Vascular flora, vegetation and conservation issues of Lake Kereta and adjacent bush, South Kaipara

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On 20 February 1993 an Auckland Botanical Society field trip circumnavigated Lake Kereta on the land and occasionally waded by the lake edge. The lake is situated at the end of Wilson Road on the eastern margin of Woodhill Forest (260 Q10 24-11-). It is in the Kaipara Ecological Region and District on the South Kaipara Peninsula.

Lake Kereta is one of a chain of small lakes on Holocene dunes positioned between two episodes of sand build up, dating 2000-5000 years old (B.W. Hayward pers. comm.). The younger, recently stabilised (mainly by planting) dunes are to the west and older more consolidated dunes to the east of Lake Kereta. The lake is 1.3 km long by 100-300 m wide and used to be connected to the three smaller lakes to the north, now separated by lower water levels (Parish & Jamieson 1981).

The lake bed is owned by three different parties. The northern half is crown owned, whilst the southern half (2 lots) is in private ownership (Figure 1). The lake is circled by a formed legal road, legal unformed road and a Department of Conservation marginal strip. Beyond this narrow band, roughly 1 / 3 is private land and 2 / 3 is managed by Carter Holt Harvey Forests Ltd.

Our trip began at the south end and proceeded clock-wise around the lake; most of the time on the west side of the lake was spent in the bush area.

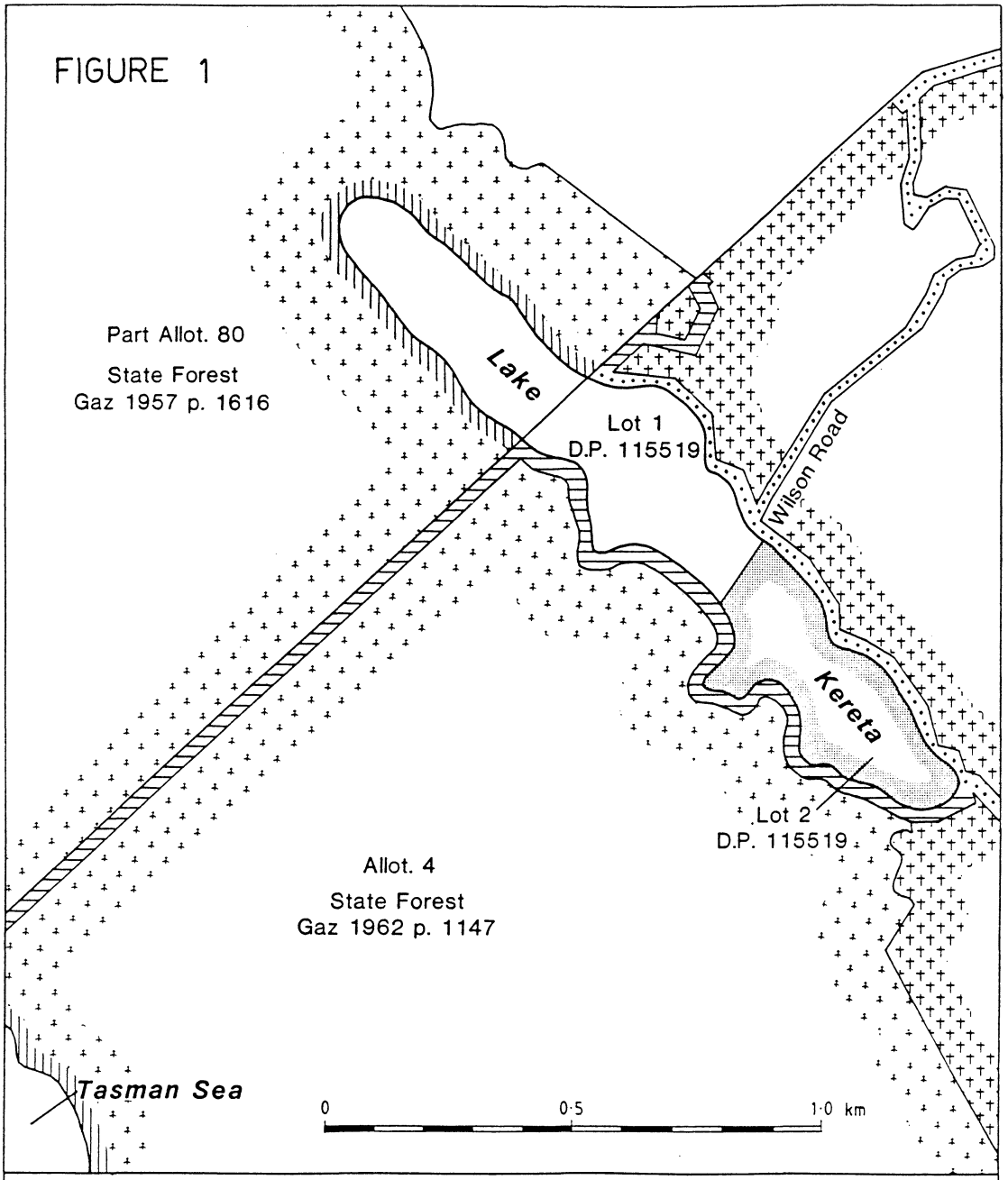
Bush

Apart from a legal unformed paper road and a marginal strip along the lake margin, the whole of the western side of Lake Kereta is managed by Carter Holt Harvey. There is a band of kanuka (*Kunzea ericoides*) for 3 / 4 of the way up this western side of the lake. To the west of the kanuka is an extensive pine plantation. This band of kanuka is 1 km long and up to 200 m wide.

The kanuka forms an even, continuous canopy 8-12 m tall with an understorey of dense, twiggy *Coprosma rhamnoides*. There is virtually no other shrub or tree species between the tall kanuka canopy and the 1-1.5 m tall coprosma thicket. Wire vine (*Muehlenbeckia complexa*) climbing through the coprosma, and *Parsonsia heterophllya* vines climbing up the kanuka are both common. There are occasional shrubs of New Zealand broom (*Carmichaelia cunninghamii*) and mingimingi (*Leucopogon fasciculatus*). Patches of milk moss (*Ptychomnium aciculare*) are common on the ground. Deer tracks and faeces were common and one decaying fallow deer was seen; rabbit burrows were seen around the bush margins.

By the south-west corner of the lake the first mahoe (*Melicytus ramiflorus*) we came across had atypically narrow leaves of that species. Most leaf blades measured 8.5-10.5 cm long by only 2.5 cm wide (AK 212723). All other mahoe seen had the more usual wider-shaped leaves.

Within the kanuka there are two areas of dense woolly nightshade (*Solanum mauritianum*); the larger is about 80 m across. We investigated the smaller one and discovered it had been a shallow lake which had dried up and had been totally invaded by woolly nightshade which now formed a continuous canopy, 4-5 m tall, over the area. Around the old lake margin were dead trunks of *Carex virgata* which were now shaded out. These dead trunks indicate that the earlier lake level had once been fairly stable.



Land Tenure of land surrounding Lake Kereta

Block V Waioneke Survey District

Key:

- Southern part of Lake Kereta
- Department of Conservation marginal strip.
- Carter Holt Harvey Forests Ltd
- Legal road not formed
- Formed legal road
- Private land

Pasture

Most of the eastern and north-western lake margin is grazed pasture. There is no boundary fence protecting the lake from stock and much of the lake margin was badly pugged by stock on the eastern side. On this eastern side there is a mixture of private and Carter Holt Harvey land with a marginal strip and a formed legal road along the lake edge.

Lake Kereta

There is no published account of the aquatic plants of Lake Kereta, but many other northern New Zealand dune lakes have been studied by Tanner et al. (1986).

The long, narrow lake is reported as being up to 5 m deep and is mainly (c. 90%) open water. It is an important bird habitat for many species and includes uncommon species such as dabchick and bittern. Although the aquatic vegetation was only partly seen the following observations were made from the shore.

The tallest emergent vegetation is the exotic Manchurian wild rice (*Zizania latifolius*) which dominates the southern half of the lake margin, reaching 3 m above the water and forming a band up to 10 m wide. Occasionally amongst the wild rice is raupo (*Typha orientalis*). Raupo is more common at the northern end of the lake which appeared to lack wild rice. Several patches of three different water lilies (*Nymphaea*) existed on the north-east side; these were presumably planted.

Locally on the lake margin there were patches of *Eleocharis* spp. (see Appendix for a full species list), *Schoenoplectus*, *Carex* spp., *Isolepis* spp., *Cyperus* spp., pink bindweed (*Calystegia sepium*), *Polygonum* spp., *Epilobium* and even small aquatic native herbs where the margin had not been disturbed by stock. These included *Myriophyllum propinquum*, *Lilaeopsis*, *Glossostigma* and the yellow flowering north American *Utricularia gibba*.

We saw freshwater mussel (*Hyridella menseii*) shells on the lake margin. This mussel had previously been recorded in Lake Ototoa and Kauwhakatai but not Kereta (Department of Conservation pers. comm., 1993).

We saw koi carp (*Cyprinus carpio*) which were first recorded in the lake in 1987 (DoC pers. comm.). The Department of Conservation has also informed me that there have been a number of other illegal fish species introductions to the lake: tench were introduced in 1974; rudd were introduced prior to 1978 and together with tench form a major fishery on the lake; perch were also introduced but it is unknown if they were successful.

The only known native fish in the lake is the common bully; even koura or freshwater crayfish have not been recorded for this lake (Department of Conservation pers. comm.).

Conservation Issues

Browsing mammals

The highly modified, non-regenerating bush is due to a long history of browsing. If the stock and feral deer could be excluded the vegetation should recover quite quickly as the bush canopy is still intact and there is a reasonable native seed source in the area. Possums must also be having an impact on the vegetation.

In Woodhill Forest there are possums, feral pigs, fallow deer and also the occasional report of a red deer. All of these animals are destructive to the environment and may also carry TB. For

these reasons their numbers should be severely reduced or preferably these animals be eradicated from all natural areas of Woodhill.

Aquatic Weeds

The main aquatic weed problem is the Manchurian wild rice which was first collected at Lake Kereta in January 1950 by N.T. Moar with the note that it "occupies the southern end and is apparently spreading" (CHR 69956). Therefore its spread has not been extremely rapid as it has probably been present for well over half a century and it has yet to establish in the northern third of the lake. If Lake Kereta is to retain its indigenous character this grass, which smothers everything in its path, must be eradicated. Wild rice sets seed but its viability in New Zealand is unknown. It is probably very low. Recent trials using a combination of herbicides have shown good control of wild rice, but environmental impacts of the spray have yet to be assessed (P. Champion pers. comm., 1993).

To a lesser extent the water lilies also intrude on the native character of the lake and should be removed while they are still limited in their distribution.

The other adventive species are generally smaller, do not stand out from the native vegetation, and do not appear to be adversely affecting native species. Although *Azolla pinnata* has replaced the native *A. rubra* in northern New Zealand (Brownsey and Smith-Dodsworth 1989), and *Utricularia gibba* is possibly replacing *U. australis* in the Auckland Region (e.g. in Bethells Swamp) (pers. obs.).

Terrestrial weeds

The worst weed is woolly nightshade which covers two small dried-out lakes. If the browsing could be eliminated to allow regeneration to occur it would be interesting to see if woolly nightshade would be replaced in the long term by indigenous species. Currently, shade tolerant native tree species are virtually absent from the area. In the absence of woolly nightshade, manuka and kanuka would have invaded these sites (as I have seen occur elsewhere in Woodhill Forest). It is now too shaded for tea tree to invade. If the woolly nightshade was killed, tea tree should invade the following autumn-winter. But the area may have to be weeded, until the tea tree is well established, to prevent re-establishment of woolly nightshade or other exotic species invading (e.g. pampas grass).

Moth plant (*Araujia sericifera*) is an abundant weed in urban Auckland and is only beginning to spread to natural areas. The single patch amongst the kanuka at Lake Kereta could easily be eradicated at this stage. The only other weeds present that should be managed or eradicated are the pampas grasses (*Cortaderia jubata* and *C. selloana*) and tree lupin (*Lupinus arboureus*), which all require full sun. The single patch of Mexican devil (*Ageratina adenophera*) would be good to eradicate as well.

Fish

It is damaging to our indigenous ecosystems when people introduce exotic fish to New Zealand waterways. Omnivorous species like koi carp could severely reduce the native aquatic vegetation. Ideally the introduced species should be eradicated from the lake.

Birds

Currently water skiing is a permitted activity of the operative Rodney District Plan on Lake Kereta. Because this lake is an important bird habitat water skiing should be banned. On such a small lake there is no need for any motorised boats. In fact, recreational boating is the agent most commonly implicated in the spread of submerged weed species (Brown 1975). Boat trailer access should be prohibited as a control on aquatic weeds and disturbance to bird life.

Tenure and Management

To give the Crown full control of the lake it should purchase the privately owned portion of the lake bed.

The native bush area needs to be encouraged to spread and form a band for at least 300 m wide around the lake on the Carter Holt Harvey leased land. Because this zone contains few pine plantings this should cause little conflict (other private land owners would be unaffected). Such an area would form a native backdrop to a scenic lake when approached by road; it would increase the present bush area by some three times, making it a more viable ecosystem; and it would eliminate open areas which can become dominated by weeds, e.g pampas grass and lupin. Native forest on these established dunes is very poorly represented in the Ecological District and must be retained or enhanced wherever possible.

Conclusion

Despite its modified state, with the right management, the picturesque lake and adjacent bush areas have the potential to increase as an important habitat for native biota (both terrestrial and fresh water). Lake Kereta and its adjacent bush is part of a long narrow chain of native forest and freshwater areas inland and parallel to the coast. Any reduction in this chain weakens its effectiveness to function as a native corridor for biota. Lake Kereta could also be a popular recreation destination with interesting lake and bush walks. The two main priorities are to get an agreement between adjacent landowners / managers to coordinate the management of the area to improve the indigenous habitats and then to exclude the stock and feral deer from the lake edge and bush areas. Other conservation measures such as bush extensions, weed control and exotic fish eradication could then follow.

Acknowledgments

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Appendix: Lake Kereta and adjacent bush vascular plant species list

Ferns (12)

Asplenium flaccidum s.s	r
A. oblongifolium	r
*Azolla pinnata**	c

Cyathea medullaris	r
Dicksonia squarrosa	r
Doodia media	o
Histiopteris incisa	r
Phymatosorus pustulatus	o
Polystichum richardii	r
Pteridium esculentum	o
Pteris tremula	o
Pyrrosia eleagnifolia	o

Dicots (44)

*Ageratina adenophora**	lc
*Araujia sericifera**	r
Calystegia sepium	c
Cassinia leptophylla	l
Carmichaelia cunninghamii	o
*Chenopodium ambrosioides**	l
*Conyza albida**	o
Coprosma rhamnoides	a
Epilobium pallidiflorum	l AK 215294
Glossostigma elatinoides	lc
Kunzea ericoides	a
Leptospermum scoparium	o
Leucopogon fasciculatus	o
Lilaeopsis novae-zealandiae	l
*Lotus pedunculatus**	c
*Ludwigia palustris**	c
*L. peploides**	l AK 215298
*Lupinus arboreus**	l
Melicytus ramiflorus	o AK 212723
Muehlenbeckia complexa	c
Myriophyllum propinquum	c AK 215299
M. triphyllum	c PC
Nymphaea "a"*	l AK 215287-88 (presumed planted)
N. "b"*	l AK 215289-90 (presumed planted)
N. "c"*	l AK 215291-93 (presumed planted)
Parsonsia heterophylla	c
*Physalis peruviana**	r
*Phytolacca octandra**	o
*Polygonum punctatum**	l
P. salicifolium	c
Pseudognaphalium luteoalbum agg.	lc AK 215300
Pseudopanax ferox	FH
*Ranunculus trichophyllus** (as *R. fluitans*)	RM
*Rumex acetosella**	l
*Senecio bipinnatisectus**	c
*S. diaschides**	lc
*S. eslerii**	r
S. glomeratum	l
S. hispidulus	o
Solanum aviculare	r
*S. mauritianum**	la
Wahlenbergia gracilis	l

*Utricularia gibba**	lc AK 215302
*Verbena bonariensis**	r

Monocots (39)

*Ammophila arenaria**	lc
*Anthoxanthum odoratum**	c
Baumea juncea	c
Carex pumila	lc
C. testacea	c-a AK 215295
C. virgata	lc
Cordyline australis	o
*Cortaderia jubata**	o
*C. selloana**	r
C. splendens	o
*Cyperus brevifolius**	lc
C. congestus	lc
*C. sanguinolentus**	lc AK 209912
C. ustulatus	lc
Eleocharis acuta	lc
E. sphacelata	l
*Eleusine indica**	o
*Festuca arundinacea**	o
Isolepis nodosa	o
I. prolifera	lc
*Juncus articulatus**	c AK 215296
*J. effusus**	o
J. pallidus	o
J. planifolius	o AK 215297
*J. tenuis**	l AK 215301
Lepidosperma laterale	l
Leptocarpus similis	l
Microlaena stipoides	c
Oplismenus imbecillis	o
*Paspalum dilatatum**	o
*Pennisetum clandestinum**	c
Phormium tenax	r
Potamogeton cheesemanii	o PC
*P. crispus**	o PC
Schoenoplectus validus	l
*Spirodela punctata**	c
*Sporobolus africanus**	c
Typha orientalis	lc
*Zizania latifolius**	la AK 212722; CHR 69956, 214665, 463451

a = abundant
c = common
o = occasional
l = local
r = rare (< 5 plants seen)
* = adventive species

AK = Auckland Museum herbarium voucher number
CHR = Landcare Research, Lincoln herbarium voucher number
PC = pers. comm. Paul Champion (from 1988 survey)
FH = pers. comm. Frank Hudson (1950's observation)
RM = Ruth Mason (1975)