Te Hiku

Ngakeketo (formerly Ngakeketa) NRC Lake No. 14.

Ngakeketo. Showing the removal of pines on the southern shore and turbid conditions at the time of survey (Tracey Burton, 2 September 2020).

Summary	Ngakeketo
Surveyed:	2004, 2017 and 2020
Overall ranking:	**Moderate**: This lake is dominated by the submerged pest plant egeria with some hornwort. Much of the lake is inaccessible to humans and provides good habitat for aquatic birds.
Threats:	The worst invasive submerged pest plants hornwort and egeria are both present. Nutrient enrichment from pastoral land is evident.
Management recommendations:	Fully fence the lake to exclude livestock and restore the lake margins to mitigate nutrient inputs/turbidity from the pastoral catchment.

Description

The lake is situated (1578964E, 6180322N) in sand dunes, it is an impounded stream system and occupies 11.5 ha with a maximum depth of 8.7 m. The catchment is vegetated with manuka (70%), pasture and pines (20%) and mobile dune (10%) near the outlet. The lake is comprised of two arms; the western arm fed by a stream flowing from the north, with the outflow obstructed by beds of emergent raupō (*Typha orientalis*), flowing into the Kauaeparaoa Stream. Access is through privately owned pasture off the Te Paki Stream Road, but with no fencing. There are no formed tracks leading to the lake edge and no easy trailer boat access.

Wetland vegetation

There is an almost complete (except the mobile dune face) but narrow fringe of emergent vegetation, mostly < 5 m wide. This was dominated by raupo, with lesser amounts of kuta (*Eleocharis sphacelata*) and *Machaerina articulata* which grew to maximum depths of up to 2 m.

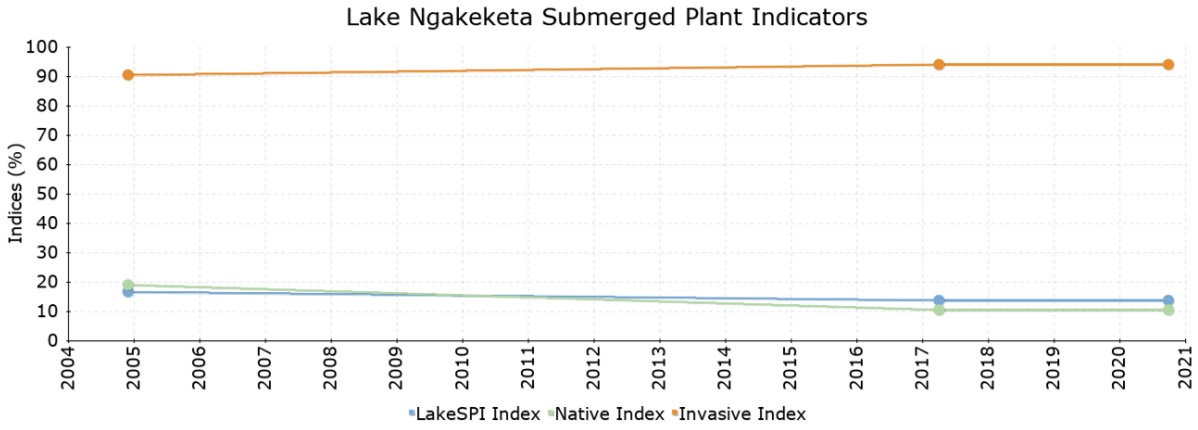
Sprawling emergent native swamp millet (*Isachne globosa*) and swamp willow weed (*Persicaria decipiens*) were locally common along with the introduced water purslane (*Ludwigia palustris*).

Turf species including *Myriophyllum votschii* and *Limosella lineata* along with sand sedge (*Carex pumila*) were common on the dune margin.

Submerged vegetation

In 2020, high turbidity prohibited effective diver surveys and surveys were undertaken using sonar and grapnel samples. Vegetation was dominated by invasive non-native species. Egeria (*Egeria densa*) had further colonized the submerged vegetation, with hornwort (*Ceratophyllum demersum*) and the indigenous *Potamogeton ochreatus* mostly in shallow water near the deepest emergent vegetation. In 2017, the submerged vegetation was dominated by the exotic egeria and lesser amounts of hornwort extending from shallow water to 5 m water depth. Beds were up to 3.5 m tall. Occasional plants of, *Chara australis* and *Nitella* sp. aff. *cristata* were seen amongst these beds. In 2005, hornwort was the dominant species and egeria was not present. It has likely spread down the Te Paki Stream from Wairaupo.

LakeSPI



Survey Date	Status	LakeSPI %	Native Condition %	Invasive Impact %
September 2020	Poor	13.7%	10.5%	94.1%
March 2017	Poor	13.7%	10.5%	94.1%
November 2004	Poor	16.6%	19.0%	90.4%

The low LakeSPI score of 14% reflects the major impact of the alien invasive plants egeria and hornwort on submerged vegetation in the lake.

Water birds

There was limited emergent and wetland vegetation habitat, but much of the lake is inaccessible to humans and would provide good habitat for aquatic birds, evidenced by the ducklings of paradise shelduck (*Tardorna variegata*) and black swan cygnets (*Cygnus atratus*) seen in 2004. Three little black shags (*Phalacrocorax sulcirostris*) were seen in 2017. A nationally endangered bittern (*Botaurus poiciloptilus*) was reported by DOC SSBI in 1991.

Fish

Schools of juvenile and adult mullet (*Mugil cephalus*) (reflecting a direct connection to the sea) and bullies (*Gobiomorphus cotidianus*) were abundant in the lake.

Aquatic invertebrates

Freshwater sponges were noted encrusting submerged logs and plants. No koura or mussels were seen.

Endangered species

No threatened plants were seen. The At-Risk Naturally Uncommon little black shag (*Phalacrocorax sulcirostris*) (Robertson et al. 2017) was noted in 2017.

Lake Ecological Value

The ecological value rating of Ngakeketo in 2020 remains “Moderate”, with a score of 6. The 2017 Secchi depth was close to the previous record (1.6 m), but in 2020, high suspended solids had reduced underwater visibility to near zero. Current nutrient concentrations differ from those previously reported (TN 350-500 mg N m^{-3}; TP 18-21 mg P m^{-3}) being lower for N and much higher for P.

Threats

The submerged vegetation of this lake is dominated by egeria and hornwort is also present. No pest fish or marginal weeds were recorded, and their risk of introduction is rated to be moderate to low due to limited usage of the lake by humans, although access is relatively easy. Nutrient run-off from pastoral activities threatens the lake with planktonic algal blooms and benthic anoxia.

Management recommendations

This lake was selected as a Freshwater Improvement Fund (Ministry for the Environment) project for the control of hornwort using the herbicide endothall dipotassium. Based on the 2020 survey and bathymetry, only 42% of the lake area was vegetated (4.5 ha). The submerged vegetation was almost exclusively non-native with egeria comprising more than 75% of this. Therefore, the plan to apply the herbicide endothall to control hornwort would almost certainly lead to complete domination of Ngakeketo by egeria, a weed not affected by that herbicide.

The pines had been removed from the southern shoreline and fully fencing the lake to exclude livestock along with restoration plantings on the lake margins are recommended to mitigate nutrient inputs and turbidity currently impacting Ngakeketo.