Flora of Lake Kowhai and adjacent bush, north Woodhill

E.K. Cameron

Lake Kowhai (Rotokowhai) is on the south Kaipara spit in the Kaipara Ecological District and is one of the most northern of the many dune lakes in Woodhill Forest, north-west Auckland. It lies on the eastern boundary of northern Woodhill Forest (Fig. 1) (map ref. NZMS 260 Q09 211239, c.50 m asl) and is bordered on the east side by pasture with a band of kanuka just by the lake. The west side is a broken canopy of tall kanuka (*Kunzea ericoides*), mixed with broadleaf species. Most of the lake and all the western side is Crown land managed by Carter Holt Harvey Ltd as part of Woodhill Forest, which is predominantly an exotic pine plantation. The narrow unfenced kanuka strip on the eastern side is the Lake Kowhai Marginal Strip (0.3 ha) managed by the Department of Conservation. East of this strip is private farmland (Fig. 2). Public access is from Lagoon Road in Woodhill Forest, and is untracked. The lake can't be seen from any of the roads.

The name Lake Kowhai (or Rotokowhai) does not appear on the early Crown Land Purchase maps, but "Waitetu" does (G. Murdoch pers. comm.). But the position of the small lake "Waitetu" on these older maps appears to be further inland than the actual position of Lake Kowhai. Therefore, does it refer to another lake that has since dried up (a frequent occurrence in this sand country) or is it the real Maori name for Lake Kowhai? (Graeme Murdoch is further researching this question). Barbara Waller (pers. comm.) suspects Lake Kowhai (and hence Rotokowhai) are made up names by the Department of Lands and Survey (when they sub-divided the land) because kowhai (*Sophora microphylla*) is an unusual species on the Woodhill dunes, but there is a patch of it by the lake.

The native bush forms an attractive backdrop to the small lake (c.200 m long x c.100 m wide), which has wonderful reflections on a still day. Due to the often green reflection, the lake is known informally by the Buckland family (owned the farm since 1881) as the Green Lake (B. Waller pers. comm.). It drains into the Kaipara Harbour via the Kawau Stream, which is bordered by native bush on its north-western side for most of its course to the coast. The trees adjacent to Lake Kowhai grow straight out of the consolidated dunes, there is no soil layer. On 21 October 1997 I visited the lake with Barbara Waller, a local resident, for about 2 hours and made the following observations. No underwater attempt was made to record any submerged aquatics. There appears to be no previous botanical account of this area, but the aquatic plants of several other northern New Zealand dune lakes (including Lake Ototoa) have been documented by Tanner et al. (1986) and articles on other Woodhill native bush areas include: Mackinder (1984), Cameron & Bellingham (1986), Cameron (1987, 1988 & 1994) and Smale et al. (1995).

As with lake Kereta (Cameron 1994), Lake Kowhai is one of a chain of small lakes on Holocene dunes positioned between two episodes of sand build up. The younger, sabilised dunes for forestry, are on the west side and the older more consolidated dunes are on the east side of Lake Kowhai.

Vegetation

A broken canopy of kanuka, 8-18 m tall, 40-60 cm dbh, dominates the quite steep slope of about 200 m, from the western lake margin up to the ridge-top (rising from c.50-90 m asl). Wind-blown kanuka are present in many of the canopy gaps. Mangeao (*Litsea calicaris*) is the second commonest tree species present, followed by mahoe (*Melicytus ramiflorus*), karaka (*Corynocarpus laevigatus*) and emergent rewarewa (*Knightia excelsa*) up to 18 m tall, 50 cm dbh. Although the lake is named after kowhai, we only saw six kowhai trees confined to one area. They were up to 8 m tall, 30 cm dbh; flowering had finished, but the new pale leaves stood out. On a previous trip to the lake Barbara Waller (pers. comm.) saw a much older kowhai tree with seedlings underneath. Common understorey shrubs were coastal karamu (*Coprosma* aff. *macrocarpa*), *Coprosma crassifolia,* hangehange (*Geniostoma rupestre*) and kawakawa (*Macropiper excelsum*).

There was a 'quaking sedgeland' about 10 m wide by 50 m long, adjacent to the channel draining the lake at the north end. This was dominated by *Baumea articulata*, raupo (*Typha orientalis*), *Carex lessoniana* and *Schoenoplectus tabernaemontani.* Amongst these sedges and raupo were *Eleocharis acuta*, kiokio (*Blechnum novae-zelandiae*), water fern (*Histiopteris incisa*) (up to 2.5 m tall), *Carex secta, C. virgata* and Mexican devil (*Ageratina adenophora*), with *Hydrocotyle novae-zelandiae* and swamp millet (*Isachne globosa*) through most of it. The land margin of the sedgeland was bordered by manuka (*Leptospermum scoparium*), scattered *Olearia solandri* up to 4 m tall and cabbage trees (*Cordyline australis*).

Flora

A list of the vascular plants seen is attached (Appendix 1), where a total of 88 native and 6 exotic species are listed. Notes on selected species:

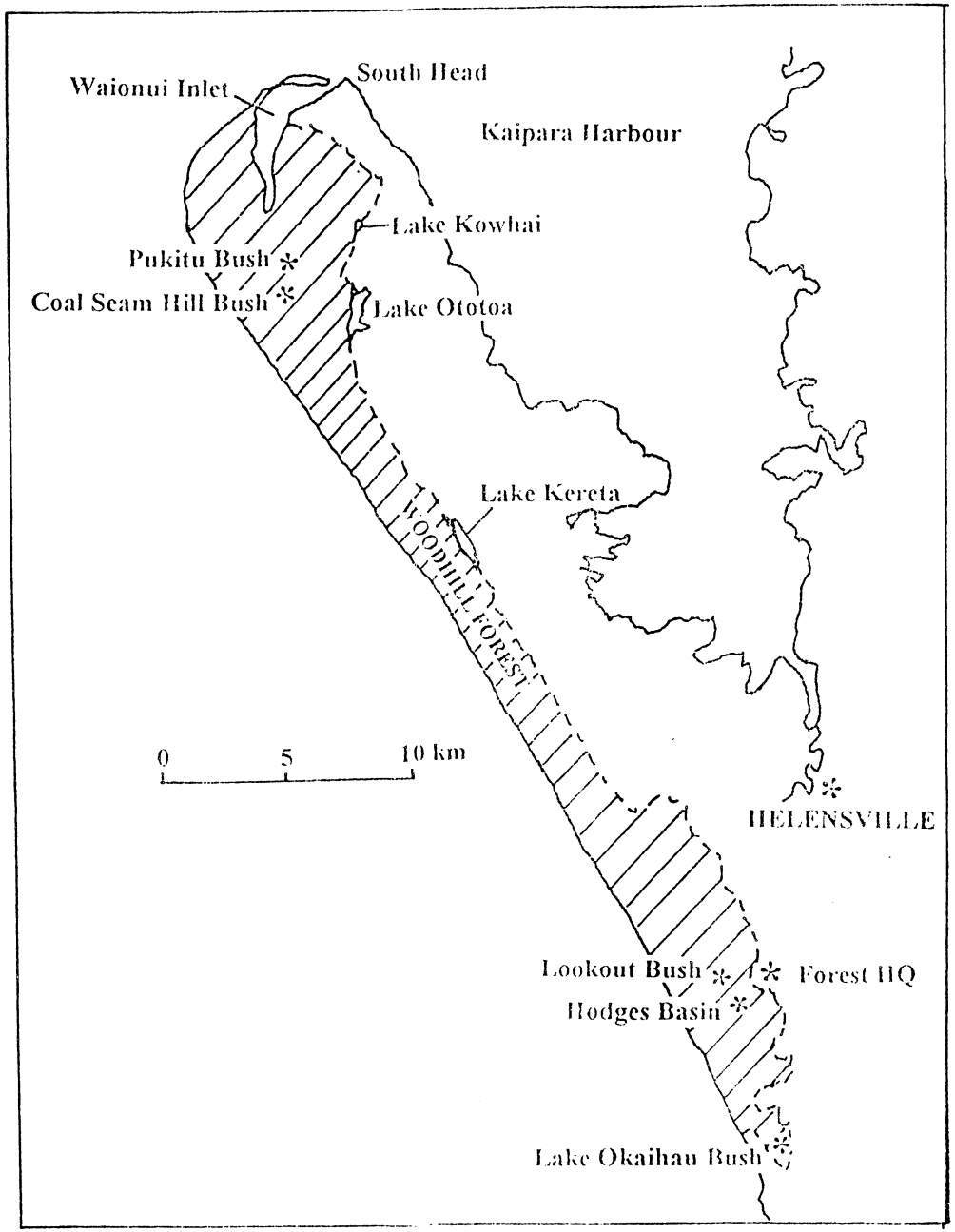

Fig. 1. Location of Lake Kowhai and some other natural areas in Woodhill Forest.

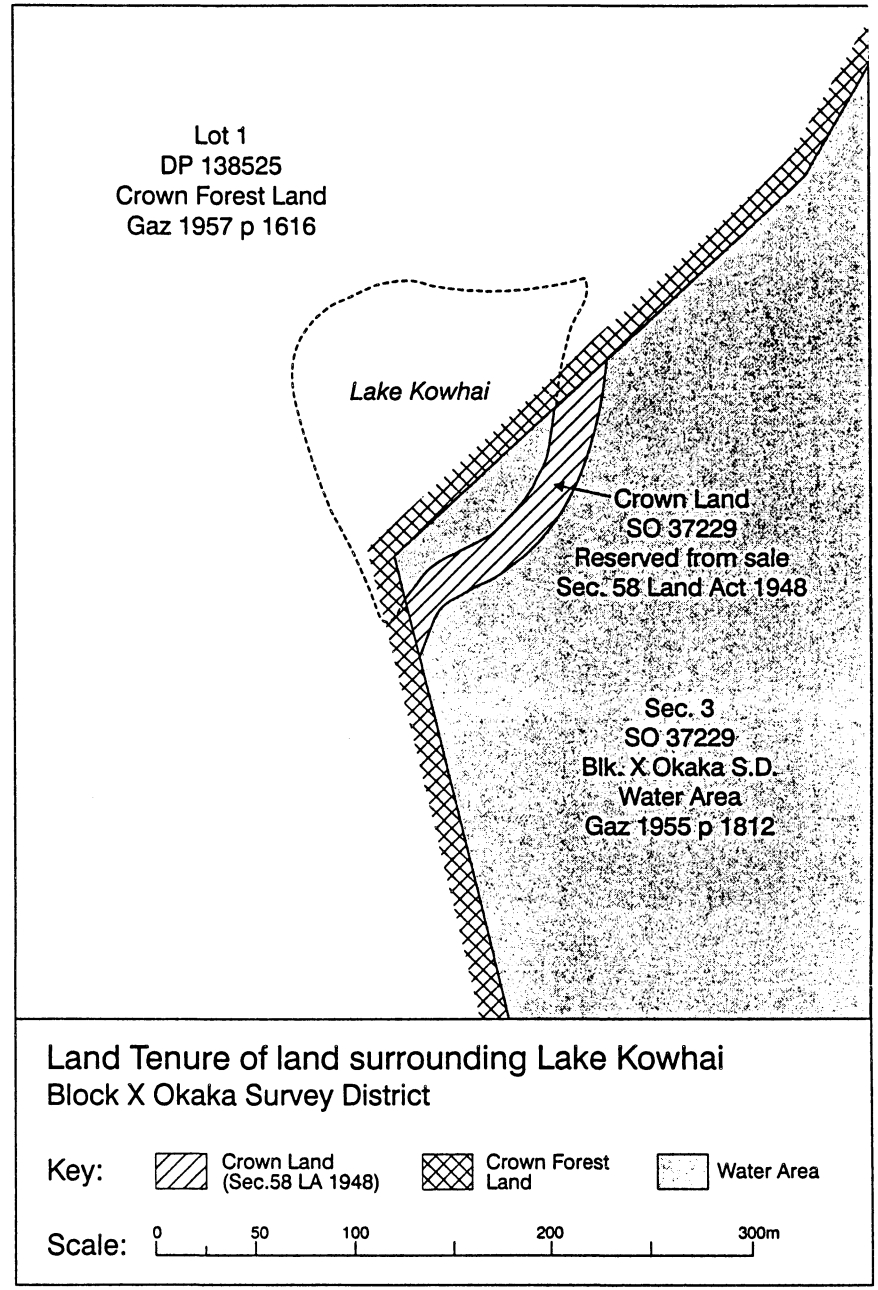

Fig. 2. Land tenure surrounding Lake Kowhai. Note: "water area" refers to water reticulation of the farming block.

Carex "raotest" - this taxon is similar to *C. testacea* but the leaves are double-folded instead of channelled. Ogle (1990: 45) discusses this undescribed taxon under *Carex* sp. (b) and also records it [under *C.* sp. (cf. *C. raoulii, C. testacea*)] as present in the similar north Kaipara bush areas on dunes (Ogle 1997).

Olearia solandri - it is rather unusual to see this species so far (>3 km) from the coast; it usually occurs at the back of a salt marsh.

Weeds

Environmental weeds were in low numbers apart from Mexican devil (*Ageratina adenophora*) which was locally common. The only other threats were a coral tree (*Erythrina* x *sykesii*), which had grown into a small tree from branches dumped from the adjacent farm, occasional clumps of pampas grass (*Cortaderia selloana*), and pasture grasses which were frequent in some of the forest gaps. Aquatic macrophytes (oxygen weeds), were not seen.

Birds

The following birds were recorded during our brief visit: blackbird, dabchick (x1 seen), fantail, grey duck (many), harrier, kingfisher, mallard duck, NZ pigeon, rosella, shining cuckoo, silvereye, tui and welcome swallow.

Discussion

The abundance of mangeao by Lake Kowhai is an unusual feature as it does not occur this commonly elsewhere in Woodhill Forest (pers. ob.). The broken kanuka canopy by the lake reflects that kanuka is falling over and is only partly being replaced by broadleaf species and in some cases by young kanuka. Most other Woodhill kanuka stands are generally younger and still have their canopies more intact (see Smale et al. 1995). By evaluating 10-year-old exclosure plots in three separate areas of Woodhill kanuka stands in 1993, Smale el al. (1995) found that the scarcity or absence of young mahoe and coastal karamu, hangehange and kawakawa in much of the kanuka forest was directly attributable to the influence of the moderate fallow deer population. The broken nature of the Lake Kowhai forest canopy is due to a lack of dense regeneration under the tall, decaying kanuka. This is probably the result of long-tern browsing by fallow deer affecting the recruitment of future canopy species and the isolation of this stand from other Woodhill bush areas (seed sources). [Note - fallow deer were released at Lake Ototoa in 1900 (Davidson & Nugent 1990)]. Although the general abundance of highly palatable (large-leaved) species: coastal karamu, hangehange, kawakawa and mahoe, and the absence of highly unpalatable species: prickly mingimingi (*Cyathodes juniperina*) and mingimingi (*Leucopogon fasciculatus*) (see Smale et al. 1995) indicates that the browsing pressure around Lake Kowhai has been lighter than in most other areas of Woodhill Forest.

Further south in Woodhill Forest, Lake Kereta (260 Q11 24-11-) (see Fig. 1) is a larger dune lake with associated bush on its western side which has a recorded vascular flora of 95 species (Cameron 1994). For Lake Kowhai, 88 of the 94 species are native, whereas only 55 of Lake Kereta's total are native. This is probably a reflection of several factors: a public road to Lake Kereta and associated baches/homes (increases human impacts), more intense browsing by fallow deer, and the younger Lake Kereta vegetation. In comparison, the smaller Lake Kowhai and its associated bush is a more diverse native habitat. Both areas are part of a long (broken) chain of small inland dune lakes with associated native bush, running parallel to the west coast. Any reduction in this chain weakens its effectiveness to function as a corridor for biota (both plants and animals).

The main priority to restore this habitat is to eradicate or reduce the browsing mammals. Browsing is opening up the forest, causing desiccation, stalling the regeneration sequence and creating a more favourable habitat for weed establishment. Straying cattle need to be properly fenced out (currently there are no adequate fences), and feral deer and pigs need to be eradicated from the whole of the Woodhill Forest as they are stalling native regeneration in virtually all the native enclaves on the south Kaipara Spit (see Smale et al. 1995). Possums need to be maintained at their present low numbers (intensively poisoned several years ago). Many of these native enclaves harbour nationally and regionally threatened plant species. Currently pampas grass is present only occasionally, but with the open nature of much of the forest canopy and continued browsing, pampas could increase rapidly if it not controlled, as it has done amongst the pine plantations.

Native forest on these consolidated dunes is poorly represented in the Ecological District and should be protected and well managed where it occurs. In fact, Smale et al. (1995) state that the Woodhill duneland kanuka forests are amongst the best remaining examples in New Zealand and that they should be a priority for nature conservation in the region. Sadly this has not occurred.

Acknowledgments
I thank Barbara Waller for encouraging me to visit the area, organising the access, coming with me and commenting on the draft of this article; Graeme Murdoch for researching the original name for the lake; Peter de Lange for pointing out the presence in Woodhill Forest of *Carex* "raotest"; Colin Ogle for supplying the morphological characters separating *Carex testacea* and *C.* "raotest" and Terry Smith (Department of Conservation) for providing figure 2.

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Appendix 1: Vascular plant list for Lake Kowhai and adjacent bush

a = abundant
c = common
o = occasional
l = local
s = scarce (< 5 plants seen)
* = adventive species (note - they are generally omitted unless potentially weedy)
AK = Auckland Museum herbarium voucher

Ferns (20)	
Adiantum hispidulum	c
Asplenium flaccidum	o-lc
A. gracillimum	o
A. oblongifolium	o
*Azolla pinnata**	1c
Blechnum novae-zelandiae	o-lc
Cyathea dealbata	o
C. medullaris	o
Deparia petersenii	1
Dicksonia squarrosa	o
Diplazium australe	l
Doodia media	c-la
Histiopteris incisa	lc
Phymatosorus pustulatus	c
P. scandens	s
Pneumatopteris pennigera	o
Polystichum richardii	o
Pteridium esculentum	la
Pteris tremula	c
Pyrrosia eleagnifolia	c

Dicots (41)	
*Ageratina adenophora**	lc, AK 234135
Alectryon excelsus	s
Carmichaelia australis	s
Coprosma crassifolia	c
C. aff. *macrocarpa*	c
C. rhamnoides	o
Corokia cotoneaster	s
Corynocaypus laevigatus	c
Erythrina x *sykesii**	s
Geniostoma rupestre	c
Haloragis erecta	lc
Hebe stricta	s
Hedycarva arborea	s
Hydrocotyle novae-zelandiae	la, AK 234509-10
Knightia excelsa	c
Kunzea ericoides	a
Lagenifera stipitata	1
Leptospermum scoparium	1
Litsea calicaris	c
Lophomyrtus obcordata	s
Macropiper excelsum	c
Melicope ternata	lc
Melicytus ramiflorus	c
Muehenbeckia australis	o
M. complexa	c
Myrsine australis	s
M. divaricata	s
Olearia solandri	1, AK 234119
Oxalis exilis	c
Parsonsia heterophylla	c
Peperomia urvilleana	o
*Phytolacca octandra**	o
Pseudopanax crassifolius	o
P. crassifolius x *P. lessonii*	o
P. lessonii	s
Rubus cissoides	1
Senecio biserratus	o
Solanum americanum	o
Sophora microphylla	1, AK 234513
Stellaria parviflora	1, AK 234512
Vitex lucens	o

Monocots (33)	
Astelia solandri	s
Baumea articulata	la
Carex lessoniana	la
C. secta	1, AK 234 508
C. virgata	o
C. ? "raotest"	o, AK 234506 & 234514
Collospermum hastatum	s
Cordyline australis	o
*Cortaderia selloana**	o
C. splendens	o
Cyperus ustulatus	o
Dianella nigrum	o
Earina aestivalis	c, AK 234505
Eleocharis acuta	la
Gahnia lacera	o
Isachne globosa	lc
Isolepis nodosa	o
*I. sepalcralis**	1, AK 234504

Microlaena stipoides	c	*Rytidosperma* sp. or spp.	lc
Oplismenus imbecillis	c	*Schoenoplectus tabernaemontani*	lc
Poa pusilla	lc	*Spirodela punctata**	lc
Potamogeton cheesemanii	l	*Typha orientalis*	lc
Ripogonum scandens	lc	*Uncinia uncinata*	c

Unuwhao Realised
12 April 1998

Maureen Young, Steve Benham, and Graeme Hambly

Still smarting from having to abort the field trip to Unuwhao Bush, Spirits Bay, during the November 1997 ABS camp (see ABS Journal Vol.53 No.1), three original members determined on another attempt during Easter weekend.

This time the approach was from the south, rather than from Spirits Bay. A 4WD track through pines was lined with *Pomaderris kumeraho* and *P. polifolia*, then this narrowed to a track through manuka scrub. A tiny green blob on the ground here, proved on close examination to be an unfurling sterile frond of the parsley fern, *Botrychium australe*. The canopy became taller, but the ground looked as though it had been subjected to the Northern Ploughing Championships, so thoroughly had the feral pigs turned over the soil. An attractive sight, nevertheless, was the sub-canopy of *Hebe ligustrifolia*, with the filtered sun highlighting the yellowish-green of the decussate leaves.

Unuwhao trig was eventually located, and from there the Pinnacle could be seen. As the area between these two high points was reported to contain a population of *Metrosideros bartlettii*, we traversed the gully, but search as we might we could not see any. The Pinnacle beckoned, so had to be climbed. The view was well worth the effort, with the high peaks of Unuwhao in one direction, and the sweep of Spirits Bay in the other.

On the return journey, to the east of Unuwhao trig, we studied more closely a trunk which had a long-neglected bait station attached to it. On the outward leg we had assumed that the pale bark signified a puriri, but it was in fact the sought after Bartlett's rata.

The Tane article by Gardner and Bartlett (1980) contains references to Unuwhao Bush, and a species list. As several people have visited the bush in the intervening years, we hope that the publication of the additional species which we saw might encourage others to pool their records so that a more complete list might be assembled.

A list of the vascular species seen at Unuwhao Bush, which are additional to the species published in Tane 26: 225-231.

Ferns and fern allies
Arthropteris tenella
Botrychium australe
Ctenopteris heterophylla
Paesia scaberula
Tmesipteris sigmatifolia

Dicot trees & shrubs
Carmichaelia australis
Coprosma lucida
Dracophyllum sinclairii ?
Hebe macrocarpa
H. perbella
Macropiper excelsum
Pomaderris edgerleyi
P. kumeraho
P. polifolia
Pseudopanax arboreus

Dicot herbs
Centella uniflora
Gonocarpus incanus
Lobelia anceps
Nertera dichondrifolia

Orchids
Winika cunninghamii

Monocot trees, shrubs & herbs
Cordyline australis
Libertia grandiflora

Sedges
Eleocharis gracilis
Gahnia setifolia
Lepidosperma australe
L. laterale
Morelotia affinis

Acknowledgements
We thank Graeme Neho of the Ngati Kuri Trust,for permission to enter Unuwhao Bush.

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