'The Red Data Book of New Zealand'".

Light browse and pig rooting were seen and some cattle strayed into the Sanctuary briefly during the field inspection.

Pukekohe Stream Ecological Area at 269 ha is compact in shape, with steep broken ridges and numerous waterfalls. Two old slips were encountered. The vegetation has been divided into five types, the most extensive being largely unmodified low altitude podocarp-hardwood forest. Most of the ridge tops in the Ecological Area are scrub covered due to the extraction of kauri and podocarps in the first half of the century; fire has also affected part of the area. There are two kauri dam sites in the reserve (see Overlay 2 of Fig. 2).

Despite its small size, the reserve has high vegetation values in the context of the Maungataniwha Ecological District. The main objective in reserving the Pukekohe Stream area was to protect the kauri-hard beech stands which occur there. This association exists only in small relic stands of which the Pukekohe Stream stands are the most northerly known. *Loxoma cunninghamii*, a species of fern which has been listed as vulnerable (Williams and Given, 1981), is also found in the Ecological Area.

Possum and goat damage is not extensive but pig rooting is common throughout the area. Broken kauri snail shells were frequently found, and could have been the result of pig predation. Control of the pig population seems therefore more needed than goat or possum control at present.

Long term management of the reserve should be aimed at maintaining the hard beech in healthy stands as they were the reason for proposing the Ecological Area. Therefore, the ecology of the hard beech and surrounding forest should be studied to meet this object.

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

1. the pig population should be reduced to the lowest practicable level.
2. the goat and possum populations in both reserves should be monitored.
3. study of the ecology of hard beech in the Ecological Area is to be encouraged.
4. efforts are to be made to locate the present roost of the short-tailed bat colony and if successful appropriate management steps should be taken.

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Appendix 1 : Botanical Species Listsa) OMAHUTA FOREST SANCTUARYFerns and Fern Allies

<i>Anarthropteris lanceolata</i>	lance fern
<i>Asplenium bulbiferum</i>	manamana, hen and chicken fern
<i>A. flaccidum</i> ssp. <i>flaccidum</i>	raukatauri, hanging spleenwort
<i>A. oblongifolium</i>	shining spleenwort
<i>A. polyodon</i>	
<i>Blechnum discolor</i>	piupiu, crownfern
<i>B. filiforme</i>	climbing sweetfern
<i>B. fraseri</i>	Fraser's hardfern
<i>B. sp.</i> (<i>B. capense</i> agg.)	kiokio
<i>Cardiomanes reniforme</i>	kidney fern
<i>Ctenopteris heterophylla</i>	
<i>Cyathea dealbata</i>	ponga, silver fern
<i>C. cunninghamii</i>	gully or slender tree fern
<i>C. medullaris</i>	mamaku, black tree fern
<i>Deparia petersonii</i> (= <i>Athyrium japonicum</i>)	
<i>Dicksonia lanata</i>	
<i>D. squarrosa</i>	wheki
<i>Diplazium australe</i> (= <i>Athyrium australe</i>)	
<i>Gleichenia dicarpa</i>	waewae-kaka, tangle fern
<i>G. microphylla</i>	" "
<i>Grammitis pseudociliata</i>	strap fern
<i>Histiopteris incisa</i>	water fern
<i>Hymenophyllum demissum</i>	filmy fern
<i>H. dilatatum</i>	"
<i>H. ferrugineum</i>	"
<i>H. flabellatum</i>	"
<i>H. multifidum</i>	"
<i>H. rarum</i>	"
<i>H. revolutum</i>	"
<i>H. sanguinolentum</i>	piripiri
<i>Hypolepis distans</i>	
<i>Lastreopsis hispida</i>	
<i>Lindsaea trichomanoides</i>	
<i>Lygodium articulatum</i>	mangemange
<i>Paesia scaberula</i>	ringfern, hardfern, pigfern
<i>Phymatosorus diversifolius</i>	kawaowao, maratata, hound's tongue
<i>Pilularia novae-zelandiae</i> *	
<i>Pneumatopteris pennigera</i>	pakauroharoha
<i>Pteridium esculentum</i>	bracken
<i>Pyrrosia serpens</i>	leather-leaf fern
<i>Imesipteris elongata</i>	
<i>T. lanceolata</i>	
<i>T. sigmatifolia</i>	
<i>T. tannensis</i>	
<i>Trichomanes elongatum</i>	filmy fern
<i>T. venosum</i>	"

* recorded by Cooper (1982), unconfirmed by this study.

Gymnosperms

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

Dicotyledons

	<i>Ackama rosaeifolia</i>	makamaka
	<i>Alectryon excelsus</i>	titoki
	<i>Alseuosmia macrophylla</i>	karapapa
	<i>A. banksii</i> X <i>A. macrophylla</i> linear leaved type	N.Z. honeysuckle
	<i>Aristotelia serrata</i>	makomako, wineberry
	<i>Beilschmiedia tarairi</i>	taraire
	<i>B. tawa</i>	tawa
	<i>Carpodetus serratus</i>	putaputaweta
A	<i>Cirsium vulgare</i>	Scotch thistle
	<i>Clematis paniculata</i>	puawananga
	<i>Coprosma grandifolia</i>	kanono
	<i>C. lucida</i>	karamu
	<i>C. rhamnoides</i>	
	<i>Cyathodes fasciculata</i>	mingimingi
	<i>Dracophyllum latifolium</i>	neinei
	<i>Dysoxylum spectabile</i>	kohekohe
	<i>Elaeocarpus dentatus</i>	hinau
	<i>Fuchsia excorticata</i>	kotukutuku
	<i>Geniostoma ligustrifolium</i>	hangehange
	<i>Knightia excelsa</i>	rewarewa
	<i>Laurelia novae-zelandiae</i>	pukatea
	<i>Leptospermum scoparium</i>	manuka
	<i>Lophomyrtus bullata</i>	ramarama
A	<i>Lotus pedunculatus</i>	
	<i>Melicytus macrophyllus</i>	large-leaved mahoe
	<i>M. ramiflorus</i>	mahoe
	<i>Metrosideros albiflora</i>	akakura, 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>Myrsine australis</i>	mapou, red matipo
	<i>M. salicina</i>	toro
	<i>Neomyrtus pedunculata</i>	rohutu
	<i>Nertera depressa</i>	
	<i>Nestegis lanceolata</i>	white maire
	<i>N. montana</i>	narrow-leaved maire

A = Adventive

	<i>Olearia rani</i>	heketara
	<i>Pennantia corymbosa*</i>	kaikomako
	<i>Pittosporum cornifolium</i>	karo
	<i>P. kirkii</i>	
	<i>Pseudopanax arboreus</i>	five finger
	<i>P. crassifolius</i>	lancewood
	<i>Quintinia serrata</i>	tawheowheo
	<i>Ranunculus hirtus</i>	
	<i>Rubus australis</i>	bush lawyer
	<i>R. cissoides</i>	bush lawyer
A	<i>R. fruticosus</i> agg.	blackberry
	<i>Schefflera digitata</i>	pate
A	<i>Senecio bipinnatisectus</i>	Australian fireweed
	<i>S. kirkii</i>	Kirk's tree daisy
	<i>Syzygium maire</i>	puka, swamp maire
	<i>Weinmannia silvicola</i> var. <i>silvicola</i>	towai

Monocotyledons

	<i>Astelia solandri</i>	kowharawhara, perching lily
	<i>A. trinervia</i>	kauri grass
	<i>Collospermum hastatum</i>	perching lily
	<i>C. microspermum</i>	"
	<i>Cordyline australis</i>	ti, cabbage tree
	<i>Cortaderia fulvida</i>	toetoe
A	<i>C. jubata</i>	pampas grass
	<i>Corybas orbiculatus</i>	
	<i>C. rivularis</i>	
	<i>Dendrobium cunninghamii</i>	epiphytic orchid
	<i>Dianella nigra</i>	turutu, blueberry
	<i>Earina autumnalis</i>	Easter orchid
	<i>E. mucronata</i>	epiphytic orchid
	<i>Freycinetia baueriana</i> spp. <i>banksii</i>	kiekie
	<i>Gahnia setifolia</i>	
	<i>G. xanthocarpa</i>	toi-kiwi
A	<i>Holcus lanatus</i>	Yorkshire fog
A	<i>Juncus effusus</i>	soft rush
	<i>J. gregiflorus</i>	
	<i>J. planifolius</i>	
A	<i>J. tenuis</i>	
	<i>Libertia pulchella</i>	native iris
	<i>Microlaena avenacea</i>	bush rice grass
	<i>M. stipoides</i>	meadow rice grass
	<i>Oplismenus imbecillis</i>	
	<i>Rhopalostylis sapida</i>	nikau
	<i>Ripogonum scandens</i>	supplejack
	<i>Schoenus maschalinus</i>	
	<i>Scirpus inundatus</i>	
	<i>Uncinia uncinata</i>	hook grass

A = Adventive

* recorded by Cooper (unpubl., 1982)

b) PUKEKOHE STREAM ECOLOGICAL AREAFerns and Fern Allies

<i>Adiantum fulvum</i>	black maidenhair
<i>Anarthropteris lanceolata</i>	lance fern
<i>Asplenium bulbiferum</i>	manamana, hen and chicken fern
<i>A. flaccidum</i> subsp. <i>flaccidum</i>	raukatauri, hanging spleenwort
<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. nigrum</i>	black hardfern
<i>B. sp.</i> (<i>B. capense</i> agg.)	kiokio
<i>Cardiomanes reniforme</i>	kidney fern
<i>Ctenopteris heterophylla</i>	
<i>Cyathea cunninghamii</i>	
<i>C. dealbata</i>	gully or slender fern
<i>C. medullaris</i>	ponga, silver fern
<i>C. smithii</i>	mamaku, black tree fern
<i>Dicksonia lanata</i>	katote, soft tree fern
<i>D. squarrosa</i>	
<i>Gleichenia cunninghamii</i>	wheki
<i>G. dicarpa</i>	tapuwae kotuku, umbrella fern
<i>G. flabellata</i>	waewae-kaka, tangle fern
<i>G. microphylla</i>	
<i>Grammitis pseudociliata</i>	waewae-kaka, tangle fern
<i>Histiopteris incisa</i>	strap fern
<i>Hymenophyllum demissum</i>	swamp fern
<i>H. dilatatum</i>	filmy fern
<i>H. ferrugineum</i>	"
<i>H. flabellatum</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 distans</i>	
<i>Lastreopsis glabella</i>	
<i>L. hispida</i>	
<i>Lindsaea trichomanoides</i>	
<i>Loxoma cunninghamii</i>	Northland fern
<i>Lycopodium cernuum</i>	clubmoss
<i>L. deuterodensum</i>	"
<i>L. varium</i> (incl. <i>L. billardieri</i>)	"
<i>L. volubile</i>	"
<i>Lygodium articulatum</i>	mangemange
<i>Paesia scaberula</i>	ringfern, hardfern, pigfern

	<i>Phymatosorus diversifolius</i>	kawaowai, maratata, hound's tongue
	<i>P. scandens</i>	moki, fragrant fern
	<i>Pneumatopteris pennigera</i>	pakauroharoha
	<i>Pteridium esculentum</i>	bracken
	<i>Pteris tremula</i>	shaking bracken
	<i>Pyrrosia serpens</i>	leather-leaf fern
	<i>Rumohra adiantiformis</i>	climbing shield fern
	<i>Schizaea dichotoma</i>	fan fern
A	<i>Selaginella kraussiana</i>	
	<i>Tmesipteris elongata</i>	
	<i>T. lanceolata</i>	
	<i>T. sigmatifolia</i>	
	<i>T. tarnensis</i>	
	<i>Trichomanes elongatum</i>	filmy fern
	<i>T. venosum</i>	"
 <u>Gymnosperms</u>		
	<i>Agathis australis</i>	kauri
	<i>Dacrycarpus dacrydioides</i>	kahikatea
	<i>Dacrydium cupressinum</i>	rimu
	<i>Phyllocladus trichomanoides</i>	tanekaha
	<i>Podocarpus hallii</i>	Hall's totara
	<i>Prumnopitys ferruginea</i>	miro
 <u>Dicotyledons</u>		
	<i>Ackama rosaeifolia</i>	makamaka
	<i>Alseuosmia macrophylla</i>	karapapa
	<i>A. banksii</i> X <i>A. macrophylla</i>	N.Z. honeysuckle
	(i) <i>A. quercifolia</i>	
	(ii) linear leaved type	
A	<i>Anthoxanthum odoratum</i>	sweet vernal
	<i>Aristotelia serrata</i>	makomako, wineberry
A	<i>Axonopus affinis</i>	
	<i>Beilschmiedia tarairi</i>	taraire
	<i>B. tawa</i>	tawa
	<i>Brachyglottis repanda</i>	rangiora
	<i>Callitriche muelleri</i>	starwort
	<i>Carmichaelia aligera</i>	broom
	<i>Carpodetus serratus</i>	putaputaweta
A	<i>Centaurium erythraea</i>	centaury
	<i>Centella uniflora</i>	
A	<i>Cirsium vulgare</i>	Scotch thistle
	<i>Clematis cunninghamii</i> (= <i>C. parviflora</i>)	
	<i>C. paniculata</i>	puawananga
	<i>Conyza floribunda</i>	fleabane
	<i>Coprosma arborea</i>	mamangi
	<i>C. grandifolia</i>	kanono
	<i>C. lucida</i>	karamu
	<i>C. rhamnoides</i>	

A = Adventive

	<i>C. robusta</i>	karamu
	<i>C. spathulata</i>	
	<i>Coriaria arborea</i>	tutu
	<i>Corynocarpus laevigatus</i>	karaka
A	<i>Crocosmia X crocosmiflora</i>	montbretia
	<i>Cyathodes fasciculata</i>	mingimingi
A	<i>Digitalis purpurea</i>	foxglove
	<i>Dodonaea viscosa</i>	akeake
	<i>Dracophyllum latifolium</i>	neinei
	<i>D. lessonianum</i>	
	<i>Dysoxylum spectabile</i>	kohekohe
	<i>Elaeocarpus dentatus</i>	hinau
	<i>Elatostema rugosum</i>	parataniwha
A	<i>Entolasia marginata</i>	
	<i>Epilobium rotundifolium</i>	
A	<i>Eupatorium adenophorum</i>	Mexican devilweed
A	<i>E. riparium</i>	mist grass
	<i>Fuchsia excorticata</i>	kotukutuku
	<i>Geniostoma rupestre</i> var. <i>crassum</i>	hangehange
	<i>Gnaphalium gummocephalum</i>	
	<i>G. involucreatum</i>	
A	<i>G. spicatum</i>	
	<i>Griselinia lucida</i>	puka, shining broadleaf
A	<i>Hakea sericea</i>	prickly hakea
A	<i>Haloragis erecta</i> var. <i>erecta</i>	
	<i>Hebe stricta</i> var. <i>stricta</i>	
	<i>Hedycarya arborea</i>	koromiko
	<i>Hoheria populnea</i> var. <i>populnea</i>	pigeonwood
	<i>Iserba brexioides</i>	houhere, lacebark
	<i>Knightia excelsa</i>	tawari
	<i>Laurelia novae-zelandiae</i>	rewarewa
	<i>Leptospermum ericoides</i>	pukatea
	<i>L. scoparium</i>	kanuka
	<i>Litsea calicaris</i>	manuka
	<i>Lophomyrtus bullata</i>	mangeao
	<i>Macropiper excelsum</i>	ramarama
	<i>Melicope simplex</i>	kawakawa
	<i>Melicytus macrophyllus</i>	
	<i>M. micranthus</i>	large-leaved mahoe
	<i>M. ramiflorus</i>	mahoe
	<i>Metrosideros albiflora</i>	akatea, 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>	
	<i>Myrsine australis</i>	mapou, red matipo
	<i>M. salicina</i>	toro
	<i>Neomyrtus pedunculata</i>	rohutu
	<i>Nertera depressa</i>	

A = Adventive

	<i>N. dichondraefolia</i> s.s.	black maire
	<i>Nestegis cunninghamii</i>	white maire
	<i>N. lanceolata</i>	narrow-leaved maire
	<i>N. montana</i>	hard beech
	<i>Nothogagus truncata</i>	heketara
	<i>Olearia rani</i>	
	<i>Oxalis lactea</i>	
	<i>Peperomia urvilleana</i>	
	<i>Phebalium nudum</i>	maire hau
A	<i>Phytolacca octandra</i>	inkweed
	<i>Pittosporum cornifolium</i>	karo
	<i>P. kirkii</i>	
	<i>P. tenuifolium</i>	kohuhu
A	<i>Plantago major</i>	broad-leaved plantain
A	<i>Polygonum pentatum</i>	
	<i>Pratia angulata</i>	
A	<i>Prunella vulgaris</i>	selfheal
	<i>Pseudopanax anomalus</i>	
	<i>P. arboreus</i>	five-finger
	<i>P. crassifolius</i>	lancewood
	<i>Quintinia serrata</i>	tawheowheo
	<i>Ranunculus hirtus</i>	
A	<i>R. repens</i>	stream buttercup
	<i>Rhabdothamnus solandri</i>	waiu-atua
	<i>Rubus australis</i>	bushlawyer
	<i>R. cissoides</i>	bushlawyer
A	<i>R. fruticosus</i> agg.	blackberry
	<i>Schefflera digitata</i>	pate
A	<i>Senecio bipinnatisectus</i>	Australian fireweed
A	<i>S. diaschides</i>	
	<i>Senecio kirkii</i>	Kirk's tree daisy
A	<i>Sonchus oleraceus</i>	sow thistle, puha
	<i>Syzygium maire</i>	maire tawake, swamp maire
	<i>Toronia toru</i>	toru
A	<i>Ulex europaeus</i>	gorse
	<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>sinclarii</i>	
A	<i>Agrostis stolonifera</i>	
	<i>Arthropodium cirratum</i>	rengarenga, rock lily
	<i>Astelia solandri</i>	kowharawhara
	<i>A. trinervia</i>	kauri grass
	<i>Bulbophyllum pygmaeum</i>	
	<i>Carex dissita</i>	
	<i>C. geminata</i> agg.	
	<i>Collosperrum hastatum</i>	perching lily
	<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
A	<i>C. jubata</i>	pampas grass

A = Adventive

A	<i>C. selleana</i>	pampas grass
	<i>Corybas orbiculatus</i>	
	<i>C. rivularis</i>	
	<i>C. trilobus</i>	
	<i>Cyperus eragrostis</i>	
	<i>Dendrobium cunninghamii</i>	epiphytic orchid
	<i>Dianella nigra</i>	turutu, blueberry
	<i>Earina autumnalis</i>	Easter orchid
	<i>E. mucronata</i>	epiphytic orchid
	<i>Freycinetia baueriana</i> spp. <i>banksii</i>	kiekie
	<i>Gahnia pauciflora</i>	
	<i>G. setifolia</i>	
	<i>G. xanthocarpa</i>	toi-kiwi
	<i>Holcus lanatus</i>	Yorkshire fog
A	<i>Juncus articulatus</i>	jointed rush
A	<i>J. effusus</i>	soft rush
	<i>J. gregiflorus</i>	
	<i>J. planifolius</i>	
A	<i>J. tenuis</i>	
A	<i>Lachnagrostis filiformis</i>	New Zealand wind grass
	<i>Libertia grandiflora</i>	native iris
	<i>L. pulchella</i>	"
	<i>Microleana avenacea</i>	bush rice grass
	<i>M. stipoides</i>	meadow rice grass
	<i>Microtis unifolia</i>	
	<i>Oplismenus imbecillis</i>	
A	<i>Paspalum dilatatum</i>	paspalum
	<i>Phormium</i> sp.	flax
	<i>Pterostylis graminea</i> var. <i>rubricaulis</i>	
	<i>Rhopalostylis sapida</i>	nikau
	<i>Rytidosperma gracile</i>	
	<i>Ripogonum scandens</i>	supplejack
	<i>Schoenus maschalinus</i>	
	<i>Scirpus inundatus</i>	
	<i>S. prolifer</i>	
A	<i>Stenotaphrum secundatum</i>	buffalo grass
	<i>Uncinia banksii</i>	hook grass
	<i>U. uncinata</i>	"
	<i>U. zotovii</i>	"

A = Adventive

Appendix 2 : Wildlife of Omahuta Forest Sanctuary and Pukekohe Stream
Ecological Area

Native Birds

<i>Apteryx australis mantelli</i>	N.I. brown kiwi
<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>Ninox novaeseelandiae</i>	morepork
<i>Petroica macrocephala</i>	pied tit
<i>Prothemadera novaeseelandiae</i>	tui
<i>Rhipidura fuliginosa</i>	North Island fantail
<i>Zosterops lateralis</i>	silvereeye

Introduced Birds

<i>Acridotheres tristis</i>	myna
<i>Platycercus eximius</i>	eastern rosella
<i>Turdus merula</i>	blackbird

Native Mammals

<i>Mystacina tuberculata tuberculata</i>	short-tailed bat
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Native Invertebrates

<i>Mystacinoba zelandica</i>	bat fly
<i>Paranephrops planifrons</i>	freshwater crayfish
<i>Paryphanta busbyi busbyi</i>	kauri snail
<i>Rhytida greenwoodi greenwoodi</i>	snail

Introduced Mammals

<i>Capra hircus</i>	goat
<i>Mus erminea</i>	stoat
<i>Rattus</i> sp.	ship rat or Norway rat
<i>Sus scrofa</i>	wild pig
<i>Trichosurus vulpecula</i>	brush-tailed possum

Introduced Amphibians

<i>Litoria aurea</i>	green frog
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