



Ecological Condition: High

Submerged Plant Indices	Score	NPS-FM Attribute band
Native Condition Index	34.3%	C
Invasive Impact Index	24.4%	B

Summary

Overall Rank: Rotoroa is a high-value lake, but it is still an impacted system. The 2026 assessment indicates some improvement in submerged plant condition relative to 2021 because of reduced *Egeria densa* dominance and increase in shallow native macrophyte growth. However, the lake still has large devegetated areas, a patchy and shallow macrophyte zone, and strong light limitation.

Threats: Eutrophication, invasive aquatic weeds, waterfowl-driven nutrient pressure, and ongoing biosecurity risk. Invasive *Egeria densa* and *Utricularia gibba* remains widespread, alligator weed is also established. Large numbers of Canada geese are likely compounding nutrient inputs and grazing pressure. Regular duck hunting is identified as a continuing pathway for pest transfer between lakes.

Recommendations: Focus on catchment restoration, reducing nutrient and sediment inputs, controlling pest plants and animals. Kākahi baseline survey and continued monitoring of algal biomass, macrophyte condition and *Trithuria inconspicua*.

General description

Lake Rototoa is a moderately sized dune lake with a surface area of approximately 32.8 ha and a maximum depth of 7.2 m, located along the west coast of the far north (1617883E, 6120400N). Compared to shallower systems in the region, its greater depth provides some increased thermal and chemical buffering. However, the lake remains sensitive to external nutrient loading due to its relatively small catchment size and intensive surrounding land use.

The lake has no direct inflows and is situated within a compact catchment of 124.91 ha, resulting in a relatively low catchment-to-lake area ratio. The land cover within the catchment is dominated by exotic vegetation (97.43%) with high-producing pastoral land accounting for 86.20% of the total catchment area. This intensive pastoral activity is a significant source of nutrient inputs, particularly nitrogen and phosphorus, as well as fine sediments and faecal-associated contaminants.

Forestry covers 11.06% of the catchment and forms part of a larger plantation block that is located below the lake along the west coast. Overland flow across the block drains away from the lake and on to the coast. As a result, the typical impacts associated with forestry activities are unlikely to have a significant impact on the lake water quality.

Native vegetation is sparse, comprising only 2.53% of the catchment and occurring as small, scattered mānuka/kānuka remnants along the catchment boundary. These fragments offer limited ecological connectivity and provide minimal buffering against diffuse contaminant runoff at the catchment scale.

Wetlands account for 1.92% of the catchment and are closely associated with the lake margin, with the majority occurring along the southern shoreline. These wetlands likely provide some localised attenuation of nutrients and sediments and contribute to shoreline stability as well as habitat diversity. However, their small extent relative to the dominance of pastoral land use limits their effectiveness in offsetting the overall nutrient and sediment loads entering the lake.

Hydrological inputs to Lake Rototoa are strongly influenced by runoff from surrounding pasture, particularly during rainfall events. The limited extent of native vegetation and

wetlands reduces the capacity of the catchment to intercept and process contaminants before they reach the lake.

Lake Rototoa's ecological condition is shaped by the interaction between its moderate depth and an intensively managed catchment. While lake depth may confer some resistance to rapid water quality degradation, the dominance of high-producing pastoral land, limited sub-catchment buffering, and small, fragmented wetlands collectively elevate the risk of nutrient enrichment, reduced water quality resilience, and progressive eutrophication.

Wetland vegetation

Dense emergent reed beds border ~95% of the lake margin. Most reed beds average ~7–11 m wide, with the south-west margin supporting markedly wider beds (~20–50 m) dominated by *Eleocharis sphacelata* (to ~1.8 m depth) with lesser *Schoenoplectus tabernaemontani* and *Machaerina articulata*. A prominent wetland (~100 m average width) occurs mid-lake along the western bank.

The lake previously supported a significant population of the Nationally Critical *Trithuria inconspicua*. However, during the 2026 survey no plants were observed, which could be partially attributed to water levels being too high for this species. A new population of the Threatened - Nationally Critical moss *Archidium elatum* was found on podzol mounds, beneath sedges (including oioi, *Apodasmia similis*), and on ancient *Agathis australis* logs within the lake. This is the sixth extant record in New Zealand and the largest population documented to date. Additional rare plants recorded in 2026 include a small patch of the At Risk–Declining swamp fern *Cyclosorus interruptus* and the Threatened - Nationally Vulnerable grass *Paspalum orbiculare*.

Alligator weed was noted in small patches in 2004 and has spread since, representing significant invasive threat to the otherwise extensive and structurally robust emergent wetland system.

The general wetland condition is high in terms of extent and habitat complexity, with very high conservation value due to threatened cryptogam and vascular plant assemblages.

The elevated water levels limiting *T. inconspicua* is concerning but hopefully its decline is part of natural climatic cycles.

Submerged vegetation

Lake Rotoroa remains in a moderate but impacted macrophyte assemblage. The current LakeSPI score indicates an improvement in macrophyte condition since 2021, primarily because invasive dominance has weakened and shallow native components are more evident. Despite this, the lake is still characterised by large devegetated areas (Video 1), high discontinuity of submerged habitat, and strong constraints from light limitation and unstable, organic-rich substrates, which collectively prevent the development of lake-wide bed-forming vegetation.



Video 1: Large devegetated sections of lakebed.

Where vegetation occurred, it was low-growing, patchy and dominated by a native charophyte/turf assemblage rather than the tall *Egeria* canopies recorded in earlier years (Video 8). The principal taxa were *Chara australis* and *Nitella* sp. aff. *cristata*, with patches of *Lilaeopsis novae-zelandiae*. *Chara fibrosa* was observed in two locations outside of the vegetation transects and did not form significant cover.

Native vascular macrophytes were scarce and spatially restricted. *Myriophyllum propinquum* occurred as short stems in isolated low-cover patches, while *Potamogeton cheesemanii* was recorded at several locations outside of the survey transects, where it formed low-cover stands along the 1 – 1.5 m contour. Most macrophyte growth was

confined to a very narrow (1 – 2 m wide) shallow (~0.1 – 0.8 m) band along emergent reed margins.

Macrophyte condition during the 2026 survey was poor with thick epiphyton growth on remnant vegetation, consistent with eutrophic stress (Video 2). From ~2.5 m depth, the benthos shifts to 80 – 90% cover of benthic algae, with the substrate becoming loose soft silt with a surficial layer of organic floc. These conditions that are generally unsuitable for macrophyte rooting and persistence. Water clarity was ~0.5 – 1.0 m, with a marked drop beyond ~2.1 m attributed to tannins. As a result, the estimated photic depth was ~1.5 - 1.8 m. Collectively, low photic depth, poor substrate quality, and eutrophication-associated effects are dominant constraints on macrophyte recovery in this lake.



Video 2: Representative macrophyte growth in poor condition along the edge of the emergent reeds.

The historical assessments have been strongly influenced by invasive *Egeria densa*, with secondary influence from *Utricularia gibba*. In 2021, one transect lacked vegetation entirely, while *Egeria* dominated three transects from ~2 - 4.5 m deep, forming beds up to ~1.5 m tall. The 2021 reduction in LakeSPI relative to 2014 was attributed to broad vegetation decline, with reduced native condition and invasive indices, likely linked to poor water clarity that compressed depth limits and diversity. The 2004 LakeSPI (24.5%) reflected pervasive *Egeria* invasion and reduced native extent, the improved 2014 LakeSPI was interpreted as potential seasonal variations.

Egeria is currently still present and widespread but no longer forms continuous dominant beds. During the 2026 assessment it was recorded at low–moderate maximum cover

(~26%) with an average cover of 1 – 5%. Taller stands were detected amongst the emergent vegetation along the norther lake margin (Video 3).



Video 3: Tall *Egeria densa* amongst the emergent vegetation.

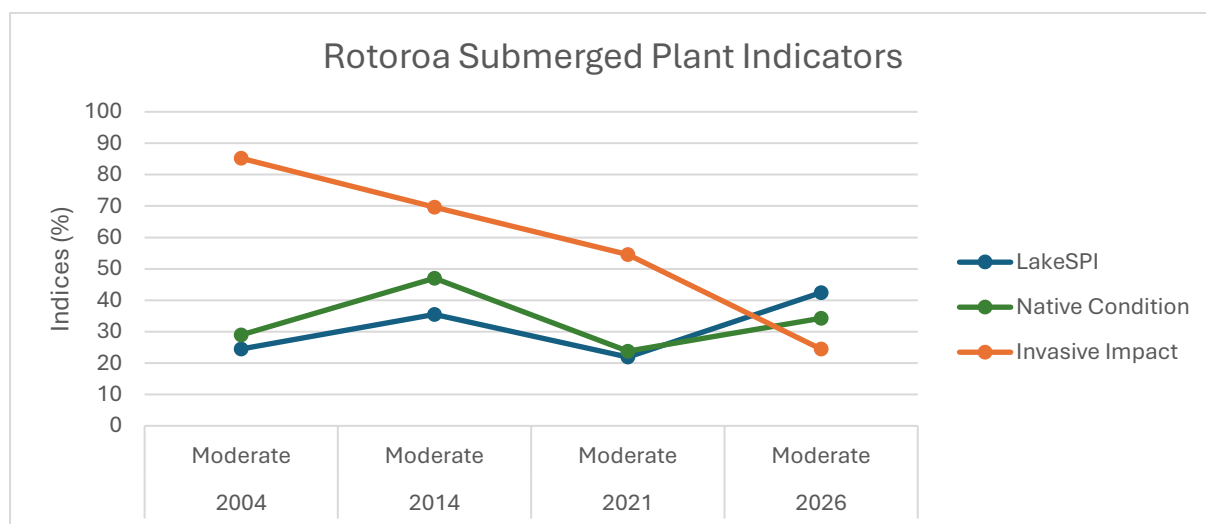
Utricularia gibba was also recorded at low covers throughout the emergent reeds. While these invasives do not currently form dense canopies, they represent an ongoing risk. If in-lake conditions shift to favour these species, they could expand rapidly and further suppress native assemblages. *Egeria* is already forming stands across the devegetated sections of the lakebed (Video 4).



Video 4: *Egeria densa* stand occupying the devegetated areas of the lakebed.

The LakeSPI trajectory indicates persistent Moderate status, but with improving index values in 2026 (Figure 1). The 2026 Final LakeSPI Index (42.44%) is an improvement

relative to 2021 and is likely due to a reduction in invasive macrophyte impact (down to 24.44 from 54.6 in 2021 and 85.2 in 2004). However, native condition remains modest (34.29), reflecting that native vegetation is largely remnant, shallow, and discontinuous rather than lake-wide and bed-forming.



Survey Date	Status	LakeSPI %	Native Condition %	Invasive Impact %
February 2026	Moderate	42.4	34.3	24.4
March 2021	Moderate	21.9	23.8	54.6
October 2014	Moderate	35.5	47	69.6
November 2004	Moderate	24.5	29	85.2

Figure 1: Rotoroa LakeSPI scores as a percentage of the maximum Potential LakeSPI score, Native Condition Index, and Invasive Impact Index.

If current drivers persist (low photic depth, tannin-stained water, eutrophication, unstable floc/silt substrates, and littoral confinement by emergent margins), Rotoroa is likely to retain the Moderate LakeSPI condition. However, the extent of devegetated lakebed should be tracked to detect early signs of lake-wide macrophyte loss. A drop in condition is possible if conditions become more favourable for invasive submerged plants such as *E. densa*. There is ample habitat availability, and these aggressive species could rapidly colonise the lake, which would further suppress native macrophyte recovery.

Wetland birds

The February 2026 survey at Lake Rotoroa (Sweetwater) recorded high waterfowl abundances dominated by Canada geese (*Branta canadensis*, ~210) and mallard/mallard-hybrids (*Anas platyrhynchos*, ~100), with large numbers of paradise shelduck (*Tadorna variegata*, ~86) and smaller numbers of black swan (*Cygnus atratus*, ~10). Other birds included shags (*Phalacrocorax carbo novaehollandiae*), southern black-backed gull (*Larus dominicanus*), and a single pied stilt (*Himantopus leucocephalus*). Despite the dominance of grazing waterfowl, wetland specialists were present, including dabchick (*Poliocephalus rufopectus*), spotless crake (*Zapornia tabuensis tabuensis*; At Risk – Declining), and Australasian bittern (*Botaurus poiciloptilus*; Threatened - Nationally Critical).

This combination indicates a system functioning primarily as open-water habitat for large-bodied waterfowl while retaining sufficiently intact emergent margins to support cryptic threatened species. Habitat quality for emergent-margin specialists is likely high due to extensive dense sedge/reed vegetation around much of the shoreline providing nesting cover, refuge and foraging opportunities. However, the high waterfowl biomass implies strong grazing pressure, sediment disturbance and nutrient recycling, increasing eutrophication risk and potentially suppressing submerged native plants. Rotoroa likely acts as a key stepping-stone/refuge within the Te Hiku/Karikari dune-lake network.

From a management perspective, reducing nutrient inputs and slowing eutrophication is key. Priorities include maintaining stock proof fencing, reducing catchment nutrient inputs, conducting predator control where feasible, and ongoing surveillance and management of invasive aquatic weeds. Given the lake's capacity to support Threatened - Nationally Critical Australasian bittern alongside high waterfowl abundance, Rotoroa should be treated as a high-value site for integrated wetland-bird management.

Fish & invertebrates

Lake bound populations of smelt (*Retropinna retropinna*) and inanga (*Galaxias maculatus*) were observed during the 2005 survey but neither of these species were recorded in 2026. *Gambusia affinis* was first recorded here in 2010 and remained

prevalent during the 2026 survey. Common bullies (*Gobiomorphus cotidianus*) also remain abundant.

Historic records of shortfin eels (*Anguilla australis*) were supported by 2026 eDNA and fyke net surveys, confirming continued presence despite the lack of diver observations. The fyke net survey also caught four At Risk – Declining longfin eels (*Anguilla dieffenbachii*). The 2026 eDNA assessment also indicated a relatively high presence of goldfish (*Carassius auratus*), representing the first record of this exotic species for the lake. Kākahi (*Echyridella menziesii*) were recorded by divers during the 2026 assessment with the population most prominent along the north-western section of the lake.

Kākahi formed a band in the upper littoral zone at depths of 0.8 – 3.5 m, with most individuals between 0.8 - 2 m. Peak densities reached 10 – 15 kākahi/m², with average densities of 3 – 7/m². The population was dominated by adult size classes with majority of individuals placed in the 61 – 70 mm size class, although a small number of c.20 mm individuals were also present (Image 1).

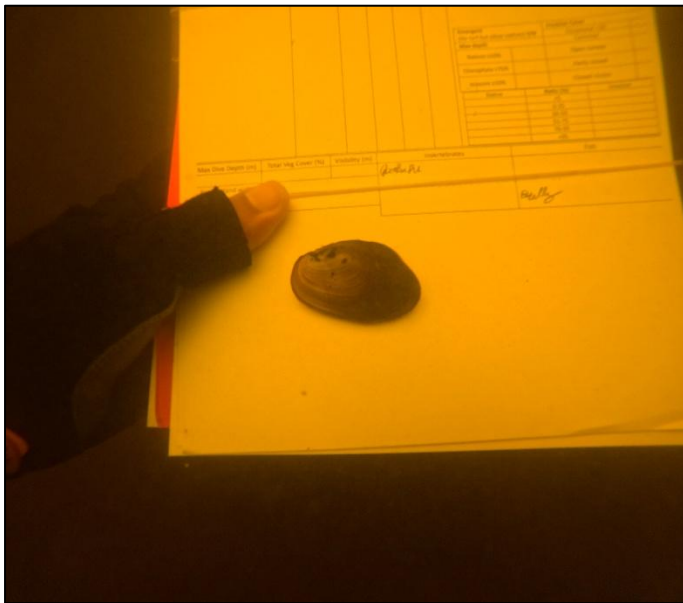


Image 1: Adult kākahi found in the upper littoral zone.

Endangered species

During the 2026 survey, kākahi (*Echyridella menziesii*; At Risk – Declining) were prevalent on the north-western section of Lake Rotoroa and were seen in varying densities at

several locations across the lake. Fyke net surveys noted four At Risk – Declining longfin eels (*Anguilla dieffenbachia*).

Rotoroa has been regarded as supporting the largest population of the Threatened - Nationally Critical *Trithuria inconspicua* in the Te Hiku area. However, abundance reportedly declined in 2021 during very low water levels, and no plants were observed in 2026 when water levels were considered too high for the species.

In 2026, a new population of the Threatened - Nationally Critical moss *Archidium elatum* was discovered on lake margins (podzol mounds, lake turfs beneath oi oi, *Apodasmia similis*, and on kauri logs), this finding represents the sixth extant New Zealand record and the largest population documented to date. Additional threatened flora included swamp fern (*Cyclosorus interruptus*; At Risk – Declining) and *Paspalum orbiculare* (Threatened - Nationally Vulnerable).

Birds of conservation interest recorded in 2026 were New Zealand dabchick (*Poliocephalus rufopectus*; Nationally Increasing), spotless crane (*Zapornia tabuensis*; At Risk – Declining), Australasian bittern (*Botaurus poiciloptilus*; Threatened Nationally Critical), Caspian tern (*Hydroprogne caspia*; Threatened - Nationally Vulnerable), black shag (*Phalacrocorax carbo*; At Risk – Relict), pied shag (*Phalacrocorax varius varius*; At Risk – Recovering), and little black shag (*Phalacrocorax sulcirostris*; At Risk – Naturally Uncommon).

Lake ecological value

Rotoroa is currently classed as a High value lake, with an Ecological Value Score of 11/20.

The habitat size is moderate due to the 32.8 ha lake area with maximum depth 7.2 m. Buffering is moderate-low, although dense emergent vegetation surrounds ~95% of the margin and provides strong littoral habitat. Indigenous vegetation and wetland extent at the catchment scale remains low and the lake is largely surrounded by intensive pastoral land use. An additional point was attained for the connectivity within the Sweetwater lake network.

Water quality value is low due to poor clarity, benthic algal mats, organic floc accumulation and ongoing eutrophication pressures noted during the 2026 assessment.

Aquatic vegetation diversity is high, but vegetation integrity is only moderate-low because submerged cover is patchy, with large devegetated areas and continuing invasive pressure from *Egeria densa* and *Utricularia gibba*.

Endangered species and key species values are significant, reflecting the large number of threatened flora and fish, including the newly documented *Archidium elatum* population and the continued presence of kākahi and longfin eels.

The overall 2026 ecological value rating is unchanged from the previous 2021 assessment however, the basis for that rating has shifted. In 2021, the lake's value was strongly influenced by large populations of *Trithuria inconspicua* despite invasive *Egeria densa* dominance and declining clarity. In 2026, the LakeSPI improved from 21.9 to 42.4, indicating reduced invasive dominance and slightly better native macrophyte expression, but ecological stress from eutrophication and invasive weeds persists, while *Trithuria* was not detected under high-water conditions.

Threats

Rotoroa shows signs of ecological stress from eutrophication and invasive macrophytes. Benthic algal mats, epiphytic growth on macrophytes and episodic blooms indicate elevated nutrient availability and declining lake condition, consistent with the surrounding agricultural land use. Large numbers of Canada geese are likely compounding these effects through nutrient inputs and grazing.

Alligator weed is established at several locations and is already displacing native vegetation in shallow water. *Egeria densa* is also present at moderate cover and may continue to expand. Regular duck hunting creates an ongoing pathway for pest transfer between waterbodies and increases the risk of new incursions.

Management recommendations

Management should focus on reducing catchment-derived nutrient and sediment inputs through fencing and restoration of the surrounding public conservation land as well as improved farm management.

Alligator weed control is recommended where possible as well as continued surveillance so new incursions are detected early (manual removal is possible with the current extent). *Egeria* cover is moderate so manual removal, and localised matting could be effective control measures. Hunting-related biosecurity should be strengthened through equipment hygiene messaging and lake-user awareness.

A baseline assessment of the kākahi population should be done to assess recruitment, current population dynamics, limiting factors and stress responses. The survey results can be used to inform targeted interventions.

Ongoing monitoring of algal biomass, macrophyte condition and weed distribution will be important for tracking change and targeting management effort. Annual monitoring of *Trithuria inconspicua* populations is recommended to track the recovery of this critically threatened species.