

Shedding light on the movement of farm nutrients

Recently published research carried out in the Horizons Region demonstrates how we can understand links between land use and water quality.

The quality of our waterways is important to everyone from farmers to recreational users. To ensure good decisions can be made around the use of the Region's natural resources, researchers wanted to understand a catchment's characteristics and how land use impacts water quality.

Transport and Potential Attenuation of Nitrogen in Shallow Groundwaters in the Lower Rangitikei Catchment, a joint project between Horizons Regional Council and Massey University, explores how we can explain characteristics of the water by examining the relationship between important environmental and physical factors.

The team of researchers, led by Horizons groundwater scientist Stephen Collins, examined how leached nutrients from farms enter the Rangitikei River via groundwater.

"The leached nutrient we typically talk about in these situations is nitrate, a form of nitrogen that is very soluble in water and can easily seep from the land into groundwater, and then to surface water such as rivers and streams," says Mr Collins.

"The varying degrees of risk come from the river and the type of interaction it has with groundwater, as well as what happens to the nitrate between the land and the river. This is

important as it shows us where in a catchment nutrients are likely to be introduced to surface water and where they are not."

Upstream of Bulls, where this study took place, groundwater is seeping into the river. This shallow groundwater flows south from Marton, following the land's topography.

Mr Collins says we need to know where groundwater flows into rivers because pollutants, such as nitrate, are introduced through these pathways.

"If we understand where nutrients come from and how they change as they move through soils and rocks, it allows regional councils to target interventions to minimise their effects," he says.

In the 832km² study area, 1066 tonnes of nitrogen a year are estimated to leach from the root zone, beneath the grass. This equates to a loss of 13 kilograms of nitrogen per hectare, or 6 milligrams per litre leaching from the surface into the groundwater, every year.

"The study showed that we don't find that amount of nitrogen in groundwater and in the river because of the extent of denitrification below the surface," says Mr Collins.

The team measured denitrification, where nitrates turn into nitrogen gas, through a process known as push-pull testing. This gave

the researchers an estimated denitrification rate of between 0.04 and 1.57 milligrams of nitrogen per litre every hour.

The results show leaching from the root zone is not reflected in the groundwater or surface water concentrations. The researchers quantified the changes in nitrogen as it leaches from the land before it has a chance to seep into the river.

Horizons science and innovation manager Abby Matthews says this research could be the basis of better informing how we can manage land use and improve water quality in the future.

"This research is one part of understanding nitrogen sources to waterways in the area. Information is also gathered on point source contributions from discharges of town wastewater and industry discharges," says Ms Matthews.

"To ensure our natural resources are managed in a sustainable way, there is a need to better understand the link between land and water. We are very happy with the research work Massey and Horizons have completed so far."

This paper can be accessed via the *Journal of Contaminant Hydrology*, volume 206, November 2017 pages 55-66 <http://dx.doi.org/10.1016/j.jconhyd.2017.10.002>



Rangitikei River at Bulls.

Water use in the Horizons Region

Horizons works hard with resource consent applicants to ensure the volumes that are applied for water use are reasonable and justifiable for the activity for which they are sought.

Two thirds of the water allocated to 'consumptive' uses in the Horizons Region is for agricultural activities (approximately 900,000m³/day), with the majority used for irrigating dairy pasture. There are also some large cropping takes.

Reasonable use guidelines are set out in Horizons' One Plan to guide resource consent decision making. However, takes for activities such as irrigation require more information including setup plans, area of land to be irrigated, crop type, and irrigation schedule.

Horizons' approach is that all water abstractions that take at a rate of 5L/s or greater require the installation of a water meter by an IrrigationNZ 'Bluetick' accredited installer, and reporting of water use data back to Horizons via telemetry – a service that is currently provided free of charge by Horizons.

This telemetry data is displayed on a web page specific to the relevant consent number, with options for the last 7 days, 30 days, or

12 months. Some consent holders tell us they use the data to manage resource consent compliance, analysing their irrigation patterns, reconciling water use with electricity cost for pumping, and planning decisions based on past irrigation activity.

The data also allows Horizons to meet its national level requirements to monitor and report water use under the National Regulations on Water Use Measurement and Reporting, automatically monitor users' compliance with their resource consent conditions, and inform allocation decision making.

If you would like to be able to access your telemetered water use data online, please visit WaterMatters on the Horizons website to register for a login. Previously registered consent holders will need to re-register to access their water use and consent information. Allow five working days for your registration to be completed before trying to access your data.

THINGS TO REMEMBER FOR THE IRRIGATION SEASON:

- If you take water from a stream, river, or riparian bore you may have a requirement in your resource consent to reduce/cease abstraction when the river flow reaches a restriction level.
- Should the river be at or below your consented minimum flow restriction level, you must restrict or cease abstraction (according to your consent conditions) for that day.
- You can check river flow information by either logging into our WaterMatters website or by phoning 0508 4 FLOOD (0508 4 35663).

Allocation status of water management zones varies across the Region. If you would like any further information on water availability please contact the water allocation team at Horizons on 0508 800 800.

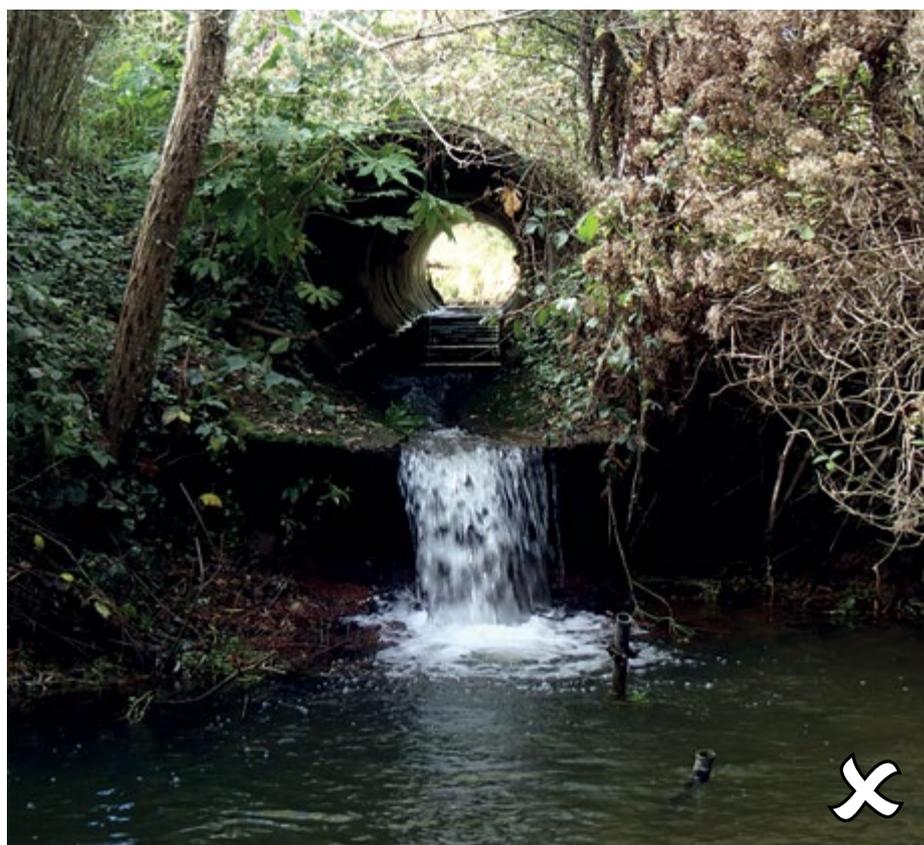


What's in that whitebait fritter?

Did you know that a whitebait fritter can be made up of five native fish species, four of which are just as threatened as the Brown Kiwi?

Whitebait caught in nets are the juveniles moving back upstream, trying to find suitable habitat to live, grow and breed in. Four of the five species that are captured at the coast are ones that can make it to the foothills of the ranges, and three of those species right into the ranges themselves.

The hurdles for whitebait to make it to adulthood range from whitebait nets and predation by fish and birds, to man-made barriers that prevent them moving upstream. Man-made barriers often take the form of poorly installed or maintained culverts that become perched. Some of our native fish have an amazing ability to detect chemical cues emitted by their adult species, attracting them to suitable habitat. If these populations aren't maintained with new recruitment because of a perched culvert, even if it is fixed at a later date, the cues to attract new fish are gone. This causes the fish species to become locally extinct in that catchment and significantly more work is required to go into their restoration.



Horizons has an active programme locating these fish migration barriers, especially in our “high aquatic biodiversity” waterways. Each barrier found is mapped in a database and prioritised on its urgency for fixing. Correct placement of a culvert below the streambed and at the same width reduces the risk of it becoming perched. If you notice a perch developing on your property, contact Horizons' freshwater team for advice and, in some cases, subsidies are available to help you reach a solution.



IN BRIEF

SUMMER BIOLOGICAL MONITORING PROGRAMMES

Shortly the Horizons' science team will be commencing their annual macro-invertebrate monitoring programme. Over the summer months, the freshwater insect and algal communities will be sampled to determine how water quality is tracking at more than 85 sites. Macroinvertebrate data is one of the major measures of

instream biological health, along with year-round monthly algal monitoring that is ongoing at 67 sites. Findings of this work will be published in our 2018 State of the Environment report.

GROUNDWATER INFORMATION DOCUMENTS AVAILABLE ONLINE

In order to allow good decision making around the allocation of groundwater,

Horizons requires robust and comprehensive resource consent applications and assessments of environmental effects (AEEs) from applicants. To help guide applicants through the process, Horizons has recently published a set of useful information documents relating to groundwater take applications. All these documents are available at www.horizons.govt.nz/managing-natural-resources/water/groundwater



The suitability of swim spots and reducing the impact of bacteria

To improve information about the suitability of our waterways for swimming and recreation, we monitor over 80 swim spots across our region from 1 November until 30 April every year.

Last year Horizons' expanded swim spot monitoring programme sampled sites weekly for faecal indicator bacteria including *E. coli* for freshwater and *Enterococci* for coastal waters, as well as cyanobacteria. All sites are graded according to a traffic light system, as recommended by the Ministry of Health, with the results made available on the Land Air Water Aotearoa (LAWA) 'Can I Swim Here?' website module, as well as Horizons' Safe Swim Spot web page.

The rainy 2016/17 summer was reflected in *E. coli* levels placing water quality at some sites in red and orange categories, however 78 percent of river swim spots were swimmable more than 50 percent of the time. Our most frequently swimmable waterways were the Ohau, Pohangina and upper reaches of the Rangitikei River. Our region's beaches are generally the most suitable sites for swimming in terms of pathogen health risk. Last summer, Herbertville and South Beach were swimmable on all sampling occasions.

In order to reduce the impact of faecal

bacteria on swimming suitability Horizons has been prioritising work in areas where *E. coli* levels exceed guideline values. This work includes intensive monitoring surveys, faecal source tracking to determine the source of the bacteria (cows, sheep, birds or human), working with landowners in identified catchments to exclude stock from waterways and plant riparian margins, and working with district councils to install UV treatment on wastewater discharges and/or seek funding for land application of wastewater.

Swim spot monitoring started again in November for the 2017/18 season. We have removed some sites from the programme, such as the Manawatu River at Ashhurst which is no longer accessible, however we have added popular swimming spots like Waihi Falls in the Tararua District and Ototoka Stream at Beach Road in Whanganui.

Monitoring involves taking samples at all sites between Sunday and Tuesday each week, allowing time for sample processing and uploading the results to LAWA for the public to



view in approximately 48 hours.

Like last year, Horizons will be running a summer swim spot campaign to complement our monitoring and work programmes, while helping to inform, educate and engage our communities on when and where they can safely swim. This will include a poll for listeners of Mediaworks and Ski FM radio stations to vote for their local swim spot to receive a spruce up. Last summer Mosquito Point, Whanganui, received 31 percent of the votes and, in conjunction with Whanganui District Council, has since received a new retaining wall, seating areas, a changing room, platform benches and vegetation enhancement.

We will also be running our #swiminourregion competition, giving you a chance to share where you are swimming over summer on social media and be in with a chance to win a \$1,500 water related prize. Last year's winner took her school class on a whitewater rafting adventure down the Rangitikei River!