North of Dargaville

Lake Taharoa (Kai-Iwi Lakes), NRC Lake No. 229.

Lake Taharoa showing exposed emergent vegetation despite the extremely high rainfall events experienced over the summer. (2023, Paul Champion).

Summary	Lake Taharoa
Surveyed:	1985, 1987, 2001, 2005, 2007, 2011, 2014, 2018 and 2023.
Overall ranking:	**Outstanding**: A native plant dominated lake, with nationally rare plants and *U. gibba* the only pest plant species present. However, submerged vegetation fell below the abundance threshold to calculate LakeSPI, water clarity appears to be declining and water level appears to be very low despite the high rainfall experienced over the 2023 summer. In 2018, it was reported as the best example of a clear-water lake in Northland, with the deepest recorded (27.5 m) submerged vegetation in the North Island.
Threats:	The lake has a high risk of pest plant introduction but currently with the subsequent impact likely to be low, low due to very low nutrient status and steep bathymetry. Declining water quality and level is likely to reduce the Ecological Value Score in the future.

Management recommendations:	Pest plant surveillance is advised at access points annually. Monitoring native biodiversity values should be undertaken every year until submerged vegetation re-establishes. Further investigations as to the causes of water quality and level decline are required.

Description

This dune lake (1658567E, 6037260N) is the second largest (197 ha) and is the deepest lake (37 m) in Northland. It is a situated in a catchment comprised of ~1.8 M year old consolidated, nutrient-poor, sand dunes with shrub land, pastoral land and planted forest. The immediate surrounds include a domain with two camping grounds and the lake is popular for boating, swimming and water skiing. There are two minor inflows at the south-west end of the lake, with no outflow. 70% of the lake's water is sourced from rainfall[1]. Access is via public roads with three boat launching areas.

Wetland vegetation

In 2023, much of shore was wave exposed with a hard iron pan and compacted sand that is unsuitable for emergent vegetation. Low covers (25%) of oioi (*Apodasmia similis*) and *Schoenus brevifolius* were present in places. Additional emergent species recorded included *Machaerina arthrophylla, M. articulata, M. juncea, Eleocharis acuta, E. sphacelata, Ficinia nodosa, Isachne globosa, Isolepis prolifera* and *Juncus pallidus*.

The native emergent turf plant *Myriophyllum votschii* was found on the western shore of the main lake basin, growing amongst the introduced *Juncus bulbosus, J. capitatus* and various annual weeds.

Lake Taharoa on the western shoreline with sand dunes smothering *Machaerina juncea* (2023 Paul Champion).

[1] https://lakes380.com/lakes/taharoa/

There was good evidence of storm impacts from the recent Cyclone Gabrielle on the western shore of the main lake basin. Sand dunes had been created and these were smothering marginal sedges and manuka. Additionally, a large slip was observed on the eastern end of the lake.

Lake Taharoa showing a large slip in the eastern catchment behind the camping area (2023 Inigo Zabarte-Maeztu).

The major woody weeds on the lake surrounds were delimited during 2014 with Sydney golden wattle (*Acacia longifolia*), coastal banksia (*Banksia integrifolia*) and two wilding pines (*Pinus pinaster* and *P. radiata*) the dominant species found. Some control of wattles and pines have been undertaken (L-J Clark, Te Roroa pers. comm.)

Submerged vegetation

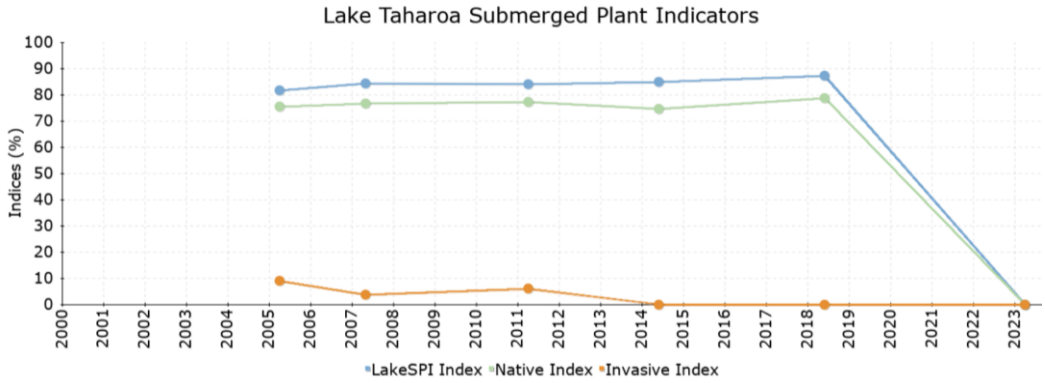
In 2023, the submerged vegetation was recorded as pale clumps, < 0.1 m tall, with covers estimated as less than the 10% cover threshold required to generate a LakeSPI result (three transects with a cover of 1% and two with a cover of 3%). Plants comprised three charophytes *Chara fibrosa, Nitella leonhardii* and *N. pseudoflabellata*, growing from a minimum depth of 3.5 m to 19.9 m.

Lake Taharoa showing patches of pale charophytes at a depth of 6m (2023, Svenja David).

This compared with the 2018 assessment, when sparse turf plants grew on the shallow (0-1 m) sandy substrates of the wave-cut shelves and included *Trithuria inconspicua, Triglochin striata* and *Myriophyllum votschii*. The exotic rush, *Juncus bulbosus*, was also recorded in these areas along with isolated plants of the bladderwort *Utricularia gibba*. Steep slopes immediately beyond these shelves were largely devoid of plants from 1 to 6 m. Charophyte meadows (>75% cover), dominated by *Chara fibrosa* and *Nitella leonhardii* (the deepest growing species) and lesser amounts of *N. pseudoflabellata* extended from 5.9 m to 27.5 m water depth.

The bottom depth limits of charophyte meadows have fluctuated from 18 to 27.5 m over the 8 surveys since 1984, but no trend in these fluctuations was apparent. On no occasion prior to 2023, was such a depauperate vegetation described.

LakeSPI



Survey Date	Status	LakeSPI %	Native Condition %	Invasive Impact %
March 2023	Non-vegetated	0.0%	0.0%	0.0%
May 2018	Excellent	87.2%	78.7%	0.0%
May 2014	Excellent	84.8%	74.7%	0.0%
March 2011	Excellent	84.0%	77.3%	5.9%
April 2007	Excellent	84.4%	76.7%	3.7%
March 2005	Excellent	81.6%	75.3%	8.9%

LakeSPI Index for Lake Taharoa as % of potential score since 2005. Native Condition Index, and Invasive Impact Index are also shown.

A Non-vegetated LakeSPI Index (default score 0%) was recorded in 2023. In all previous assessments, an Excellent LakeSPI score of >80% was obtained, reflecting the depth extent of vegetation, the predominance of the native charophyte community and lack of impact by invasive exotic plants. Prior to 2023, LakeSPI condition had remained very stable.

Water birds

The limited development of marginal and emergent vegetation and popular use of this lake by the public reduce its suitability for water birds. Despite this, large numbers of waterfowl are reported to utilise the Kai Iwi lakes. The regionally rare dabchick (*Poliocephalus rufopectus*) was reported from Lake Taharoa. Few birds were seen during the current survey.

Fish

Native fish sighted during surveys include common bullies (*Gobiomorphus cotidianus*), while the exotic pest gambusia (*Gambusia affinis*) were also observed. Previous surveys have recorded

shortfin eels (*Anguilla australis*) and rainbow trout (*Oncorhynchus mykiss*) stocked by Northland Fish and Game. Dune lakes galaxias were last recorded in a 1999 survey. There was a report of a koi carp (*Cyprinus rubrofuscus*) being seen in Lake Taharoa in 2021 by a member of the public. No further observations of this species have been made.

Aquatic invertebrates

Kēwai (*Paranephrops planifrons*) were observed at each transect site in 2023, but no freshwater crab (*Amarinus,* (previously *Halicarcinus*) *lacustris*) were observed.

Kēwai (*Paranephrops planifrons*) with the pale coloration usual in Lake Taharoa (2023 Aleki Taumoepeau)

Endangered species

The Nationally Endangered *Centrolepis strigosa,* an annual, was found in the marginal turf in 2010 and has been found in the same location subsequently, usually as dead plants. Over 100 plants of this species were found on iron pan outcrops and beach areas in November 2013. No sign of this species was found in most of these areas during our 2018 survey, suggesting our annual surveys do not correspond with the actively growing stages of its life-cycle. The National Critical *Trithuria inconspicua* was uncommon in this lake, with few plants seen during our shoreline survey in 2014. It was locally common at one site amongst *Machaerina arthrophylla* in the “Sin-bin” area. The At-Risk Relict sundew *Drosera pygmaea* was noted amongst mosses on iron pan outcrops.

The At-Risk Naturally Uncommon dune lakes galaxias (restricted to the Kai iwi lakes) has not been seen during our vegetation surveys since 1999 and a survey of fish in Lake Taharoa is advocated.

There appears to be a secure population of the freshwater crab (*Amarinus lacustris* - At Risk Naturally Uncommon).

Lake Ecological Value

In 2023, Lake Taharoa was assessed with an Outstanding Lake Ecological Value score of 12, with a major decline in submerged vegetation since 2018, when it was regarded as the best example of a clear-water lake in Northland with the deepest recorded (currently 27.5 m) submerged vegetation in the North Island. Water quality trends show this lake is stable with an oligotrophic (or better) status from 2006. The 2020 water quality data equated to a TLI of microtrophic (1.7), but it had changed to oligotrophic in 2021, with a TLI of 2.2 (similar to TLI recorded from 2007 to 2016[2]). Additionally, lake level appears to be markedly low despite extreme rainfall events experienced over the summer. However, there is still a deficit between rainfall and evapotranspiration over the year and it may take a while for Lake Taharoa to recharge (Hoa Pham, NRC pers. comm.)

Threats

While good boat access to the lake results in a high risk for introduction of pest plants, the potential impacts are currently very low. Firstly, the exposed wave cut platforms around the lake reduce the likelihood of establishment and secondly, unusual water chemistry limits the development of large vascular plants, likely due to dissolved carbon limitation. However, changes in water chemistry could make the lake more vulnerable to pest plant invasion. Such a change would be initially indicated by development of tall-growing native vascular plants such as *Myriophyllum* spp. and *Potamogeton* spp.

Large numbers of the pest fish gambusia could threaten the population of the endangered dune lake galaxias.

Nutrient loading from the catchment is a major threat with potential sources from nitrogen-fixing woody vegetation, pine harvesting and livestock farming. Resulting changes in water chemistry would not only decrease water quality but could also facilitate native vascular and pest plant establishment.

Management recommendations

Further investigations into the decline of water quality and low lake levels are urgently required.

Continue investigations into ground water and the identification of possible nutrient sources from the catchment with consideration of appropriate mitigation measures.

Investigate water takes from Lake Taharoa and other loss processes.

Pest plant surveillance should be undertaken at access points annually.

Lake native biodiversity value monitoring is recommended every year.

A survey of Lake Taharoa fish and benthic invertebrates is advocated.

[2] https://www.lawa.org.nz/explore-data/northland-region/lakes/lake-taharoa/