

Poutō Peninsula

Roto-otuauru / Lake Swan, (Poutō), NRC Lake No. 355.



Roto-otuauru (Lake Swan) showing access (centre foreground gap in trees) and the lake catchment.

Summary

Survey dates 2005, 2009, 2010, 2011, 2012, 2013.

Overall ranking

Moderate: Was highly degraded by presence of invasive plant pests egeria (*Egeria densa*) and hornwort (*Ceratophyllum demersum*) but is now de-vegetated due to grass carp browsing. A lake-locked population of īnanga (*Galaxias maculatus*), and several threatened birds are present at the lake.

Threats

Grass carp have likely eradicated the pest plants but require removal to allow native regeneration. Potentially, hornwort could invade the lake from overflows from Lake Egg, situated to the south west of Roto-otuauru. This source of hornwort needs to be removed before grass carp removal.

Management recommendations

Grass carp were introduced in May 2009 to eradicate egeria and hornwort. Hornwort needs to be eradicated from Lake Egg before grass carp removal is advocated. On-going monitoring is recommended.

Description

The lake (1702249E, 5978792N) is 17.4 ha and is 5.5 m deep. The catchment was mostly pasture, with 30% pine plantation and some areas of scrub. The lake perimeter is fenced. Access is by 4-WD across private land and small boat launching is possible.

Wetland vegetation

Emergent species surround about 75% of the lake forming a dense fringe about 5 to 15 m wide of *Eleocharis sphacelata* (to 2 m tall) with a mix of *Eleocharis acuta*, *Schoenoplectus tabernaemontani*, *Machaerina articulata* and *Typha orientalis*. Grass carp grazing has reduced but not completely extirpated these species.

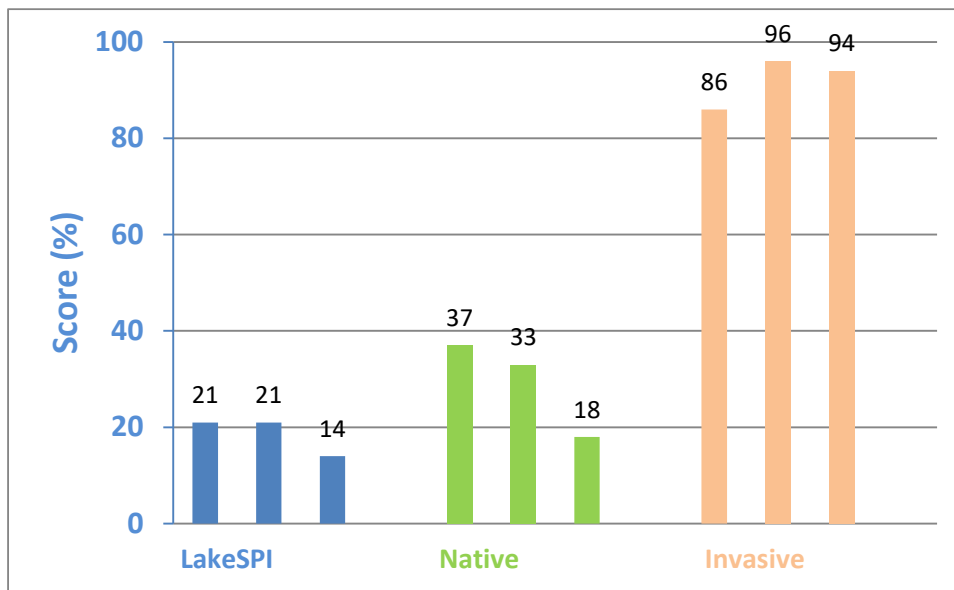
Exposed turf areas contained large mats of the 'Regionally Rare' *Gratiola sexdentata*, and also *Triglochin striata* and *Myriophyllum votschii*. The invasive alligator weed (*Alternanthera philoxeroides*) was present at low cover.

Submerged vegetation

At a few locations a wide range of turf species were present with *Glossostigma elatinooides* the dominant species. The rare plant *Trithuria inconspicua* has not been seen since 1988. In 2010, charophytes persisted at one small area in shallow water (to 1.8 m) on the northern shore of the main body of the lake but since then had been eaten by grass carp. These plants dominated the lake vegetation in the past but were displaced by invasive weeds. Prior to 2010, the submerged vegetation was dominated by tall-growing invasive species egeria (*Egeria densa*) and hornwort (*Ceratophyllum demersum*). Egeria was first reported in the lake in 1992, while hornwort was first recorded in the 2005 survey.

Grass carp were introduced in May 2009 to eradicate the egeria and hornwort. In April 2010, virtually all the egeria had gone along with half the extent of hornwort. In 2011, all the hornwort had gone except for a few shoots amongst the marginal vegetation. *Utricularia gibba* heavily covered much of the egeria in 2010, but none remained in 2011. In 2012 and 2013, there were no signs of hornwort or egeria and other submerged plants other than the turf species.

LakeSPI



LakeSPI Index as % of potential score for Roto-otuauru, with Native Condition Index, and Invasive Impact Index shown from 2005, 2009 and 2010 (from left to right). Note grass carp directly affect LakeSPI metrics and currently the default score is zero with no submerged macrophytes found.

A very low LakeSPI score of 14% was recorded in 2010 as egeria and hornwort had greatly reduced native values in the lake. After 2010 grass carp had removed all the submerged vegetation so it scored 0% (Non-vegetated). When grass carp grazing pressure is removed LakeSPI is expected to improve markedly with an all-native submerged vegetation restored from the seed bank.

Water birds

Fencing of the lake to exclude cattle and the large emergent beds surrounding much of this lake created a desirable habitat for many water birds. Large numbers of black swan (*Cygnus atratus*) and mallard (*Anas platyrhynchos*) were recorded. Threatened species recorded from the lake include the nationally endangered bittern (*Botaurus poiciloptilus*) and regionally significant dabchick (*Poliocephalus rufpectus*) and fernbird (*Bowdleria punctata vealeae*). More recently bird numbers, particularly black swan have decreased as the aquatic vegetation is eaten by grass carp.

Fish

Īnanga (*Galaxias maculatus*), bully (*Gobiomorphus cotidianus*) and shortfin eels (*Anguilla australis*) were noted in 2010.

Grass carp were introduced in May 2009. They will change habitat for other fish by removing submerged and emergent vegetation, but other studies have not reported significant fisheries impacts.

Aquatic invertebrates

Large numbers of invertebrates including freshwater mussels (*Echyridella menziesi*) were recorded.

Endangered species

The Nationally Critical *Trithuria inconspicua* has not been found since 1988.

A lake-locked population of the At Risk Declining īnanga (*Galaxias maculatus*), formerly recognized as a different species (*G. gracilis*) restricted to the Poutō lakes, remains abundant in Roto-otuauro with large schools of this fish seen during dive surveys in 2010.

The At Risk Declining torewai (freshwater mussels) were abundant in the lake.

Lake Ecological Value

Roto-otuauro has a Lake Ecological Value score of 7 “Medium”, with good populations of īnanga and torewai. Prior to the introduction of egeria and then hornwort, the lake was impacted by nutrient enrichment, with regular planktonic algal blooms. The invasive species completely dominated all but the deepest basin of the lake and water clarity improved, followed by poor water clarity after grass carp had removed these plants.

Threats

Hornwort and egeria posed a significant risk to other lakes in the region, particularly nearby ‘outstanding’ Humuhumu and Kanono. Boat access to Lake Swan with a 4-WD is easy across private land. This risk has been mitigated with grass carp removal of the pest plants. Re-introduction of pest plants is not a risk until the grass carp are removed.

Potentially, hornwort could invade the lake from overflows from Lake Egg, situated to the south west of Roto-otuauro. This source of hornwort needs to be removed before grass carp removal is advocated.

Management recommendations

Eradication of submerged weeds by introduction of grass carp has been successful. Hornwort needs to be eradicated from Lake Egg before grass carp removal is advocated. Once this is achieved, grass carp should be removed to allow re-establishment of native vegetation.