

Te Hiku

Rotokawau (Sweetwater), NRC Lake No. 116.



Rotokawau from access point.

Summary	Rotokawau
Surveyed:	1985, 1988, 2001, 2004, 2009, 2014 and 2019.
Overall ranking:	High: Although decreases in TLI (to eutrophic) and LakeSPI and increased ammoniacal nitrogen concentration with cattle access to the southern shore and loss of <i>Utricularia australis</i> , the re-establishment of the Critically Endangered <i>Trithuria inconspicua</i> has kept the ranking as High.
Threats:	Introduction of invasive pest plants such as hornwort or egeria would displace remaining native vegetation. Nutrient enrichment from cattle and land use intensification would cause further deterioration.

Description

A dune lake (1618821E, 6124849N) accessible through private land with a 2-wheel drive under fair weather conditions with launching site for small boats. A small (14.2 ha), shallow (3.1 m) water body within a catchment of mostly fenced pasture (70%), scrub and planted forest (30%), with no major inflows or outflow. Despite much of the lake margin being fenced, direct cattle access on the south-western lake edge allows added nutrients and grazing of emergent vegetation as photographed in 2014.



Cattle pugging and heavy grazing of emergent vegetation on the margin of Rotokawau, May 2014.

Wetland vegetation

The lake was encircled by a reed bed of *Eleocharis sphacelata* (90% cover) extending 10 - 30 m into the lake to a maximum depth of 2 m. *Machaerina arthropophylla*, *M. articulata*, *M. juncea*, *Apodasmia similis* and *Eleocharis acuta* were also present. A small patch of raupo (*Typha orientalis*) was noted for the first time in 2014. This could indicate a local source of nutrient enrichment.

Submerged vegetation

Turf plants were occasional at the inshore edge of the reed bed and included the regionally rare *Grotia sexdentata* and *Triglochin striata*.

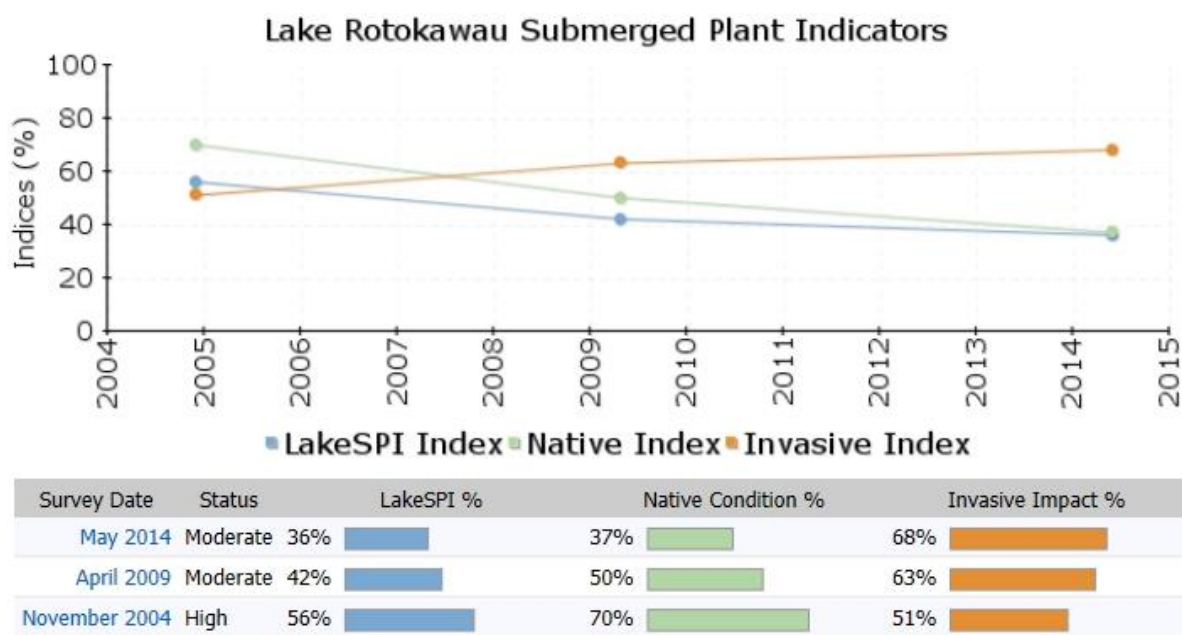
The submerged vegetation was dominated by the charophytes *Chara fibrosa* and *Chara australis* to their maximum lake depth (~2.7 m) in the past. However, the exotic invasive species *Utricularia gibba* covers most of the lake (cover >50%) and charophyte species cover has decreased markedly from an average cover of 76 - 95 % to 1 - 5% at present. *Utricularia australis* was present at low covers on one profile in 2014 but was much more abundant in 2007. It was not found in 2019.

A population of the nationally threatened *Trithuria inconspicua* was found in very shallow water (0 to 0.1 m deep) on the northern shore.



The critically endangered *Trithuria inconspicua* on the margin of Rotokawau, May 2019. Clusters of individual plants (arrows) in shallow water (top) and an individual plant (bottom).

LakeSPI



The LakeSPI scores have shown a significant and steady deterioration over time. The invasive *Utricularia gibba* has increased in cover markedly, with a corresponding decrease in charophyte cover.

Water birds

The extensive emergent beds and adjacent scrub areas provide good habitat for water birds. The Nationally Endangered bittern (*Botaurus poiciloptilus*) and regionally significant dabchick (*Poliiocephalus rufopectus*) and Australasian little grebe (*Tachybaptus novaehollandiae*) were all previously recorded from this lake. Fernbird (*Bowdleria punctata vealeae*) were heard in the manuka scrub at the western edge of the lake in 2014.

Fish

Common bullies (*Gobiomorphus cotidianus*) and the exotic pest fish gambusia (*Gambusia affinis*) were observed in 2009 and previous sampling occasions. There were also reports of a landlocked population of inanga (*Galaxias maculatus*) although none were observed.

DOC conducted a fish survey during 2014 using a combination of Gee minnow (4) and fyke nets (2). The recorded a total of 3,246 gambusia but no other fish species.

Aquatic invertebrates

The introduced snail *Physella acuta* was noted. During the 2014 DOC fish survey 200 diving beetles (*Onychohydrus hookeri*) and 4 dragonfly nymphs were caught.

Endangered species

The Nationally Critical *Utricularia australis* was a common component of the submerged vegetation but has markedly declined since its re-discovery in 2007. Ongoing water quality deterioration is likely to lead to the loss of this species in the future and no plants of this species were found in 2019. The Nationally Endangered *Trithuria inconspicua*, last recorded in 1992 had re-established in the same

area in 2019. It occupied a zone in 0.1 m deep to emerged on the lake shore, occupying approximately 600 m² of firm sandy sediments, with an average cover of 10%. The habitat appears to be induced by horse browsing, preventing the establishment of taller vegetation.

A land-locked population of At Risk, Declining inanga were previously sampled in Lake Rotokawau. However, no native fish were caught during the DOC sampling in 2014.

Lake Ecological Value

Vegetation (both LakeSPI and deterioration of charophytes) and water quality monitoring has shown a recent decline in this lake. *Utricularia gibba* is now the dominant plant within the lake. The charophyte meadows have reduced markedly in abundance with a conspicuous *Chara fibrosa* decline. The 'Nationally Endangered' *Utricularia australis* was not seen in 2019, but *Trithuria inconspicua* (also Nationally Critical) had re-established, the third known population in Te Hiku lakes. The current Lake Ecological Value score (2019) is 10 "High".

Threats

Access through private land minimises the risk of further exotic plant introductions. Water quality deterioration combined with invasive impacts of *U. gibba* and gambusia appear to be the most immediate threats to this lake, with no native fish sampled in 2014.

Management recommendations

All indicators point to a deterioration of the ecological status of this lake. The landowner on the northern side of the lake has fenced off lake access, but it was evident that direct cattle access occurs on the southern lake shore. Such a relatively small and shallow lake is very sensitive to nutrient enrichment unless carefully managed.