6.10 Lake Rotokawau (Pouto), NRC Lake No. 364; surveyed in 1985, 1988, 2001, 2005 and 2007

Plate: Lake Rotokawau showing the exposed north east shoreline with few emergent species.

Summary

Overall ranking

High: The submerged vegetation was invaded by *Egeria densa*, however it had good water quality and extensive turf communities dominated by the nationally endangered *Trithuria inconspicua*, charophyte meadows with tall-growing native species, and a good population of nationally rare dwarf inanga.

Threats

E. densa (introduced in early 1990's) dominated many submerged profiles. and *Utricularia gibba* was present but prolific only in the sheltered lagoon. *Ceratophyllum demersum* could have a much greater impact if introduced, with nearby Lake Swan the most likely source. Presumably eel fishing nets were the mode of introduction and pose a threat for future introductions, although access to the lake is now much more difficult than previously due to changing farm use. Water quality is still good but prone to nutrient enrichment if pastoral practices intensified.

Management recommendations

Lake native biodiversity value monitoring every 5 years.

Description

This dune lake (1702929E 5976997N) is 26.4 ha in size and 12 m deep. The catchment is pastoral, with plantation pine and shrubland. Access is across private farmland, requiring 4-WD but it is possible to launch a boat.

Wetland vegetation

Pockets of emergent species on occasional soft shores occupied 15% of the lake margin. Dominant species included *Schoenoplectus tabernaemontani, Baumea articulate, Baumea juncea, Eleocharis acuta, Isolepis prolifer, Typha orientalis* and *Eleocharis sphacelata*. The sheltered lagoon had a dense fringe of emergents. Exposed turf communities were common just above the water line and included regionally significant *Myriophyllum votschii*. The pest plant royal fern (*Osmunda regalis*) was collected from the lake margin in 2010.

Submerged vegetation

Turf communities were well developed with *Lilaeopsis novae-zelandiae* and the nationally threatened *Trithuria inconspicua* co-dominants. There was a very significant *T. inconspicua* habitat within this lake, apparently the largest population of this species in Northland. Tall-growing native species, *Potamogeton cheesemanii* and *P. ochreatus* were common. The exotic species *Egeria densa,* with lesser amounts of *Elodea canadensis*, were widespread but were not having a major impact on native vegetation at three of the five profiles. *Utricularia gibba* was present but prolific only in the sheltered lagoon where it covered dense charophyte beds. Charophytes were the dominant vegetation in much of the lake with *Chara fibrosa* the most abundant species.

LakeSPI

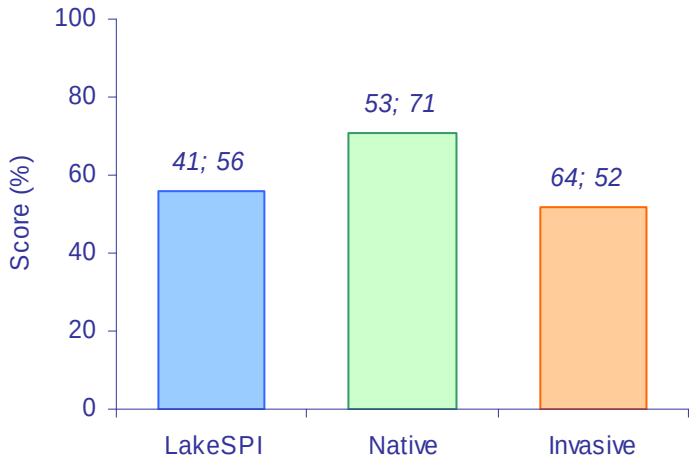


Figure: 2007 LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right) with 2005; 2007 values shown respectively, values shown indicating a marked improvement in the lake.

The LakeSPI Index has improved markedly. A closer look at the difference since 2005 found that charophyte meadows were limited to around 6 m deep in 2005 but in 2007 extended to around 10 m. Such a large increase in native cover also reduced the Invasive Index as it occupied a smaller % of the total vegetation. Water clarity in the lake is likely to have improved or perhaps the lake has not stratified in 2007 but was in 2005.

Water birds

Limited marginal vegetation provides limited cover for resident water birds although good water clarity and submerged vegetation would attract feeding birds. No birds were seen during the field visit but Logan Forrest recorded a total of 19 aquatic birds from Lake Rotokawau including the nationally endangered bittern (*Botaurus poiciloptilus*) and regionally significant dabchick (*Poliocephalus rufopectus*) and scaup (*Aythya novaezeelandiae*).

Fish

Good habitat for fish. Common bully (*Gobiomorphus cotidianus*) and the rare dwarf inanga (*Galaxias gracilis*) were observed in this lake, with NIWA FBIS records of these species and also shortfin eel (*Anguilla australis*).

Aquatic invertebrates

Abundant freshwater mussels (*Hyridella menziesii*), leeches (*Richardsonianus mauianus*), and *Potamopyrgus antipodarum* snails.

Changes in indicators

Other surveys were carried out in 1985, 1988, 2001, and 2005. Depth limits of the vegetation have varied between 8.5 and 6.0 m and are currently at 10.5 m. Charophytes grew to a maximum depth of 7.6 m in 2001, now 10.5 m. The exotic weeds *E. densa* were first reported in 1993 and *E. canadensis* in 2001 and both were common throughout the lake with *E. densa* probably having reached it maximum impact in the 2007 survey. *U. gibba* was reported for the first time in 2007.

Threats

Ceratophyllum demersum introduction would be the greatest threat to the high ecological values. *C. demersum* is invasive in clear water low-nutrient lakes (e.g., Taupo, Tarawera) and would pose a much greater threat to this lake than *E. densa*.

Management recommendations

Lake native biodiversity value monitoring every 5 years.

6.11 Lake Roto-otuauru / Swan, (Pouto), NRC Lake No. 355; surveyed in 2005, 2009 and 2010

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

Summary

Overall ranking

Moderate: Highly degraded by presence of invasive plant pests *Egeria densa* and *Ceratophyllum demersum*. It has the rare fish *Galaxias gracilis*, and several threatened birds utilise the lake margins.

Threats

Grass carp need time to eradicate the pest plants, then removed to allow native regeneration.

Management recommendations

Grass carp were introduced in May 2009 to eradicate *Egeria densa* and *Ceratophyllum demersum*. Ongoing 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 was fenced. Access is by 4-WD across private land and small boat launching is possible.

Wetland vegetation

Emergent species surrounded about 75% of the lake forming a dense fringe about 5 to 20 m wide of *Eleocharis sphacelata* (to 2 m tall) with a mix of *Eleocharis acuta, Schoenoplectus tabernaemontani, Baumea articulata* and *Typha orientalis* also present. Some signs of grass carp grazing were evident on 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 in this area.

Submerged vegetation

At a few locations a wide range of turf species were present with *Glossostigma elatinoides* the dominant species. The rare plant *Hydatella inconspicua* has not been seen since 1988. In 2010 charophytes persisted at one small site in shallow water (to 1.8m) on the northern shore of the main body of the lake but are now being eaten by grass carp. These plants dominated the lake vegetation in the past but have been displaced from deeper depths by invasives. The submerged vegetation was dominated by tall-growing invasive species *Egeria densa* and *C. demersum*. *E. densa* was first reported in the lake in 1992, *C. demersum* was first recorded in the 2005 survey.

Utricularia gibba heavily covered much of the *E. densa* in 2010.

Grass carp were introduced in May 2009 to eradicate the *C. demersum* and *E. densa*. In April 2010 virtually all the *E. densa* had gone and about half the *C. demersum* (photo in plate below).

Plate Lake Swan after 11 months of grass carp grazing with a few remnant stalks of *E. densa* (foreground left) and the rest *C. demersum*.

LakeSPI

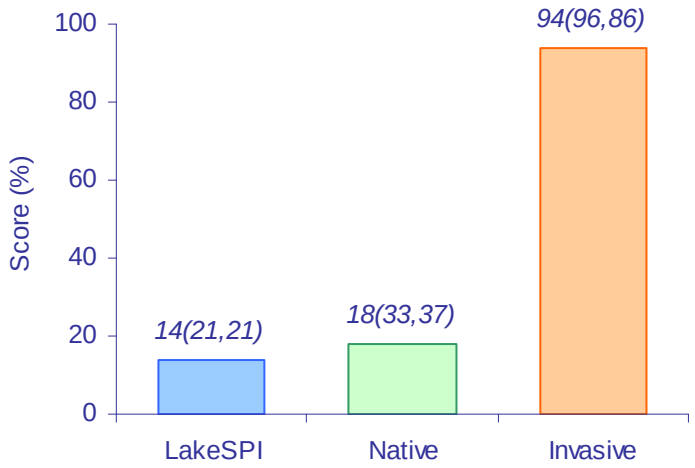


Figure: 2010 LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right) with 2005 scores in brackets.

A very low LakeSPI score of 14% as *E. densa* and *C. demersum* have greatly reduced native values in the lake. In time grasscarp will remove all the vegetation so will give a default score of zero. Only when these species have been eradicated and grass carp grazing pressure is removed will we see LakeSPI improve markedly with an all native submerged vegetation restored.

Water birds

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

Fish

In shallower water, the large emergent beds provide good habitat for some species. Dwarf inanga (*Galaxias gracilis*), bully (*Gobiomorphus cotidianus*) and shortfin eels (*Anguilla australis*) were noted in 2010.

Grass carp were introduced in May 2009. They will change fish habitat, but other studies have not reported significant fisheries impacts.

Aquatic invertebrates

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

Changes in indicators

Previously this was a native lake of high value, with charophyte meadows and the tall-growing species *Potomogeton ochreatus* dominant. Now native species are nearly all displaced by the pest plants *E. densa* and *C. demersum.* Gras carp will remove all submerged vegetation except for the turf species.

Threats

E. densa and *C. demersum* pose a significant risk to other lakes in the region, particularly nearby 'outstanding' Lakes Humuhumu and Kanono. Boat access to Lake Swan with a 4-WD is easy across private land. This risk is diminishing with grass carp removal of the pest plants.

Alligator weed is apparently only present at the access point and threatens the marginal vegetation of this lake.

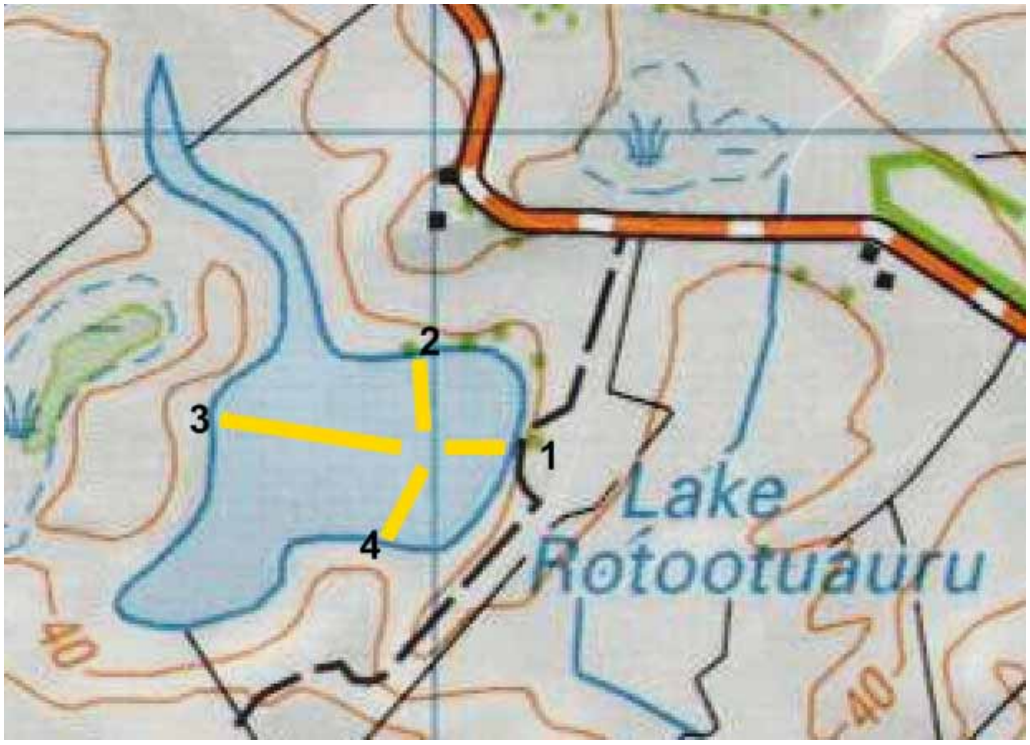
Management recommendations

Recommendations to isolate the lake to contain the submerged invasive weeds have been followed to protect the nearby pristine lakes and rehabilitate this one in time. Eradication of submerged weeds by introduction of grass carp has been implemented and this eradication strategy will continue to be monitored.

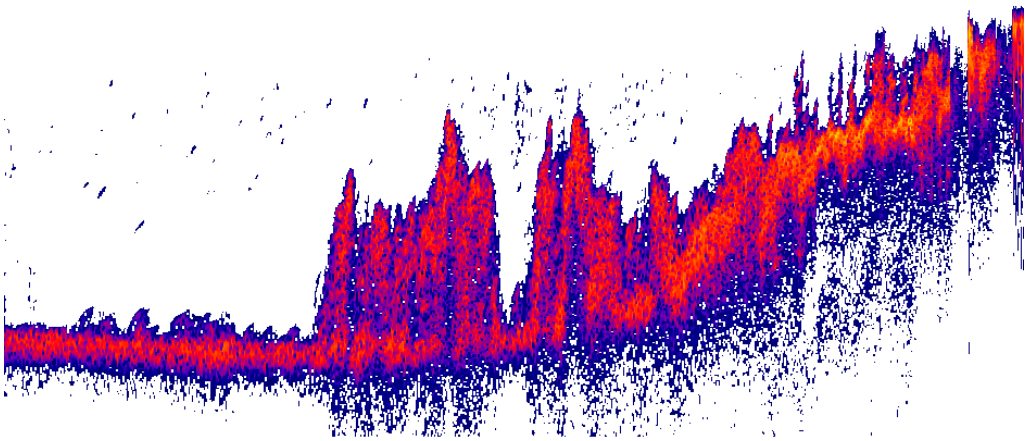
A survey of alligator weed abundance and management (if appropriate) is recommended.

Baseline vegetation pre-grass carp survey April 2009

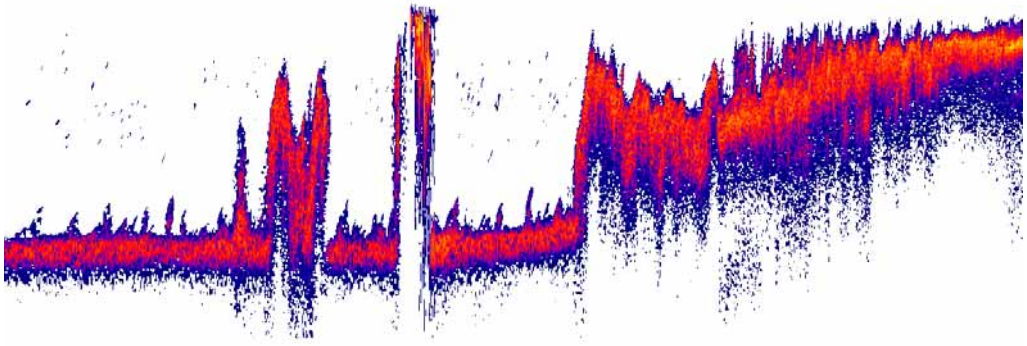
A sonar survey of the lake was conducted along the four SCUBA profiles as shown on the map. In addition observations were made of the vegetation in the north arm.



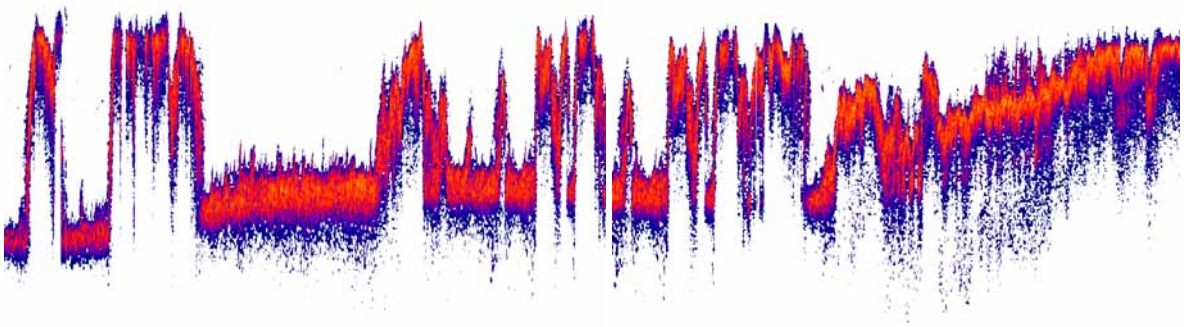
Map: Lake Roto-otuauru showing the location of the four profile sites.



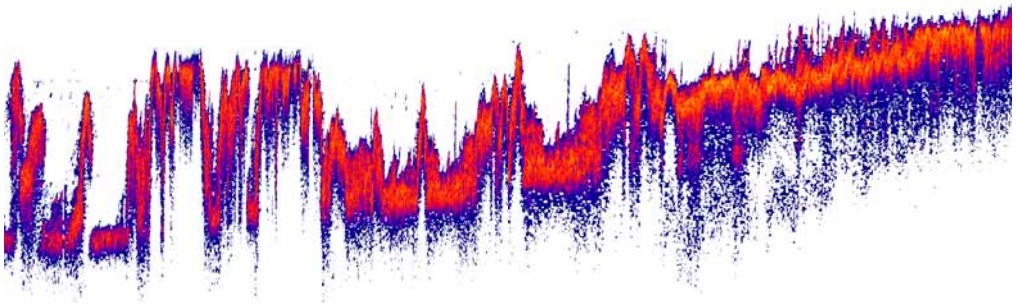
Sonar image Profile 1: The sonar image shows an outline of the weed beds in April 2009. This transect is about 120 m long and the maximum depth is 5 m to the top of the red band (soft sediment) at left of image. See the map of Lake Roto-otuauru for profile location.



Sonar image Profile 2: The sonar image shows an outline of the weed beds in April 2009. This transect is about 150 m long and the maximum depth is 5 m to the top of the red band (soft sediment) at left of image. See the map of Lake Roto-otuauru for profile location.



Sonar image Profile 3: The sonar image shows an outline of the weed beds in April 2009. This transect is about 350 m long and the maximum depth and height of weed bed is 5 m to the top of the red band (soft sediment) at left of image. See the map of Lake Roto-otuauru for profile location.



Sonar image Profile 4: The sonar image shows an outline of the weed beds in April 2009. This transect is about 160 m long and the maximum depth and height of weed bed is 5 m to the top of the red band (soft sediment) at left of image. See the map of Lake Roto-otuauru for profile location.

In ground truthing these profiles it was noted that kuta beds (*Eleocharis sphacelata*) dominated the emergent vegetation on the margins of the lake. *E. densa* dominated the vegetation on profiles from about 2 m water depth (near the outer margin of the kuta beds) to 2.8 m and *C. demersum* dominated from 2.8 m to 5 m, the maximum depth the submerged vegetation grew to. *E. densa* mostly grew to about 1 m of the surface (swan browsed) whereas hornwort was often surface-reaching even from 5 m water depth. Profile 2 had the only significant native submerged vegetation which were made up mainly of charophytes and restricted to less than 1.8 m water depth. *C. demersum* was the dominant plant in the northern arm with a large area of *E. densa* at the entrance.

Vegetation survey post-grass carp April 2010

Unfortunately the sonar unit failed to operate and we were unable to repeat the sonar traces. The most marked changes were seen in Profile 1 with virtually all the *E. densa* removed and about 70% of the *C. demersum*, particularly in areas deeper than 3.5 m. In other areas the *E. densa* had been mostly removed but *C. demersum* was less affected. In the narrow arm *C. demersum* was still very abundant with no apparent degree of control, but elsewhere (Profiles 2, 3, and 4) about 40% of the *C. demersum* had been removed.

6.12 Lake Rotopouua (Pouto), NRC Lake No. 348; first surveyed in 2008

Plate: Lake Rotopouua.

Summary

Overall ranking

Outstanding: Good intact native emergent margin and submerged vegetation with some endangered biota. *Utricularia gibba* present.

Threats

Introduction of invasive species. Nutrient enrichment.

Management recommendations

Lake native biodiversity value monitoring every 5 years.

Description

Lake Rotopouua (1699531E, 590047N) is a small (<5ha) lake with a maximum depth c. 9 m. The lake is ponded between dunes to the west and weathered hill country, with heavy clay soils, to the east. The catchment is primarily plantation pine forestry manuka/kanuka scrub and fenced pasture. Access is across farm land from the Pouto

Road and the lake has limited boat access (carry across a fence) and is fenced off from stock.

Wetland vegetation

The lake is completely fringed with emergent species. The dominant emergent species are *Eleocharis sphacelata, Typha orientalis, Baumea juncea, B. articulata, Schoenoplectus tabernaemontani* and *Carex secta* growing from the lake margin to ~1.0 m or less. The nationally threatened fern *Thelypteris confluens* was common growing amongst emergent sedges.

Submerged vegetation

Turf communities were not recorded due to extensive and dense emergent beds. Some *Utricularia gibba* was found in shallow water amongst emergent sedges. Tall-growing *Potamogeon ochreatus* was common with charophyte meadows dominated by *Nitella* aff. *cristata* and *Chara australis* to about 6 m.

LakeSPI

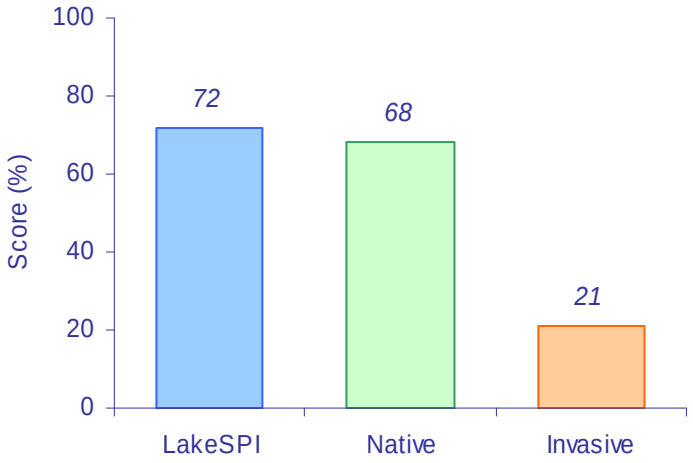


Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right).

The invasive impact is from *Utricularia gibba*; otherwise the lake has a high LakeSPI.

Water birds

Extensive emergent vegetation and a relatively isolated lake provide good habitat for water birds. The nationally endangered bittern (*Botaurus poiciloptilus*) and regionally threatened dabchick (*Poliocephalus rufopectus*) were seen.

Fish

Abundant common bullies (*Gobiomorphus cotidianus*), were observed during vegetation surveys. The endangered dwarf inanga (*Galaxias gracilis*) were reported as common in this lake (Rowe and Chisnall 1997), but a thorough search by DoC Northland Conservancy staff could not relocate this species.

Aquatic invertebrates

Many dead shells of the freshwater mussels (*Hyridella menziesi*) were common throughout the lake but no live ones were found. It is likely the lake has had a recent anoxic event. Snails, *Potamopyrgus antipodarum*, as well as freshwater sponges and hydra were common.

Changes in indicators

This was the first time this lake has been surveyed.

Threats

The restricted access to this lake reduces the threat of introduction of pest plants. Should invasive species be introduced to the lake it is likely that they would displace much of the current native vegetation. The lake appears to have deteriorated recently with a mass extinction of mussels and apparently dwarf inanga, probably caused by the lake going anoxic for a period. This indicates increased nutrient input (from farming or forestry?) and resulting algal loads in the lake in recent times.

Management recommendations

An assessment of lake native biodiversity value at 5 yearly intervals is recommended.

Annual monitoring of water quality should be undertaken to determine the extent of nutrient enrichment.

6.13 Lake Rototuna (Pouto), NRC Lake No. 328; surveyed in 1988, 2001, 2005 and 2007

Plate: Lake Rototuna in a pastoral catchment with some pines on the western margin.

Summary

Overall ranking

High: A lake with retired margins, mostly vegetated with endangered biota, and pest fish established.

Threats

Invasive submerged weeds would displace the existing vegetation, though access is now more difficult. Possibly issues with road run-off entering lake via a culvert with turbidity/nutrient issues. The invasive reed sweet grass (*Glyceria maxima*) threatens the lake margins.

Management recommendations

Lake native biodiversity value monitoring every 2 to 3 years. Eradicate *Glyceria maxima*.

Description

A dune lake 6 ha in area and 5.1 m deep. The catchment is pasture with some pine trees, and the margin fenced since 1999 with a thick mat of kikuyu surrounding the lake. No inflow or outflow streams. Adjacent to main Pouto Road, but fenced off with padlocked gate.

Wetland vegetation

About 50% of the shoreline had emergent species, with *Typha orientalis*, *Eleocharis sphacelata* and *E. acuta*, and *Schoenoplectus tabernaemontani* forming a narrow band 5 - 10 m wide. *E. sphacelata* beds extended to 1.8 m deep, the other species < 0.5 m. The invasive reed sweet grass (*Glyceria maxima*) was found for the first time in 2007. It was located amongst raupo on the south-eastern shore of the lake.

Submerged vegetation

Turf species were present around about half of the lake, with *Glossostigma elatinoides* and *Lilaeopsis novae-zelandiae* most common but always at low covers (<26%). Tall-growing native species were present on all profiles with *Potamogeton ochreatus* the most abundant (26-95% median cover) and *Myriophyllum triphyllum* widespread and occasionally abundant. No tall-growing exotic species were present except *Potamogeton crispus*, found in 2005 but not seen in 2007. Charophytes were the dominant vegetation in the lake, with *Nitella* aff. *cristata* at high (>75%) average cover at all profiles and composing the deepest growing vegetation to 5.0 m. *Chara australis*, *Nitella pseudoflabellata* and *N. hyalina* were also recorded. The nationally 'At-risk' *Stuckenia pectinata* was recorded in 2005 but not found in 2007.

LakeSPI

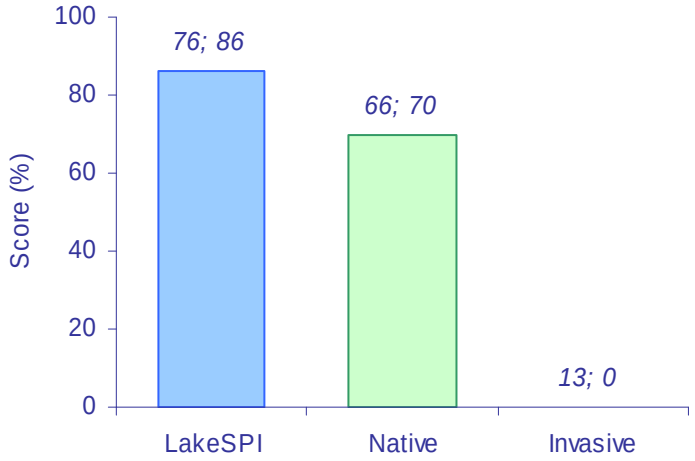


Figure: 2007 LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right) with 2005; 2007 values shown respectively.

The improvement in lake condition was due to *P.crispus* presence in 2005, but not recorded in 2007. The lake had a high LakeSPI Index of 86% with no invasive macrophyte impact.

Water birds

Dabchick (*Poliocephalus rufopectus*), regionally significant, and scaup (*Aythya novaezeelandiae*) were noted with 18 other common birds, mostly black swans (*Cygnus atratus*) and paradise shelduck (*Tardorna variegata*).

Fish

Nationally threatened dwarf inanga (*Galaxias gracilis*) were recorded by the NIWA FBIS database although none were seen during the survey. Common bully (*Gobiomorphus cotidianus*) and exotic *Gambusia affinis* were observed. Rudd (*Scardinius erythrophthalmus*) were also reported.

Aquatic invertebrates

The introduced snail *Physella acuta* was recorded during the vegetation survey.

Changes in indicators

Previous surveys were conducted in 1988, 2001 and 2005 survey. The 1988 survey had much reduced bottom limits with the maximum depth of vegetation only as 2.5 m, but subsequent surveys have shown the lake to be mostly vegetated with only a small area deeper than 5 m beyond the bottom limit of the vegetation.

Threats

The vegetation is native dominated and introduction of other weed species is now less likely due to fencing of access points and the diligence of landowners. The sprawling emergent weed reed, sweet grass, threatens much of the marginal vegetation.

Pest fish (gambusia and rudd) are of concern. The possible loss of dwarf inanga from Lake Kai-iwi, may have resulted from gambusia impacts, and the recent introduction of these pest fish may have similar impacts in Lake Rototuna. Rudd are herbivorous in large part and have been implicated in loss of vegetation in nutrient stressed lakes such as this one, however they have been present in the lake for around a decade with little apparent impact.

Management recommendations

Lake native biodiversity value monitoring every 2-3 years.

Eradicate reed sweet grass from the lake margin using a grass-specific herbicide.
Investigate dwarf inanga recovery.

6.14 Lake Waingata (Pouto), NRC Lake No. 371; surveyed in 2005 and visited in 2010

Plate: Lake Waingata surrounded by pasture with emergent vegetation completely lacking.

Summary from 2001 (lake not dived 2005 or 2010)

Overall ranking

Low: Mostly de-vegetated (both submerged and emergent) by grass carp, but the endangered dwarf inanga are probably still abundant.

Threats

Low risk of introduction and establishment of invasive weeds. Water quality poor.

Management recommendations

No lake native biodiversity value monitoring until grass carp removed. Advocate removal of grass carp.

Description

A small (9 ha) dune lake (1703256E, 5976471N) of 9.5 m depth, set in a pastoral catchment. Access through 2 km private farmland, mostly on a well-formed track and requiring 4-WD if wet. Small boats can be launched with 4-WD from northern lake edge.

Wetland vegetation

No emergent vegetation. The pest plant *Alternanthera philoxeroides* was recorded in several areas around the lake in 2001.

Submerged vegetation

Casual observations made in 2005 and 2010 showed turf community was common, with *Lilaeopsis novae-zelandiae, Elatine gratioloides* and *Glossostigma elatinoides* the dominant turf species. These species and 6 others were found in 2001, with the turf extending between the lake margin and 1 m deep with scattered plants of *Chara australis* extending to 1.9 m.

LakeSPI

LakeSPI score is not generated from previous survey data.

Water birds

The lake provides minimal bird habitat. Twenty scaup (*Aythya novaezeelandiae*) were seen on the lake in 2005. Early (pre-1995) records from this lake included the regionally significant dabchick (*Poliocephalus rufopectus*).

Fish

The lake was stocked with rainbow trout (*Oncorhynchus mykiss*) in the 1950's until 1980, but have since died out. The nationally endangered dwarf inanga (*Galaxias gracilis*) is present in the lake, and was recorded as abundant in 1997. Common bully (*Gobiomorphus cotidianus*) were the only other fish present in Lake Waingata until 67 grass carp (*Ctenopharyngodon idella*) were introduced in 1995 to eradicate the elodea.

Aquatic invertebrates

No invertebrates were recorded in 2001.

Changes in indicators

Prior to grass carp introduction there was a marginal emergent cover of 77% of the shoreline dominated by *E. sphacelata*, but also including *Baumea articulata, B. arthrophylla, E. acuta, Schoenoplectus tabernaemontani* and *Typha orientalis*. Thirteen submerged species were reported including the nationally endangered *Trithuria inconspicua* and *Nitella* aff. *cristata* which grew to a maximum depth of 6 m along with *C. australis*. The exotic weed *Elodea canadensis* was present in Lake Waingata until 1996, after which it was eliminated by grass carp browsing. Grass carp have subsequently eliminated all emergent vegetation and restricted submerged vegetation to shallow turfs.

Threats

The isolation of the lake and absence of eels provide a low risk of introduction and establishment of invasive weeds is most unlikely due to grass carp browsing pressure. Water quality is currently poor.

Management recommendations

No lake native biodiversity value monitoring until grass carp removed.

Advocate removal of grass carp.

6.15 Lake Wainui (Pouto), NRC Lake No. 305; surveyed in 2001, 2005 and 2007

Plate: Lake Wainui viewed from the north (access point south end by sheds). Note the steep sided pasture catchment. Photo Lisa Forester 2010.

Summary

Overall ranking

Moderate to High: A small lake with native submerged vegetation, prone to nutrient enrichment. Margins were fenced in 2010.

Threats

Risk of pest introduction is low, but should these be introduced there would be major impacts on the lake. Nutrient enrichment and nutrient release from anoxic bottom sediments from stratification turnover.

Management recommendations

Lake native biodiversity value monitoring every 5 years. Re-vegetation of steep sloping margins.

Description

A small (4.8 ha) dune lake (1679414E, 6004475N) with a maximum depth of 11.8 m and situated in a pastoral catchment with cattle grazing to the lake edge. No inflow or outflow streams. Access across 1 km private farmland by 4-WD, difficult with a boat.

Wetland vegetation

Narrow (2 to 5 m) marginal fringe on ~75% of shoreline dominated by *Schoenoplectus tabernaemontani* with some areas of *Typha orientalis, Baumea articulata, Eleocharis acuta* and *E. sphacelata* growing to a maximum depth of 1.5 m. Apart from the western shore where emergent vegetation grew to the lake edge, emergents in Lake Wainui were disturbed by cattle access on the shoreline, with a zone of bare pugged soil surrounding the lake (Plate). Mostly annual weeds dominated this zone although one plant of the regionally significant native sedge *Fimbristylis velata,* a new record, found for the first time.

A new record the pest plant primrose willow, (*Ludwigia peploides*) formed floating mats at the south end of the lake. A non-weedy exotic, swamp lily (*Ottelia ovalifolia*), was also present with both submerged and floating leaved forms.

Submerged vegetation

No turf species were noted and charophyte meadows composed mostly of *Nitella* aff. *cristata* and *Chara australis* grew to 5.9 m deep with tall-growing native species mostly *Potamogeton ochreatus* (to 3.5 m deep), and some *P. cheesemanii* and *Myriophyllum triphyllum* dominated the submerged vegetation. No exotic submerged species were recorded.

LakeSPI

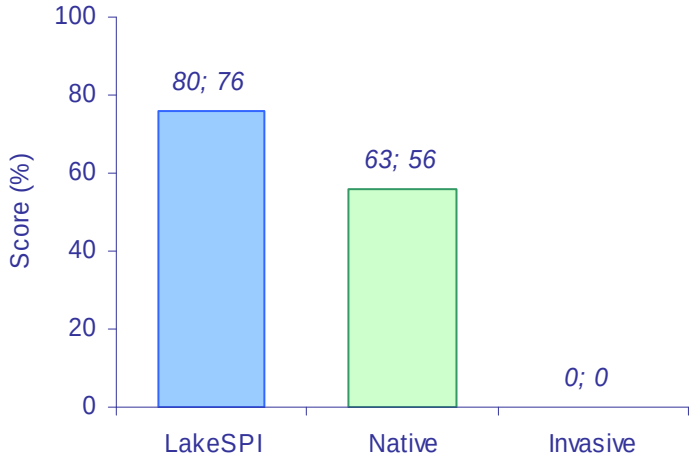


Figure: 2007 LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right) with 2005; 2007 values shown respectively.

A high LakeSPI score of 76% is driven by a totally native vegetation, but moderated by poor water clarity and shallow depth limits.

Water birds

Limited marginal habitat, due to grazing. Four regionally rare dabchick (*Poliocephalus rufopectus*) and black swan (*Cygnus atrata*) and paradise shelduck (*Tadorna variegata*) were seen during the 2007 field visit. Earlier reports include the nationally endangered bittern (*Botaurus poiciloptilus*) and regionally significant scaup (*Aythya novaezeelandiae*).

Fish

No species recorded.

Aquatic invertebrates

Leeches (*Richardsonianus mauianus*), backswimmers (*Sigara arguta*) and *Physella acuta* snails were common.

Changes in indicators

In 2001 submerged vegetation reached a depth of only 2.6 m whilst bottom limits of up to 5.6 m were recorded in 2005 and 5.1 in 2007. Similar species composition was recorded on all surveys.

Threats

An indigenous submerged vegetation with tall-growing natives, is very susceptible to invasion by tall-growing exotic species. Risk of introduction is low. The catchment is grazed pasture with little buffer to run-off entering the lake.

Management recommendations

Lake native biodiversity value monitoring every 5 years.

Recommend fencing lake and enhance/stabilise the steep catchment with marginal plantings.

6.16 Lake Wairere (Pouto), NRC Lake No. 339; surveyed in 2005

Plate: Lake Wairere surrounded by rough pasture and scrub to the west (left) and steep scrub covered cliffs to the east. Note the raupo (*Typha orientalis*) dominated emergent vegetation.

Summary

Overall ranking

Moderate-High: Isolated and set within mostly indigenous vegetation, with native aquatic vegetation, but algal bloom, endangered bird spp. present.

Threats

Low risk of introduction of invasive weeds. Water quality poor.

Management recommendations

Lake native biodiversity value monitoring every 5 years.

Description

This narrow (~2 km long, <100 m wide) dune lake (1691256E, 5985189N) is 16.5 ha in size and at least 2 m deep. It has a margin of steep scrub covered cliff to the east and rough pasture, wetland and mobile sand dunes to the west. Access is through 3 km

of pine forestry roads and rough pasture, mostly on a well-formed track requiring 4-WD. No boat access.

Wetland vegetation

Extensive wetlands to the west of lake with *Typha orientalis*, *Schoenoplectus tabernaemontani, Baumea articulata, B. arthrophylla, Eleocharis acuta, E. sphacelata* and *Carex secta* common. The lake was fringed with a dense 5-10 m bed of *T. orientalis*.

Submerged vegetation

Vegetation comprised a dense 0.4 m tall meadow of *Chara australis* extending to over 2 m deep with a few shoots of *Potamogeton cheesemanii* present.

LakeSPI

Reconnaissance only – no LakeSPI score generated.

Water birds

The lake and surrounding wetlands provide excellent bird habitat. DoC SSBI records (1977) of the nationally threatened bittern (*Botaurus poiciloptilus*) and regionally threatened dabchick (*Poliocephalus rufopectus*) and scaup (*Aythya novaezeelandiae*). A spotless crake (*Porzana tabuensis plumbea*) was seen in the wetland during the field visit.

Fish

Poor underwater visibility, no fish seen.

Aquatic invertebrates

Poor underwater visibility, no invertebrates seen.

Changes in indicators

First surveyed in 2005.

Threats

The isolation of the lake provides a low risk of introduction of invasive weeds but establishment is likely should this occur. Water clarity is currently poor due to a dense planktonic algal bloom, probably due to nutrient addition from the forestry area to the east.

Management recommendations

Lake native biodiversity value monitoring every 5 years.

6.17 Lake Whakaneke (Pouto), NRC Lake No. 390; surveyed in 2005 and 2007

Plate: Lake Whakaneke surrounded by manuka scrub with dense emergent vegetation dominated by *Typha orientalis* and *Schoenoplectus tabernaemontani*.

Summary

Overall ranking

High: Isolated and set within indigenous vegetation and dense emergent margins, with excellent water bird habitat and good populations of several endangered birds, but with no submerged vegetation and poor water clarity.

Threats

Low risk of introduction of invasive weeds.

Management recommendations

Lake native biodiversity value monitoring every 5 years.

Description

A dune lake (1696559E, 5973120N) of 20.5 ha size, about 2.5 m deep, set within a manuka scrub covered area. There were no inflow streams but it appears that water flows south from Lake Mokeno via areas of wetland, with an outflow at the entry point on the western shore, discharging to the entrance to Kaipara Harbour via an extensive wetland. A dune face is situated to the east and rough pasture, wetland and mobile sand dunes to the west. Access is by 4-WD through forestry and Māori land (15 km of tracks, some very boggy) requiring passage through a locked gate. No boat access.

Wetland vegetation

The lake was fringed by dense 10-20 m wide beds of *Typha orientalis* and *Schoenoplectus tabernaemontani* extending from the shore to 0.5 m deep. *Eleocharis sphacelata, E. acuta* and *Baumea articulata* were present in the emergent zone, with the indigenous *Persicaria decipiens* and *Isachne globularis* commonly sprawling amongst these emergent beds.

Submerged vegetation

No submerged vegetation was found in 2007 and only occasional stalks of *Myriophyllum triphyllum* and *Chara australis* fragments were found in 2005.

LakeSPI

No LakeSPI score generated as vegetation not present.

Water birds

The lake and surrounding wetlands provide excellent bird habitat. The nationally rare bittern (*Botaurus poiciloptilus*) and 20 of the regionally threatened dabchick (*Poliocephalus rufopectus*), 10 scaup (*Aythya novaezeelandiae*) and a spotless crake (*Porzana tabuensis plumbea*) were observed from the lake margin. Other threatened species reported include the regionally significant banded rail (*Rallus philippensis assimilis*) and fernbird (*Bowdleria punctata vealeae*). Brown teal (*Anas aucklandica chlorotis*) 'critically endangered', were recorded in this area.

Fish

Common bullies (*Gobiomorphus cotidianus*) were seen.

Aquatic invertebrates

Backswimmers (*Sigara arguta*), snails *Potamopyrgus antipodarum* and *Physella acuta* (exotic species) were present with a large number of chironomids.

Changes in indicators

No submerged plant indicators to monitor. The lake continues to support good populations of a number of endangered birds.

Threats

Isolation provides a lower risk of introduction of invasive weeds and establishment is unlikely should this occur as water clarity is currently very low.

Management recommendations

Lake native biodiversity value monitoring every 5 years.