

## Poutō Peninsula

Lake Karaka (Poutō), NRC Lake No. 347.



**Lake Karaka.** Photo taken from the tall pasture covered dunes to the east of the lake. (Photo: Paul Champion 11 August 2022).

Summary	Lake Karaka
<b>Surveyed:</b>	2005, 2007, 2012, 2015, 2018 and 2022.
<b>Overall ranking:</b>	<b>High:</b> Hornwort incursion detected in 2021, reducing Lake Karaka ranking. Prior to this the lake was outstanding, with an indigenous vegetation (no <i>U. gibba</i> ) and fauna, much of the margin surrounded by wetland with nationally endangered plants, fish and birds present.
<b>Threats:</b>	Hornwort will cause a major impact on other submerged biota. Water quality is currently poor with submerged vegetation collapse occurring in May 2015. Water quality is likely to be impacted by farming intensification and forest fertilization and harvesting within the catchment.
<b>Management Recommendations:</b>	Instigate an eradication programme for hornwort and continue annual monitoring. Determine the drivers of poor water quality and consider remedial actions.

## Description

This dune lake (1693415E, 5980559N) is 11.1 ha in size and 5.4 m deep with an undulating bottom. The staff gauge measured 10.04 m in August 2022. It is one of the lakes situated on the south-western Poutō Peninsula between consolidated dunes to the east and mobile dunes to the west. The immediate catchment is pastoral (25%), and flax/sedge/raupō wetlands (75%) extend to the north and south of the lake, linking it with other water bodies with mobile sand dunes at the western end. There are no inflow or outflow streams.

Access is difficult through forestry roads and rough pasture over consolidated dunes. The lake has 4- WD access only, with difficult boat access.

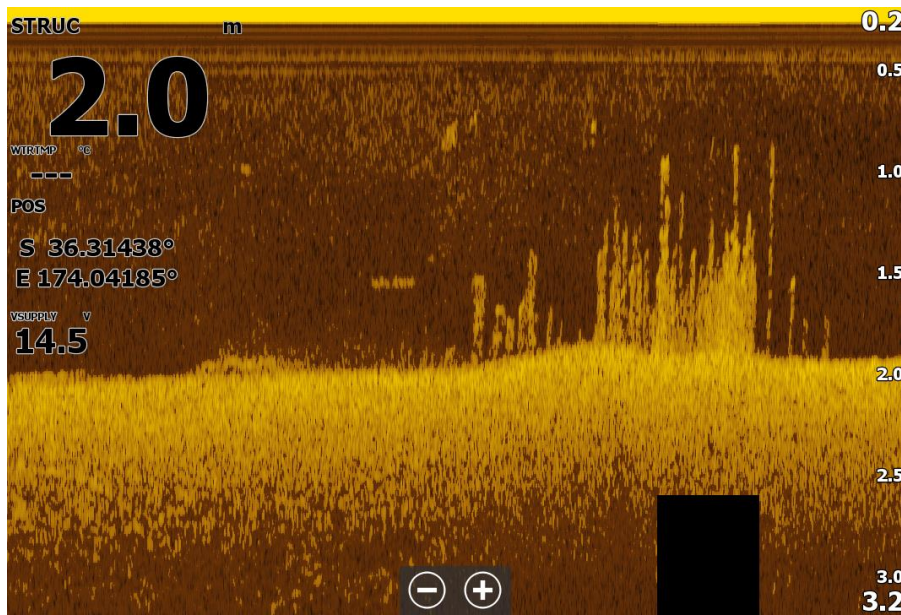
## Wetland vegetation

Emergent species encircle most of the lake, except the margin bordered by pasture and open to cattle grazing. *Typha orientalis* and *Machaerina articulata* dominated. These extended over a 20 m wide band in most areas growing to depths of 1.5 m. Other emergent species seen included *Apodasmia similis*, *Carex maorica*, *Carex secta*, *Cyperus ustulatus*, *Eleocharis acuta*, *Isachne globosa*, *Isolepis prolifera*, *Juncus pallidus*, *Machaerina arthrophylla*, *M. juncea*, *Schoenoplectus tabernaemontani*, harakeke and tī kōuka. The fern *Thelypteris confluens* was common amongst the *M. juncea* vegetation.

## Submerged vegetation

Until July 2021, only native vegetation was recorded in this lake. An incursion of hornwort (*Ceratophyllum demersum*) was noted by Andrew Knock (DOC, email 1 July 2021) and a delimitation survey by Marine Environmental Field Services (MEFS) in August 2021 found two 10 m<sup>2</sup> dense areas of this plant in the southeastern part of the lake, with scattered fragments or small clusters of plants elsewhere around the lake (Sutton 2021).

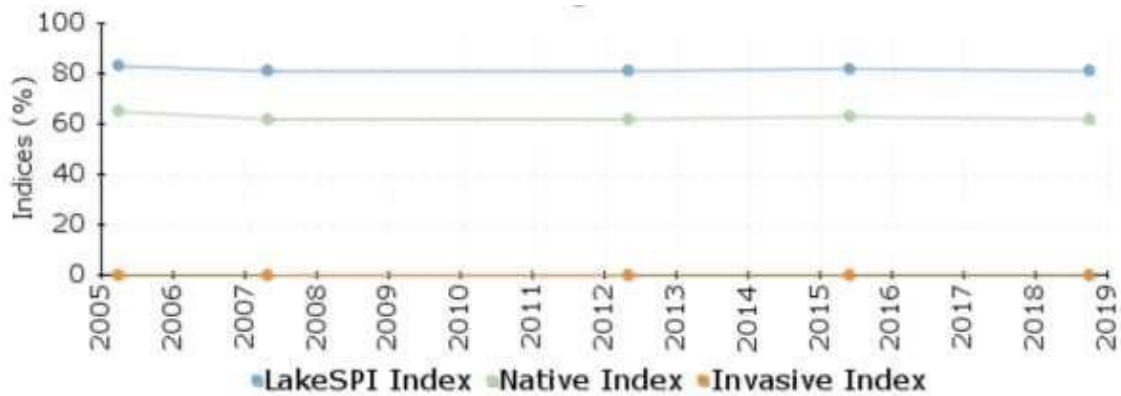
The 2022 survey was restricted to submerged vegetation sampling of rake throws and sonar, due to planktonic cyanobacterial blooms. Water clarity was estimated at 1 m. Hornwort was sampled at 15 of the 17 sites investigated by rake throws to a maximum depth of 5.1 m, with significant quantities sampled on 8 occasions at all LakeSPI transects. Additional species (in order of abundance) included *Potamogeton cheesemanii*, *Chara australis*, *P. ochreatus*, *Myriophyllum triphyllum* and *M. propinquum*.



**Beds of *Chara australis* (left) and taller *Potamogeton cheesemanii*, with dense hornwort (right) detected by sonar in August 2022**

Prior to the hornwort incursion (2018), the dominant species was *Chara australis*, which grew to a maximum depth of 2.4 m, in meadows up to 1.5 m tall. Another charophyte, *C. globularis* was recorded in the lake for the first time. The vascular species *Myriophyllum triphyllum* and *Potamogeton cheesemanii* were locally abundant, with lesser amounts of *P. ochreatus*. The submerged vegetation had recovered from a partial vegetation collapse in 2015, most likely resulting from shading by dense algal blooms.

### LakeSPI



Survey Date	Status	LakeSPI %	Native Condition %	Invasive Impact %
September 2018	Excellent	81%	62%	0%
May 2015	Excellent	82%	63%	0%
April 2012	Excellent	81%	62%	0%
April 2007	Excellent	81%	62%	0%
March 2005	Excellent	83%	65%	0%

**Figure 3-11: LakeSPI results for Lake Karaka.** LakeSPI Indices expressed as a percentage of lake maximum potential.

Prior to the hornwort incursion, Lake Karaka was categorised as being in excellent ecological condition with a LakeSPI Index of 81%. No LakeSPI score was generated in 2022 as this survey relied on sonar and rake sampling, rather than Scuba. However, the invasive impact is likely to be significant and will likely result in a decreased score compared to previous assessments.

### Water birds

The extensive wetland areas provide outstanding habitat for water birds. Dabchick (*Poliiocephalus rufopectus*), little black shag (*Phalacrocorax sulcirostris*), scaup (*Aythya novaeseelandiae*), paradise shelduck (*Tadorna variegata*), pukeko (*Porphyrio melanotus*) and black swan (*Cygnus atratus*) were seen in 2018. Other threatened species previously reported included bittern (*Botaurus poiciloptilus*), banded rail (*Rallus philippensis assimilis*) and spotless crane (*Porzana tabuensis plumbea*).

### Fish

Common bullies (*Gobiomorphus cotidianus*) were very common, with most specimens having swollen abdomens indicative of an infestation of endoparasitic cestode or trematode species. Both longfin and shortfin eels (*Anguilla dieffenbachii* and *A. australis*) and inanga (*Galaxias maculatus*) are reported from this lake and several eels were seen during most surveys, including 2018. Giant kokopu (*Galaxias argenteus*) have been collected from Lake Karaka (T. Birch, DOC pers. comm.) but none were found during a joint NRC and DOC survey in early 2022.

### Aquatic invertebrates

Snail feeding native leeches were noted in 2018. The native snail *Potamopyrgus antipodarum* was recorded from one profile in 2015.

### Endangered species

The At risk – Declining longfin eel (*Anguilla dieffenbachii*), inanga (*Galaxias maculatus*) and giant kokopu (*Galaxias argenteus*) have all been recorded from Lake Karaka. The At risk Naturally Uncommon *Theypteris confluens* was common, growing amongst emergent *Machaerina juncea* at the water's edge. Threatened birds seen in 2018 included At risk: Recovering dabchick and At Risk Naturally Uncommon little black shag. Bittern were seen by NRC at the lake in August 2022.

### Lake Ecological Value

A provisional ecological value rating of “12- high” has been assigned to Lake Karaka with a decrease in water quality. Impacts of hornwort are likely to have decreased the native aquatic vegetation condition score which will decrease unless management of this weed is undertaken. Even prior to the hornwort incursion submerged vegetation collapse was noted in 2015 and similar events may occur in the future.

### Threats

Despite the relative isolation and difficulty of access, with an earlier assessment of risk of introduction of pest species regarded as low, hornwort has established in Lake Karaka. In the absence of management, it will significantly impact indigenous biota. Nutrient enrichment from land management in the catchment (or of the aquifer) may be the cause of algal blooms and low water clarity noted. Decline of charophytes in 2015 is indicative of the lake being close to flipping from a clear water macrophyte dominated state to a turbid planktonic algal dominated state.

## Management recommendations

A programme to control and hopefully eradicate the hornwort incursion has been discussed and agreed with landowners and Northland Regional Council, with input from Department of Conservation and NIWA. Lake native biodiversity value monitoring and pest plant surveillance should be undertaken annually until no hornwort has been detected for five years.

A consideration of nutrient sources from the catchment might reveal why this lake is so enriched and inform possible mitigation measures.

## References

Sutton, B. (2021) Lake Karaka hornwort delimitation. MEFS Dive Report: 11 August 2021.