Science Snapshot Report

Bay of Plenty river water quality

Summary of state and trends to 2018

Bay of Plenty Regional Council and NIWA currently test 59 local river sites regularly to understand how healthy they are and whether they are getting better or worse over time.

This allows Regional Council to manage and implement effective strategies to improve water quality. We use a broad range of attributes to check and manage water quality, including the following that are discussed in this summary:

- **Total nitrogen (TN) and total phosphorus (TP)** All forms of nitrogen or phosphorus in a water sample. These are nutrients that naturally occur in rivers, and can be increased by humans and animals. Both are essential nutrients for plant life, but high concentrations can cause excessive algae or weed growth, especially in lakes or estuaries that rivers flow into.
- **Ammoniacal nitrogen (NH_4-N) and nitrate-nitrite-nitrogen (NNN) –** Different forms of nitrogen that occur naturally in rivers and can be increased by human and animal waste. NNN combines nitrate nitrogen and nitrite nitrogen. Nitrate is a plant fertiliser and one of the most common contaminants in rural and suburban areas. In high concentrations these can be toxic to humans, fish and animals.
- **Dissolved reactive phosphorus (DRP) –** A measure of the dissolved phosphorus compounds that are available for plants and algae to grow. Too much DRP (alongside NNN) can cause nuisance algal or plant growths (algal blooms).
- **Escherichia coli *(E. coli)* –** A type of bacteria commonly found in the guts and faeces of warm-blooded mammals (including people) and birds. People can get sick if they drink, gather shellfish from, or swim in water that has high levels of *E. coli.* Common sources of *E. coli* bacteria are animal waste from farm stock and water fowl, storm water run-off and sewerage leaks.
- **Turbidity –** A measurement of how 'cloudy' the water is and is determined by light scattering from suspended particles in the waterways, such as clay, silt, algae, inorganic and organic compounds.
- **Total suspended solids (TSS) –** Particles of silt, clay, or organic matter suspended in a water. They affect invertebrate food quality and cause sedimentation of streams and estuaries.
- **Water colour (A440 or colour absorbance coefficient) –** A measure of water colour. This affects aesthetics, the amount of light available for plant growth and is associated with some sources of pollution (e.g. wood processing).
- **Water clarity (black disc) –** Measures of how clear the water is and the underwater visibility. Clarity affects plant growth, animal behaviour, aesthetics and recreational values.

This snapshot provides an overview of the current state and recent trends in the region's river water quality, based on March 2020 analysis of Bay of Plenty Regional Council and NIWA water quality monitoring data from 1990-2018.

River health current state

- Over the last five years (2014-2018), nitrogen (NH_4-N and NNN) levels at monitored river sites have remained within the good or very good range that presents low toxicity risk for aquatic animals.

  Note however, that even at levels categorised as good for ecological health, nitrogen can impact other aspects of river health such as through increased weed or algae growth (including periphyton or river slime), that may need to be managed to lower levels in some places, to reduce those impacts.

  Maketu and Waihī estuaries are two local examples of where excessive algae growth has occurred in response to nitrogen inputs from contributing waterways.
- Around the region, water clarity is best in many of the western streams entering Tauranga Harbour (Waiau River, Tuapiro, Uretara, Te Rereatukahia, Waitekohe, and Ngamuwahine), lake outlets (Tarawera and Rangitāiki at Aniwhenua) and in catchments that have high levels of native forest cover, such as for the Tauranga, Haparapara and Kereu Rivers.
- Total nitrogen (TN) and nitrate concentrations were highest in the Otamatea, upper Rangitāiki and Pongakawa Rivers, and high in streams entering the eastern end of Tauranga Harbour.
- Total phosphorus (TP) was highest in the Pongakawa River, Tarawera River, Waitahanui River and Puarenga River.
- Some of the high TP is due to natural sources. High TP relative to dissolved reactive phosphorus (DRP) in the Puarenga River is due to alum dosing which began in 2009. Alum, or aluminium sulphate, is used to bind to dissolved phosphorus, preventing it from growing algae. This short-term interim measure has helped to improve Lake Rotorua water quality while longer-term solutions such as land use change are worked through.

River health ten year trends

From 2009 to 2018, most the region's monitored rivers had overall worsening trends for turbidity, DRP, TP, NNN, and to a lesser extent total suspended solids (TSS). This contrasts to the overall improvement of TP in rivers nationwide.

Worsening TP and TN levels were most prevalent in the Pongakawa, Waitahanui and Rangitāiki catchments. TP has also worsened in the Tarawera and Waioeka catchments, and in Lake Rotorua inflows.

TOTAL PHOSPHORUS

3% **Improving at four percent of sampling sites**

58% **Worsening at 58 percent of sampling sites**

TOTAL NITROGEN

17% **Improving at 17 percent of sampling sites**

23% **Worsening at 23 percent of sampling sites**

There have also been some improvements from 2009-2018 as follows:

Water colour (A440) improved at 47 percent of monitored sites; mainly in lowland areas and the Tarawera, Rangitāiki and Nukuhou Rivers.

Ammoniacal nitrogen has improved at 37 percent of sites, this includes the Kaituna and Tarawera catchments.

DRP and NNN improved at three percent of sites.

TSS improved at seven percent of sites.

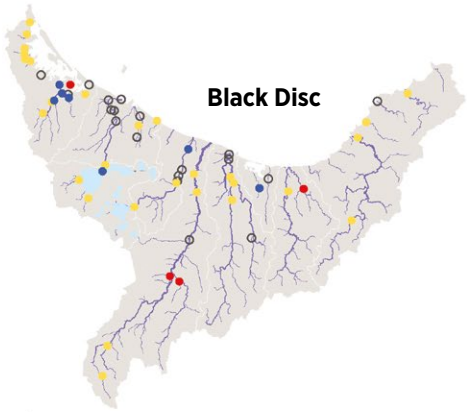
E. coli concentrations improved at two percent of sites.

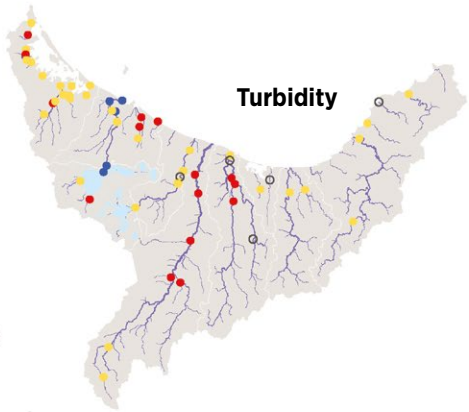
Water clarity has improved at 12 percent of sites including Kopurererua, Tarawera and Wairoa Rivers.

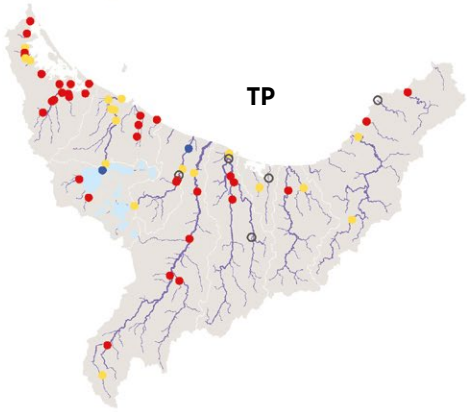
Ten-year river water trends by site (2009-2018)

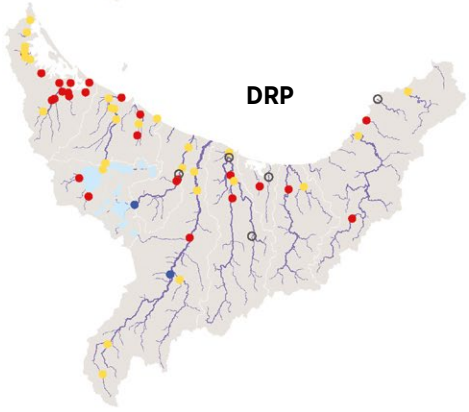
Ten Year Trend

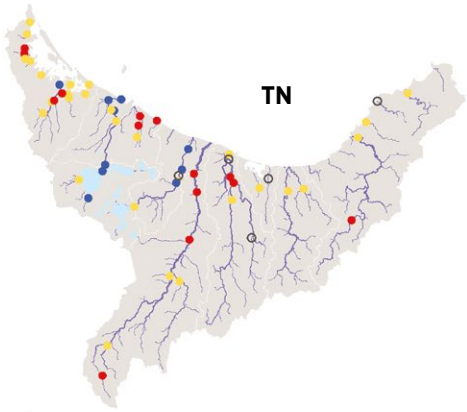
- Not Analysed
- Worsening
- Uncertain
- Improving

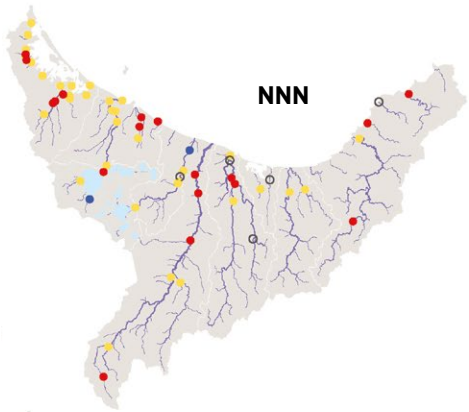


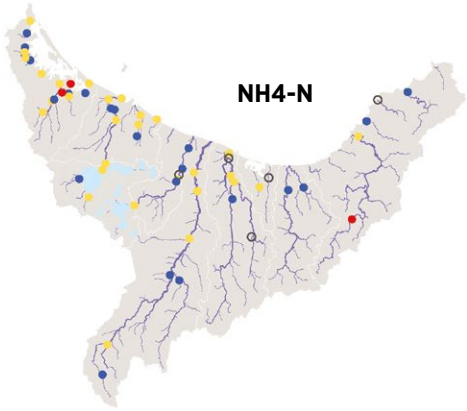


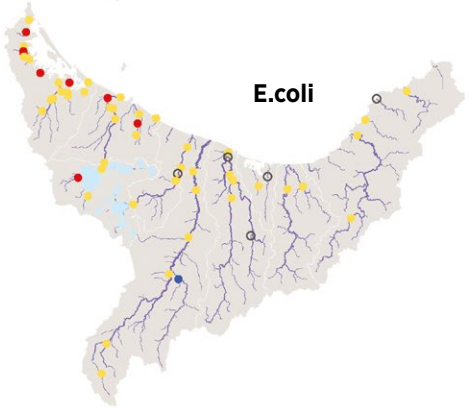












Land use impacts on water quality

Sites with more native forest in the catchment generally had better water clarity and less (better) levels of NNN, TSS and E. coli bacteria.

In catchments with high levels of pastoral, urban or agriculture land-uses, worsening clarity, lower pH, and higher (worse) TN, NNN, NH_4N and E. coli bacteria levels are more common than at monitoring sites in less developed catchments.

Sites with more pasture in their catchments had stronger worsening trends in water clarity, TSS, NNN, DRP and E.coli bacteria.

For more information

For more information, see our full report - River water quality state and trends in the Bay of Plenty to 2018, in the 2020 environmental publications section of our website at **www.boprc.govt.nz/publications**

Further water monitoring information, such as our latest swimming water quality sampling results is available at **www.lawa.org.nz**

BAY OF PLENTY REGIONAL COUNCIL TOI MOANA

GD204473