Water Quality in Whakakī Lake

Whakakī Nui a Rua (Whakakī Lake) is a shallow, brackish lake system about 10km east of Wairoa.

A narrow strip of beach dune acts as a natural dam between the lake and the ocean. This natural dam stops freshwater flowing out to sea and creates the lake and wetland complex. The lake is regularly opened to the sea to relieve flooding on surrounding farmland.

What makes a shallow lake tick?

Shallow lakes such as Whakakī usually exist in one of two states; a clear water lake dominated by aquatic vegetation or a turbid (muddy) lake dominated by algal blooms.

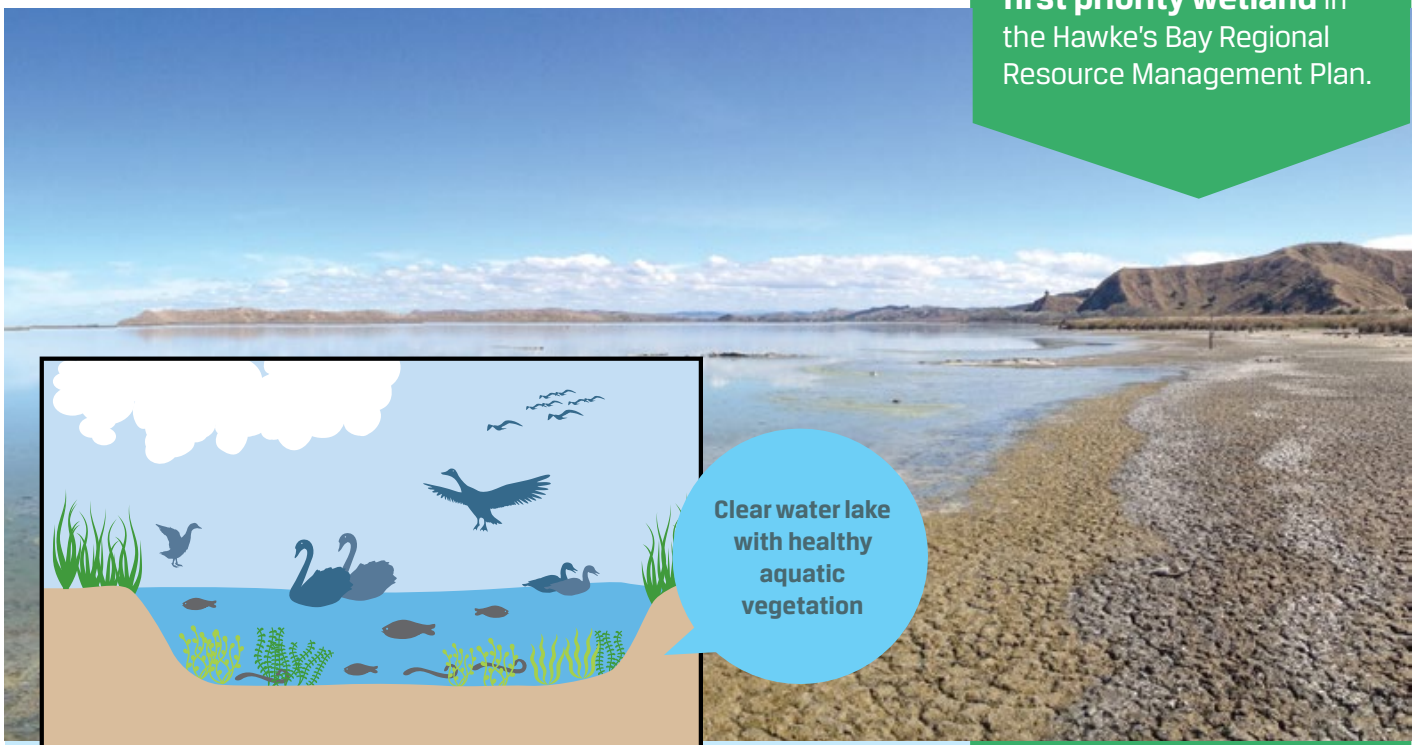
When aquatic vegetation is abundant, it stabilises the sediment on the bottom of the lake and absorbs nutrients from the water so that algal blooms are less likely to occur. When algal blooms dominate, they stop light reaching the lakebed and aquatic vegetation struggles to grow, which keeps the lake in a constantly muddy and algal dominated state.

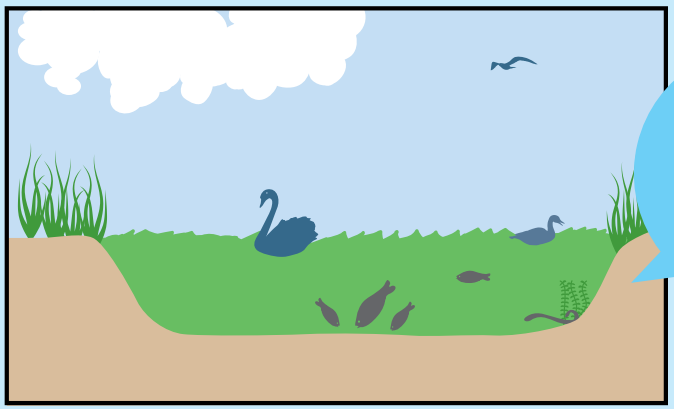
QUICK FACTS

Whakakī Nui a Rua is taonga to Ngati Hine, Ngati Hinepua and Ngai Te Ipu.

It is the **largest freshwater lagoon** on the East Coast of the North Island.

Whakakī Lake is listed as the **first priority wetland** in the Hawke's Bay Regional Resource Management Plan.





Whakakī is currently in an algal dominated state, but evidence shows it was dominated by aquatic vegetation 10-20 years ago.

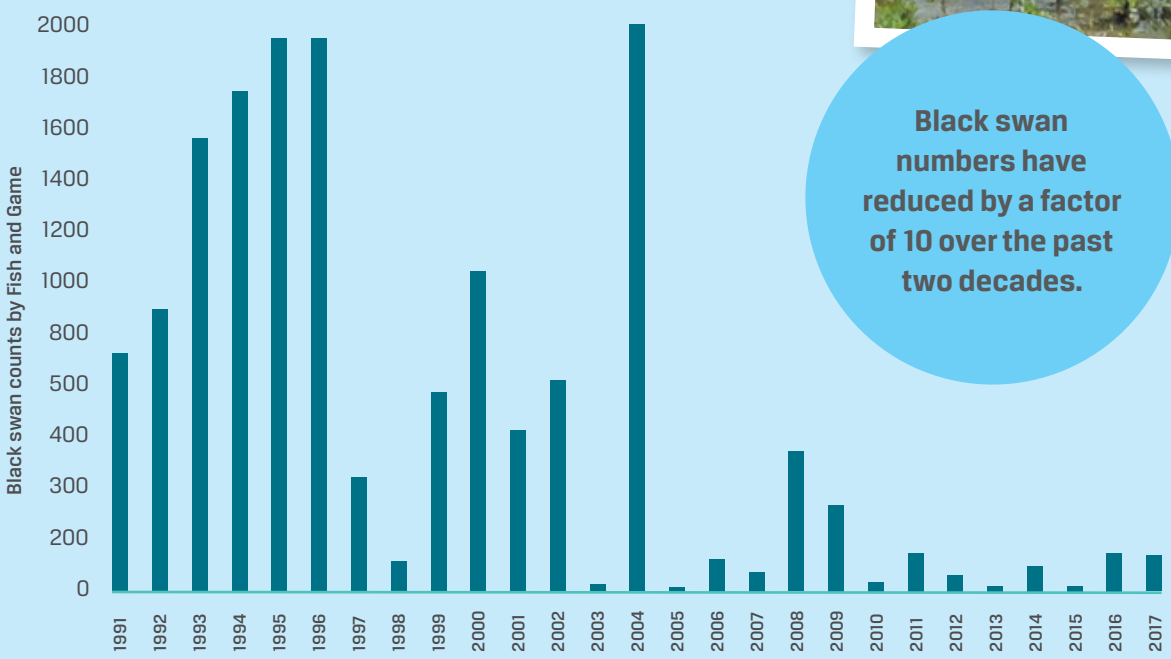
Where did the Black Swans go?

Black swans mainly eat aquatic vegetation, although they also graze lakeside pasture when food in the lake is scarce or too deep to reach.

Their vegetarian diet makes the abundance of black swans a useful indicator for the abundance of aquatic vegetation.

The National Institute of Water and Atmosphere (NIWA) has undertaken three aquatic vegetation surveys in Whakakī Lake. In 1991/92, there was a healthy aquatic vegetation community, which was drastically reduced in 2009 and had all but disappeared in 2016. This follows a similar trend in black swan counts, which have been undertaken by Fish and Game since 1991. There were up to 2000 black swans counted on the lake in the early 90s, but fewer than 200 have been counted each year over the last 10 years. Both lines of evidence indicate a dramatic decline in aquatic vegetation in Whakakī since the 1990's.

Black swan numbers over time



Black swan numbers have reduced by a factor of 10 over the past two decades.

An image (left) taken in 1999 shows large numbers of black swans on the lake.

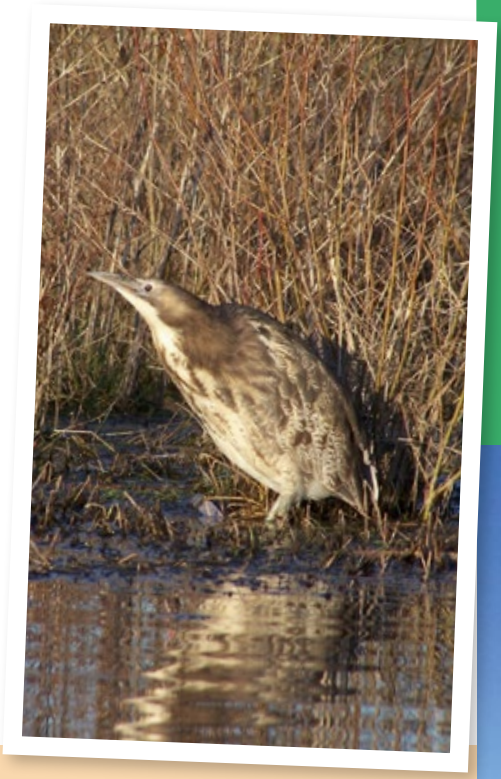
Large weed mats (right) washed up along the shoreline are indicative of an abundant aquatic vegetation community.

Current State of Whakakī Lake

The Trophic Level Index (TLI) for Whakakī Lake is among the worst of all monitored lakes in New Zealand.

The TLI is a logarithmic scale, like the Richter scale used for earthquakes, which means an increase of one TLI unit equates to more than a simple '+1' in terms of eutrophication. The calculations are more complex than for the Richter scale, and in this case, the eutrophication of Whakaki was more than twice as much as Te Waihora, and more than five times as much as Tutira.

It can be misleading to compare lakes using TLI alone, because other factors such as fish and bird life are very important and contribute to the overall 'health' of a lake. The tuna (shortfin eel) in Whakakī, for example, seem to be thriving, but water quality data make it clear just how enriched with nutrients Whakakī Lake is.



Bittern in local wetland

QUICK FACTS

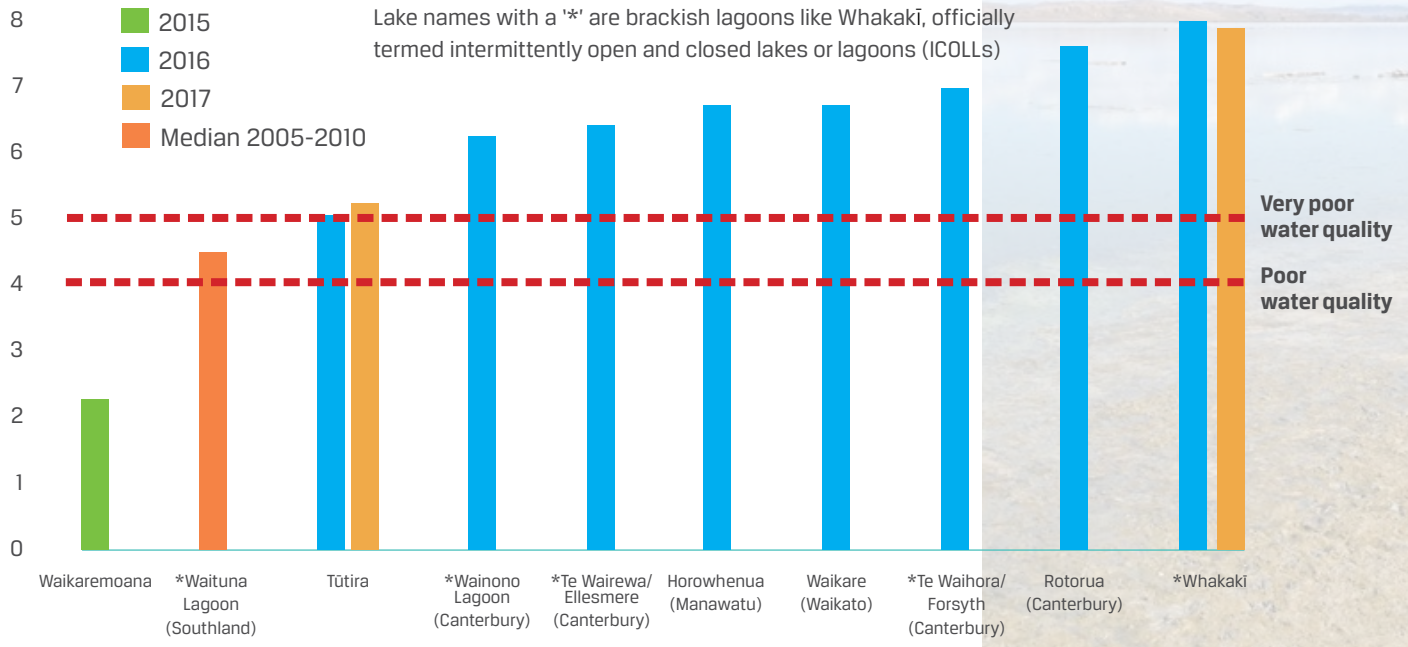
The lake supports a thriving tuna population, which is sacred to tāngata whenua.

46 water bird species have been recorded in Whakakī Lake.

Whakakī Lake is among the worst for TLI of all monitored lakes in New Zealand.

The eutrophication status of a lake is quantified using the 'trophic level index', or TLI. The TLI combines four separate water quality variables: nitrogen, phosphorus, chlorophyll-*a* (algal biomass), and water clarity. The combination of values for these four variables gives an index reflecting the nutrient enrichment and water clarity in a lake.

Trophic Lake Index



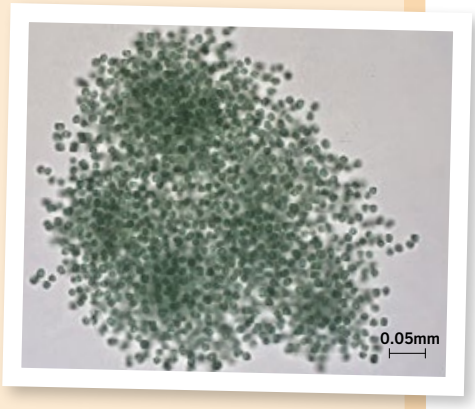
Whakakī Lake

Is Whakakī turning toxic?

Rahui Channel mouth during an opening event

How safe is it to swim in?

Nodularia (long filaments with nodules) and ***microcystis*** (clustered globes) (see below) are two species of potentially toxic cyanobacteria that are often abundant in Whakakī Lake over summer.



The abundance of cyanobacteria in the lake during March 2018 was 50 times higher than the limit considered safe for contact recreation.

Analysis by the Cawthron Institute confirmed toxins were present in the lake water, and the Hawke's Bay Regional Council and the Whakakī Lake Trust are now exploring whether toxins are accumulating in the tissue of fish as well. The tuna fishery is of the utmost importance to tāngata whenua, and it is important to be sure that algal blooms are not making tuna unsafe to eat.

HBRC staff taking water samples from Whakakī Lake during a bad algal bloom.

Community gather at edge of Whakakī Lake during a Wānanga.

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