3.18 Lake Pretty (Aupouri), NRC Lake No. 24; surveyed in 2005.

Plate: Lake Pretty from the access point (north-eastern end of lake) showing sparse emergent vegetation.

Summary

Overall ranking

Moderate: Small shallow lake with no invasive biota, low vegetation covers, poor habitat for fauna

Threats

Low risk of introduction of invasive pests. Moderate-low risk of nutrient enrichment from pine plantation activities (logging, fertilisers). Continued decline in water level may further deteriorate lake habitat.

Management recommendations

No monitoring or active management.

Description

The lake (1584443E 6173185N) is approximately 5.7 ha in area with a maximum recorded depth of 4.4 m. Catchment of plantation pine forestry on Holocene sand dune field. No inflows or outflows. Accessed through well-formed private forestry roads, no boat access.

Wetland vegetation

Mostly steep sided, with margin predominantly of kanuka scrub with rushland at access point. Emergent vegetation was sparse (30% of lake shore), forming a narrow (~1 m wide) intermittent fringe. Dominant species were *Eleocharis sphacelata, E. acuta, Baumea articulata* and *Juncus pallidus*.

Submerged vegetation

Open turf was dominated by *Myriophyllum propinquum* from lake margin to 1.2 m deep. Below this a charophyte meadow dominated by *Nitella pseudoflabellata* in a mosaic with *Potamogeton ochreatus* extended to 3m, with scattered plants of these spp. deeper than this (to maximum depth of 4.4 m). It is the only Northland lake surveyed with *N. pseudoflabellata* dominated vegetation. No endangered or invasive plant species were found.

LakeSPI

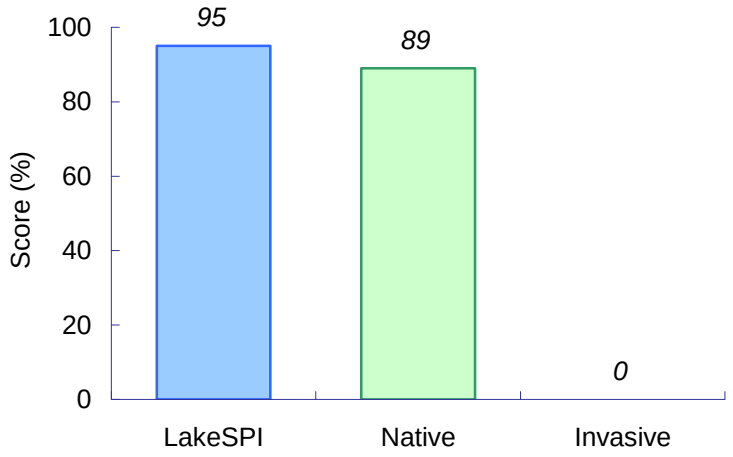

Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right).

A high LakeSPI index of 95% reflects the totally native submerged vegetation present over most of this shallow lake.

Water birds

Poor water bird habitat provided by the sparse wetland vegetation. No birds seen on field inspection, with common waterbirds reported in earlier surveys.

Fish

Common bullies (*Gobiomorphus cotidianus*) frequently observed on field inspection.

Aquatic invertebrates

No aquatic invertebrates recorded on field inspection.

Changes in indicators

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

Threats

There are currently no pest plants or fish reported from this lake. The access through private forestry roads (6 km off access road) and poor boat access mean the likelihood of introduction of alien species is low, but if introduced, these could have major deleterious impacts on the lake.

There is apparently some livestock access (cattle, horses?) based on pugged lake margins and absence of emergent vegetation in shallow water areas (see plate).

The water level had dropped by approximately 3 m since pines were planted in the catchment and future decreases could occur.

Management recommendations

No monitoring is recommended.

3.19 Lake Rotokawau (Aupouri), NRC Lake No. 116; surveyed in 2005 and 2009.

Plate: Lake Rotokawau from access point**.**

Summary

Overall ranking

High: Impacted by *Utricularia gibba*. The 'Nationally Endangered' *U. australis* was re-discovered in 2009 raising the ranking from Moderate-High to High.

Threats

Biosecurity, possible introduction of *Ceratophyllum demersum* or *Egeria densa*

Management recommendations

Lake condition monitoring required at 5 year intervals. Survey lake for land-locked inanga.

Description

A dune lake (1618821E, 6124849N) accessed through private land via 2-wheel drive under fair weather conditions, and accessible for small boats. A small (14.2 ha), shallow (3.1 m) water body within a catchment of fenced pasture (70%), scrub (30%) and planted forest, with no major inflows or outflow. Access is through private land managed by owners who are aware of lake threats.

Wetland vegetation

The lake was encircled by a reed bed of *Eleocharis sphacelata* extending out 10-30 m to a maximum depth of 2 m (90% cover). *Baumea arthrophylla*, *B. articulata*, *B. juncea*, *Apodasmia similis* and *Eleocharis acuta* were also present.

Submerged vegetation

Turf plants were occasional at the inshore edge of the reed bed, and included the regionally rare *Gratiola sexdentata* and *Triglochin striata*. The submerged vegetation was dominated by the charophyte *Chara fibrosa* to the maximum lake depth (3.1 m), but with the exotic invasive species *Utricularia gibba* covering much of the lake vegetation (cover >50%) between 0.5 and 2.8 m. The only other exotic plant, *Juncus bulbosus*, was limited to shallow water at one site only. The 'Nationally Endangered' *Utricularia australis* was present low to medium covers at ~2 m depth (amongst *U. gibba*) throughout the lake in 2009, after not being recorded in 2004.

LakeSPI

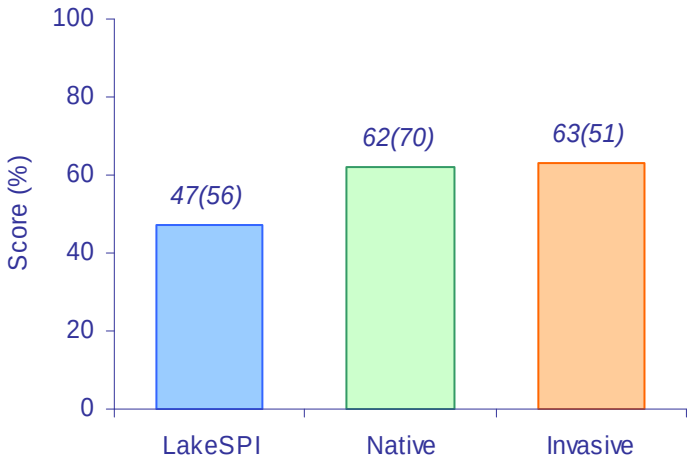

Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right) with 2004 results in brackets.

The LakeSPI score of 47% is moderate, reflecting the presence of several key native plant communities, but impacted by the extent of the invasive exotic, *U. gibba*. Relative to 2004 there was a slight decrease in maximum depth of native species and an increase in the depth of *U. gibba* lowering the LakeSPI score.

Water birds

The extensive emergent beds and adjacent scrub areas provide good habitat for water birds. The nationally threatened bittern (*Botaurus poiciloptilus*) and regionally significant dabchick (*Poliocephalus rufopectus*), Australasian little grebe (*Tachybabptus novaeholandiae*) and fernbird (*Bowdleria punctata vealeae*) were all previously recorded from this lake.

Fish

Common bullies (*Gobiomorphus cotidianus*) and the exotic pest gambusia (*Gambusia affinis*) were observed. There are also reports of a landlocked population of inanga (*Galaxias maculatus*), which may be of special status (cf. recent evaluation of Lake Ngatu population of inanga (B. David pers. comm).

Aquatic invertebrates

The introduced snail *Physella acuta* was noted.

Changes in indicators

Both the exotic species *U. gibba* and *J. bulbosus* were new records for this lake in 2004. *U. gibba* is now one of the dominant plants within the lake. The charophyte meadows have survived despite the extensive covering by *U. gibba*, and at the time of the 2009 survey were of lower cover than recorded in 2004. Previous observations recorded the 'Nationally Vulnerable' *Trithuria inconspicua* (1988, 1991). The 'Nationally Endangered' *U. australis* was prominent in 2009 raising the lake ranking from Moderate-High to High.

Threats

U. gibba a recent invader in 2004 appeared to have displaced the native *U. australi*s, but in 2009 *U. australi*s was recorded on all profiles growing amongst the *U. gibba*. Access through private land minimises the risk of further exotic plant introductions. The exotic pest fish gambusia will have impacts on other fish.

Management recommendations

Lake condition monitoring every 5 yrs.

Sample for land-locked inanga to determine their status and compare with Lake Ngatu fish.

3.20 Lake Rotoroa (Aupouri), NRC Lake No. 126; surveyed in 2005.

Plate: Lake Rotoroa, approaching from the north-east and showing the predominantly pastoral catchment and much of the lake edge fenced with riparian plantings.

Summary

Overall ranking

High: Submerged vegetation dominated by invasive *Egeria densa*, but large population of the endangered *Trithuria inconspicua*, moderate water quality and good water bird habitat.

Threats

Current high level of impacts from *E. densa*, but other introductions unlikely. Alligator weed (*Alternanthera philoxeroides*) could displace other emergent species. Margins fenced, re-vegetation of riparian zone undertaken.

Management recommendations

Lake condition monitoring every 5 years.

Description

Part of the Sweetwater group of lakes (1617883E, 6120400N). The lake is fairly large (26.5 ha) and relatively deep (8 m). This lake is accessed across 2 km of private pastoral land that comprises most of the catchment; boat access is difficult. The lake has no defined inflows or outflows.

Wetland vegetation

The south-western half of the lake is encircled by dense beds of emergent species extending over 20 m wide, dominated by *Eleocharis sphacelata* to 1.8 m deep, with lesser amounts of *Schoenoplectus tabernaemontani*. The northern part of the lake has much sparser emergent vegetation, with extensive turf communities in shallow waters.

The invasive pest plant alligator weed (*Alternanthera philoxeroides*) was noted in small patches adjacent to mai-mais on the south-western part of the lake.

Submerged vegetation

Species-rich turf vegetation occurred at shallow (<2 m) shoreline areas, except where dense emergents occurred. Turfs were dominated by *Lilaeopsis novae-zelandiae* and in some areas the nationally rare *Trithuria inconspicua*. *Utricularia gibba* was present at low covers in association with stands of emergents, extending to 2.5 m deep on one profile. The exotic *Egeria densa* dominated from depths of 2 m to c. 5 m depth, forming dense beds up to 3.5 m tall. Isolated clumps and shoots of *E. densa* were present to the maximum surveyed depth of the lake at 7 m. *Potamogeton ochreatus* and *Chara australis* co-existed with low covers of *E. densa*.

LakeSPI

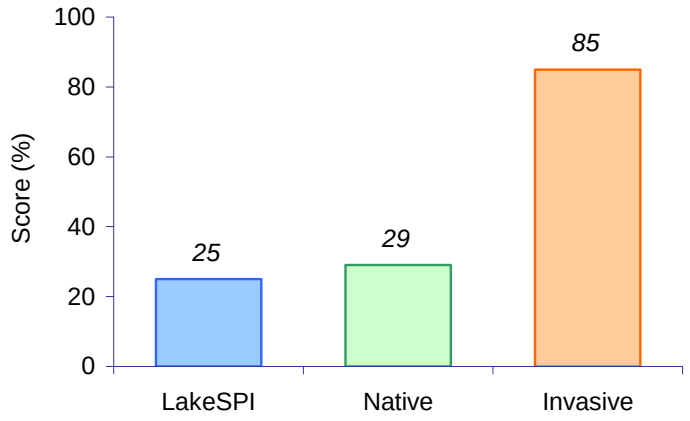

Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right).

The low LakeSPI score of 25% reflects the pervasive nature of invasion by *E. densa* and reduced extent of native plant communities.

Water birds

The extensive emergent vegetation provided good water bird habitat. Black swans (*Cygnus atratus*) and paradise shelduck (*Tadorna variegata*) were noted during the field visit. Recent OSNZ records include the nationally threatened bittern (*Botaurus poiciloptilus*) and regionally significant scaup (*Aythya novaezeelandiae*), dabchick (*Poliocephalus rufopectus*) and Australasian little grebe (*Tachybaptus novaehollandiae*).

Fish

Common bullies (*Gobiomorphus cotidianus*), smelt (*Retropinna retropinna*) and inanga (*Galaxias maculatus*) were seen on the vegetation survey. Both smelt and inanga are lake-bound populations. NIWA FBIS database also reports shortfin eels (*Anguilla australis*) from this lake.

Aquatic invertebrates

Freshwater mussels (*Hyridella menziesi*) and pea mussels (*Sphaerium novaezelandiae*) were abundant in the north eastern end of the lake.

Changes in indicators

The maximum recorded depth for submerged plants has varied somewhat over four vegetation surveys, from 4.5 m in 1985, greater than 5.5 m in 1988, 5.3 m in 2001 and at least 7 m in the current survey. The vegetation composition remains similar, with the exception of the introduction of the exotic *Utricularia gibba* since 2001, and absence of the regionally significant *Triglochin striata* . Alligator weed was recorded for the first time in 2004.

Threats

The pest plant *E. densa* has been well established since 1985 and has had a substantial impact on the native vegetation. *U. gibba* is a new pest record, however it is not expected to have a large impact in this large, and relatively wave exposed lake. The exotic plants *Otellia ovalifolia* and *Potamogeton crispus* have been recorded at times, probably when introduced as seed by water fowl, but have minimal impact. Access to the lake is difficult and the likelihood of future pest plant or fish introductions is low. Floating mats of *Alternanthera philoxeroides* could threaten shallow sheltered areas by smothering other vegetation.

The lake is now completely fenced and development of riparian and emergent vegetation in formerly grazed lake margins is likely to reduce nutrient inputs from the catchment.

Management recommendations

Lake condition monitoring every 5 years.

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

3.21 Salt Lake (Aupouri), NRC Lake No. 48; surveyed in 2005.

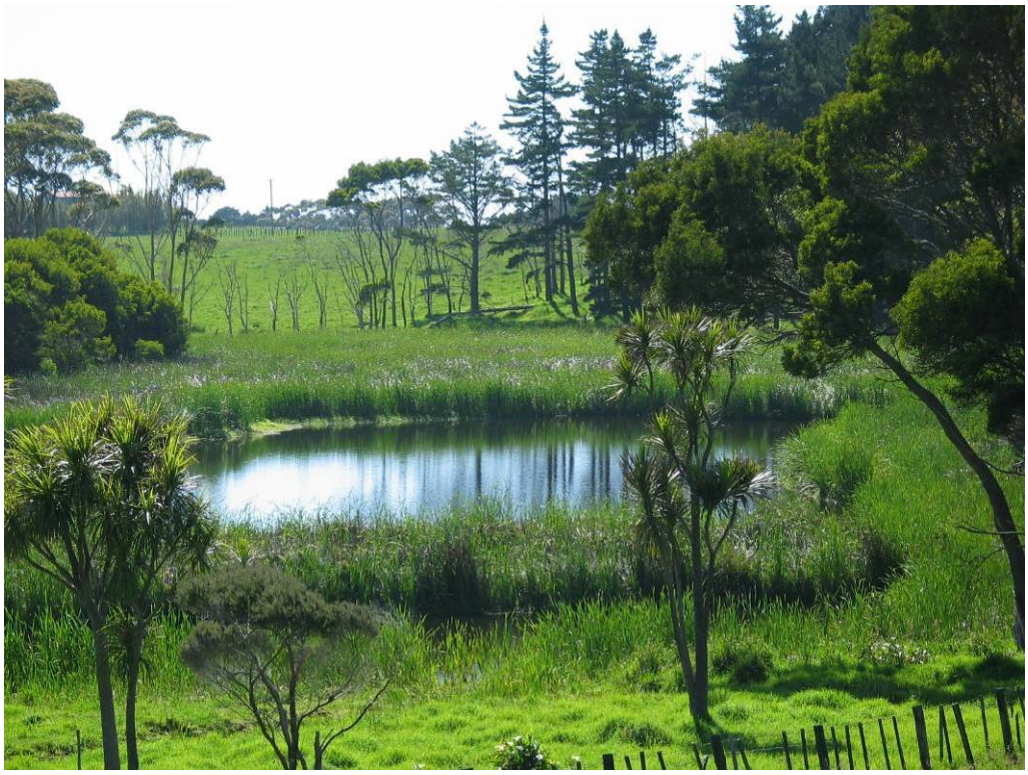

Plate: Salt Lake showing the large beds of emergent raupo (*Typha orientalis*) surrounding open water.

Summary

Overall ranking

Low: Poor submerged vegetation, recent vegetation clearance.

Threats

Already appears to be nutrient enriched. No pest species but low value habitat.

Management recommendations

No monitoring recommended.

Description

Salt Lake (1602314E, 6159583N) is 2.2 ha in area with a maximum recorded depth of 1.5 m. It is situated in a pasture catchment, with a surrounding fringe of wetland, much of which was recently drained. There are no inflow streams but the lake discharges into the Tauwhia Stream via a wetland at the southern end of the lake. This

stream flows to the East Coast. Access is off the Onepu Block Road through approximately 500 m of private farmland. Boat access is difficult.

Wetland vegetation

Tall (2.5 m) *Typha orientalis* dominated the emergent vegetation and occupied 50% of the lake area to a depth of 0.5 m, although rhizome mats had rafted over water 1 m deep in some areas. At one site *Baumea articulata* and *Eleocharis sphacelata* were also present. The wetland on the northern lake boundary was of similar composition to the emergent vegetation with additional cabbage trees (*Cordyline australis*), and mat-forming *Persicaria decipiens*, *Ranunculus amphitrichus* and the exotic *Ludwigia palustris.*

Submerged vegetation

A sparse submerged vegetation was present at one of the three profiles with low covers of *Potamogeton ochreatus* (0.5 to 1 m deep) and *Nitella* aff. *cristata* (0.5 m deep).

LakeSPI

No LakeSPI score generates as vegetation cover <10%.

Water birds

The dense raupo vegetation provides good shelter for water birds. Paradise shelduck (*Tadorna variegata*) were the only species seen during the field visit. No rare species were reported in previous surveys.

Fish

No fish were observed.

Aquatic invertebrates

Backswimmers (*Sigara arguta*) were common.

Changes in indicators

Not previously surveyed. It appears that much of the wetland and scrub vegetation described in the 1991 DoC SSBI report has been cleared, some relatively recently.

Threats

No pest species present, but low habitat value. Drainage and clearance of surrounding native vegetation, especially wetland, further reduces value.

Management recommendations

No monitoring.

3.22 Te Arai Ephemeral Wetland and Pond (Aupouri), NRC Lake No. 46; surveyed in 2005.

Plate: Te Arai Pond with grazed margins and sparse emergent vegetation, note the exotic floating fern (red) *Azolla pinnata*.

Summary

Overall ranking

Moderate: Small areas of water, with decreasing water level, grazing damage by horses.

Threats

Further decline in water table would reduce the habitat value.

Management recommendations

No monitoring.

Description

This dune wetland area (1598022E 6159812N) supports a small pond ~ 0.2 ha in area with a maximum depth of ~ 1 m and an adjacent shallow ephemeral turf area (total area 2.3 ha). The catchment is pine plantation forestry with a fringe of grass and scrub around the wetland margin. There are no inlets or outlets. Access is through 2 km of forestry roads past Bulrush Lake.

Wetland vegetation

Much of the area accessible to grazing had scattered clumps of *Typha orientalis* (pond) and *Eleocharis sphacelata* with widespread turf communities in the ephemeral wetland. Dominant species here were the native *Centella uniflora, Myriophyllum propinquum, Centipeda aotearana* and the introduced *Ludwigia palustris, Callitriche stagnalis* and *Paspalum distichum*.

Submerged vegetation

The pond was dominated by *Chara australis* forming a 0.8 m tall turf across the bottom (1 m) with surface-reaching *Potamogeton cheesemanii* occasionally present.

LakeSPI

Reconnaissance only – no LakeSPI score generated.

Water birds

Approximately 20 mallard (*Anas platyrhynchus*) and pairs of Canada goose (*Branta canadensis*) and paradise shelduck (*Tardorna variegata*) were seen.

Fish

No fish were seen.

Aquatic invertebrates

Backswimmers (*Sigara arguta*) were noted.

Changes in indicators

First visited in November 2004.

Threats

Decreasing water table and horse grazing appear to be the main threats to this area.

Management recommendations

No monitoring.

3.23 Te Arai Lake (Aupouri), NRC Lake No. 47; surveyed in 2006.

Plate A: Te Arai Lake with scrub and forestry margins and mobile sand dunes to the north west.

Summary

Overall ranking

Low: remote dune lake, little invasive species impact, low macrophyte abundance, high wildfowl values.

Threats

Further decline in water table would reduce the habitat value.

Management recommendations

No lake condition monitoring.

Description

This dune lake (1597154E 6159761N) is recorded as a 12.9 ha area in the NRC database, but the lake occupies ~ 6 ha, with an ephemeral wetland to the west of the lake formerly contiguous with this. The lake had a maximum depth of 1.9 m. The catchment is mostly scrub, with pine forest to the south and mobile dunes to the north west. There are no inlets or outlets. Access is through 3 km of forestry roads past Bulrush Lake and ~ 100 m of steep sided scrub margin.

Wetland vegetation

The eastern half of the lake was predominately vegetated with emergent *Typha orientalis* and *Baumea arthrophylla* (0 to 0.5 m deep) with *Eleocharis sphacelata* growing in deeper water (to 1 m) on about 25% of the lake margin. Other parts of the lake were fringed with a narrow (<5 m) emergent margin of the same species but with significant sections without emergent vegetation. Here turfs were dominated by *Elatine gratioloides* and *Glossostigma diandrum.*

Submerged vegetation

When visited in 2005 only the east end of the lake was accessed and shallow areas of the lake (up to 0.5 m), amongst emergent vegetation was dominated by a dense bed of *Chara australis* and small amounts of the exotic *Utricularia gibba,* with *Potamogeton cheesemanii* dominated the vegetation from 0.5 m to a maximum of 1.5 m deep. In 2006 only the west end of the lake was accessed. The same species were recorded but cover was very sparse with just the odd plant present due to heavily stained water. Lisa Forester (pers. comm.) recalled this was the situation in 2005, so it does not represent a change in Lake Condition.

Plate B: Lake Te Arai west end 2006, showing highly stained water not suitable for submerged vegetation.

LakeSPI

Reconnaissance only – no LakeSPI score generated as the submerged vegetation was too sparse.

Water birds

The regionally threatened dabchick (*Poliocephalus rufopectus*) and mallard (*Anas platyrhynchus*) were seen. DoC SSBI records from 1991 report regionally rare fernbird (*Bowdleria punctata vealeae*) and nationally threatened bittern (*Botaurus poiciloptilus*).

Fish

No fish were seen.

Aquatic invertebrates

Backswimmers (*Sigara arguta*) and the introduced snail *Physella acuta* were noted.

Changes in indicators

First visited in November 2004, no change in indicators.

Threats

Few invasive threats noted as access to lake difficult, but water levels are receding.

Management recommendations

No monitoring recommended.

3.24 Lake Te Kahika (Aupouri), NRC Lake No. 29; surveyed in 2006 and 2009.

Plate A: Lake Te Kahika showing marginal emergent vegetation and scrub/pine catchment.

Summary

Overall ranking

Outstanding: This clear-water acidic lake is unique, with submerged vegetation limited to some *Sphagnum* and high covers of *Utricularia australis* in an inflow.

Threats

Low risk of introduction and establishment of invasive pests. Low to moderate risk of nutrient enrichment from pine plantation fertilisation with urea. Pine harvesting could impact water quality and nutrient status.

Management recommendations

Leaving the zone of scrub would offer some buffer for the lake from nutrient additions associated with logging activities.Lake condition monitoring every 5 years.

Description

The lake (1600007E 6168587N) is approximately 18 ha in area with a maximum recorded depth of 10.8 m. It is situated on Holocene sand dunes, formed by a stream system impounded by dunes. The catchment is vegetated by pine plantation forestry with an intermediate zone of scrub (manuka and hakea). The lake is comprised of two arms each fed by an inflow, with the outflow (Kahika Stream) at the western edge of the lake discharging into Great Exhibition Bay (East Coast). Access is through private forestry roads (4-WD) through a locked gate and permission to cross Maori-owned land is required. There are no formed tracks leading to the lake edge and no formed boat access.

Wetland vegetation

There was a complete fringe of emergent vegetation, 5 to 20 m across dominated by *Eleocharis sphacelata* which grew to depths of 2.5 m, with swamp millet (*Isachne globosa*) and *Gleichenia dicarpa* also common. Several species typical of bog vegetation (including *Baumea teretifolia* and the regionally significant *Empodisma minus*) bounded much of the lake in shallow water (to 0.2 m deep) especially surrounding the inflows and outflow stream. In 2009 the 'Nationally Endangered' *Todea barbara* was recorded in tall manuka.

Submerged vegetation

There was no submerged vegetation reported in this lake despite good water clarity apart from high covers of the moss *Sphagnum* sp. amongst *E. sphacelata* at two sites and the nationally endangered *Utricularia australis* formed 100% covers in the inlet stream (Plate B). It is one of the few Northland lakes currently without *U. gibba*.

Plate B: Lake Te Kahika showing *Sphagnum* (LEFT)at 1.0 m in marginal emergent vegetation and a rare sight, *Utricularia australis* (RIGHT) abundant in an inflow stream, >3 m deep.

LakeSPI

No LakeSPI score generated as vegetation cover <10% and pH is an overriding factor.

Water birds

The isolated nature of the lake and large areas of emergent and wetland vegetation provide good habitat for many wetland birds, although lack of submerged vegetation and fish would limit the habitat for some species. Few birds were noted during the field visit. Fernbirds (*Bowdleria punctata vealeae*) were noted at the southern end of the lake, dabchick (*Poliocephalus rufopectus*) were present and little black shag (*Phalacrocorax silcirostis*). The endangered spotless crake (*Porzana tabuensis plumbea*), and Caspian tern (*Sterna caspia*) were previously recorded.

Fish

No fish were seen in the lake, however a shortfin eel (*Anguilla australis*) was noted in one inlet stream, and eel holes were common in places.

Aquatic invertebrates

Few aquatic invertebrates were noted, with *Sigara arguta* the most prevalent, with caddisfly (*Trichoptera*) and dragonfly larvae (*Odonata*). The rarely seen whirligig beetle *Gyrinus convexiusculus* was noted at the access point. It is a self-introduced Australian species which lives in ponds and lakes in Waikato and Northland.

Changes in indicators

The lake has been sampled on three previous occasions, in summer 1991, 1996 and 2005. With a lack of vegetation, plants cannot be used as an indicator unless they start growing in the lake. Water quality records would be the best indicator. The source of the lakes increasing acidity (pH 3.95 in 2005) and sulphate concentrations is not known and warrants further investigation.

Threats

There are currently no alien plants or fauna reported from this lake. Due to the acid nature of the lake and poor access, the likelihood of introduction and establishment is low.

Fertilisation of pine forests and run-off as a result of harvesting could result in nutrient enrichment. As the lake is possibly N limited, urea fertiliser application could deleteriously affect clarity and increase planktonic algal abundance.

The greatest threat to the lake would be increasing acidity and sulphate concentrations.

Management recommendations

Biosecurity threats are low. The chemistry of the lake is very unusual and warrants further study to explain the source of acidity (pH 3.95) and elevated sulphate concentrations. It is likely to be geothermally influenced. It is recommended that lake condition (biota and water quality) of this unusual and outstanding lake should be monitored every 5 years.

3.25 Te Paki Dune Lake (Aupouri), NRC Lake No. 15; surveyed in 2005 and 2007.

Plate 1: Te Paki Dune Lake with emergent *Baumea articulata* (foreground) and *Eleocharis sphacelata* (centre left) and showing the manuka and sand dune catchment.

Summary

Overall ranking

Outstanding: This isolated shallow lake, within native scrub and dunes, has an outstanding indigenous vegetation including an endangered species but with isolated plants of *Utricularia gibba* and *Ottelia ovalifolia*.

Threats

Low risk of introduction of invasive pests, but future expansion of *U. gibba* is likely. There are few threats of nutrient enrichment.

Management recommendations

Lake condition monitoring every 5 years.

Description

The lake (1580999E, 6178871N) is 2.2 ha, about 2.5 m deep and situated between mobile dunes and areas vegetated by manuka and hakea, Plate 1. The lake has no inflows or outflows. Access is through private land and a narrow sandy overgrown track (4-WD). There are no formed tracks for lake entry and no boat access.

Wetland vegetation

Approximately 60% of the lake was covered with emergent vegetation, dominated by *Baumea articulata* and *Eleocharis sphacelata* growing to depths of 1.0 and 2.5 m respectively. There was no emergent vegetation in the vicinity of the dune face. Other emergents reported from water less than 0.2 m depth were *Baumea juncea, Eleocharis acuta* and the regionally uncommon *Sparganium subglobosum*.

Submerged vegetation

Charophyte meadows of *Chara fibrosa* (Plate 2) or *C. australis* (~ 0.5 m tall) and *Nitella* aff. *cristata* were present in open areas of water and amongst emergents with some areas of tall *Potamogeton cheesemanii* (2.5 m tall) and *Myriophyllum propinquum* (2 m tall), (Plate 3). The nationally endangered *Utricularia australis* was abundant (about 50% cover) throughout the lake (Plate 2). A small infestation of the invasive exotic *Utricularia gibba* was also found. Some turf species *Callitriche petriei, Myriophyllum votschii, Limosella lineata* and *Lilaeopsis novae-zelandiae* were located on the dune face at the western edge of the lake. *Ottelia ovalifolia* was also found for the first time.

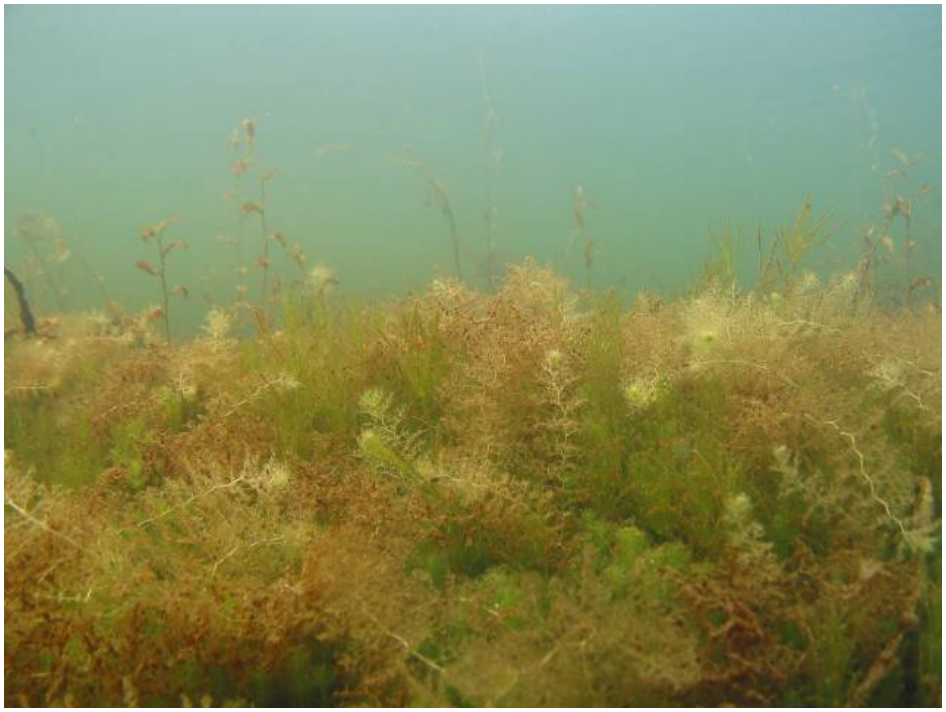

Plate 2: Te Paki Dune Lake with 'nationally endangered' *Utricualria australis* abundant on top of *Chara fibrosa* with tall-growing *Potamogeton cheesemanii* in the background. This assemblage of native species is very rare.

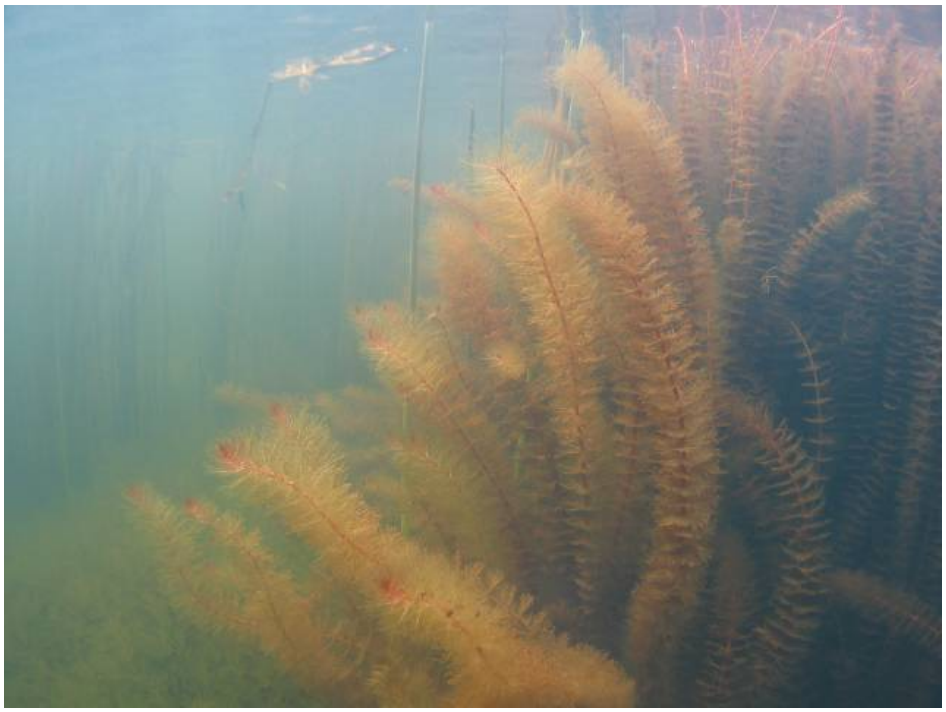

Plate 3: Te Paki Dune Lake with tall-growing *Myriophyllum propinquum* reaching the surface.

LakeSPI

A high LakeSPI score of 97% reflected the extent of native vegetation development in the lake.

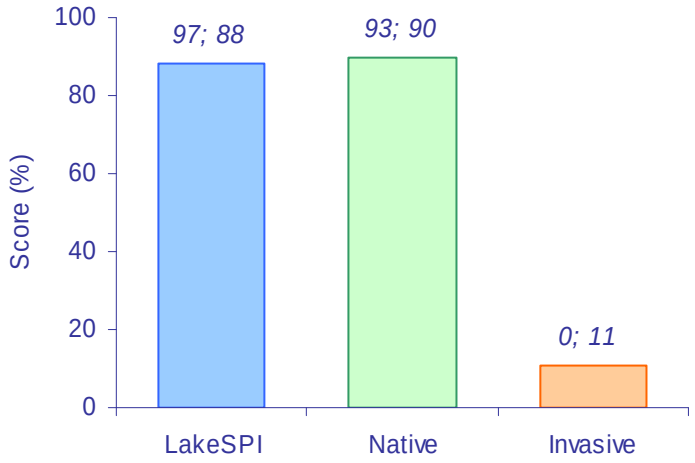

Figure: 2007 LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right). 2005; 2007 values shown.

Water birds

The isolated nature of the lake and large areas of emergent and wetland vegetation provide good habitat for many aquatic birds. Few birds were seen during the field visit, but it is likely that several endangered species utilise this area. Fernbird (*Bowdleria punctata vealeae*) were reported on the DoC SSBI from 1991.

Fish

Several large shortfin eels (*Anguilla australis*) were noted in the lake.

Aquatic invertebrates

Few aquatic invertebrates were noted, with the native leech *Richardsonianus mauianus* encountered on the 2007 survey.

Changes in indicators

The invasive index has increased with *Utricularia gibba* found in the lake but at the time of survey it was having no impact being only one strand found.

Threats

Since last surveyed, *Utricularia gibba* has appeared in the lake. Currently it is so scarce it has had no impact on native species, but is expected to become abundant. Also *Ottelia ovalifolia* was found in the lake, but this is a seed dispersed exotic species that usually has very low impact on native species. Other than that there are currently no alien plants or fauna reported from this lake. Due to the poor access and isolated nature, the likelihood of further introductions is very low.

Threats of modification of the scrub/mobile dune catchment are not foreseeable. Dune encroachment could fill in the lake.

Management recommendations

Lake condition monitoring every 5 years.

3.26 Te Werahi Lagoon (Aupouri), NRC Lake No. 6; surveyed in 2005.

Plate: Te Werahi Lagoon showing the pasture and mobile sand dune catchment and low (possibly grazed) beds of raupo (*Typha orientalis*).

Summary

Overall ranking

Low: This lagoon is surrounded by unfenced pasture or mobile dunes, with a range of pest plant species established.

Threats

Already impacted by problem submerged weeds *Ceratophyllum demersum* and *Egeria densa*, margins are browsed by cattle.

Management recommendations

None. A more comprehensive survey of the wetlands surrounding the Te Werahi Stream is recommended.

Description

This lagoon (1573420E, 6184962N) is an 11 ha waterbody with a maximum recorded depth of 3 m. It is situated on sand dunes, formed by a stream system impounded by dunes. The catchment is unfenced pasture (cattle grazed) apart from mobile dunes to the west and a few wetlands associated with inflow streams. The lagoon is the largest impounded waterbody on the Te Werahi Stream which flows from the south, draining land from Scotts Point and discharging to the north in Te Werahi Bay (West Coast). Access is through private farmland (4-WD) with no formed tracks leading to the lagoon edge and no boat access.

Wetland vegetation

There was a complete fringe of pasture at the one site visited, however a floating mat of wetland vegetation dominated by *Typha orientalis* with *Baumea articulata, Eleocharis sphacelata, Carex maorica* and *Phormium tenax* was noted. This vegetation was much shorter than expected and had either been recently grazed or cleared by fire. The nationally threatened herb *Mazus novae-zeelandiae* ssp. *impolitus* was collected from this area in 1966.

Submerged vegetation

There were high covers of the tall exotic weeds *Ceratophyllum demersum* and *Egeria densa* and also the native pondweed *Potamogeton ochreatus*. Lower covers of the exotic *Potamogeton crispus* and the native charophytes *Nitella* aff. *cristata, N. leonhardii* and *Chara australis* were noted.

LakeSPI

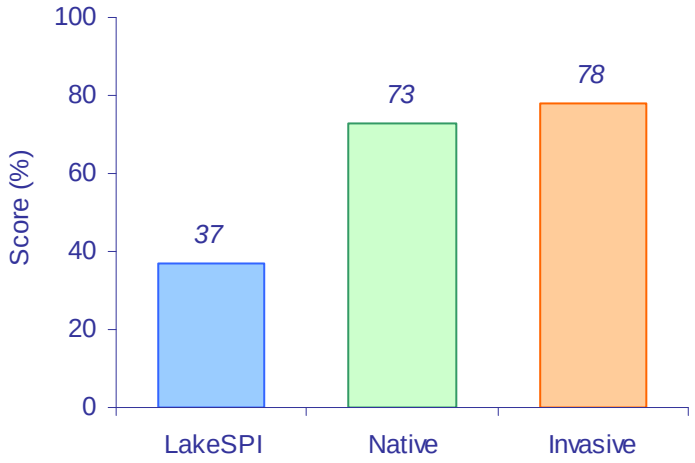

Figure: LakeSPI Index as % of potential score, Native Condition Index, and Invasive Impact Index (from left to right).

The low LakeSPI score of 37% reflects the impact of invasion by *C. demersum* and *E. densa*, but still with some areas of native plant communities remaining. Profiles were limited so this LakeSPI assessment should be considered provisional.

Water birds

The large areas of wetland may provide good habitat for many aquatic birds, although grazing access may disturb some species. Hundreds of black swans (*Cygnus atratus*) and a flock of Canada geese (*Branta canadensis*) were noted during the field visit. No endangered birds were recorded.

Fish

Grey mullet (*Mugil cephalus*) were observed.

Aquatic invertebrates

No aquatic invertebrates were noted.

Changes in indicators

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

Threats

Although situated in farmland, the lagoon is easily observed from State Highway 1 and access is relatively easy.

The highest ranked submerged weed species *C. demersum* is already present in the lagoon. This lagoon may provide the local source of this species and also *E. densa*, both also located in the lakes near Te Paki (Ngakeketa and Ngakeketa North respectively).

Transfer would most likely be from fishing nets, so local fishers should be informed of the risks. Control of these weeds is not recommended, as only short-term reduction in abundance would be achieved at this site.

Management recommendations

No monitoring is recommended.

A more comprehensive survey of the wetlands surrounding the Te Werahi Stream is recommended.