3.27 Lake Wahakari (Aupouri), NRC Lake No. 35; surveyed in 2005 and 2008.

Plate: Lake Wahakari.

Summary

Overall ranking

Outstanding: Good emergent and submerged vegetation with numerous endangered biota. Pest plants and fish present, possible water quality decline.

Threats

Introduction of invasive species.

Management recommendations

As access to this water body is now severely restricted, annual surveillance for pest plants should be discontinued. Lake condition monitoring every 5 years.

Description

Lake Wahakari (1592960E, 6165597N) is a large (84.4 ha) lake with a maximum depth c. 12 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 recently harvested plantation pine forestry (50%) manuka/kanuka scrub (40%) and fenced

pasture (10%). There is an inflow at the north-western end of the lake, apparently surrounded for much of its 3 km length by bog vegetation. The outlet at the south-eastern end passes through a raupo/flax swamp and discharges into Parengarenga Harbour via the Te Kao Stream. Access is a rough gravel track via a locked gate from Te Ahu Road. The lake serves as a water supply to the district and boat access is difficult even for 4-WD launching.

Wetland vegetation

Most of the lake margins have beds of emergent species of up to 10 m wide. The dominant emergent species were *Eleocharis sphacelata, Apodasmia similis, Baumea juncea, B. arthrophylla, B. articulata* and *Typha orientalis* growing from the lake margin to 2.6 m depth. *Baumea rubiginosa* was noted as emergent in the south eastern bay during the 2008 survey.

Submerged vegetation

Turf communities were sparse due to extensive and dense emergent beds. The nationally threatened species *Utricularia australis* was relocated at one site and *Isolepis fluitans* (Plate below) was found in three locations. This included two profiles, amongst *E. sphacelata* beds and also amongst *Apodasmia similis* at the south eastern bay. Charophytes (mostly *Chara fibrosa, C. australis,* and *Nitella* aff. *cristata*) were found from the edge of emergent communities to a maximum depth of ~3 m in 3 profiles. Below this, the pondweed, *Potamogeton ochreatus* formed scattered low density growths (~ 0.5 m tall) to 5.7 m. *Utricularia gibba* had recently spread to this lake (since 2004). It was restricted to the emergent vegetation zone to a maximum depth of 1.5 m, occasionally with high covers of 50-75%.

Plate: *Isolepis fluitans*

In the previous 2003 survey the vegetation was much more abundant, with tall growths of *Potamogeton ochreatus* to 2.5 m tall growing at high covers to depths of 7.3 m.

LakeSPI

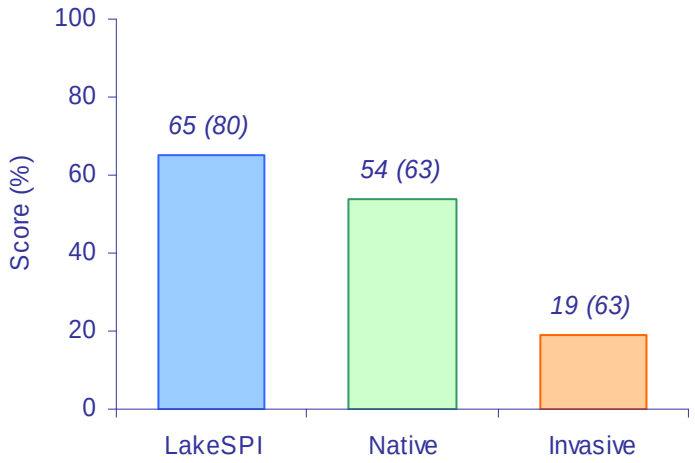

Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right).

A high LakeSPI score of 80% in 2004 reflected a high and diverse cover of indigenous plants extending to over 7 m deep. In 2008 LakeSPI had dropped to 65% with *Utricularia gibba* now present and a reduction in submerged plant cover and depth.

Water birds

Extensive emergent vegetation and a relatively isolated lake provides good habitat for water birds. The regionally threatened dabchick (*Poliocephalus rufopectus*), scaup (*Aythya novaezeelandiae*) and fernbird (*Bowdleria punctata vealeae*) were reported in DoC SSBI records. Canada geese (*Branta canadensis*) were noted during the 2008 survey.

Fish

Common bullies (*Gobiomorphus cotidianus*), eels (*Anguilla* spp.) and the exotic pest gambusia (*Gambusia affinis*) were observed during vegetation surveys. NIWA FBIS also records smelt (*Retropinna retropinna*) caught in this lake.

The Golden Bell frog (*Litoria aurea*) was also common in the margins.

Aquatic invertebrates

Freshwater mussels (*Hyridella menziesi*) were common throughout the lake including below the vegetated zone. The snail *Potamopyrgus antipodarum* and freshwater sponges were also seen.

Changes in indicators

The vegetation in Lake Wahakari has been sampled since 1984. Between 1988 and 2001 the dominant submerged vegetation switched from charophytes to *Potamogeton ochreatus* although bottom limit was similar. In 2008 the *P. ochreatus* was much less abundant and much of the deeper depth range had little vegetation present.

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 vegetation.

The pest fish *Gambusia affinis* may have a deleterious impact on other fish such as smelt.

The indicators of lake condition are showing a decline. The drivers of vegetation decline in this lake need further consideration such as looking to see if there is a decline in water quality with increased TN, TP and chlorophyll a.

Management recommendations

An assessment of lake condition at 5 yearly intervals is recommended.

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

3.28 Lake Waihopo (Aupouri), NRC Lake No. 78; surveyed in 2006 and 2009.

Plate: Lake Waihopo from the boat access point, note the extensive emergent vegetation.

Summary

Overall ranking

Outstanding: Well developed submerged vegetation, with dense emergent beds supporting numerous endangered biota.

Threats

Utricularia gibba impacting on submerged vegetation, risk of further invasive species introductions.

Management recommendations

Lake condition monitoring every 5 years.

Description

Lake Waihopo (1603898E, 6154039N) is a small (3.3 ha) dune lake with a maximum depth of ~3 m. The catchment is primarily pasture (80%) with areas of grazed manuka/kanuka scrub. However, the lake is completely fenced to exclude livestock. There are no inlet streams, but the outlet, Waihopo Stream, flows through a wetland area at the eastern end of this lake discharging into Houhora Harbour (East Coast).

Access is through private farmland off Kimberley Road. Power Boat access is difficult due to emergent vegetation, shallow water and deep peaty-muddy lake bottom though relatively easy for light boats.

Wetland vegetation

Much of the lake (70%) is occupied by large beds of emergent species, up to 50 m wide. The dominant emergent is *Eleocharis sphacelata* growing from the lake margin to 1.8 m, with other species including *E. acuta, Baumea articulata, B. juncea, B. rubiginosa, Isolepis prolifer* and *Typha orientalis* all common. The regionally significant maru (*Sparganium subglobosum*) was noted in the peaty marginal vegetation. The nationally threatened *Thelypteris confluens* is reported from this lake. A large population of another nationally threatened fern *Cyclosorus interruptus* was found in 2006.

Submerged vegetation

In 2005, the dominant submerged vegetation was a meadow of the charophyte *Nitella* aff. *cristata* extending from the edge of emergent vegetation to a maximum depth of 2.4 m. The exotic *Utricularia gibba* was recorded sprawling over this meadow, with a median cover of 26-50%. The nationally threatened *Utricularia australis* was found in pools among the emergent vegetation. The maximum depth of vegetation increased to 2.7 m in 2006, with an increase to 3.4 m recorded in the 2009 survey. Essentially the entire bottom of this shallow lake is now vegetated, with median covers of 75-95%. Dominant species were *Nitella* aff. *cristata* and *Chara australis* with lesser amount of *Potamogeton cheesemanii*. *U. gibba* extended over this charophyte dominated vegetation to depths of ~ 3m but median cover was reduced from 2005 assessments to 6-26% cover.

LakeSPI

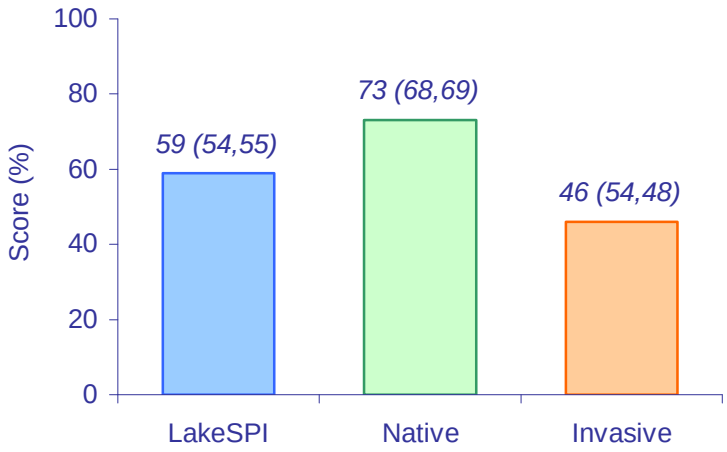

Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right) for 2009, with 2006 and 2005 data in brackets.

A moderate LakeSPI score of 54% in 2006 reflected the impact of the invasive *U. gibba* which sprawled over much of the submerged vegetation. The 2009 LakeSPI score has improved to 59 reflecting the increased extent of charophyte dominated vegetation and lower covers of the invasive *U. gibba*.

Water birds

Extensive emergent vegetation and surrounding scrub areas provide excellent habitat for water birds. The nationally threatened bittern (*Botaurus poiciloptilus*) and the regionally rare fernbird (*Bowdleria punctata vealeae*), scaup (*Aythya novaezeelandiae*) and spotless crake (*Porzana tabuensis plumbea*) were seen on the field trip. Dabchick (*Poliocephalus rufopectus*) and the Australian vagrant chestnut-breasted shelduck (*Tardorna tardornoides*) were reported in OSNZ records from 2000.

Fish

No fish were seen during the survey. The nationally threatened black mudfish (*Neochanna diversus*) is reported from this lake.

Aquatic invertebrates

Freshwater sponges, hydra and backswimmers (*Sigara arguta*) were recorded in the lake.

Changes in indicators

The vegetation in Lake Waihopo has been sampled on 4 previous occasions. The 1985 survey reported charophyte beds dominated by *Chara australis* with *U. australis* common throughout the vegetation profile. In 2001 the lake was essentially de-vegetated, with *N.* aff. *cristata* the dominant species. In the 2005 and 2006 surveys submerged vegetation had re-established with *N.* aff. *cristata* the dominant species extending to 2.7 m in 2006, but the alien *U. gibba* was covering much of this meadow. The 2009 showed further increase in bottom limit of the vegetation to 3.4 m, with *C. australis* also a common component of this vegetation. No *U. australis* was found on this occasion.

Threats

Utricularia gibba may affect the submerged vegetation. Other submerged weed species are unlikely to be introduced in Lake Waihopo, but could further impact on lake vegetation if this occurs. Lake water quality is currently poor; the recent fencing could result in an improvement in lake condition, but cattle were present inside the fenced zone during the 2009 visit and were noted wading into the lake.

Management recommendations

Carry out lake condition monitoring every 5 years.

3.29 Lake Waimimiha North (Aupouri), NRC Lake No. 136; surveyed in 2005.

Plate: Lake Waimimiha North showing surface-reaching beds of *Ceratophyllum demersum* (bottom left) on the margin of emergent vegetation.

Summary

Overall ranking

Low: The pest plant *Ceratophyllum demersum* has displaced all other submerged species, but emergent vegetation provides valuable habitat for endangered waterbirds.

Threats

Highly impacted by pest plants and nutrient enrichment.

Management recommendations

No monitoring recommended.

Description

This lake (1615456E 6111245N) is 2.2 ha in area, with a maximum recorded depth of ~ 2 m. It is situated on sand dunes. The catchment is predominantly pasture with some market gardening. The Wairoa Stream (running parallel to the coastline for 5 km north of this lake) discharges into this lake via a wetland on the eastern side and the lake is linked to Waimimiha South from the south. The outflow stream passes through a further lake before flowing into Ahipara Bay (West Coast). Access is via 2 km of rough track on private property. No boat access.

Wetland vegetation

There is a dense fringe of emergent vegetation up to 10 m across comprised predominantly of *Typha orientalis*, with a deep water outer edge of *Eleocharis sphacelata* to depths of 1 m.

Submerged vegetation

The submerged vegetation was dominated by surface-reaching (~ 2 m tall) beds of *Ceratophyllum demersum* covering the entire lake outside of the emergent beds.

LakeSPI

Reconnaissance only – no LakeSPI score generated.

Water birds

The large areas of dense tall emergent vegetation provide good habitat for many aquatic birds, although no endangered species were observed during the field visit. The regionally significant spotless crake (*Porzana tabuensis plumbea*) and fernbird (*Bowdleria punctata vealeae*) are reported from this lake complex.

Fish

No fish were seen in the lake.

Aquatic invertebrates

No aquatic invertebrates were noted.

Changes in indicators

This lake was surveyed for the first time in November 2004.

The limited available data suggest there has been little change in lake water quality between 1991 and 2003.

Threats

The worst invasive submerged weed *C. demersum* completely dominated the lake. Alligator weed (*Alternanthera philoxeroides*) was found further downstream and possibly could occupy the open lakeward edges of *T. orientalis* dominated emergent vegetation in the future.

Water quality is already poor (hypereutrophic status).

Management recommendations

No monitoring is recommended.

3.30 Lake Waimimiha South (Aupouri), NRC Lake No. 137; surveyed in 2005.

Plate: Lake Waimimiha South showing margin of emergent vegetation. Note the green tinge to the water indicating an algal bloom.

Overall ranking

Low: No submerged species were seen, but emergent vegetation provides valuable habitat for endangered water birds.

Threats

Highly impacted by pest plants and nutrient enrichment.

Management recommendations

No monitoring recommended.

Description

This lake (1615561E, 6110795N) is 9.2 ha in area. It is situated on sand dunes. The catchment is predominantly pasture with some market gardening. There is a small stream entering the southern end of this lake and an outlet to the north linking to Lake Waimimiha North. Access is via 12 km of rough track on private property. Difficult boat access.

Wetland vegetation

There is a dense fringe of emergent vegetation up to 10 m across comprised predominantly of *Typha orientalis*, with occasional clumps of *Eleocharis sphacelata* in deeper water. No investigation of depth of vegetation was attempted due to possibly toxic algal blooms. The problem weed *Glyceria maxima* was collected from this lake in 1988, but not seen on the reconnaissance visit.

Submerged vegetation

No investigation of submerged vegetation was attempted due to possibly toxic algal blooms, however development of plants with such restricted clarity is unlikely.

LakeSPI

Reconnaissance only – no LakeSPI score generated.

Water birds

The large areas of dense tall emergent vegetation provide good habitat for many aquatic birds, with one nationally endangered bittern (*Botaurus poiciloptilus*) observed during the field visit. Conning and Holland (2003) report the regionally significant spotless crake (*Porzana tabuensis plumbea*) from this lakes complex, while OSNZ survey in 2000 recorded fernbird (*Bowdleria punctata vealeae*).

Fish

No fish were seen in the lake.

Aquatic invertebrates

No aquatic invertebrates were noted.

Changes in indicators

This lake was surveyed for the first time in November 2004.

The limited available data suggest there has been little change in lake water quality between 1991 and 2003.

Threats

Poor water clarity would restrict the development of submerged vegetation. Alligator weed (*Alternanthera philoxeroides*) was found further downstream and possibly could occupy the open lakeward edges of *T. orientalis* dominated emergent vegetation in the future.

Water quality is already poor (hypereutrophic status).

Management recommendations

No monitoring is recommended.

3.31 Lake Waipara / Dead Lake (Aupouri), NRC Lake No. 25; surveyed in 2005.

Plate: Lake Waipara showing the margin of scrub vegetation with pine forestry behind this. Note the narrow emergent zone.

Summary

Overall ranking

High: Indigenous lake with indigenous scrub margin, reduced submerged vegetation due to humic staining, endangered birds present.

Threats

Low; isolated lake, possible threat from diggers, buffered from groundwater nutrient additions.

Management recommendations

Lake condition monitoring every 5 years.

Description

Lake Waipara (1586647E, 6172834N) is 1.3 ha in area and > 5 m deep. Ringed by a narrow margin of manuka scrubland, a forest road and then plantation pine forestry. No inflow or outflow streams. Access is through 7 km of forestry roads with trailer access possible at one point (bulldozed track to lake margin).

Wetland vegetation

The lake was ringed by a narrow (2 to 5 m wide) emergent band of *Baumea articulata* (edge to 0.5 m deep) and *Eleocharis sphacelata* (0.5 to 2 m deep).

Submerged vegetation

Submerged vegetation was native but depauperate due to low light penetration. *Chara australis* the most common charophyte extending from the edge of emergent vegetation to a maximum depth of 2.8 m. *Potamogeton cheesemanii* was the only tall-growing species.

LakeSPI

Reconnaissance only – no LakeSPI score generated.

Water birds

The isolated nature of this lake with a scrub margin, but relatively poorly developed emergent vegetation provides a moderate habitat for water birds. The nationally threatened bittern (*Botaurus poiciloptilus*) and regionally significant fernbird (*Bowdleria punctata vealeae*) were both recorded at this lake during the vegetation survey.

Fish

No fish were recorded.

Aquatic invertebrates

Pea mussels (*Sphaerium novaezelandiae*) and freshwater sponges were observed during the vegetation survey.

Changes in indicators

No previous surveys.

Threats

Risk of introduction is low, unless drainage machinery accesses the lake. Pest impacts would be minimal due to low light penetration. Good buffer to nutrient addition via ground water/run-off.

Management recommendations

Lake condition monitoring every 5 years.

3.32 Lake Waiparera (Aupouri), NRC Lake No. 102; surveyed in 2005.

Plate: Lake Waiparera.

Summary

Overall ranking

Moderate to High: Submerged vegetation sparse with invasive species (weeds and fish) present, but good water bird habitat and threatened fish present.

Threats

Moderate impacts from *Egeria densa, Lagarosiphon major, Utricularia gibba* and alligator weed. *Gambusia* and goldfish present, rudd were recorded. Margins fenced, lake is nutrient enriched.

Management recommendations

Lake condition monitoring every 5 years.

Description

The lake (1616526E, 6133135N) is the largest of the Aupouri lakes (103 ha) but relatively shallow (6 m). This catchment is approximately 70% pasture (mostly fenced) with the remainder in native scrub or wetland. The lake has several inflows, mostly drains on the south western side, but also a drain on the north-western and north eastern shores. There do not appear to be any outflows. Access for vehicles and boats is easy with a sign-posted turning off SH1.

Wetland vegetation

Emergent vegetation nearly encircled the lake extending over 10 m in many places. Vegetation was dominated by monocultures of the following; *Typha orientalis, Apodasmia similis, Baumea articulata, B. arthrophylla* and *Eleocharis sphacelata* to 1.5 m deep.

The alien invasive alligator weed (*Alternanthera philoxeroides*) formed floating mats on the south western shore and appeared to be well established around the southern part of this lake.

Submerged vegetation

Low cover turf vegetation occurred at shallow (<1 m) shoreline areas, except where dense emergents occurred. Turfs were dominated by *Lilaeopsis novae-zelandiae* with several charophytes including *Chara fibrosa, C. globularis, C. australis, Nitella leonhardii* and *N. pseudoflabellata* predominantly restricted to this vegetation. The exotic *Utricularia gibba* was also present at low covers in these areas. The exotic oxygen weeds *Egeria densa* and *Lagarosiphon major* formed low covers (<26%) from 1 m to 2.4 m deep, along with the native *Potamogeton ochreatus. Nitella* aff. *cristata* formed denser covers 26-50% from 2 to 2.8 m deep.

LakeSPI

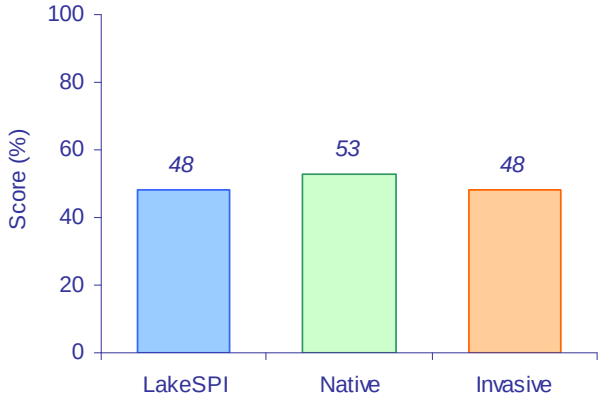

Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right).

The low LakeSPI score of 48% reflects the presence of the invasive alien *E. densa* and *L. major* and low covers of plant communities in Lake Waiparera.

Water birds

The extensive emergent vegetation and fenced areas provided good water bird habitat. Several of the regionally significant scaup (*Aythya novaezeelandiae*) were present on the lake at the time of survey with other common species such as black swans (*Cygnus atratus*) and paradise shelduck (*Tadorna variegata*). DoC SSBI records include the nationally threatened bittern (*Botaurus poiciloptilus*).

Fish

NIWA FBIS database reports common bullies (*Gobiomorphus cotidianus*), lake-bound inanga (*Galaxias maculatus*), long and shortfin eels (*Anguilla dieffenbachii* and *A. australis*) and the pest fish *Gambusia affinis* from this lake. DoC sampling on the current field trip sampled many goldfish (*Carassius auratus*), but no rudd (*Scardinius erythrophthalmus*) were caught, despite these being seen in 2001.

Aquatic invertebrates

Freshwater sponges and the native snail *Potamopyrgus antipodarum* were commonly observed in the lake.

Changes in indicators

The submerged vegetation appears to have declined between the 1980's and 2001 with reduced cover (~ 90% to <5%) and bottom limit (4 to 2.5 m). This survey reports a denser vegetation ~ 50% with a slightly deeper bottom limit (2.8 m). The pest plants *E. densa* and *L. major* were first recorded in Lake Waiparera in 1990 and 1975 respectively, but *A. philoxeroides* and *U. gibba* are reported for the first time this survey. The nationally endangered turf species *Trithuria inconspicua*, last recorded here in 1993, was not relocated in this lake.

Threats

The lake is already highly impacted by introduced species with further impacts unlikely. Access to the lake is easy and has resulted in several incursions in the last 40 years. Neither submerged oxygen weed species is forming dense tall beds in this lake. Perhaps the large wave exposed nature of this shallow water body prevents this, and similarly *C. demersum* is unlikely to thrive should it be introduced. This species lacks roots and thus is unlikely to establish in exposed areas. *U. gibba* and alligator weed are also predicted to have limited impact. Pest fish may impact on the vegetation and other fish within the lake.

The lake is now completely fenced and development of riparian and emergent vegetation in formerly grazed lake margins is likely to reduce nutrient inputs, however drains entering provide point sources of nutrients draining from pastoral land.

Management recommendations

The lake may provide a source of pest plants and fish to other water bodies. Signage and possible weed control in the vicinity of the boat ramp are suggested.

Lake condition monitoring every 5 years.

The status of inanga and relation to Lake Ngatu fish needs further investigation.

3.33 Waitahora Lagoon (Aupouri) NRC Lake No. 4; surveyed in 2007 and 2009.

Plate 1: LEFT 2007 showing the east end of Waitahora Lagoon, showing a saline influenced wetland dominated by the green oioi (*Apodasmia similis*) and brown sea rush (*Juncus kraussii* var. *australiensis*)., RIGHT 2009 showing a closer of the same area but with the oioi impacted by saltwater intrusion.

Summary

Overall ranking

Outstanding: Pristine wetland complex with both saline and freshwater components, numerous endangered biota, and an indigenous catchment. No pest species were recorded.

Threats

Low risk of introduction of invasive pests. The isolated nature of this lagoon and the surrounding indigenous vegetation indicates there is little immediate invasive threat to this site. Saline intrusions due to cyclical changes at the outlet could impact freshwater components.

Management recommendations

Ecological condition monitoring every 5 years.

Description

Waitahora Lagoon (NZMG 2493880E, 6749715N) is a large (20.7 ha) coastal lagoon surrounded by indigenous vegetation. It was linked to the sea at the western end and most of the lagoon was saline. The catchment was primarily scrub although a large wetland was present around the Waitahora Stream and other unnamed streams, at the

east end of the lagoon. This section of the lagoon and links with smaller freshwater lakes (see next section). The lagoon is accessed from the Cape Reinga Walkway some 6 km west of the Kapowairua Camp Ground. It can be accessed through a locked gate under DoC control and a 4 WD track.

Wetland vegetation

The west half of Waitahora Lagoon lacked significant wetland margins being situated between scrub on the southern side and dunes to the north. Dune vegetation included the nationally rare grass *Austrofestuca littoralis*. The east half of the lagoon was surrounded by an extensive wetland dominated by oioi (*Apodasmia similis*) and sea rush (*Juncus kraussii* var. *australiensis*). Marginal areas contained *Baumea juncea, Cyperus ustulatus* and the nationally endangered *Hibiscus diversifolius*. In 2009, salt water intrusion into the lagoon had killed shoots of oioi, and *Baumea juncea,* but seedlings of *Lilaeopsis novaezelandiae, Mimulus repens* and *Selliera radicans* were noted. Amongst the tall emergent vegetation and along the channels of the upper lagoon were typical salt marsh species such as *Selliera radicans* and *Samolus repens* and large areas of the nationally 'Ar-risk' *Mimulus repens*. It is a rare plant in Northland with only two other sites known and the Waitahora Lagoon site comprises the largest and least vulnerable population for the species.

Submerged vegetation

Most of the lagoon was saline with no submerged vegetation. However, some sparse vegetation (5-25% cover) was noted in 2007 in the upper channels (as shown in Plate 1). Species present included *Ruppia polycarpa, Triglochin striata, Mimulus repens* and a charophyte in the genus *Lamprothamnium.* All these species are typical from brackish areas, although the first of these plants is also relatively common in freshwater lakes. Prior to the 2007 survey one species of *Lamprothamnium* (*L. macropogon*) was recorded from the southern North Island, the South Island and Chatham (Rekohu) Island, with the northernmost record from the Whakaki Lagoon near Wairoa (Hawkes Bay). The Waitahora Lagoon plant appears to be a different species (M. de Winton pers. comm.) and has been planted to grow on to enable its identification. In 2009 the *Lamprothamnium* site had recently been affected by a saline intrusion and no submerged plants were found and surrounding rushes / sedges were brown. A channel closer to the freshwater wetland supported *Utricularia australis* growing over dead rushes / sedges.

LakeSPI

LakeSPI score not generated for this lagoon.

Water birds

Extensive emergent vegetation and relatively undisturbed nature of this lake provides a good habitat for water birds. The regionally significant fernbird (*Bowdleria punctata vealeae*) was heard in the wetland areas at the east end of Waitahora Lagoon. OSNZ records from this locality include the nationally endangered brown teal (*Anas chlorotis*) and one of the few Northland records of marsh crake (*Porzana pusilla*).

Fish

About a 40 strong school of grey mullet (*Mugil cephalus*) up to 30 cm long was observed in the clear waters of the lagoon in 2007. There are no NIWA FBIS records of fish from this location.

Aquatic invertebrates

No invertebrates were noted.

Changes in indicators

Too shallow for LakeSPI.

Threats

The isolated nature of this lagoon (with locked gate) and the surrounding indigenous vegetation indicates little immediate threat to this site. Periods of saline inflow when the western end of the sand bar is open (as was the case in 2009) along with periods where the lagoon is dominated by freshwater results in a highly dynamic habitat.

Management recommendations

Carry out 5 - year ecological condition monitoring.

A fish survey is advocated to determine the fauna of the saline and freshwater parts of the Waitahora wetland complex.

3.34 Waitahora Lakes (Aupouri) NRC Lake No. 3; surveyed in 2007 and 2009.

Plate 2: Freshwater lake, east of Waitahora Lagoon dominated by *Eleocharis sphacelata*.

Summary

Overall ranking

Outstanding: Pristine wetland complex with both saline and freshwater components with numerous endangered biota and an indigenous catchment. No pest species recorded.

Threats

Low risk of introduction of invasive pests. The isolated nature of these lakes and the surrounding indigenous vegetation indicates little immediate threat to this site. Wetland is dependent on water banking up behind the dune complex.

Management recommendations

Ecological condition monitoring every 5 years.

Description

There were several small freshwater bodies to the east of Waitahora Lagoon (NZMG 2494230E, 6749760N), the largest being 2.3 ha in area, although most of this was covered by tall emergent vegetation. The catchment was primarily manuka scrub with a large wetland around the Waitahora Stream, other unnamed streams, and surrounding the freshwater lakes. Water was tea-stained indicating high humic content (Plate 3). The lakes are accessed from the Cape Reinga Walkway some 5.5 km west of the Kapowairua Camp Ground.

Wetland vegetation

The water bodies were predominantly filled with the emergent sedges *Eleocharis sphacelata* (Plate 2) and *Baumea articulata* growing to depths of 1 m. The nationally endangered *Hibiscus diversifolius* (classified as 'National Vulnerable') was common in the marginal vegetation of these lakes.

Submerged vegetation

In 2007, open areas of water had some *Chara australis* and *C. fibrosa*, with pondweeds (*P. cheesemanii* and *P. ochreatus*), the milfoil *Myriophyllum propinquum* and the introduced swamp lily (*Ottelia ovalifolia*). The nationally endangered *Utricularia australis* was commonly found (Plate 3). The introduced water purslane (*Ludwigia palustris*) was found at the margin of the lake.

In 2009 in the same area was covered in *Azolla pinnata* covered open water amongst the *Baumea articulatata* and *Eleocharis sphacelata* with submersed *Myriophyllum propinquum* and sprawling *Percicaria decipiens*.

LakeSPI

No LakeSPI score was generated for this lagoon.

Water birds

Extensive emergent vegetation and relatively undisturbed nature of this lake provides a good habitat for water birds. The nationally threatened bittern (*Botaurus poiciloptilus*) was seen and the regionally significant fernbird (*Bowdleria punctata vealeae*) was heard.

Fish

No fish were seen and there are no NIWA FBIS records of fish sampled from this location.

Aquatic invertebrates

No invertebrates were noted

Changes in indicators

First sampled in 2007.

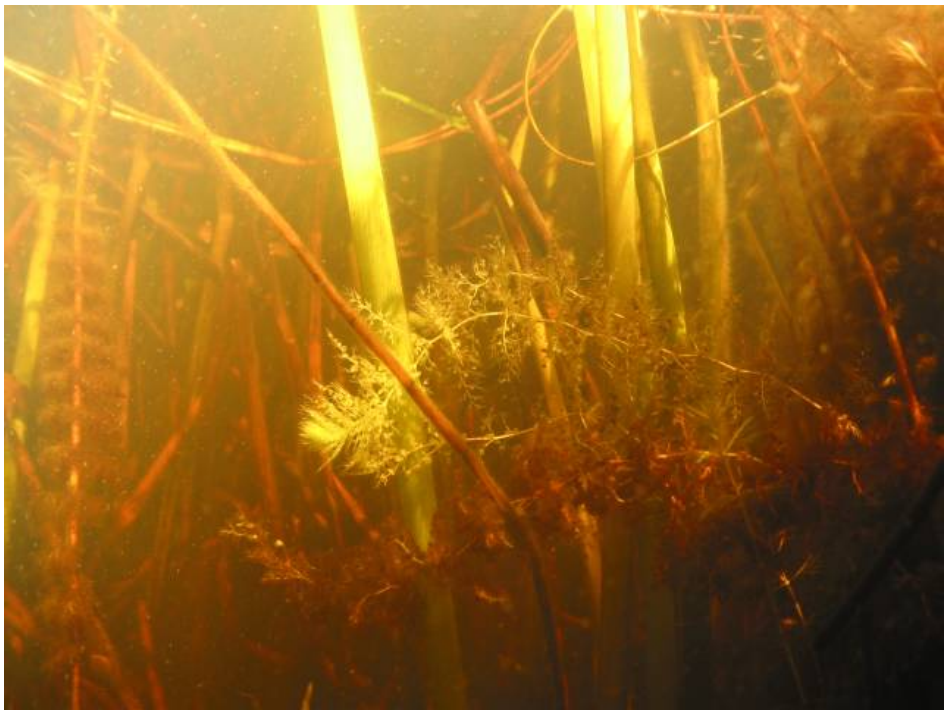

Plate 3: Freshwater lake east of Waitahora Lagoon with the endangered bladderwort (*Utricularia australis* – centre) and the milfoil *Myriophyllum propinquum* (left and right) in open water amongst the culms of *Eleocharis sphacelata* (centre background).

Threats

The isolated nature of this lagoon and the surrounding indigenous vegetation indicates little immediate threat to this site. The introduced swamp lily and water purslane are common species in Northland and pose little threat to the ecology of this otherwise pristine system.

Management recommendations

Ten year ecological condition monitoring.

A fish survey is advocated to determine the fauna of the saline and freshwater parts of the Waitahora wetland complex.

3.35 West Coast Road (Aupouri), NRC Lake No. 121; surveyed in 2005, visited in 2007.

Plate: West Coast Road Lake showing emergent dominated water body with the endangered *Myriophyllum robustum* (bottom right) 2005, though not present in 2007.

Summary

Overall ranking

High: Outstanding water bird habitat, also endangered plants present, impacted by invasive *Utricularia gibba*.

Threats

U. gibba and tall emergent vegetation spread threaten endangered plants.

Management recommendations

Lake condition monitoring every 5 years.

Description

This dune lake (1616741E 6123403N) is 1.6 ha in area with a maximum depth of ~ 1.5 m. The catchment is pine plantation forestry (50%), wattle scrub (20%), pasture and roadside grassland (30%). There are no inlets or outlets. Access is directly off the West Coast Road, but boating is not possible due to high emergent cover.

Wetland vegetation

Approximately 90% of the lake was covered with dense emergent vegetation dominated by *Eleocharis sphacelata* with local patches of the taller *Baumea articulata*. In 2005 the nationally endangered *Myriophyllum robustum,* a sprawling emergent species, was restricted to areas of open water amongst the taller sedges (see plate). However when visited in 2007 these plants could not be found, with sedges occupying the area in which *Myriophyllum robustum* formally occurred.

Submerged vegetation

Vegetation in the roadside pools was dominated by dense mats of the exotic *Utricularia gibba*, in full flower, with *Myriophyllum robustum, M. propinquum, Isolepis prolifer* and *Persicaria decipiens* emergent through the mat in 2005. However, an inspection of the roadside pools area in 2007 found the open water was gone with *Eleocharis sphacelata* growing densely. At the eastern end of the lake the landowners had cleared the emergent vegetation with an area of open water resulting. Submerged vegetation was sparse in this area.

LakeSPI

Reconnaissance only – no LakeSPI score generated.

Water birds

The dense tall emergent vegetation provided excellent habitat for many aquatic birds, including the nationally threatened bittern (*Botaurus poiciloptilus*) and regionally significant dabchick (*Poliocephalus rufopectus*) and spotless crake (*Porzana tabuensis plumbea*).

Fish

The pest fish *Gambusia affinis* were abundant in the lake, the only species seen and recorded in the NIWA FBIS database.

Aquatic invertebrates

No aquatic invertebrates were noted.

Changes in indicators

The invasion of *U. gibba* into this sheltered shallow water body may have displaced a range of submerged species previously recorded (1984 to 2001) including the charophytes *Nitella* aff. *cristata* and *N. leonhardii* and the nationally threatened *Utricularia australis*. Emergent vegetation appears to have encroached on previously open water areas out competing *M. robustum*.

Threats

U. gibba may be having a major impact on other species. The free-floating pest plant *Salvinia molesta* previously dominated the vegetation of this lake and was eradicated in the mid-1990's. Control measures opened up the wetland vegetation and provided habitat for other species. Further invasive submerged species are unlikely to impact this water body.

Management recommendations

A suitable site to monitor *U. gibba* impacts and possible control techniques.

Lake condition monitoring every 5 years.

3.36 Lake Yelavich (Aupouri), NRC Lake No. 105; surveyed in 2008.

Plate: Lake Yelavich, a dune lake within plantation pine forestry

Summary

Overall ranking

High: A shallow lake with a large population of the endangered *Myriophyllum robustum*, with a large entire marginal fringe of emergent species.

Threats

Low: Isolated, with access through private forestry.

Management recommendations

Monitoring for nutrient status and 5 yearly condition monitoring

Description

Lake Yelavich (1614575E, 6132392N) is about 3 ha in area. The lake was heavily tannin stained, but not turbid with visibility of around 1 m. The lake lies in a scrub and pine plantation catchment. Access was through Juken Nissho Ltd. forestry roads.

Wetland vegetation

The lake was encircled with emergent vegetation 10 – 20 m wide dominated by *Eleocharis sphacelata* extending to 2 m depth.

Submerged vegetation

There was little submerged vegetation beyond the emergent vegetation. *Utricularia gibba* was common to 2 m deep with covers exceeding 95% in two of the 3 profiles. Additional submerged species were *Potamogeton cheesemanii* and *Myriophyllum propinquum* in shallow water. The nationally threatened *Myriophyllum robustum* was widespread at low covers from 1.4 to 1.7 m deep amongst the *Eleocharis sphacelata*.

Water birds

The lake has good habitat for birds (large expanses of tall emergent vegetation) although none were recorded during the visit.

Fish

No fish were seen, but in-water visibility was limited.

Aquatic invertebrates

None seen.

Changes in indicators

This was the first time this lake has been surveyed.

Threats

Pines were recently harvested but no effects (e.g., high suspended sediments) were recorded. The isolated nature of the lake and large surrounding wetland indicate that there are few threats of nutrient enrichment or invasive species.

Management recommendations

This is a good example of a shallow tannin-stained lake, with intact fringe of emergents and no livestock access. An assessment of lake condition at 5 yearly intervals is recommended.

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