Endangered Species Foundation

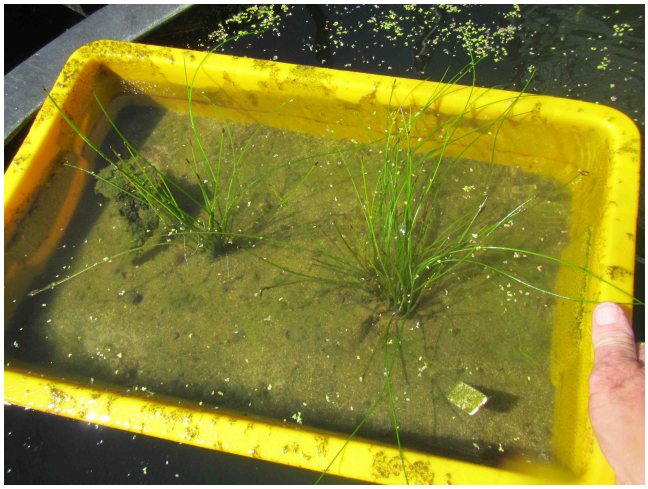
Protecting New Zealand's rarest of the rare

Lake Omapere Quillwort

Isoetes aff. *kirkii* (CHR 247118A; Lake Omapere)

Conservation Status: Nationally Critical

Rediscovering a treasure



Lake Omapere quillwort in cultivation. Rohan Wells, NIWA

Quickfacts

Only found in Lake Omapere and Wairoa Falls, Northland, where it is now extinct

Died out due to massive changes in the lake's ecology

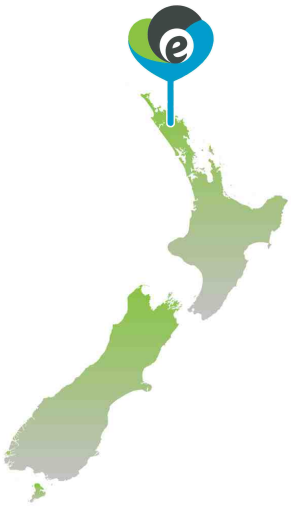
Now only survives in aquariums

Lake Omapere is a taonga of its Nga Puhi kaitiaki

Wai ora - water quality

Northland was one of the choicest locations to live during the early years of human colonisation of New Zealand. Its warm climate and fertile forests, coasts, rivers, harbours and lakes produced high numbers of food plants and animals such as kukupa (pigeon), tī kōuka (cabbage tree), pikopiko (fern shoots), tuna (eel), kōkopu (freshwater fish), kuta (rush), pipi, tuatua and toheroa (surf clams), kākahi (freshwater and marine mussels), harakeke (flax plant), weka (woodhen), kōura (freshwater and marine crayfish) and many other birds, fish, plants and shellfish.

The lake at Omapere was a taonga (treasured place) of Ngapuhi (the Maori Iwi who live in the surrounding lands) and this food basket provided them with tonnes of tuna and other kai (food), and its water was so fresh it supplied the town of Kaikohe. However, New Zealand's lakes have a chequered recent history. Some, mainly alpine, lakes have remained nearly pristine since people arrived in New Zealand. Examples of these are lakes Taupo, Waikareiti, Rotoroa & Rotoiti, Ohau, Pukaki, Wakatipu, Mavora, Wanaka, Borland and Te Anau, which are renowned for their scenic beauty, fisheries, and



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recreation opportunities. Unfortunately, other lakes have had a more damaging history. These are mainly lowland lakes, where changes in both the surrounding landscape and within the lake itself alter its ecology and nature, and which, if unchecked, result in a lifeless (eutrophic) morass of bad-smelling, rotting vegetation and few native animals or plants.

It is human use of the land that can result in such a lifeless lake, and the effects of this use are often insidious, cumulative and interacting. Removing the forest cover around a lake increases the amount of sediments and nutrients that flow into the lake, and also lets the sun warm the water more, decreasing the amount of oxygen the water can hold. Also removing large quantities of the fauna, such as kākahi, reduces the lake's ability to filter out algal growths. Removing a lake's fringing vegetation results in nutrients not being captured before they enter the lake, and also decreases the amount of shade required by many of the native flora and fauna. The movement of people between areas brings in new weeds and pests, which often find the now-altered lake habitat perfect and can spread explosively. Rampant weed growth can outgrow the available light and nutrients and die, resulting in putrid rafts of partly decomposed plants. As the rafts decay they deplete the lake's oxygen, suffocating the fish and other aquatic fauna. High sediment and nutrient loads entering the lake promote blooms of algae and bacteria which also deplete the lake's oxygen and make the water murky, dramatically decreasing the amount of light reaching the lake floor. Adding fertilisers or increasing the biomass of animals living on surrounding land results in even higher inflow of nutrients into a lake - unless the fertiliser is added carefully and the land and its drainage system is well managed. Various combinations of these factors has resulted in over 1,000 (44%) of New Zealand's lakes larger than 1 ha being classified as eutrophic (or close to it).

Lake Omapere nearly died in such a collapse: weed growth was so thick it could be walked upon, the surface was covered in a layer of foam, and it was filled with toxic levels of algae. The weed growth attracted 17,000 black swans, whose droppings further fouled the water. As well as destroying Lake Omapere's ability to provide food and water, the toxins created by decay of the algae flow from the lake and poison the Utakuri River and the Hokianga Harbour into which it flows.

Lake Omapere, 4 km north of Kaikohe, is the largest lake in Northland at 1,214 hectares. It formed when a basaltic volcanic eruption blocked and partly infilled a shallow valley some 80,000 years ago. It is very shallow, and at times it has been almost completely covered by a wetland. Historically it contained a range of plant communities, and important fragments of these remain. Nineteen rare or endangered species have been recorded from the lake (the highest number of any site in Northland). The collapse of Lake Omapere nearly caused the extinction of a small, inconspicuous, innocuous plant that scientists know as *Isoetes* aff. *kirkii* (CHR 247118A; Lake Omapere) as this lake is the only place where it was known to survive. A member of the quillwort family, which are primitive aquatic ferns, it differs genetically (and slightly in appearance) from the

two other quillwort species in New Zealand. It does not yet have a scientific name, hence the long unwieldy name. It was first discovered in Lake Omapere by G.B. Rawlings in 1972, who found it inhabiting stony muds between rocks in shallow areas of the lake. Some plants that may also be this species were known to inhabit the Wairua River above Wairua Falls and in a few other Northland lakes, but are no longer known at these locations. *Isoetes* plants require clear water and high light, and as the water quality in Lake Omapere declined (the water was considered undrinkable in 1985) the number of *Isoetes* plants would have decreased. In 2001, it was thought extinct, but careful searching found four plants and now 12 *Isoetes* plants are being carefully grown in a NIWA aquarium. The Department of Conservation (DOC) is also gaining experience in cultivation through growing the related *Isoetes kirkii*.

Renewing a taonga - restoration of Omapere

Lake Omapere is a taonga (treasure) of its kaitiaki (guardians) Nga Puhi, the people who have lived by its shores for generations and who value it as a food basket. Efforts have been made to renew Lake Omapere, and Nga Puhi have planted 160,000 harakeke (flax) along the shores of the lake. In 2002, 20,000 weed-eating grass carp (*Ctenopharyngodon idella*) were released into the lake to help bring the dense growths of oxygen weed *Egeria densa* under control. Coincidentally, this was about the time that the oxygen weed outstripped its nutrients and died in spectacular and huge masses. Grass carp have been used to successfully eradicate oxygen weed from several lakes and ponds in New Zealand, and it appears that they have been successful at eliminating oxygen weed from Lake Omapere as no plants have been seen for several years. Many of the wetlands in Northland are of very high ecological value, and Lake Omapere is ranked as the 11th most important wetland in Northland. New Zealand's lakes are classified by Landcare Research as vulnerable, originally rare ecosystems.

What next?

The threats to the survival of *Isoetes* aff. *kirkii* are:

1. The health of Lake Omapere.
2. The very few plants that remain.
3. Other demands for the lake's water.
4. Reintroducing a plant into a waterway occupied by an exotic plant-eating fish.

Successfully protecting *Isoetes* aff. *kirkii* from these threats must be achieved in order for a conservation programme to succeed. Ideally, this should be done by:

1. Building strong relationships: Mā te rangitāmiro i ngā weu e torokaha ake ai
Returning *Isoetes* aff. *kirkii* to Lake Omapere requires a strong relationship between those who can make it happen: Nga Puhi, Northland Regional Council, NIWA and DOC.

Building this relationship does not require money, but it will need people to act together.

2. Improving the quality of water in Lake Omapere: Te roto waiora
Improving Lake Omapere's water quality will require collaboration between many people over many years. Key agencies are Nga Puhi, Northland Regional Council through the Waiora Northland Water programme, local farmers, DOC and the National Institute of Water and Atmosphere.

Further improving the water quality of Lake Omapere is likely to cost at least $500,000 and take many years.

3. Increasing the number of plants in cultivation:
The small number of *Isoetes* aff. *kirkii* plants being grown at only one site increases the risk of losing all the plants in an unforeseen calamity. The number of *Isoetes* aff. *kirkii* plants in cultivation needs to be increased to at least 500 held at three different sites. One potential site is the old Fish and Game hatchery ponds near Kerikeri. Additional plants will need to be grown to support a reintroduction programme.

Increasing the number of *Isoetes* plants and keeping them for ten years is likely to cost $296,000 (including staff time). The Auckland Botanic Gardens and a specialist plant grower in Dunedin are currently practicing growing the related *Isoetes kirkii* as a step towards growing *Isoetes* aff. *kirkii*.

4. Reintroducing Isoetes aff. kirkii to Lake Omapere: Haere mai Isoetes. Nau mai! Nau mai!

Isoetes aff. *kirkii* should be reintroduced into Lake Omapere in a Nga Puhi-led project. Submerged stainless steel exclosure cages will be needed to protect *Isoetes* aff. *kirkii* from the grass carp that remain in the lake. Plants will need to be held down by a buried mesh grid to prevent them being washed away. The reintroduction programme will require five years of planting *Isoetes* that has been sourced from the cultivated

population.

The *Isoetes* aff. *kirkii* Lake Omapere reintroduction programme is likely to cost $32,000 over five years.

More information

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