North of Dargaville

Kai-Iwi (Kai-Iwi Lakes), NRC Lake No. 236.

Kai-Iwi. with emergent *Machaerina arthrophylla* in the immediate foreground, then a zone of kuta (*Eleocharis sphacelata*) (Photo: Lisa Forester, NRC 2 May 2018).

Summary

Surveyed 1984, 1985, 1987, 2001, 2005, 2007, 2011, 2014 and 2018.

Overall ranking

Outstanding: A native plant dominated lake, with nationally rare plants and *U. gibba* the only pest plant species present. Water quality trends showed increases in chlorophyll a (planktonic algae) and total nitrogen with decreased water clarity and a change in TLI from oligotrophic to mesotrophic in 2014, but since 2016 TLI is oligotrophic.

Threats

A locked gate has stopped access to the lake for trailered boat traffic, with a decreased risk of inadvertent pest plant introductions. However, should an introduction occur then subsequent impact is likely (cf. Taharoa). High impact from *Gambusia affinis* has contributed to the possible extirpation of the nationally near-threatened dune lakes galaxias. Water quality parameters had deteriorated indicating nutrient enrichment from surrounding land in 2014 and 2015, with pine harvesting suspected to be a cause. Since 2016, water quality has improved.

Management recommendations

Lake native biodiversity value monitoring every 5 years, pest plant surveillance every three years.

Further monitoring including water quality and a fish survey.

Description

This dune lake (1659066E, 6036450N) is 22.6 ha in area, with a 16 m maximum depth. The lake margin is predominantly vegetated by scrub (70%) and logged pine plantation (30%), with pasture in the larger catchment. Minor drainage inflows from Taharoa at the south of the lake with no outlet. There is no road access to this lake and the final approach is prevented by a locked gate and no formed boat ramp.

Wetland vegetation

Most of the lake had a 3 - 10 m wide margin of emergent vegetation, with dense oioi (*Apodasmia similis*) and occasional *Schoenus brevifolius* closest to the terrestrial margin and *Machaerina arthrophylla* (especially on the exposed eastern shore). *Machaerina articulata* and *M. juncea* were common in shallow water up to 0.7 m deep and an outer zone of *Eleocharis sphacelata* extended up to 2.6 m deep on one transect. One patch of raupo (*Typha orientalis*) was noted for the first time in 2014. This could indicate a local source of nutrient enrichment. Small saplings of the conifer pond cypress (*Taxodium distichum* var. *imbricarium* (syn. *T. ascendens*)) were noted amongst the oioi on the eastern shoreline. This is the first known naturalised record of this plant.

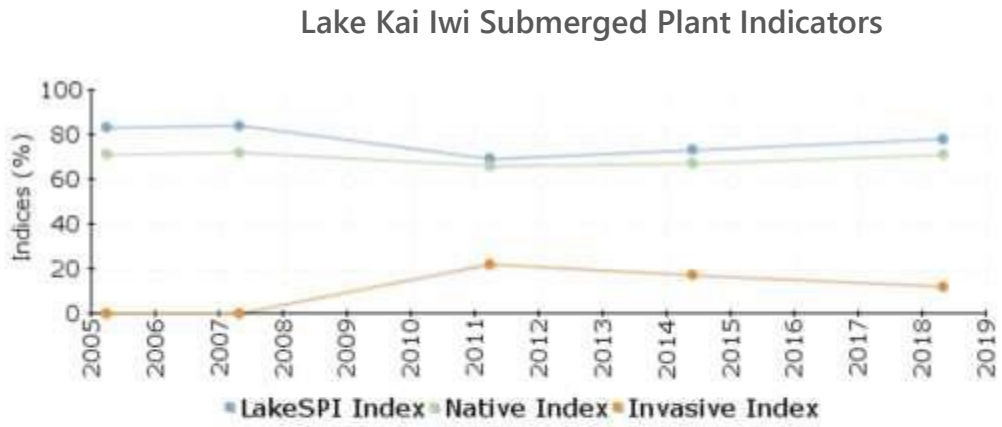
Submerged vegetation

Turf plants occurred to 2 m depth in several locations with abundant *Trithuria inconspicua, Triglochin striata, Lilaeopsis novae-zelandiae* and *Myriophyllum votschii*.

Surveys prior to 2018 recorded charophyte meadows that extended from < 2 m to ~12 m, dominated by *C. fibrosa* to ~7 m and *Chara australis* to ~12 m deep. *Potamogeton cheesemanii* frequently occurred at low covers to about 4 m water depth. The invasive *Utricularia gibba* was found in deep water in three of the five transects to depths approaching 10 m deep. However, it was localised and of low covers, not apparently impacting other submerged vegetation. In the past, vegetation bottom limits have varied averaging around 12 m. However, in 1985 the bottom limit was only 8.5 m and there was very poor visibility in the hypolimnion, suggesting anoxia. Subsequent surveys showed bottom limits had extended to around 12 m.

As with the other two main Kai-Iwi lakes, Kai-Iwi had record vegetation depth limits in 2018. *Chara australis* meadows extended to 13.3 m in three transects and 13.9 m in another. The maximum depth of vegetation was not established on the other transect. *Utricularia gibba*, although present, was only found on three transects, within the emergent zone with low covers.

LakeSPI



Survey Date	Status	LakeSPI %	Native Condition %	Invasive Impact %
April 2018	Excellent	78%	71%	12%
May 2014	High	73%	67%	17%
March 2011	High	69%	66%	22%
April 2007	Excellent	84%	72%	0%
March 2005	Excellent	83%	71%	0%

The 2018 LakeSPI score saw a return to the 'Excellent' status after two subsequent monitoring occasions with 'High' status. This increase in status reflected the increased extent of charophyte vegetation and apparently reduced *U. gibba* presence and impact (reduced from 22% in 2011 to 17% in 2014 to 12% in 2018).

Water birds

The isolated nature of much of this lake and extensive emergent and scrub vegetation provide good habitat for water birds, probably acting as a refuge from the human-mediated disturbance in the two adjacent lakes. There are earlier reports of large numbers of waterfowl utilising this lake, including the Nationally Threatened bittern (*Botaurus poiciloptilus*). A pair of dabchick (*Poliocephalus rufopectus*) were noted in 2018.

Fish

Native fish records include common bullies (*Gobiomorphus cotidianus*) and historically dune lakes galaxias were found, also a single fish was captured in a recent DOC survey (Andrew Knock, DOC, pers. comm.). Exotic fish present include gambusia (*Gambusia affinis*), rudd (*Scardinius erythrophthalmus*) and a stocked population of rainbow trout (*Oncorhynchus mykiss*).

Aquatic invertebrates

Invertebrates were abundant in the lake. No freshwater mussels (*Echyridella menziesii*) were seen but empty shells have been noted in previous surveys. The remains of koura (*Paranephrops planifrons*) were commonly observed along the water's edge in 2014.

Endangered species

Lake Kai iwi supports possibly the largest Northland population of the Nationally Critical *Trithuria inconspicua* with a c.10 m band of this species in shallow water or exposed sand (average cover of 10%) around much of the lake. The total population size was estimated at 2 ha. It was most commonly associated with open emergent beds of *M. arthrophylla* but was absent in local areas of dense *M. articulata*. De Lange et al. (2018) recognise the taxonomic difference between Northland and South Island *Trithuria* plants. The reappraisal was based on a 50–70% decline in Northland plants with a total area of occupancy ≤ 10 ha. Dead plants of the Nationally Endangered *Centrolepis strigosa,* an annual species, were found in the marginal turf in 2018, the first collection from Lake Kai-Iwi since the 1980's. The status of this species has improved from Nationally Critical based on surveys of the Kai-Iwi lakes, with the population assessed as stable and occupying ≤ 10 ha.

The At-Risk Naturally Uncommon dune lakes galaxias (restricted to the Kai Iwi lakes) may be present in extremely low numbers in this lake. An increase in threat status is advocated for this species, as is a targeted fish survey.

Lake Ecological Value

Kai-Iwi ecological value rating is assessed as 15 “outstanding”, based on the deep charophyte meadows, high species diversity and large populations of threatened species. 2014 assessment of water quality indicated this had deteriorated with increases in chlorophyll *a* (planktonic algae), total nitrogen and decreasing water clarity resulting in a change in TLI from oligotrophic to mesotrophic. However, since 2016 water quality has improved with an oligotrophic TLI.

Threats

The lack of motorised boat traffic to this lake reduces the risk of pest introduction. However, conditions in this lake are suitable for the establishment and growth of invasive vascular weeds. If pest plants were introduced, they would be expected to establish quickly and would severely impact lake values.

Rudd have been present in the lake since c.1991 with little apparent impact on plants, however, these herbivorous fish have been implicated in the loss of vegetation elsewhere so remain a threat if a population still survives in the lake.

Management recommendations

Invasive pest plants pose a greater threat to this lake than the adjacent lakes as higher nutrient conditions would favour their rapid growth. However, boat access is now extremely difficult.

Continuance of annual surveillance of the access point for pest plant incursion needs discussion, with a possible 3-yearly surveillance adequate.

A targeted fish survey is recommended for pest fish and also the At Risk Naturally Uncommon dune lakes galaxias. An increase in threat status of this fish would be advocated, should no fish be located during this survey.