

Poutō Peninsula

Lake Mokeno (Poutō), NRC Lake No. 356.



Lake Mokeno. Photo taken from the western edge of the lake looking south. (Photo: Paul Champion 10 August 2022).

Summary	Mokeno
Surveyed:	2005, 2007, 2012, 2015, 2016, 2018 and 2022.
Overall ranking:	High: A large lake set in a wetland / scrub / dune complex covering the south- western Poutō Peninsula, which contains nationally significant populations of endangered biota. Formerly with an intact native submerged vegetation, but prolonged poor water clarity has led to vegetation decline, with very limited submerged vegetation in 2022.
Threats:	Nutrient inputs from land use in the catchment has led to an enriched (supertrophic) water quality causing algal blooms and loss of most submerged vegetation. Submerged weed invasion is unlikely due to the lake's isolation. Royal fern (<i>Osmunda regalis</i>) is present in the surrounding vegetation and poses a severe threat to the wetlands surrounding this lake and elsewhere in the region.
Management recommendations:	Determine the drivers of poor water quality and consider remedial actions. A nutrient budget is recommended. Algal blooms indicate nutrient threat to ecological condition. Ensure royal fern management continues to mitigate its impact on marginal vegetation. Five yearly surveillance for pest plants and lake native biodiversity value monitoring.

Description

Lake Mokeno (1695174E, 5977171N) is a dune lake 148.3 ha in area with a 6.1 m maximum recorded lake depth. The catchment is mostly kanuka scrub adjacent to pine plantation forestry, with large areas of wetland and some unconsolidated dunes on the western margin. There are no inflow or outflow streams, but it appears that water flows south from the lake towards Lakes Otapuiti and Whakaneke, eventually discharging to the entrance to Kaipara Harbour via an extensive wetland.

Access to the northern end of the lake is through forestry and Māori land (7 km of well-formed tracks) requiring access through a locked gate. Small boats can be launched with difficulty using a 4- WD.

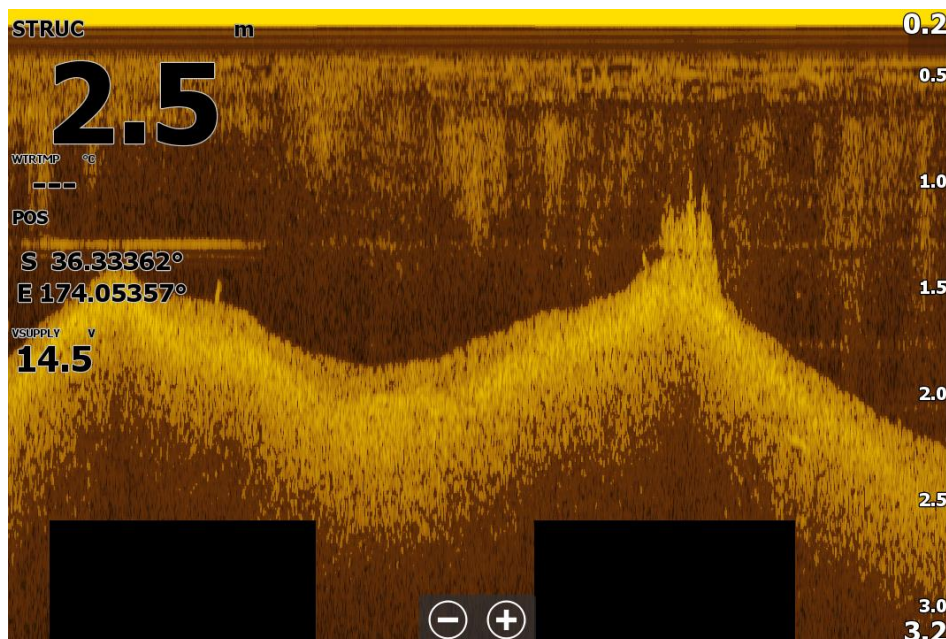
Wetland vegetation

The lake was surrounded by extensive beds of emergent species up to 20 m across and extending from the lake edge to 2 m deep. Species included *Typha orientalis*, *Eleocharis sphacelata*, *E. acuta*, *Machaerina articulata*, *M. arthrophylla*, *M. rubiginosa*, *M. juncea*, *Schoenoplectus tabernaemontani*, *Carex secta* and *Phormium tenax*. This vegetation merged into a manuka (*Leptospermum scoparium*) / flax (*P. tenax*) wetland zone around much of the lake. At the south-east end of the lake a distinctive *C. secta* / *M. arthrophylla* / *Thelypteris confluens* wetland was noted. *Thelypteris confluens* was also found on the lakeward edges of flax and *C. secta* tussocks. The invasive royal fern (*Osmunda regalis*) is presently being managed at the northern end of Lake Mokeno by DOC. This species poses a severe threat to the wetlands surrounding this lake and elsewhere in the region.

Submerged vegetation

Only native submerged vegetation has been recorded in Lake Mokeno.

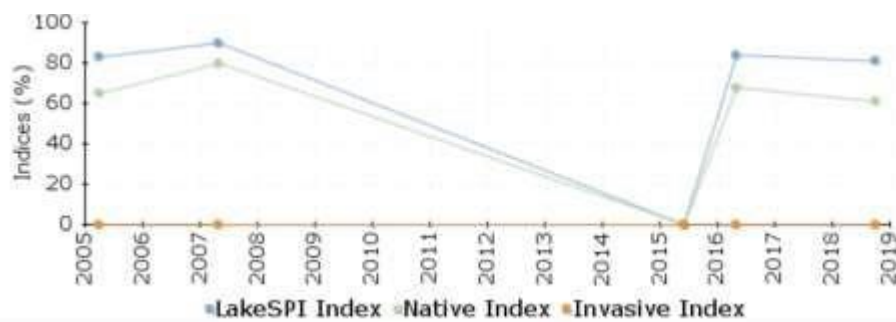
In 2022, no submerged plants were recorded on the five LakeSPI transects. Planktonic cyanobacterial blooms and poor water clarity (< 0.3 m) at the time of survey restricted sampling to rake throws and sonar. Away from the transects, *Myriophyllum triphyllum*, *Chara australis*, *Potamogeton ochreatus* and *P. cheesemanii* were occasionally sampled with beds of *M. triphyllum* growing over 1 m tall at one site.



Local beds of *Myriophyllum triphyllum* detected by sonar in August 2022

In 2005 and 2007, the lake had clear water and was 100% vegetated with a charophyte meadows recorded to 6 m deep. In 2012, water clarity was poor with a dense algal boom and the deep charophytes were rotting in situ. In 2015 submerged plants were present but only within a few metres of the edge of the emergent vegetation, to a maximum depth of 2.5 m, and at average covers less than 10%. In 2016, partial recovery was evident, the vegetated depth range had extended to a maximum depth of 4.2 m at covers between 10 and 20%. *Chara australis* was the most common submerged plant with lesser amounts of *Potamogeton ochreatus*, *Chara globularis* and *Myriophyllum triphyllum*. In 2018, the submerged vegetation was variable in cover, with *C. australis* the dominant species with maximum covers greater than 50% and the deepest vegetation (*P. ochreatus*) was recorded at 3.1 m.

LakeSPI



Survey Date	Status	LakeSPI %	Native Condition %	Invasive Impact %
September 2018	Excellent	81%	61%	0%
April 2016	Excellent	84%	68%	0%
May 2015	Non-vegetated	0%	0%	0%
April 2007	Excellent	90%	80%	0%
March 2005	Excellent	83%	65%	0%

LakeSPI results for Lake Mokeno. LakeSPI Indices expressed as a percentage of lake maximum potential.

In 2018, Lake Mokeno is categorised as being in excellent ecological condition with a LakeSPI Index of 81%, one of the highest LakeSPI indices recorded for the Northland lakes. No LakeSPI score was generated in 2022 as this survey relied on sonar and rake sampling, rather than Scuba. Based on these sample methods, no submerged vegetation was detected which would suggest a LakeSPI score of 0 (a similar result to 2015).

High LakeSPI scores recorded for the lake in 2005 and 2007, reflected the quality of native submerged vegetation in Lake Mokeno and lack of any invasive species. A LakeSPI survey planned for April 2012 could not be carried out due to very poor clarity and a dense algal bloom, but was likely to still be high as grab samples confirmed charophyte meadows were still present beyond a depth of 5.3 m, although plants were noted as rotting *in situ*. Plant collapse followed at some point after that survey and an absence of submerged plants resulted in a LakeSPI Index of zero in 2015. In 2016, the LakeSPI status had returned to excellent. In 2018, charophyte meadows were only present in two of the five profiles (present at all five sites in 2016), growing to slightly shallower overall maximum depths.

Water birds

The indigenous scrub, wetland and emergent margins provide excellent water bird habitat reflected in the large number of species reported from this lake and seen during the field visit. Bittern (*Botaurus poiciloptilus*), dabchick (*Poliiocephalus rufopectus*), mallard duck (*Anas platyrhynchos*), grey teal (*Anas gracilis*), scaup (*Aythya novaezeelandiae*), black swan (*Cygnus atratus*), little black (*Phalacrocorax sulcirostris*) and little shag (*Phalacrocorax melanoleucos*) were noted in 2018. Other threatened species reported include banded rail (*Rallus philippensis assimilis*), spotless crake (*Porzana tabuensis plumbea*), and formerly the critically endangered brown teal (*Anas aucklandica chlorotis*) were also recorded in this area.

Fish

The lake represents good habitat, with fish access to the sea. Species recorded were common bully (*Gobiomorphus cotidianus*), īnanga (*Galaxias maculatus*), smelt (*Retropinna retropinna*) and shortfin eel (*Anguilla australis*). Longfin eel (*Anguilla dieffenbachii*) were also reported in Lake Mokeno. A possible sighting of grey mullet (*Mugil cephalus*) was made during the 2012 visit, which, if confirmed, would indicate temporary connection of Lake Mokeno to the sea during high water events.

Aquatic invertebrates

No living freshwater mussels (*Echyridella menziesii*) have been found since 2015. Mussels were previously common and introduced freshwater jellyfish (*Craspedacusta sowerbyi*) were also noted in previous surveys.

Endangered species

The At Risk Naturally Uncommon *Thelypteris confluens* was common, growing amongst emergent species at the water's edge and in the wetland to the south of the lake, with Poutō being the national stronghold of this species.

Threatened birds noted in 2018 included the Nationally Critically Endangered Australasian bittern, At Risk Recovering dabchick and At Risk Naturally Uncommon little black shag.

The At Risk Declining longfin eel (*Anguilla dieffenbachii*) and īnanga (*Galaxias maculatus*) have been recorded from Lake Mokeno.

Lake Ecological Value

The Lake Ecological Value score for 2022 is 9 "High-Moderate", a decline from 13 "Outstanding" in 2018. The frequent poor water clarity and cyanobacterial blooms has led to at least two devegetation events with loss of most submerged plants and freshwater mussels. The aquatic ecology of this lake is in an unstable state.

Threats

The catchment is well buffered by an extensive wetland and surrounded by indigenous scrubland, but water quality and observations of algal blooms indicate nutrient enrichment from land use or climatic factors influence the catchment.

No pest plant or fish impacts are evident and the likelihood of introduction of freshwater pests are low. However, royal fern (*Osmunda regalis*) could invade large areas of the wetland fringe.

Management recommendations

Algal blooms had severely reduced in-water ecological values in this lake from 2012 to 2016, so analysis of water quality monitoring and investigation of ground water nutrient fluctuations is required to determine the nutrient sources and the potential to mitigate these.

Ensure royal fern management continues to mitigate its impact on marginal vegetation.

It is recommended that lake native biodiversity value monitoring and pest plant surveillance is undertaken every five years.