Judges' Report

2015 New Zealand's Most Improved River Awards

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Why nitrogen?

This year's Most Improved River Awards have been made on the basis of improvements in the concentrations of dissolved inorganic nitrogen (DIN) in river water over the last 10 years.

Nitrogen is a nutrient and small increases in concentrations can result in increased growth of river algae and slimes on riverbeds. Besides being unsightly, the algae and slime can smother the habitat of other freshwater organisms and can cause other water quality issues (high pH and reduced oxygen).

There are three different chemical forms of DIN: nitrate (NO_3-N), nitrite (NO_2-N) and ammoniacal nitrogen (NH_4-N). Various chemical and biological processes can transform one type of DIN to another. At high concentrations, all of these forms of nitrogen can potentially have direct toxic effects on sensitive aquatic life, causing reductions in growth and even mortality.

DIN can get into waterways from a variety of sources. Nitrate comes from many sources across the landscape and is often closely associated with intensive agriculture. Nitrate can reach waterways through surface runoff from the land and also through leaching and groundwater. In contrast, ammoniacal nitrogen is typically associated with point-source discharges such as waste water treatment plants.

Control of nitrogen leaching can be challenging, but there is a range of options available including:

- diversion or further treatment of discharges from wastewater treatment plants
- protecting and maintaining natural wetlands which can remove nitrogen
- development of artificial wetlands to remove nitrogen
- careful use of nitrogen/urea fertiliser so it is applied at times where it will have positive effects and result in less leaching
- storage and deferred application of waste water to land when soils and pastures are not saturated and can assimilate the nitrogen
- concentration and subsequent treatment of animal wastes using feed pads and herd homes
- fencing to prevent stock access to waterways
- matching stock numbers and rotation with the soil's capability to assimilate wastes
- land retirement or conversion to forestry to increase nitrogen uptake
- increasing soil organic matter content to promote nitrogen retention in the soil

A reduction of nitrogen in river water over time reflects active management of land, infrastructure and waterways. Any combination of these activities may result in reductions in nitrogen concentrations over time.

The judging process

The dataset from the Land, Air, Water Aotearoa (LAWA) website (www.lawa.org.nz) displays water quality information for over 1,100 freshwater sites throughout New Zealand. This was used to determine the award winners.

We focussed on sites with monthly data collection and excluded any sites that had less than 90% of the expected data over the 10 year period (January 2005- December 2014).

We assessed the significance and strength of trends in the data using a statistical test called the Seasonal Kendall Trend Test.

We considered rivers for an award only if they showed a statistically significant downward trend in DIN concentrations over the last decade. From an initial database of 350 river sites that had sufficient monthly data, 158 of these (48%) showed statistically significant trends. Of these, 80 sites showed decreases in DIN concentrations. For some regions there were no rivers that met the requirements for monthly data collection and showed statistically significant improvements in DIN concentration.

The final check on a site's suitability for inclusion in the award list was made following discussions between the Morgan Foundation, the relevant Regional Council and other stakeholders such as the Landcare Trust and Fish & Game New Zealand. This ensured that changes in land management and restoration initiatives on the river had taken place to an extent that we agreed would have been consistent with the observed improvement in DIN concentrations. As mentioned above, reductions in DIN concentrations may be the result of a range of management initiatives. It was challenging to identify initiatives responsible for observed improvements in some cases, but we have tended towards recognising improvements even if the causes of these improvements are not necessarily clear.

One river showed significant improvement, but further analysis of a longer-term water quality record showed the improvement in DIN was due to the typical pattern of changes in DIN associated with the forest harvest and replanting cycle, rather than an active effort to improve water quality. Therefore, we decided the Mimihau at Venlaw Forest should not be considered for a national Award, but it was appropriate for it to receive the Most Improved Award for the Southland region.

We made our judgements from the results at single monitoring sites. In some of the larger rivers there may have been more than one monitoring site on that river. In the recommended awards we specify the site at which the qualifying measurements were recorded.

The winners

1. Most improved river in a region:
   Ten sites were identified as most improved on a regional basis.

   The river sites, percent improvement per year and the Council jurisdictions they are in, were:

Mangahahuru Stream at Apotu Rd	3.9%	Northland
Lucas Creek	12.7%	Auckland
Nukuhou at Old Quarry	3.4%	Bay of Plenty
Piako River at Paeroa-Tahuna Rd Br	6.8%	Waikato
Mangapapa at Troup Rd	13.6%	Horizons
Mangaehu River at Raupuha Rd Bridge	3.3%	Taranaki
Waipawa River at State Highway 50	4.2%	Hawkes Bay
Ngarara Stream at Field Way	16.2%	Wellington
Kaituna Stream at Recorder	10.0%	Canterbury
Mimihau, Venlaw Forest	14.8%	Southland

2. Grand awards for the most improved rivers nationally:
   Three finalist river sites with the highest rate of improvement for DIN were selected.

First	Ngarara Stream at Field Way	16.2%	Wellington
Second	Mangapapa at Troup Rd	13.6%	Horizons
Third	Lucas Creek	12.7%	Auckland

Recommendations for monitoring

Once again, we emphasise the need for strong monitoring programmes. Recommendations include:

1) Ensure consistent methods are used for sampling and laboratory analyses, so robust water quality trend analyses are possible.
2) Weigh up the potential economic benefits of regularly tendering out laboratory testing of water quality samples with the risk of inconsistent results over time.
3) Establish monthly state of the environment monitoring across all regions (rather than quarterly).
4) Measure river flow at the same time as water samples are collected so the effects of flow changes can be incorporated into future trend analyses.

We strongly support the current initiatives by regional councils and MFE to improve the consistency of freshwater monitoring programmes across New Zealand.