How we monitor river health

As well as monitoring water levels, flow and rainfall, we use a range of indicators to check and manage water quality and ecosystem health. To do this, we take regular samples from over 270 freshwater sites across the region and use these indicators to assess their health.

Good water quality is not always obvious. Clear water can contain unseen bacteria.

Good water quality is clean water that we can use, swim, and fish from. It keeps rivers and streams healthy so they can support wildlife and thriving harbours downstream.

Our scientists look at

What the stream looks like

Deposited sediment, suspended sediment and turbidity

As erosion occurs, soil can be washed off the land and into waterways. Some of this soil will settle on the bottom (called deposited sediment) and some finer soil particles will remain in the water (called suspended sediment). High levels of deposited or suspended sediment can make water turbid (cloudy), raise water temperatures, smother wild-life in waterways and estuaries, and make it unpleasant for swimming.

Periphyton

This is the mix of algae and fungi that grow on the beds of our rivers, lakes and streams and turn dissolved nutrients into food for freshwater invertebrates. Too much **periphyton** can make the river bed slippery or slimey, and too much can be toxic to dogs and humans. It can also result in low dissolved oxygen.

What is unseen

Nutrients: nitrogen (N) and phosphorus (P)

Excess nutrients (such as **Nitrate (NO_3N), Ammonium (NH_4N)** and **Dissolved Reactive Phosphorus (DRP)**) encourage aquatic weed and algal growth, reducing oxygen levels, which in extreme cases can kill fish. Nutrients come from a range of sources including fertilisers (agricultural sprays), uncontained waste dumping, animal urine and sewerage overflows. These nutrients can drain through soil into groundwater or be flushed off the land into rivers and streams when it rains. Eventually they end up in our lakes and estuaries.

Temperature and dissolved oxygen

Warm water temperatures (usually caused by lack of shading) can reduce dissolved oxygen and exacerbate aquatic weed and algae growth. Fish need cool (<20˚C), well-oxygenated water to survive.

Bacteria

Elevated levels of faecal **bacteria** from animal dung, human wastewater and birds can make water unsafe for people to swim in or gather kai from. This is often used as a measure of 'swimmability'. ***E. coli*** is the bacteria we measure as an indicator of other bacteria that could be present.

Ecosystem Metabolism

Ecosystem metabolism is a way of measuring how carbon is produced (through respiration) and used (through photosynthesis) by aquatic life in a river or stream ecosystem. It gives an indication of how well the freshwater ecosystem is functioning in the ever-changing environment created by humans.

What creatures live in the stream

Freshwater macroinvertebrates

Freshwater macroinvertebrates include worms, snails and insects; both in their immature larval phase, and as adults (e.g., mayflies, caddisflies, beetles) all of which play a significant role in a healthy stream. The more invertebrates there are in a waterway, and the more variety of species, the more likely the stream can support healthy populations of fish and other wildlife. We use three different measures to assess the ecological health of streams.

- The **Macroinvertebrate Community Index (MCI)** is based on the tolerance or sensitivity of species to organic pollution and nutrient enrichment and measures the presence (or absence) of invertebrates. Higher MCI scores indicate better stream conditions at the sampled site.
- The **Quantitative Macroinvertebrate Community Index (QMCI)** is similar to the MCI but uses the abundance of macro-invertebrates to determine stream health. The QMCI is considered more sensitive to subtle changes in water quality and stream health.
- The **Average Score Per Metric (ASPM)** refers to the population of three insects that are typically sensitive to degradation: mayflies, stoneflies and caddis flies. Together, these insects are known as EPT, referring to their scientific names Ephemeroptera, Plecoptera and Trichoptera, respectively. The poorer the stream health, the fewer EPT will be found in a sample. The ASPM combines three metrics, and averages them to indicate stream health. These are the MCI, the richness of EPT and the percent abundance of EPT.

Fish

Fish are a key part of healthy waterways. Many native fish migrate to and from the sea as part of their lifecycle, so their presence in a stream suggests that no significant barriers are preventing their natural upstream migration, their habitat is in reasonable state and they're not overfished. As with invertebrate data, fish monitoring results are simplified into a single metric that describes the overall health of the fish community, based on species that are found at a site in relation to its distance from the sea.

Find out more on the work we are delivering at
www.boprc.govt.nz/freshwater

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