Te Hiku

Kihona (Aupouri), NRC Lake No. 31.

Kihona. In 2004 (above), the lake was situated in a plantation pine forest catchment being harvested as viewed from the SE; in 2017 (below) the lake catchment had a young pine forest cover with a manuka and raupo dominated margin.

Summary	Kihona
Surveyed:	2004 and 2017.
Overall ranking:	**High-Moderate**: Intact emergent vegetation and scrub buffer this lake from the pine dominated catchment. The Nationally Critical bladderwort, *Utricularia australis* was abundant and is now only one of two lakes supporting healthy populations of this species. Characean meadows were the dominant vegetation, mostly replacing the area dominated by the invasive hornwort in 2004.
Threats:	Hornwort is present but is no longer a dominant transforming species in this lake. Catchment disturbances could reverse the situation. Alligator weed is present at the outlet stream.
Management recommendations:	Provide advice to forestry companies to modify activities in the lake catchment to minimise future nutrient enrichment or decreased water clarity. Regular water quality monitoring and regular ecological assessments including the abundance and extent of bladderwort.

Description

A dune lake (1591072E, 6168119N) formed from a gully system dammed by sand dunes to the west and is 7.8 ha and 8.3 m deep. The catchment is pine plantation forest (logged in 2005) with a manuka scrub buffer between the lake and pines (Figure 3-6). The inflow stream enters the north-eastern end of the lake, with the outlet (Pukekura Stream) discharging to the west coast 5 km to the south-west. Access is through approximately 10 km of eroded forestry roads to the outlet. Small boat access has become very difficult with over growing vegetation and erosion of the tracks.

Wetland vegetation

A margin of emergent vegetation up to 20 m across was present with *Eleocharis sphacelata* the dominant species, present around most of the lake growing to a depth of 2.5 m. *Typha orientalis*, *Machaerina articulata*, *Cyperus ustulatus*, *Carex secta*, *C. virgata*, *C. maorica* and *E. acuta* were also present.

Alligator weed (*Alternanthera philoxeroides*) was present at the access point (outlet stream).

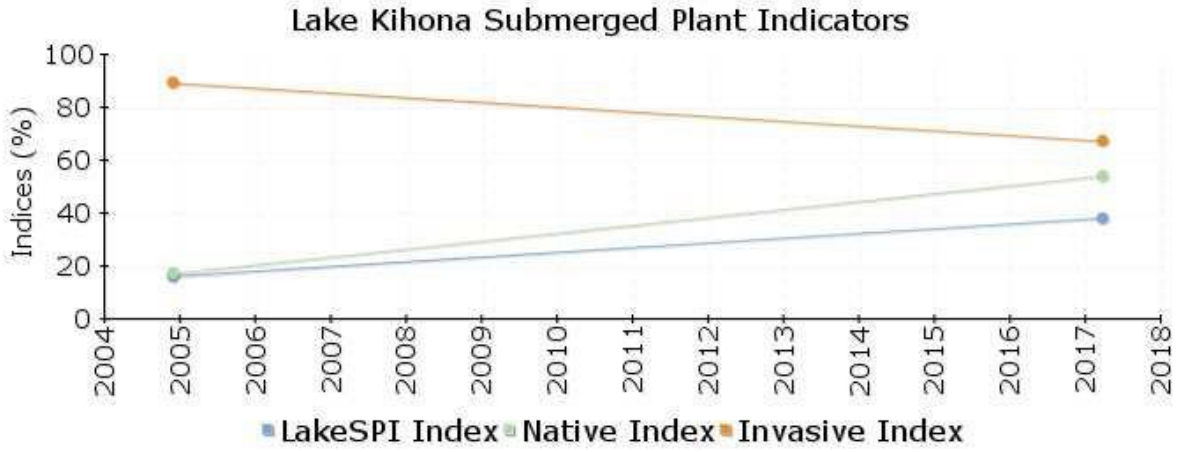
Submerged vegetation

No significant turf communities were present due to dense emergent vegetation. Charophyte meadows of *Chara australis* were present on all profiles to a maximum depth of between 4 and 5 m. Tall growing *Myriophyllum propinquum* (to 1.6 m tall) was widespread throughout the lake and *Utricularia australis* (cover photo) was present on 4 of the 5 profiles. It grew unusually deep and tall (to 5.1 m deep and up to 2.6 m tall) with maximum covers exceeding 75% on two profiles. The invasive weed hornwort (*Ceratophyllum demersum*) was present on 4 of the 5 profiles also but did not form the dense high cover weed beds described in 2005 and

had reduced in average cover (to about 10%). The 2017 submerged vegetation contrasted markedly with that of 2005 when the catchment was being harvested of pines.

In 2004, the lake vegetation was dominated by the invasive weed hornwort, present throughout the lake with a maximum cover of 100% on all three profiles. *Chara australis* was present but at low (≤5%) average covers and did not form meadows. *Utricularia australis* was recorded on only one of the 3 profiles and at less than 5% maximum cover.

LakeSPI



Survey Date	Status	LakeSPI %	Native Condition %	Invasive Impact %
March 2017	Moderate	38%	54%	67%
November 2004	Poor	16%	17%	89%

In 2004, the LakeSPI score of 16% was low as the lake was dominated by the invasive weed hornwort, with little native vegetation present. In 2017, the invasive impact had decreased markedly, and native condition index had increased.

Water birds

Good water bird habitat. In 2017, grey duck (*Anas superciliosa*), black swan (*Cygnus atratus*), dabchick (*Poliocephalus rufopectus*) and pied shag (*Phalacrocorax varius*) were seen. In 2004, black swan, pied shag and shoveler (*Anas rhynchotis*) were seen. Fernbird (*Bowdleria punctata vealeae*) were previously recorded in 1991 (DOC SSBI) but were not noted by our surveys or the 1996 OSNZ survey. Past logging would have caused major disruption of the lake and its surrounding vegetation.

Fish

Shortfin eel (*Anguilla australis*) and common bully (*Gobiomorphus cotidianus*) were seen during the vegetation surveys. DOC SSBI also reported grey mullet (*Mugil cephalus*) in this lake.

Aquatic invertebrates

No koura or mussels were found.

Endangered species

The Nationally Critical bladderwort *Utricularia australis* was rare in 2004, with <5% cover at only one of the three profile sites. In 2017, it was common on 4 of the 5 profiles assessed. It grew to 5.1 m deep and up to 2.6 m tall with maximum covers exceeding 75% on two profiles and is one

of only two lakes surveyed in Northland still supporting large populations of this species.

Threatened bird species reported from the lake include Nationally Critical grey duck (*Anas superciliosa*) and two At-Risk Recovering species; dabchick (*Poliocephalus rufopectus*) and pied shag (*Phalacrocorax varius*).

Lake Ecological Value

The condition of Kihona has improved from Moderate in 2004, changing to High to Moderate in 2017 (score = 9). This reflected an increase in emergent vegetation (buffering), indigenous aquatic vegetation diversity and native condition index. The increase in abundance and extent of the critically endangered bladderwort did not increase the threatened species score, but reflect the improved condition of this lake, despite containing the most invasive of submerged plants, hornwort.

Threats

The lake is isolated with difficult access at present, however both hornwort and alligator weed have been introduced in the past; the former probably with eel nets, the latter via a digger used to deepen the outlet as an emergency water supply for forest fire management.

Forestry activities such as fertiliser application and logging within the catchment can markedly affect the nutrient status of the lake.

Management recommendations

The lake is a significant habitat for *U. australis* so warrants special consideration regarding future impacts from catchment activities that impact lake water quality and clarity. Provide advice to forestry companies to modify activities in the lake catchment to minimise future nutrient enrichment or decreased water clarity.

Regular water quality monitoring is advocated, as are regular ecological assessments (three to five yearly).